BiGGAR Economics

Combined Economic Impact of the University of Groningen and UMC Groningen

A report to
University of Groningen and UMCG

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1 EXECUTIVE SUMMARY

BiGGAR Economics was appointed in March 2014 to carry out an economic impact study on the University of Groningen (or RUG as it is locally known) and also the UMC Groningen (UMCG). This work took place alongside a further study by BiGGAR Economics for the NFU on 8 UMCs across the Netherlands.

This report presents the combined results for RUG and UMC Groningen. Separate reports have been prepared for the RUG and UMCG on their own and issued to each of these clients individually.

Economic impact was considered on two levels: through increased Gross Value Added (GVA) in the economy and through the number of jobs supported by the organisation.

Together, RUG and UMCG generate a core economic impact which is worth €1,0 billion (miljard[1]) in GVA in Groningen, €1,3 billion in The Northern Provinces and €2,5 billion GVA across the Netherlands as a whole. It supports 13.500 jobs in the Groningen, 16.300 jobs in The Northern Provinces and 30.000 jobs across the Netherlands. This impact is generated through people employed directly at the two institutions, through their expenditure on supplies, through the money spent by their staff in the local economy and through spending on capital projects on the sites. The figure takes into account the indirect and multiplier effects of all the direct expenditure and employment.

Student expenditure, and student employment is worth a further €357,7 million in GVA to the economy of Groningen, €469,4 million in The Northern Provinces and €784,7 million GVA to the Netherlands as a whole. This supports a further 8,100 jobs in Groningen, 9.600 in The Northern Provinces and 13.200 jobs across the Netherlands.

We have considered six key aspects of commercialisation and knowledge transfer activity supported by RUG and UMCG that can reasonably be quantified in economic terms from the data provided. The aspects of valorisation that we can quantify are: technology licensing, spinouts and start-ups, collaborative research, continued professional development, science park activity and social returns to medical research. These have a combined impact which is worth €191,5 million in GVA and 1.800 fte jobs in Groningen, €245,7 million and 2.100 jobs in The Northern Provinces and €1,1 billion in GVA and 9.100 jobs across the Netherlands.

There is an overall catalytic impact created by RUG and UMCG in terms of stimulating and attracting inward investment across the Netherlands and supporting the development of economic clusters. Both institutions are thought to contribute €201,5 million in GVA and 3.400 jobs across the Netherlands through their catalytic impact.

The tourism impact created by visits to staff and students, attendance at conferences and visits to open days for prospective new students creates an impact of €7,6 million GVA and 160 jobs in Groningen, €8,1 million GVA and 150 jobs in The Northern Provinces and €4,8 million GVA and 80 jobs across the Netherlands.

[1] *Note: Throughout this report €m refers to €million (miljoen) and €b refers to €billion (miljard).*

Finally, we have added in the impact of teaching and learning to recognise the increased earnings over a lifetime that stem from having a degree. This impact is estimated to be worth €274,8 million GVA and 180 jobs in Groningen, €595,5 million GVA and 1.100 jobs in The Northern Provinces and €870,3 million GVA and 4.700 jobs across the Netherlands.

All impacts together suggest that RUG and UMCG generate a total impact of €1,9 billion GVA and 24.200 jobs in Groningen, €2,6 billion and 29.700 jobs in The Northern Provinces and €5,4 billion GVA and 60.400 jobs across the Netherlands.

The employment impact includes a direct impact of 12,579, which means that the employment multiplier in the wider Dutch economy is **4,80**. In terms of GVA impact, the direct GVA of RUG and UMCG combined is €0,9 billion therefore the GVA multiplier in the wider Dutch economy is **5,68.**

2 INTRODUCTION

This report summarises the findings of a study undertaken by BiGGAR Economics Limited into the combined economic impact of the University of Groningen (RUG) and UMC Groningen in the north of the Netherlands.

2.1 Scope of Study

This report sets out the combined economic impact of RUG and UMCG. Separate studies consider the impact of the two institutions individually. Both of these individual studies include the impact generated by the medical faculty. This is because although the medical faculty is part of RUG, it is located within UMCG. For this reason the impact presented in this report is lower than the sum of the impacts presented in the two individual reports.

2.2 Objectives

The objectives of the study were to quantify the economic impact of both institutions in terms of:

- their core impact on income and employment;
- their student-related impact from students spending and working in the area;
- the commercialisation and valorisation/ knowledge transfer activity created by and arising from both organisations;
- the tourism impact created by activity at these centres; and
- the lifetime productivity gains from education delivered by RUG and UMCG.

2.3 Methodology

The concept of assessing the impact of universities is one that has been in wide usage for at least 20 years. A large number of individual universities, particularly in the UK and the US, have undertaken economic impact studies over the last 20 years, and particularly over the last 5 years.

Although the methodologies used for these studies often differ, the starting point for most studies (including this one) is the core operations of the institution. This typically includes the value added to the economy and direct employment supported as well as the wider impact of the institutions expenditure.

This type of approach is comparable in many ways to the input-output approach often used in national accounting. The main weakness of this type of approach is that it only provides a static snap-shot of the impact of activity that is directly generated by the institution being considered. This means that it does not capture the wider impact of activity that occurs because of the university (such as student spending) or the wider role that universities often play as drivers of economic growth.

To address the first of these issues many studies go beyond the traditional input-output approach by considering the impact of the expenditure of students within the host economy and in some cases the contribution that universities make to the local tourism economy. While such studies provide a more robust picture of

the impact of a university, they do not capture the (often substantial) impact that universities can play in shaping the economic environment in which they operate.

The methodology used in this study attempts to address this by looking at the full spectrum of activity undertaken by RUG. This includes for example the impact of the University's valorisation activity and the role that it plays in supporting the development of important sectors in the Northern Netherlands. This means that the impacts presented in this study are likely to be higher than those that would be obtained using a more traditional input-output approach. For this reason, direct comparisons between the results of this report and other economic impact analysis may be misleading.

2.3.1 Other Similar Research

BiGGAR Economics has used a similar approach to that used in this study to estimate the economic impact of several higher education institutions in the UK and elsewhere in Europe. Most relevant to this study is the work that BiGGAR Economics undertook on behalf of Leiden University and the Leiden University Medical Centre (LUMC). This work began in 2011 with a study that considered the economic impact of the research activity undertaken by the two institutions. This study was updated in 2012 and expanded to incorporate the teaching and other activities undertaken by the two institutions.

BiGGAR Economics has also used a similar approach to estimate the economic impact of several higher education institutions in the UK and Ireland. Of particular relevance to this study is work undertaken for the University of Surrey and the Royal Surrey County Hospital in 2013, which considered the individual and combined impact of the two institutions. Some other examples of similar studies undertaken by BiGGAR Economics and others include:

- the University of Edinburgh (BiGGAR Economics, 2008, updated in 2012)
- the University of St Andrews (BiGGAR Economics, 2010, updated 2012)
- 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); and
- the University of Notre Dame, Indiana (September 2013, Appleseed).

Universities Scotland[2] has also published economic impact work of the Scottish universities sector, using the same methodology. This has influenced Scottish Government decisions on its approach to tuition fees (which are funded from taxation revenues for Scottish and EU students, a departure from UK policy) and on identifying the universities sector as one of seven priority sectors in the Government Economic Strategy. Universities UK, the umbrella organisation for universities across the UK has also used a similar approach to demonstrate the impact of the higher education sector's contribution to the UK economy[3].

[2] Universities Scotland (2013), Grow Export Attract Support: Universities' contribution to Scotland's economic growth (available at http://www.universities-scotland.ac.uk)
[3] Viewforth Consulting Ltd (April 2014), the Impact of Universities on the UK Economy (available at http://www.universitiesuk.ac.uk/highereducation)

The approach used for the economic impact of universities and research institutes is also consistent with Guidance issued by several governments and public sector organisations. For example, the methodology for the UMCs economic impact is consistent with the principles set out in European Commission Guidance[4] on major projects, which highlights the importance of assessing the fullest range of potential economic effects possible.

2.4 Report Structure

This report is structured as follows:

- section three provides some background information about RUG and UMCG the economic context in which they operate;
- section four presents the economic impacts arising from RUG and UMCG's core activity including those associated with direct income and employment, the purchase of bought in goods and services; expenditure of employees and capital spending;
- section five describes the impacts associated with students whilst studying and spending in the local economy and working part-time in local businesses;
- section six describes the valorisation impact associated with RUG and UMCG and its employees using their knowledge to benefit other organisations, including the impacts from technology licensing, spin-outs and start-up companies, collaborative research, continuing professional development, science park activity and social returns to medical research all of which occur as a result of RUG and UMCG's presence;
- section seven describes the catalytic impact of RUG and UMCG in attracting, retaining and growing indigenous companies and supporting the development of economic clusters.;
- section eight assesses RUG and UMCG's impact on tourism from visits to students and staff, visits to UMCG patients, expenditure at conferences and attendance at open days hosted on both sites;
- section nine discusses the economic impact arising from the role of higher education in increasing productivity during the working life of graduates; and
- section ten summarises RUG and UMCG's total economic impact.

Appendix A provides a guide to abbreviations and terms commonly used throughout the report and Appendix B contains a statement on the methodology used to calculate the economic impact.

2.5 Baseline Year, Measures and Geography

The economic impacts described in this report are for 2012, which is the latest year for which published data on income, staff and students was available at the time of writing, in early 2014.

[4] 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)

Economic impact has been reported using two measures:

- Gross Value Added (GVA) - which is the measure of the value that an organisation, company or industry adds to the economy through their operations. The report used the production approach to measuring this impact, where the GVA is equal to the value of production less the value of the inputs used. Typically this is calculated by subtracting the non-labour costs of the organisation from the organisation's total revenue.
- employment (jobs) measured in full time equivalent (fte) jobs supported.

All of these impacts are assessed on three geographic levels:

- Groningen;
- The Northern Provinces; and
- the Netherlands as a whole.

2.6 Key Economic Assumptions

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

- turnover to GVA ratio – this is used to estimate the GVA impact of spend in an area. It is obtained from data published by Statistics Netherlands for GDP, production and expenditure, output and income for 2012;
- turnover per employee – this is used to estimate the employment impact of spend in an area and is taken from the same source; and
- GVA and employment multipliers – these are used to estimate the supplier and income impact created by businesses that directly benefit from additional spend in an area. This is obtained from the Input Output Tables, 2008 that are published by Statistics Netherlands. Adjustments for the other study areas have been based on assumptions made by BiGGAR Economics in previous work.

The starting point for calculating the direct impact of RUG and UMCG is the additional turnover generated or people employed by Netherlands-based companies as a result of the centre's activities. This turnover is converted into GVA by applying GVA/turnover ratios for relevant sectors. The employment supported by this turnover is estimated by multiplying the number of employees by an estimate of GVA per employee in relevant sectors.

The indirect impacts considered in this report include the effect of purchases made elsewhere in the supply chain by businesses and their employees. These impacts are calculated by applying an appropriate GVA and employment multiplier to the direct impact. This captures the impact of subsequent spending rounds as income is re-spent elsewhere in the economy. A more detailed economic method statement is contained in Appendix B.

3 CONTEXT

This chapter provides some background information about RUG and UMCG and the economic context within which they operate.

3.1.1 University of Groningen

The highly regarded University of Groningen is placed in or around the top 100 Universities globally on all key influential university ranking lists. These include the Academic Rankings of World Universities, the Times Higher Education Supplement, the QS World University Rankings and the National Taiwan University Rankings. The institution celebrates its 400th anniversary in 2014.

The German Centre for Higher Education puts the University of Groningen as a member of the Excellence Group of best universities in Europe in five out of seven investigated disciplines, namely biology, physics, psychology and economics.

Further evidence of the University's reputation is found in the Global Employability Survey, where the University of Groningen was ranked in 81st position in terms of the employability of its alumni.

It is also an attractive place to work. A survey of life science academics carried out by The Scientist magazine in 2012 placed the University of Groningen in 3rd place in Europe and 24th place in the world in terms of places to work. Particular strengths of the university that were reported by the academic staff were role tenure, promotion and job satisfaction.

The University collaborates with a number of renowned foreign universities, including Uppsala in Sweden, Göttingen in Germany and Ghent in Belgium and is committed to actively collaborating with their social partners, focusing specifically on the research themes of Healthy Ageing, Energy and Sustainable Society. With these themes the University is looking to bridge the gap between science and society with researchers at the University cooperating on a large scale with partners in business, public organisations and the government, within and outside the region.

The research priorities are also focused on the future covering the challenges and opportunities of a sustainable society in the areas of health, the environment, technological developments and energy.

There are ten Faculties within the university covering Economics and Business, Behavioural and Social Sciences, Theology and Religious Studies, Arts, Medical Sciences, Law, Spatial Sciences, Philosophy, Mathematical and Natural Sciences and the University College Groningen.

3.1.2 UMCG

The University Medical Centre Groningen (UMCG) is the main hospital of the city of Groningen. It was established in 2005 as a merger between the University of Groningen and the Academic Hospital Groningen. At present it is one of the largest hospitals in the Netherlands and is one of the largest employers in the Northern Netherlands[5].

[5] Source: UMCG website.

The medical centre is a referral centre for the northern part of the Netherlands and is also a specialist centre for transplant surgery. The stated key priorities of UMCG are:

- acute care;
- children;
- chronic patients;
- oncology;
- psychiatry;
- the elderly; and
- transplants.

Research and education at the UMCG are funded through the University of Groningen, and the Faculty of Medical Sciences functions as an integral part of the University. The Dean of the Faculty of Medicine is appointed by the Board of the University and is a member of the Board of Directors of the UMCG. More than 3,400 students of the University of Groningen study Medicine, Dentistry or Human Movement Sciences, while more than 340 physicians are doing their specialty training at the state of the art facilities of the UMCG.

UMCG and the University of Groningen, in partnership with the universities of applied sciences, governmental bodies, and the commercial sector of the three northern provinces of the Netherlands, have established a knowledge cluster around the topic of Healthy Ageing: the Healthy Ageing Network Northern Netherlands (HANNN). The HANNN aspires to become a leading body in northern Europe in the area of healthy ageing.

At the European level, UMCG has collaborative ties with the Max Planck Institute in Cologne, the Institute for Ageing and Health in Newcastle, and the University College London. They have also established an alliance with the Mayo Clinic in Rochester, Minnesota (USA) for fundamental and clinical research on ageing.

Beyond the field of Healthy Ageing, UMCG has a joint graduate school with the Ruprecht-Karls University in Heidelberg/Mannheim, Germany. This collaboration relates to PhD projects on the themes of cardiovascular disease, auto-immune disease, kidney disease, cancer and transplant medicine. UMCG also takes part in collaborative research and PhD programmes with universities in Italy, China and the USA.

3.2 Economic Context

RUG and UMCG are both located in Groningen, one of four large cities in the Northern Netherlands. Although more than two-thirds of the 1.7 million inhabitants of the Northern Netherlands live and work in the urban areas, overall population density is relatively low by Dutch standards. The demographic profile of the Northern Netherlands is also distinctive within, characterised by almost non-existent population growth and a rapidly ageing population.

A report published by the Organisation for Cooperation and Development in 2013[6] found that the concentration of economic activity around urban areas in the Netherlands has resulted in outward migration from the northern provinces in particular. The report suggests that that this has undermined the provincial skills base, resulting in higher unemployment levels and a lower level of skills.

This has important consequences for the economy of the northern Netherlands, which can be illustrated through the following statistics[7]:

- gross regional product per capita in the Northern Netherlands is around 80% of the national average and grew more slowly than elsewhere in the Netherlands between 2000 and 2009;
- educational attainment in the Northern Netherlands is lower than the national average: the share of high-qualified employment is 27% compared to 33% for the Netherlands as a whole;
- in 2011, unemployment in the Northern Netherlands was higher than the national average (6.2% versus 5.4%), although the gap has narrowed since 2000;
- although 10.5% of the Dutch population live in the Northern Netherlands, the area accounts for just 8% of the total Dutch economy; and
- private investment in research and development (R&D) is lower in the Northern Netherlands than it is elsewhere in the Netherlands. In 2010 25% of companies in the Northern Netherlands were considered "innovative" (i.e. had conducted product or process innovation in the past three years). Across the Netherlands as a whole this proportion was 31%.

Despite all this, the Northern Netherlands does have real strength in several important areas. There are five clusters in particular that are expected to play an important role in driving economic growth in the coming years. These are:

- **Healthy Ageing** - the broad Northern Netherlands healthcare sector consists of 6,000 companies with 100,000 jobs generates around €5 billion turnover/year. The sector is characterised by an integrated approach to growing old healthily and the involvement of the entire healthcare chain: prevention, healthcare providers, researchers, insurers, professional organisations and companies. Innovative SMEs, national and multinational companies are active the region.
- **Energy** - the Northern Netherlands has a leading role in the field of renewable energy and climate policy. This is due to the concentration of the gas industry and a growing position in electricity generation. With more than 400 companies, 30,000 direct jobs and an added value of around € 1.5 billion the energy sector is strongly represented in the Northern Netherlands.
- **Sensor technology (high tech)** - Northern Netherlands is building an international position in the development of sensor technology. Approximately 175 sensor technology companies employing some 2,000 people are located in the Northern Netherlands but sensor technology is strategically important

[6] OECD (2013), Demographic Change in the Netherlands: strategies for resilient labour markets.
[7] Samenwerkingsverband Noord-Nederland (SNN) http://www.snn.eu/en/facts-figures/ website accessed in June 2014.

for a much larger number of companies. It is estimated that the sector generates added value of around € 100 million per year;

- **Water technology** - around 150 companies are believed to be active in the water technology sector in the Northern Netherlands and it is estimated that these companies provide about 1,000 jobs and generate around €150 million in added value; and
- **Agribusiness** - the agricultural sector is strongly represented in the Northern Netherlands accounting for around 6,000 companies, 15,000 jobs and an added value of approximately €1.3 billion.

4 CORE IMPACT

The core impact covered in this chapter includes:

- the direct effect (income and employment);
- the supplier effect (impact from expenditure on supplies and services and jobs supported by this spend);
- the income effect (impact from employees spending wages and salaries in the economy); and
- the capital spending effect.

4.1 Direct Effect

The direct impact of any organisation is the value it adds to the economy and the number of jobs it supports in a given time frame. The value an organisation adds to the economy is measured using gross value added (GVA), which can be estimated in this context by adding together an organisation's operating profit and staff costs.

The GVA and employment directly supported by RUG and UMCG is shown in Tables 4.1 and 4.2.

Table 4.1: RUG & UMCG: Direct Effect – GVA

	Total (€ million)
Total Income	1.361,9
Less Expenditure on Supplies	406,4
Direct GVA	955,5

Source: RUG & UMCG

Table 4.2: RUG & UMCG: Direct Effect – Employees

	Total
Employees (headcount)	16.148
Employees (FTEs)	12.579

Source: RUG

RUG and UMCG jointly support 12.579 full-time equivalent (fte) jobs and provides an output of €955,5 million in GVA in the economy. The further effects arising from this employment and level of output are estimated in the next section.

4.2 Supplier Effect

The supplier effect is the impact occurring from buying in goods and services since these purchases generate GVA and support employment in businesses that supply RUG and UMCG. The assumptions used to calculate the supplier effect are shown in Table 4.3.

Table 4.3: RUG & UMCG: Supplier Effect - Assumptions

Expenditure on goods and services	Total
Total	€406,4 million
Location of Suppliers	
Groningen	12%
The Northern Provinces	34%
Netherlands	95%
Outside Netherlands	5%

Source: RUG, UMCG and BiGGAR Economics Assumptions

A further round of GVA and employment is supported indirectly by the businesses that supply the initial suppliers of goods and services to RUG and this is calculated using multipliers for all industries as a whole. It is assumed that a large proportion of this further round of spending comes from outside the province of Groningen therefore the indirect effect is much larger at the national level.

The total supplier effect for RUG and UMCG is shown in Table 4.4. This is worth €27,0 m GVA and 326 fte jobs to the Groningen economy and €113,8 m GVA and 1.314 fte jobs across the Northern Provinces. The impact is much larger at the national level where, due to the nature of RUG and UMCG's supplier network, this impact is worth €577,9 m in GVA and supports 6.370 jobs.

Table 4.4: RUG & UMCG's: Supplier Effect - Impact

TOTAL	GVA (€m)	Employees (fte)
Groningen	27,0	326
The Northern Provinces	133,8	1.314
Netherlands	577,9	6.370

Source: BiGGAR Economics Analysis

4.3 Staff Spending

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

This effect can be estimated by assessing the amount of wages spent in each of the study areas, based on the number of employees and where they live. The key assumptions used in calculating this impact are shown in Table 4.5.

Table 4.5 – RUG & UMCG: Staff Spending - Assumptions

Staff Numbers	
Number of FTEs	12.579
Staff Costs (€m)	876,0
Salaries as % of staff costs	81%
Staff Location	
Groningen	59%
The Northern Provinces	15%
Netherlands	26%
Location of Spending	
Groningen	12%
The Northern Provinces	34%
Netherlands	95%

Source: RUG, UMCG and BiGGAR Economics Assumptions

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

The resulting employment impacts are calculated by dividing the GVA impact by an estimate of the average GVA/employee and finally multipliers are applied to capture the indirect effects of subsequent spending rounds.

This results in a staff spending impact of €45,2 million in GVA and 558 fte jobs in Groningen, €181,7 million and 2.207 fte jobs in the Northern Provinces and €876,2 m in GVA and 10.442 jobs across the Netherlands as a whole. This is summarised in Table 4.6.

Table 4.6: RUG & UMCG: Staff Spending - Impact

TOTAL	GVA (€m)	Employees (fte)
Groningen	45,2	558
The Northern Provinces	181,7	2.207
Netherlands	876,2	10.442

Source: BiGGAR Economics Analysis

4.4 Capital Impact

In 2012, RUG and UMCG spent €36,8 million on capital projects. Although the nature of the capital projects varies from year to year, this figure is broadly typical of average annual expenditure and as such can be used to calculate an annual impact.

Capital spending provides an important income stream for the Dutch construction sector and it is possible to convert this expenditure into GVA by applying a turnover to GVA ratio for the construction sector. The employment impact of this expenditure is estimated by dividing the GVA impact by an estimate of average GVA per employee in the construction sector.

The indirect impacts of this expenditure can then be calculated by applying GVA and employment multipliers for the construction sector. In this way it can be estimated that the total impact of construction expenditure by RUG and UMCG amounts to €49,5 million in GVA in the Netherlands as a whole, of which approximately €11,9 million occurs in the Northern Provinces. This results in an overall employment impact of 606 jobs across the Netherlands, of which 163 are supported in the Northern Provinces. The impact of capital spending in Groningen itself is relatively small at €2,0 m in GVA and 31 fte jobs.

The assumptions used in calculating this impact are summarised in Table 4.7 and the impacts are summarised in Table 4.8.

Table 4.7 – RUG & UMCG: Capital Spending - Assumptions

Capital Spending	
Annual Capital Expenditure, 2012 (€m)	36,8
Location of Spending	
Groningen	12%
The Northern Provinces	80%
Netherlands	95%
Outside Netherlands	5%

Source: RUG, UMCG and BiGGAR Economics Assumptions

Table 4.8: RUG & UMCG: Capital Spending - Impact

TOTAL	GVA (€m)	Employees (fte)
Groningen	2,0	31
The Northern Provinces	11,9	163
Netherlands	49,5	606

Source: BiGGAR Economics Analysis

4.5 Summary of Core Impacts

The impact associated with the core activity of receiving income, supporting employment, spending on goods and services and capital projects results in an estimated impact of €1.029.8 million in GVA and 13.494 fte jobs in Groningen, €1.262,9 million in GVA and 16.263 fte jobs in the Northern Provinces and €2.459,1 million in GVA and 29.997 fte jobs in the Netherlands as a whole. These figures include the multiplier effects of the core activity.

The core impacts are summarised in Table 4.9.

Table 4.9: RUG & UMCG: Core Impact - Summary

	GVA (€m)	Employees (fte jobs)
Groningen		
Direct Impact	955,5	12.579
Supplier Impact	27,0	326
Staff Spending Impact	45,2	558
Capital Spend Impact	2,0	31
Total Core Impact	1.029,8	13.494
The Northern Provinces		
Direct Impact	955,5	12.579
Supplier Impact	113,8	1.314
Staff Spending Impact	181,7	2.207
Capital Spend Impact	11,9	163
Total Core Impact	1.262,9	16.263
Netherlands		
Direct Impact	955,5	12.579
Supplier Impact	577,9	6.370
Staff Spending Impact	876,2	10.442
Capital Spend Impact	49,5	606
Total Core Impact	2.459,1	29.997

Source: BiGGAR Economics Analysis

5 STUDENT IMPACT

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

- student spending; and
- the impact arising from students working part-time.

5.1 Student Spending

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

The starting point is to consider the number of students at RUG and UMCG per year and to apply an average expenditure profile to this total based on information about student living costs that was previously provided by Leiden University[8]. This estimates that, on average, students will require €11.700 per year to cover housing, living and social costs while studying. It should be noted that this represents the basic minimum income that all students will require in order to complete their course; however, some students will have a higher income than this as a result of part-time work or support from family. For this reason, the impact of student spending calculated below is likely to be conservative.

We assume 92% students live in the province of Groningen during term-time and that 17% live there outside term-time. The key assumptions used in making these calculations are shown in Table 5.1.

[8] *Economic Impact of Leiden University and LUMC*, 2012, BiGGAR Economics, August 2012

Table 5.1: RUG & UMCG: Student Spending - Assumptions

	Value
Total number of students	31.692
Annual Student Expenditure Profile	
Rent	5.100
Living Costs	2.400
Transport	780
Health & Liability Insurance	960
Books/ Study materials	660
Social Activities	1.800
Total	€11.700
Term-time Residence	
Groningen	92%
The Northern Provinces	97%
Netherlands	100%
Student Origins	
Groningen	17%
The Northern Provinces	37%
Netherlands	88%
Outside Netherlands	12%

Source: RUG & UMCG

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

A further round of GVA and employment is then supported indirectly through this level of spending (the indirect effect) and this is estimated by applying sector-specific multipliers to the direct impact. A larger proportion of the second level of spending is expected to impact on the Netherlands more widely to reflect the fact that students often return to their home address outside term-time. Finally, these figures are added together to estimate the total impact of student spending. The results are shown in Table 5.2.

Table 5.2: RUG & UMCG: Student Spending - Impact

Total	GVA (€m)	Employees (fte jobs)
Groningen	277,0	2.810
Northern Provinces	321,1	3.278
Netherlands	453,9	4.712

Source: BiGGAR Economics Analysis

This results in a student spending impact of €277,0 million and 2.810 FTEs in Groningen, €321,1 million and 3.278 across the Northern Provinces and €453,9 million and 4.712 FTEs in the Netherlands as a whole.

5.2 Part-time Work

Students working part-time can make an important contribution to the local labour market and therefore enable businesses and organisations to increase economic activity as they are able to fulfil their labour needs. It is assumed that 75% of students work to supplement their income and that 10% of these jobs are with the UMCG. The economic activity supported by this 10% has been captured in the direct impact analysis in the previous chapter, therefore these jobs have been excluded from this section of the analysis to avoid double counting.

Consultations regarding the labour market conditions in Groningen in the sectors in which students usually undertake part-time work suggest 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, it is assumed that 70% of student part-time employment is additional.

The analysis of the impact of part-time work is based on the number of students living in each area as it is assumed that students take up part-time jobs in the area in which they live. International students have not been considered in this analysis due to the restricted hours that they are able to work. The key assumptions used in calculating the impact of student part-time work are shown in Table 5.3.

Table 5.3: RUG & UMCG: Student Part-time Working - Assumptions

	Value
Number of Students	31.692
Percentage of students who undertake part-time work (excluding international students)	75%
Percentage of students who undertake part-time work with RUG	0%
Additionality of part-time work	70%
Proportion of GVA as staff costs	80%
Average hours worked per week	14,2
Number of hours worked per week in FTE equivalent job	35

Source: RUG, UMCG and BiGGAR Economics

The value of the additional economic activity (GVA) supported by student employment is estimated by applying national ratios of GVA/ employee for the sectors in which students typically work. A further round of GVA and employment is then supported indirectly through this level of spending (the indirect effect) and this is estimated by applying sector-specific multipliers to the direct impact. The proportion of the direct GVA that are paid as staff costs were then subtracted from this to avoid any overlap with the student spending impact.

This results in a total impact from student employment of €80,7 million and 5.338 ftes in Groningen, €148,3 million and 6.315 across all of the Northern Provinces and €330,8 million and 8.482 ftes across the Netherlands as a whole (Table 5.4).

Table 5.4: RUG & UMCG: Student Part-time Working - Impact

Total	GVA (€m)	Employees (fte jobs)
Groningen	80,7	5.338
Northern Provinces	148,3	6.315
Netherlands	330,8	8.482

Source: BiGGAR Economics Analysis

5.3 Summary of Student Impacts

The impact associated with student spending and student employment is estimated at €357,7 million in GVA and 8.148 fte jobs in Groningen, €469,4 million in GVA and 9.593 ftes in The Northern Provinces, and €784,7 billion in GVA and 13.194 ftes in the Netherlands (Table 5.5).

Table 5.5: RUG & UMCG: Student Impact - Summary

Groningen	GVA (€m)	Employees (fte jobs)
Student Spending Impact	277,0	2.810
Student Working Impact	80,7	5.338
Total Student Impact	357,7	8.148
The Northern Provinces		
Student Spending Impact	321,1	3.278
Student Working Impact	148,3	6.315
Total Student Impact	469,4	8.482
Netherlands		
Student Spending Impact	453,9	4.712
Student Working Impact	330,8	8.482
Total Student Impact	784,7	13.194

Source: BiGGAR Economics Analysis

6 VALORISATION IMPACT

This section considers the impact occurring in the economy due to RUG & UMCG's combined valorisation activity. This relates to the concept of capitalising on the research, technology and skills within the work of both institutions and transferring the benefits more widely through the creation of new businesses and opportunities outside the organisation. Specifically, we have considered the impact of six key aspects of valorisation that can reasonably be quantified:

- technology licensing;
- start-up and spin-out companies;
- collaborative research;
- continuing professional development;
- social impact of staff time; and
- social returns to medical research.

6.1 Licensing

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

The amount of royalties paid depends on the details of the licensing agreement and this can vary considerably from company to company. In order to agree a licensing deal, negotiators must first form a view of how much the IP is worth to the prospective licensee. There are a wide variety of variables that may inform this judgement including potential risks to the company, the technology's stage of development, any capital investment that might be required and market conditions.

The World Intellectual Property Organisation[9], sets out the "well known and widely quoted 25% rule" according to which the licensor should receive around one quarter to one third of the profits accruing to the licensee. This rule has been used by IP negotiators for at least 40 years.

In 2012, RUG and UMCG earned €7,1 million in royalty income from licence agreements for technologies. Of these, it is assumed that only 8% of licence holders are based in Groningen, 40% are based elsewhere in the Netherlands and the remaining majority of 52% are licensed to companies located elsewhere in the world, therefore the overall benefit to the Netherlands is relatively small.

A significant proportion of the royalties income earned by RUG and UMCG in 2012/13 was derived from a patent for a type of inhaler. A case study of this technology is provided in Figure 6-1.

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

Figure 6-1 – Successful valorization – user friendly asthma inhalers

The Novolizer is user friendly type of inhaler designed for asthma and Chronic Obstructive Pulmonary Disease (COPD) sufferers. The technology was developed by academics in the Pharmaceutical Technology and Biopharmacy research group, who filed a patent application for the technology in 2001. Rights to the patent were subsequently transferred to a Swedish company called MEDA, which in turn transferred some of the rights to a Spanish company called Almirall.

Over the past decade the technology has been successfully introduced to the global market and by 2014 thousands of patients around the world were using it. The University of Groningen receives royalties based on the turnover that Almirall generates from selling the inhaler. These royalties now make up the majority of licence fees that the University receives each year.

Part of these royalties have been used to support continued research of the academic groups responsible for the initial invention. This has resulted in the development of a new disposable inhaler known as the Twincer. A patent application for the Twincer was filed in 2003 and is expected to result in a substantial additional income flow in the future.

Source: University of Groningen (September 2013), The Value of Knowledge.

The next step is to convert this turnover into GVA by dividing it by a turnover to GVA ratio for the sectors in which licence agreements are made. The employment impact is then calculated by dividing the GVA impact by an estimate of the average GVA added by each employee in these sectors. The effect of subsequent spending rounds is captured by applying GVA and employment multipliers.

In this way it can be estimated that the licensing activity of RUG and UMCG contributes €88,6 million GVA to the economy of the Netherlands and supports 982 jobs. This impact and the assumptions used to calculate it are summarised in Tables 6.1 and 6.2.

Table 6.1: RUG & UMCG: Licensing Impact - Assumptions

	Value
Licensing Income	€7,1 m
Royalties as % of additional turnover generated	5%
Companies located in Groningen	8%
Companies located in the Northern Provinces	8%
Companies located in Netherlands	32%
Companies located outside Netherlands	52%

Source: Consultation with RUG

Table 6.2: RUG & UMCG: Licensing - Impact

	GVA (€m)	Employees (fte)
Groningen	7,1	92
The Northern Provinces	18,0	221
Netherlands	88,6	982

Source: BiGGAR Economics Analysis

6.2 Start-ups and Spin-outs

RUG & UMCG contribute to the economy through the creation of start-up and spinout companies. In 2014 there were around 128 active spinout companies from RUG and UCMG operating in and around Groningen and many more that are no longer active.

It would however be wrong to regard inactive companies as failures as in many cases they have left a legacy of discovery and innovation that continues to benefit the Dutch economy even after the original company has ceased operations. For example, one spinout company that is no longer active was a biomaterials design company that once employed 50-60 people. Since ceasing operations three or four further companies have spun out of the remnants of this company illustrating how even "failed" spinouts can still generate positive economic impacts.

Many of the start-up and spin-out companies associated with RUG and UCMG are relatively young companies employing just a few people but the list also includes more established companies that generate a substantial impact for the local economy. An example of the latter is Syncom, a contract research organisation founded in 1987. A description of Syncom is provided in Figure 6-2.

Figure 6-2 – Syncom

Syncom was founded in 1987 by a professor from RUG with the aim of providing molecules and synthetic compounds to the pharmaceutical industry. The international academic reputation of the company's founder helped the company to become quickly established in the market. The company was also able to rent laboratory space from the university and build on existing relationships with other academics.

Major success for the company came in 1996 when an employee (now CEO) developed a new method of separating stereoisomers that enabled projects that would previously have taken months to complete to be undertaken within a day. This idea helped to propel Syncom onto the global market place.

Following this development Syncom was able to grow rapidly: establishing partnerships with major pharmaceutical companies such as Pfizer and expanding to employ around 40 people. Since 2000 the company has continued to grow as the market for contract research has continued to expand. By 2006 Syncom was one of the fastest growing companies in the Netherlands and by 2014 it was estimated that Syncom employed between 300 and 400 people.

Source: Signed by Syncom (25 year anniversary publication)

The GVA economic impact to the study areas is found by converting the estimated turnover of each company into GVA by applying industry ratios. The employment impact is found by then applying the relevant GVA/employment ratios. The indirect impact is calculated by applying sector-specific multipliers to these base figures. The contribution of start-ups and spinouts is therefore estimated at €74,2 million GVA and 1.237 fte jobs in Groningen, €55,6 million in GVA and 919 ftes in The Northern Provinces and €190,5 million and 3.034 ftes in the Netherlands.

Table 6.3: RUG & UMCG: Start-ups and Spin-outs - Assumptions

	Value
Number of Start-ups/ Spin-outs	111
Number of employees (fte)	999

Source: RUG and BiGGAR Economics Assumptions

Table 6.4: RUG & UMCG: Start-ups and Spin-outs - Impact

	GVA (€m)	Employees (fte)
Groningen	74,2	1.237
The Northern Provinces	55,6	919
Netherlands	190,5	3.034

Source: BiGGAR Economics Analysis

6.3 Collaborative and Contract Research

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

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

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

Recognition of the importance of collaborative research amongst economists can be traced back to the seminal work of Nobel Prize winning economist Robert Solow[10] in 1956. In this work, Solow demonstrated that 87,5% of the increase in US labour productivity between 1909 and 1949 could not be explained by increases in factor inputs of labour and capital. Solow attributed this residual to technological change.

This led to various attempts by researchers to model the so-called 'Solow residual' using measures such as R&D spending and patenting. Most of these studies found that R&D spending makes a significant contribution to productivity growth, with a 1% increase in the R&D capital stock typically leading to a rise in output of between 0,05% and 0,1%[11].

[10] Solow, R. (1957), *Technical Change and the Aggregate Production Function*, Review of Economics and Statistics, pp. 312-20.
[11] Cameron G (1994), R&D Productivity and the Case for a UK R&D Tax Credit, Nuffield College, Oxford.

In most European countries, business R&D typically represents between 1% and 2% of total GDP. The Netherlands is no exception to this and data from the Centraal Bureau voor de Statistiek (CBS) can be used to estimate that in 2009, business R&D in the Netherlands represented approximately 1,8% of GDP.

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

Different bodies commission collaborative research and contract research. Contract research will involve research that is funded by industry and collaborative research will be funded by a mixture of public bodies,, other research organisations and private companies. The returns to research in the contract research in this instance are calculated for the private sector partners. Therefore the process for calculating the economic impact of contract research with industry and the income from private partners involved with collaborative research is the same.

A good example of UCMG's approach to industrial collaboration is the Northern Drug Targeting and Delivery Cluster that was established in 2009. The Cluster is a joint initiative between the UCMG, the University of Groningen and nine other life science organisations around the region. It is designed to work in an open innovation model similar to that used at the Philips High Tech Campus in Eindhoven, where high-tech R&D companies and researchers operating in related fields share their knowledge and experience leading to more successful development and market introduction of products and technology.

6.3.1 Approach to Working With Industry

As the previous sections have illustrated, licencing and spinouts can and do generate substantial economic returns; however, negotiating licence agreements and establishing successful spinout companies is extremely challenging and the returns are generally very uncertain. In recognition of this RUG and UCMG are increasingly focusing on industrial collaboration as an alternative route to knowledge transfer.

This approach involves working directly with companies to develop solutions to actual issues and existing problems. It can be contrasted with more traditional "technology push" approaches to commercialisation that aim to encourage industry uptake of new technologies that have already been developed. This approach has enabled RUG to develop successful partnerships with several major international corporations including Philips, Tata Steel and Royal DSM.

In recent years RUG has been particularly successful in establishing partnerships with industry through the Carbohydrate Competence Centre (CCC), a description of which is provided in Figure 6-3.

Figure 6-3 – Collaborating with industry – the Carbohydrate Competence Centre (CCC)

The CCC was established in 2007 to generate and develop high-quality knowledge in the field of carbohydrates with the aim of stimulating innovation within the agri-food sector and contributing to a healthier and more sustainable society.

The agri-food sector is of huge economic importance to the Netherlands, particularly in the north where it is estimated to account for 15% of all jobs. In order to respond to challenges such as increasing costs and take advantage of new market opportunities it is important for the sector to innovate. The CCC helps to drive this process by providing new practical knowledge that can be applied directly in the field to increase added value and reduce costs. In this way CCC helps to improve the competitive position of the Dutch agri-food sector, both in the production of agricultural raw materials and in the industrial processing of these materials into foodstuffs and other products.

The Centre is a public-private partnership. This means that academics cooperate with industrial partners to define objectives, activities, budgets and the progress of work packages. The partners invest on an equal basis (50% of CCC funding is provided by industry) but also share joint ownership of the research results. This means that partners will only invest if they are really interested in the outcomes of the activities – so research is driven by the needs of industry.

The first phase of the CCC initiative secured €17 million funding from local, national and EU government sources and attracted a further €28 million funding from industry. To date projects undertaken at the CCC have resulted in 9 patent applications and the creation of new products, processes and jobs. With employment in agri-businesses estimated to account for 15% of all jobs in the Northern Netherlands, this has brought substantial benefits to the economy of the province.

Due to the success of the CCC, RUG is now preparing to implement the same approach in other areas.

Source: CCC website, accessed on 29th April 2014

Despite UCMG and RUG's success in establishing partnerships with large businesses, the University is also aware of the importance of working with smaller businesses. To achieve this the two institutions support initiatives designed to enable smaller businesses to access academic support, such as the Biobrug project, details of which are provided in Figure 6-4.

Figure 6-4 – Working with smaller businesses - BioBrug

BioBrug brings university research and business together to jointly develop and market new technologies on the basis of specific business questions in the field of green energy and materials, where biotechnology plays a major role. The project is aimed at small and medium sized enterprises (SMEs) that require academic expertise to address a particular issue but cannot afford to sponsor a PhD project.

The BioBrug programme involves matching masters students with companies on a specific business problem or issue. The student then works as part of a team on projects can last from a few weeks to up to six months for more complex issues. Entrepreneurs are encouraged to actively participate in the projects, which ensures that the solutions identified are firmly rooted in the market.

For businesses the BioBrug programme provides a cost effective way of accessing academic expertise and specialist knowledge while for the students involved it provides valuable work experience.

Source: Signed by Syncom (25 year anniversary publication)

It is possible to estimate how much collaborative research is worth to the economy based on the amount of income the institutions secure from industry each year. This income represents direct investment by private companies in

research undertaken by academic researchers. It is then possible to calculate the value of this activity to the Dutch economy by applying an assumed multiplier for the relevant group of industries.

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

Different bodies commission collaborative research and contract research. Contract research will involve research that is funded by industry and collaborative research will be funded by a mixture of public bodies,, other research organisations and private companies. The returns to research in the contract research in this instance are calculated for the private sector partners. Therefore the process for calculating the economic impact of contract research with industry and the income from private partners involved with collaborative research is the same.

In 2012, RUG & UMCG received €100,8 million in contract research income.

The assumptions used to estimate the impact of collaborative research are presented in Table 6.5.

Table 6.5 – RUG & UMCG: Collaborative & Contract Research - Assumptions

Assumption	Value
Contract Research Income	€100,8 m
Location of Research Income	
- Groningen	2%
- The Northern Provinces	0%
- Netherlands	20%
- Outside Netherlands	78%

Source: Information provided by RUG, UMCG and BiGGAR Economics Assumptions

It is possible that some of the resulting spillover activity would have occurred anyway at another Dutch university and therefore not all off the impact could be attributed to RUG & UMCG. However, the reputation and high ranking of RUG demonstrates that the research undertaken at this institution is of a particularly high quality. For this reason, we assume that most of the impact arising from industrial R&D spillovers can be attributed to RUG.

From consultation it is understood that only 2% of this activity occurs within the Groningen area, while a further 20% occurs across the Netherlands and the remaining 78% occurs outside the Netherlands.

Applying these assumptions to the amount of collaborative research contract expenditure suggests that industrial spillover effects attributable to RUG and UMCG contributes €486,6 m GVA to the Dutch economy each year and supports 4.891 fte jobs. This is summarised in Table 5.6.

Table 6.6: RUG & UMCG: Collaborative & Contract Research - Impact

	GVA (€m)	Employees (fte)
Groningen	30,8	400
The Northern Provinces	69,0	879
Netherlands	486,6	4.891

Source: BiGGAR Economics Analysis

6.4 Workforce Training

In 2012, RUG & UMCG provided refresher courses and congresses with 13.198 participants across a broad range of subject areas.

The economic benefits of the continued professional development are accrued directly by the organisation that the trainee works for. Previous studies by BiGGAR Economics have found that the impacts can vary significantly depending on the course, industry and motivations for undertaking the course. However, it was found that the average business interaction with academia returned 360% GVA to the company. The total impacts were then estimated by applying the appropriate multipliers for the industries involved.

The cost of the courses varies depending on the type of course and the length of the course, however, this analysis assumes that an average course costs €300 per participant.

It is further assumed that 40% of attendees on the course work at RUG & UMCG and therefore their impact has been calculated elsewhere, 20% of the remainder of the participants come from The Northern Provinces, 40% from the rest of the Netherlands and 40% from outside the Netherlands. The assumptions used are set out in Table 6.7.

Table 6.7: RUG & UMCG: Workforce Training - Assumptions

	Value
Number of participants on RUG & UMCG refresher courses and congresses	13.198
Average cost of an UMC course	€300
% of participants from RUG & UMCG	40%
% of remaining participants from Northern Provinces	20%
% of remaining participants from Netherlands	40%
% of remaining participants from outside the Netherlands	40%
Estimated benefit to society of course as ratio to monetary cost	1:1

Source: RUG & UMCG

Applying economic ratios and multipliers as previously explained, this results in an impact of €2,8 million GVA and in Groningen, €5,3 million GVA in The Northern Provinces and €13,1 million in the Netherlands as a whole. This supports 46 fte jobs in Groningen, 79 fte jobs in The Northern Provinces and 169 fte jobs across the Netherlands as a whole (Table 6.8).

Table 6.8: RUG & UMCG: Workforce Training - Impact

	GVA (€m)	Employees (fte)
Groningen	2,8	46
The Northern Provinces	5,3	79
Netherlands	13,1	169

Source: BiGGAR Economics Analysis

6.5 Social Returns to Medical Research

Research by the Wellcome Trust on the value of medical research in the UK considers two types of return: health gains (net of the health care costs of delivering them) and economic gains[12]. Our analysis has already considered economic gains of medical research. However, we have not yet captured the value of health gains – these are the wider health returns to patients who ultimately benefit from the research.

The value of health gains was assessed in the Wellcome Trust report using the quality adjusted life years (QALY) method[13]. This is a widely used method developed by health economists to assess how many extra months or years of life of a reasonable quality a person might gain as a result of treatment. Although the QALY method is not perfect, it is widely used and is the accepted method of evaluating potential NHS treatments in the UK. The economic value of the QALY improvement delivered by a particular medical intervention can be assessed by considering the opportunity cost of the investment i.e. by considering what level of improvement could have been achieved by investing the same resources directly in frontline services.

The key finding of the report was that the sum of the total health and economic gains medical research in the UK gave a total rate of return of around 39%, which included an economic return of 30% and a health gain of just over 9%. This means that a €1.00 investment in public/charitable CVD research produced a stream of health benefits thereafter that is equivalent in value to earning €0.09 per year in perpetuity.

Assuming a discount rate of 5% this implies that over a 20 year period each €1 invested in medical research would deliver a total return of €1.38. The value of the health care gains from medical research was therefore estimated by applying this multiplier to the total value of research undertaken by UMCG in the Netherlands in 2012. The resulting impact is shown in Table 6.9.

Table 6.9: UMCG: Social returns to Medical Research - Impact

	GVA (€m)	Employees (fte)
Groningen	10,8	n/a-
The Northern Provinces	31,8	n/a
Netherlands	259,4	n/a

Source: BiGGAR Economics Analysis

[12] Medical Research: What's it worth? Estimating the economic benefits from medical research in the UK, For the Medical Research Council, the Wellcome Trust and the Academy of Medical Sciences, November 2008

[13] Ibid.

6.6 Social Impacts of Staff Time

Staff at the University are often involved in social activities and public and charitable bodies. The staff contribute their time outwith their contracted hours, however it is their expertise and association with RUG and UMCG that enables them to contribute to these bodies. The time of staff is given for free to these bodies and enables these bodies to benefit from their expertise that is gained in the UMCs. The activities that the staff participate in include:

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

It is assumed that the time staff work on social activities is equivalent to 7,5% of their working hours. Therefore the costs which would be associated with this, if the public and charitable bodies were to pay equivalently qualified people, is equivalent to 7,5% of the total staff costs of RUG and UMCG. This takes into account that more senior staff are likely to spend a higher proportion of their time on such activities, while junior staff are unlikely to spend as much time. This estimates the total value of staff's contribution to these bodies to be €65,7 million.

Table 6.10: Social Impacts of Staff Time

	Value
Proportion of staff time on social activities	7,5%
Value of staff time on social activities (€m)	65,7

Source: BiGGAR Economics Assumption

6.7 Summary of Valorisation Impacts

The combined impact due to valorisation activity generated by and sustained by RUG and UMCG is €191,5 million GVA and 1.776 fte jobs in Groningen, €245,7 million and 2.098 ftes in The Northern Provinces and €1.1 billion and 9.076 ftes in the Netherlands (Table 6.11).

Table 6.11: RUG & UMCG: Summary Valorisation Impact

Groningen	GVA (€m)	Employees (fte jobs)
Technology Licensing Impact	7,1	92
Spin-outs and Start-Ups Impact	74,2	1.237
Collaborative Research	30,8	400
Workforce Training	2,8	46
Social Returns to Medical Research	65,7	-
Social Impact of Staff Time	10,8	-
Total Valorisation Impact	**191,5**	**1.776**
The Northern Province		
Technology Licensing Impact	18,2	221
Spin-outs and Start-Ups Impact	55,6	919
Collaborative Research	69,0	879
Workforce Training	5,3	79
Social Returns to Medical Research	65,7	-
Social Impact of Staff Time	31,8	-
Total Valorisation Impact	**245,7**	**2,098**
Netherlands		
Technology Licensing Impact	88,6	982
Spin-outs and Start-Ups Impact	190,5	3.034
Collaborative Research	486,6	4.891
Workforce Training	13,1	169
Social Returns to Medical Research	259,4	-
Social Impact of Staff Time	65,7	-
Total Valorisation Impact	**1.103,9**	**9.076**

Source: BiGGAR Economics analysis ansss

7 CATALYTIC IMPACT OF RUG & UCMG

The previous section focused on the economic impact generated by RUG and UCMG's activity with individual companies. What is more difficult to quantify is the wider catalytic effect that this activity has on the economy of the Northern Netherlands. The wider contribution that the two institutions make to the economy can be considered in terms of the role that they plays in:

- supporting the growth, retention and development of indigenous companies by supporting important clusters of economic activity;
- attracting new talent and investment; and
- safeguarding and enhancing existing economic activity.

This chapter considers how RUG and UCMG have contributed to each of these three areas.

7.1 Groningen – A Strategic Approach to Development

The city of Groningen is small by international standards, with a population of just 185,000 and is located in one of the least densely populated parts of the Netherlands. As a result, Groningen does not have many of the important economic drivers commonly found in more urban areas such as airports, large company headquarters or important government departments. This means that RUG is in the position to play a particularly important role in supporting the economic development of the region.

This is a role that RUG takes very seriously. This is evident from the strategic research priorities identified by the University and the fact that these are closely aligned with the key challenges and opportunities faced by the provincial economy. The research priorities of RUG include:

- Energy;
- Healthy ageing; and
- Sustainable society.

In developing these priorities, the University has set out to identify areas where its research strength is well aligned with important challenges and opportunities faced by the provincial economy. For example, as discussed in section 3.2, the population of the Northern Provinces is ageing more rapidly than most other areas of the Netherlands, which creates real challenges for the health care sector in particular. Groningen is also located next to the largest natural gas field in Europe, which presents opportunities for companies in the energy sector.

This approach has enabled RUG to become an integral component of the economic governance of the City and the wider region, working together with businesses and the government for the benefit of the region. This collaborative approach is deeply embedded within the culture of the University and encompasses a wide variety of activities but is formally expressed through the Groningen Agreement.

The Groningen Agreement is a strategic partnership between RUG, Hanze University Groningen, the UMCG and the City of Groningen. The Groningen

Agreement aims to provide a strategic framework that will enable the partners to act together on the basis of a unified vision and common agenda in order to strengthen Groningen's position as the focus for knowledge and innovation in the northern Netherlands.

In order to achieve this the partners have identified two priority areas on which to focus:

- healthy ageing; and
- energy.

These priorities have been chosen to exploit existing knowledge strengths within the City and echo the research priorities identified by RUG. The partners to the Groningen Agreement have collectively identified a number of strategic projects that will help the City to realise its full potential in these areas. RUG is a key contributor to many of these initiatives, some of which are highlighted in this section.

7.2 Supporting Indigenous Growth

An important focus for energy related activity in Groningen is the Zernike Science Park, a large industrial estate adjacent to RUG's main campus. The owners of the Park (RUG, Hanze University Groningen and the City of Groningen) are working hard to position the Park as a hub for energy related research and expertise. They aim to achieve this by concentrating energy related activity within the Park and by making the Park a practical testing ground for new energy innovations being developed by the Renqi laboratory.

The RenQi laboratory is a collaborative project that involves RUG that aims to develop not only the technology but also the software, legal and logistical expertise required to operate decentralised energy network. The clearly delineated Zernike Campus and Science Park is expected to provide an ideal testing ground for this.

The Park already provides an important focus for much of the energy related research undertaken at RUG. Major sections of the University (and of the Hanze University Groningen) are based there as are many spinout and start-up companies. All new buildings on the Park are also designed to be energy–efficient and sustainable energy sources such as wind, solar and geothermal are being used on site.

Zernike Science Park was founded in the mid-1980s with financial support from the Dutch Government. The original objective of the Science Park was to help establish spinout companies from RUG.

This was achieved using a two step model that involved first determining the commercial potential of a new idea and then, once the business idea had been proven, moving the fledgling business into an incubation centre on the Science Park. Successful businesses that grew were then either encouraged to take up larger space in the nearby business centre or to build their own premises on land belonging to the Science Park.

This process helped to establish a successful cluster of knowledge based activity that helped make the Science Park an attractive location for other businesses with no formal connection to RUG. Over the years this has resulted in the

development of a substantial Science Park that now covers an area comparable with the entire University campus and accounts for a significant proportion of the 23,800 knowledge jobs in Groningen.

Research published in 2012[14] suggests that around 550 people work in businesses located on the Zernike Science Park. As the Science Park would not have existed without RUG it is reasonable to attribute this impact to the University.

The research referred to in the previous paragraph also suggested that 25 of the 70 businesses located on the Park are spinouts from RUG. Assuming that average employment in spin-out companies is similar to the park average, it can be estimated that around 200 of these jobs have already been counted as part of the spin-out impact considered in section 6.2. These jobs are therefore excluded here to avoid double counting.

This chapter therefore only considers the additional impact associated with the 354 jobs on the Science Park that have not been considered elsewhere in this report.

7.2.1 The Zernike Group

The development of the Zernike Science Park has also generated wider economic benefits for the Dutch economy as a whole as a result of the commercial success of the Zernike Group, which runs the Park.

The Zernike Group began life as a commercial offshoot of RUG, delivering intellectual property management services on behalf of the University. This enabled the Zernike team to develop expertise in various areas of technology development. Eventually Zernike broke away from the University and began operating as a private company.

Since then the company has become a highly successful science park operator and now manages facilities across the Netherlands, in the UK and Australia. As the Zernike is effectively a spinout from RUG, it would be reasonable to attribute a proportion of the economic impact generated by the company to the University. Although it is not possible to quantify this, the scale of the Group's operations means that the impact is likely to be substantial.

7.2.2 Healthy Ageing Campus

Groningen is also the focus of a large life sciences and health cluster in the northern Netherlands, which is considered one of the top three life science locations in the Netherlands. At the heart of this cluster is the Healthy Ageing Campus where UMC Groningen is based. At around 1km in length and covering an area of around 30 hectares the campus occupies a prominent position in the field of healthy ageing. It is a place where high-quality research and education, knowledge-intensive business and government work together.

Research undertaken in 2012[15] showed that around 420 people were employed on the Healthy Ageing Campus in 2012 (this excludes employment in QPS, which is considered in section 7.3.2 and LifeLines, which is considered in section 7.3.1. Although all of this employment can be attributed to the UMCs virtually all of it is within spinout companies, the impact of which was considered in the previous section. For this reason the impact of the employment supported on the Healthy

[14] Buck Consultants International (November 2012), Actueel beeld campussen in Nederland
[15] Buck consultants International (November 2012), Actueel beeld campussen in Nederland

Ageing Campus was not included as part of the catalytic impact considered in this chapter.

7.3 Attracting New Investment

As well as supporting the growth of indigenous companies, the research expertise of RUG and the UMCG has also helped to make Groningen an attractive location for investment for companies based elsewhere in the Netherlands and around the world. This has been particularly visible in the field of healthy ageing where the research expertise of academics at RUG and UMCG has enabled Groningen to attract a number of important investments and led to the development of what is now known as the Healthy Aging Campus adjacent to the Hospital.

7.3.1 LifeLines Project

One of the most important milestones in the development of the Healthy Ageing Campus occurred in 2006 when the LifeLines project began.

The LifeLines project is a long-term medical research project that aims to discover how people can age more healthily. To do this the project will to track the health of 165.000 people from the north of the Netherlands from three generations over a period of 30 years – making it the largest study of its kind anywhere in the world.

The genetic, (bio-) medical, psychological, and social details, as well as data on lifestyle and environment of this large group of participants will be collected in a biobank. This biobank will enable researchers to gain a more detailed insight into the factors that determine whether a person ages healthily and is expected to contribute to the development of more effective diagnosis, prevention, treatment and monitoring of chronic diseases.

It is estimated that around 150 people are employed in administering this €100 million enterprise. The project is based in Groningen in order to take advantage of the research expertise within RUG and UMCG therefore the impact of this employment is entirely attributable to the two institutions.

The research expertise concentrated within RUG and the UMCG has also enabled the Healthy Ageing Campus to attract substantial investment from companies active in related areas. For example, the lifelines project generates vast amounts of data, which requires expertise in the management of “big data”.

Developing this expertise has enabled the two institutions to effectively bridge the gap between medical research and ICT, helping it to develop a distinctive strength in an increasingly important area. It is believed that this expertise was an important influence on IBM’s decision to open a new research centre in Groningen in 2013, which now employs between 350 and 400 people. For the purposes of this analysis it was assumed that half of this employment can be attributed to RUG and the UMCG.

Using these assumptions it was estimated that the LifeLines project directly and indirectly supports 338 jobs in the Netherlands that are attributable to the RUG and have not been considered elsewhere in this report.

7.3.2 Contract Research Organisations

The medical expertise concentrated around the campus for healthy ageing has also been instrumental in enabling Groningen to attract major investment by two large contract research organisation, QPS and PRA.

Both companies are full-service contract research organisations (CRO) with extensive experience of conducting and staffing international Phase I to Phase IV clinical trials across a broad range of therapeutic areas for a wide variety of clients. QPS also has a dedicated 34-bed clinical pharmacology unit located at UMC Groningen.

It is understood that together QPS and PRA now employ around 650 people in the northern Netherlands, all of which can be attributable to the UMCG and RUG.

7.3.3 SPRINT

The expertise concentrated within the Campus for Healthy Ageing has not only helped to attract investment from large companies but has also supported innovation and growth within smaller businesses operating in this field. A good example of how this has been achieved is the Smart Prevention, Rehabilitation and Intervention Technologies (SPRINT) initiative.

SPRINT is a collaborative initiative between RUG, UMCG, Univeriteit Twente and a variety of institutions and private companies. It aims to develop smart technical solutions to help people, particularly older people, to maintain independent mobility. The project provides a framework for academic researchers to work with businesses in order to develop producible and affordable products. To date around 45 businesses have engaged with the project.

The quantifiable impact of this initiative was captured as part of the valorisation activity described in chapter 6 and as such it is not counted again in this chapter to avoid double counting.

7.4 Clinical Trials

According to a study published in 2013 the Netherlands is the second most desirable location in Europe[16] in which to run a clinical trial. The Netherlands scores particularly highly on the accessibility and transparency of information required to run clinical trials. This is partly due to the close relationship and trust that exists between patients and doctors, which results in high quality information. The close working relationship between the UMCs also means that companies can easily access a large population.

The UMC model, which combines the three roles of teaching, research and patient care, also provides an attractive environment for companies engaged in clinical trials. For example, in this model doctors may visit patients with students and take research samples while they are there. This integrated approach leads to better delivery of all three activities. It also generates economic impact by

[16] Marta Gehring, Rod S Taylor, Marie Mellody, Brigitte Casteels, Angela Piazzi, Gianfranco Gensini, Giuseppe Ambrosio, (15 November 2013), BMJ Open, Factors influencing clinical trial site selection in Europe: the Survey of Attitudes towards Trial sites in Europe (the SAT-EU Study)

helping to attract investment from contract research organisations that carry out clinical trials in the Netherlands.

In 2012 it was estimated that the world market for pharmaceutical contract research was worth around $25 billion, equivalent to approximately €18 billion. Data published by ClinicalTrials.gov, an international registry and results database of publicly and privately supported clinical trials around the world, shows that at the time of writing there were around 70,000 open[17] and active clinical studies being undertaken around the world. Of these, just over 3% were being undertaken in the Netherlands. That suggests that the value of the clinical trials market in the Netherlands is likely to be between €560 and €600 million.

A review of the ClinicalTrials.gov database suggests that at the time of writing the eight NFU UMCs were leading almost 600 open trials and approximately 130 active trials. These trials represent around a third of all open and active trials being undertaken in the Netherlands. This suggests the eight NFU UMCs account for around €200 million of the total turnover of the Dutch CRO industry.

It is important to note that this figure relates only to the value of clinical trials that are being *led* by members of the NFU UMC network. In addition to these trials the UMCs are also involved as collaborators in many more trials. Taking these trials into account suggests that the UMCs are involved with almost half (47%) of all open or active clinical trials in the Netherlands – activity that has a market value closer to €300 million.

As it is not possible to assess how much of the impact of trials led by other institutions should be attributed to the UMCs, this section considers only the impact of trials that are actually led by the UMCs. For this reason it is likely that the full value of this impact has been somewhat underestimated.

The direct employment supported by clinical trials led by all the NFU UMCs was estimated by dividing total turnover by an estimate of the average turnover/employee in the Dutch biomedical sector. In this way it was estimated that this activity directly supported 749 jobs in the Netherlands.

These jobs will include the 650 people employed by QPS, which was discussed in section 7.3.3. To avoid double counting these employees were therefore excluded here, implying that the UMCs support 99 jobs in the clinical trials sector that have not been considered elsewhere in this report. It was assumed that this impact was equally attributable to each of the eight NFU UMCs suggesting that around 12 of these jobs may be attributable to UMCG.

This section therefore considers only the impact of the 12 jobs that can be attributed to UMCG that have not been considered elsewhere in this report.

7.4.1 Danone

Danone is a global food company, headquartered in France that employs approximately 100.000 employees and has a turnover of around €20 million. The company specialises in four areas: fresh dairy products, baby nutrition, waters and medical nutrition.

Prior to 2013 Danone operated major research centres in the Netherlands (Wageningen, Zoetermeer and Cuijk), France (Palaiseau), Germany

[17] Open trials refer to studies that were actively recruiting participants at the time of writing and active trials refer to studies that were underway but no longer recruiting.

(Friedrichsdorf) and the UK (Liverpool). In 2013, the company combined its Dutch, German and UK operations in one state-of-the-art innovation centre on the Utrecht Science Park.

The new Danone Research Centre for Specialised Nutrition is a life sciences innovation centre for the development of new product concepts for early life nutrition and medical nutrition. The Centre brings together almost 450 employees and represents a new strategic alliance with between Danone and Utrecht Life Sciences. The goal of this alliance is to intensify collaboration in the areas of research, education and entrepreneurship.

Danone considered two options for this Centre, the Netherlands and France and the Netherlands was a more attractive option due to its extensive network in food and nutrition. Therefore, although the new facilities are located in Utrecht and UMC Utrecht played an important role in attracting the investment, it would be unreasonable to attribute the entire impact of the investment to the UMC Utrecht. This is because Danone's decision to locate in Utrecht is also believed to have been driven by the fact that from this location the Company will also be able to easily interact with life science faculties and academic hospitals elsewhere in the Netherlands. For this reason, it was assumed that 5% of the jobs created by Donone's investment could be attributed to UCMG.

This suggests that around 23 of the 450 jobs supported by Danone in Utrecht could be attributed to UCMG.

7.5 Safeguarding Existing Economic Activity

As well as attracting new investment and supporting the development of indigenous companies, RUG and UMCG also plays an important role in helping to safeguard existing jobs and economic activity in the northern Netherlands. The University does this by developing strong relationships with established businesses in the area in order to enhance their commitment to remaining in the area. This is perhaps best illustrated by the work that RUG and UMCG undertake with Philips.

7.5.1 Philips Health Care

Royal Philips of the Netherlands is a diversified technology company, focused on the areas of healthcare, consumer lifestyle and lighting. Philips global headquarters is based in Amsterdam but the company has operations all over the world, employing approximately 115,000 people in more than 100 countries and generating sales that amounted to €23.3 billion in 2013.

Healthcare is an important and growing area of activity for Philips, accounting for approximately 37,000 of the company's global workforce. The company is a leader in cardiac care, acute care and home healthcare. In order to develop and maintain this position Phillips has invested in partnerships with research institutions all over the world.

Although Philips is a Dutch company it is also a multi-national corporation. This means that in theory research investment could have been undertaken anywhere in the world. The fact that Phillips has instead chosen to maintain and grow its main research headquarters in Eindhoven in the Netherlands is therefore a testament to the quality of the Dutch research base. Given the importance of healthcare to the company, it is reasonable to conclude that the quality of medical

research in the Netherlands – particularly within the UMCs - must have been an important factor in this decision.

UMC Groningen has contributed to this decision by collaborating with Philips on a number of projects. For example UMC Groningen is a member of a consortium of partners in the Advancing Care Coordination and Tele-health Deployment (ACT) programme. This EU funded programme is led by Royal Phillips Electronics and includes healthcare authorities, clinical experts, universities and industry partners in five European regions.

The project aims to create a "cookbook" of best practices to facilitate care coordination and tele-health deployment and could potentially transform care for millions of chronically ill people and save healthcare systems billions of Euros each year.

Approximately 1.500 Philips employees work at the Philips research head quarters in Eindhoven and for the reasons described above it is reasonable to assume that some of these jobs can be attributed to UMCG. The key assumptions made in order to estimate this impact were:

- 50% of jobs at the Eindhoven research campus are related to healthcare research and can be attributed to the UMCs;
- 50% of the jobs that can be attributed to the UMCs have already been counted elsewhere in this report (for example as part of the contract and collaborative research impact); and
- the impact of the jobs supported by Philips that can be attributed to the UMCs and have not been counted elsewhere are equally attributable to the eight NFU UMCs.

Using these assumptions it was estimated that 47 jobs in the Philips research HQ in Eindhoven are attributable to UMCG and have not been considered elsewhere in this report.

7.5.2 Philips Ecostructure

Royal Philips is a diversified technology company, focused on the areas of healthcare, consumer lifestyle and lighting. The Company is one of the largest in the Netherlands and has operations all over the world, employing approximately 115,000 people in more than 100 countries and generating sales that amounted to €23.3 billion in 2013.

Philips global headquarters is based in Amsterdam and research activity is concentrated on the High Tech Campus in Eindhoven (where Philips employs around 1.500 staff). Philips also has smaller operations elsewhere in the Netherlands, including the Northern Provinces.

Groningen is located some 250km from Eindhoven and around 180km from the Company's HQ in Amsterdam, making operations in the Northern Provinces somewhat isolated from the Company's important decision making centres. This led to concerns that local operations may not be as firmly rooted within the local economy and that the impact of these operations may not be as strong as it could be.

Around six years Freisland Province launched the Philips Ecostructure initiative to help address these concerns. The objective of the initiative was to help Philips

develop more connections with small and medium sized enterprises in the Northern Provinces and to the knowledge base. The Initiative is a collaboration involving several important partners including Philips, local businesses, the city and provincial government, RUG and UMCG.

The Initiative was designed to be practical as well as strategic. For example, soon after the Initiative was launched an event was hosted that enabled employees from Philips and RUG to pitch ideas to each other in order to identify opportunities to collaborate. As a result of this approach Philips now has much stronger local roots within the provincial economy, including a more extensive local supply chain and greater interaction with the local research base.

An example of one of the projects that emerged from this Initiative is the Smart Factory project, which is described in further detail below.

7.5.3 Smart Factories

In addition to the work that UCMG undertakes with Philips in the field of healthcare, RUG also works with the companies in other areas, helping to secure Dutch investment from other areas of the companies business. A good example of this is the work that has been done as part of the smart factories initiative.

The objective of the smart factories initiative is to develop new technologies and approaches to manufacturing that will help to substantially improve the productivity of the Dutch manufacturing industry. This is necessary to enable the sector to compete effectively with low-cost producers elsewhere in the world. It is expected that the smart factory concept could help to significantly improve the competitiveness of Dutch manufacturing and help to safeguard thousands of jobs.

Creating a "smart factory" involves applying insight from a number of different - mostly IT related - knowledge areas. For example, it is expected that RUG's expertise in big data could be used to develop better ways of managing large data flows that could help to make industrial processes self-learning.

The potential of the smart factory concept was powerfully illustrated in early 2012 when the consumer electronics giant Philips announced its intention to increase investment in its facility in Drachten. This announcement followed an earlier decision by the company to move production of electronic shavers to China to take advantage of lower costs. The decision to reinvest in the Netherlands was made following a collaborative project involving RUG that helped to significantly reduce failure rates on the production line – an improvement that could not be matched by the Chinese factory.

The improvements that Philips was able to make by adopting the smart factory approach helped to reduce production costs below the level achieved in the Chinese factory. This is expected not only to result in to the creation of new jobs at the Drachten plant but also to help secure the jobs of the 2,000 employees who already work there[18].

It would be unreasonable to attribute the entire impact of this to RUG since the University is only one of the partners involved in the initiative and other factors (such as rising wage rates in China) also helped to make Dutch production cheaper than Chinese production. In order to account for this it was therefore

[18] Business Week (19th January 2012), China no match for Dutch plants as Philips shavers come home

assumed that 10% of the jobs safeguarded by Philips decision could be attributed to RUG.

This implies that RUG's work on the smart factories initiative has already helped to secure 200 jobs in the northern Netherlands that would otherwise have been lost. Similar on-going projects with other important manufacturers such as Fokker mean that this impact is likely to increase over the coming years.

This chapter therefore considers the impact of the 200 jobs that RUG has helped to secure in Philips that have not been considered elsewhere in this report.

7.6 Quantifying the Catalytic Impact of RUG and UCMG

This chapter has demonstrated that several investment decisions that have benefited the Dutch economy are attributable to the UMCG. It is estimated that these investments support 6.844 jobs in the Netherlands of which 1.624 can be attributed to UMCG and have not been counted elsewhere in this report. A breakdown of this employment is provided in Table 7-1.

Table 7-1 – Employment supported by investment attracted or retained by the UMCs

Science Park/Geographic Cluster	Total employment supported	Employment attributable to UMCs and not counted elsewhere
Zernike Science Park	550	354
Healthy Ageing Campus	420	-
LifeLines/IBM	525	338
QPS	650	650
Clinical trials	749	12
Danone	450	23
Philips	3.500	247
Total	**6.844**	**1.624**

Source: BiGGAR Economics Analysis

In order to estimate the direct GVA impact of this, these jobs were multiplied by estimates of GVA/employee in relevant sectors. Appropriate GVA and employment multipliers were then applied in order to estimate the effects of subsequent spending rounds.

In this way it was estimated that the catalytic impact of RUG and UMCG amounted to €201,5 million GVA and 3.397 jobs. A break-down of this impact for each of the study areas is provided in .

Table 7-2: RUG & UMCG: Summary Catalytic Impact

Groningen	GVA (€m)	Employees
Zernike Science Park	25,1	399
Investment attracted (QPS, LifeLines/IBM, Danone & clinical trials)		
Investment retained (Philips)		
Total Catalytic Impact	25,1	399
The Northern Provinces		
Zernike Science Park	31,1	488
Investment attracted (QPS, LifeLines/IBM, Danone & clinical trials)		
Investment retained (Philips)		
Total Catalytic Impact	31,1	488
Zernike Science Park	27,9	728
Investment attracted (QPS, LifeLines/IBM, Danone & clinical trials)	148,5	2.256
Investment retained (Philips)	25,0	412
Total Catalytic Impact	201,5	3.397

Source: BiGGAR Economics Analysis

8 TOURISM IMPACT

This section considers the contribution that RUG and UMCG makes to tourism in the area. This impact arises from:

- visits from friends and family to staff and students;
- visitors due to conferences held at RUG and UMCG;
- visits to patients; and
- attendance at open days for prospective students.

8.1 Visits to Staff and Students

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

The impact of visits to staff and students has been calculated by assessing the number of visits from friends and family per head of the population in each region of the Netherlands as estimated by the Dutch tourism statistics. We considered visits from domestic residents and overseas residents as the spending assumptions differ for each group. We applied this to the total number of staff and students employed at RUG and UMCG. Next, we applied an estimate of trip expenditure per visit. The economic impact in the study areas was found by converting trip spend (turnover) to GVA and employees and applying multipliers to estimate the indirect and induced effect of this level of spending. The assumptions used and the impacts calculated are shown in Tables 8.1 and 8.2.

Table 8.1: RUG & UMCG: Visits to Staff and Students - Assumptions

Assumptions	Value
Total number staff & students	47.840
No. visits per staff/student - domestic	0,14
No. visits per staff/student - internationally	0,02
Total number of visits from friends and family - domestic	6.383
Total number of visits from friends and family - overseas	1.122
Trip spend per domestic visitor (€)	155
Trip spend per overseas visitor (€)	361

Source: RUG, UMCG and Previous BiGGAR Economics research

Table 8.2: RUG & UMCG: Visits to Staff and Students - Impact

	GVA (€m)	Employees (fte)
Groningen	0,8	17
The Northern Provinces	1,1	20
Netherlands	1,8	29

Source: BiGGAR Economics Analysis

This results in an estimated impact from visits to visits to staff and students of €0,8 million and 17 ftes in Groningen, €1,1 million in GVA and 20 jobs in The Northern Provinces and €1,8 million and 29 ftes in the Netherlands as a whole.

8.2 Conference Impact

In 2012, RUG and UMCG organised a series of conferences that involved 13.909 delegates. Some 18% of these were from outside the Netherlands and a further 49% were from outside Groningen. The remaining 33% were assumed to be from the Groningen area and therefore their expenditure was not additional to the study area.

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

This results in an impact from conferences of an estimated €1,9 million GVA and 41 fte jobs in Groningen, €2,3 million GVA and 44 ftes in the Northern Provinces and €1,6 million and 26 ftes in the Netherlands as a whole. The assumptions used are shown in Table 8.3 and the resulting impacts are presented in Table 8.4.

Table 8.3: RUG & UMCG: Conferences - Assumptions

Assumption	Value
No. of delegates to RUG & UMCG organised conferences and events	13.909
Estimated % of attendees from Groningen	33
Estimated % of Dutch attendees from outside Groningen	49
Estimated % of International attendees	18
Trip spend per domestic visitor on business (€)	319
Trip spend per overseas visitor on business (€)	509

Source: RUG & UMCG

Table 8.4: RUG & UMCG: Conferences - Impact

	GVA (€m)	Employees (fte)
Groningen	1,9	41
The Northern Provinces	2,3	44
Netherlands	1,6	26

Source: BiGGAR Economics Analysis

8.3 Visits to Hospital Patients

Economic impact is created by visits to hospital patients from their friends and family, particularly if the patient is from outside the area.

The first step in estimating this impact was to multiply overnight clinical admissions to the percentage of patients from outside the region in order to estimate how many patients come from outside the region. We then applied data supplied by UMCG on the average length of patient admission. It was assumed patients have an average of one visitor who will come and stay in Groningen for

the length of time the patient is in hospital. The total number of days spent in Groningen by friends and family was then multiplied by average expenditure per day.

As in the previous section of this chapter, economic impact is estimated by converting spend into GVA and employment and applying multipliers. The assumptions used are shown in Table 8.5 and the impacts calculated are shown in Table 8.6.

Table 8.5: UMCG: Visits to Hospital Patients - Assumptions

Assumptions	Value
Clinical admissions	535.045
% of patients staying overnight	7%
Percentage of overnight patients from outside region	42%
Length of stay per patient (days)	8.3
Spend per day (€)	40

Source: UMCG and BiGGAR Economics Analysis

Table 8.6: UMCG: Visits to Hospital Patients - Impact

	GVA (€m)	Employees (fte)
Groningen	2,9	60
The Northern Provinces	1,8	34
Netherlands	0,8	12

Source: BiGGAR Economics Analysis

This results in an estimated impact from visits to hospital patients of €2,9 million and 60 ftes in Groningen, €1,8 million GVA and 34 fte jobs in The Northern Provinces and €0,8 million and 12 ftes in the Netherlands as a whole. The impact is estimated to be greater in The Northern Provinces than in the Netherlands as if this money had not been spent on visiting a patient in hospital it would most likely have been spent elsewhere in the economy rather than in the locality of the hospital.

8.4 Open Days

A further tourist impact stems from students attending open days before deciding on their preferred location for study. We can estimate this by starting with RUG and UMCG data on the number of people attending open days and the proportions of these who have travelled from outside the region and also from international destinations. We then apply a number of assumptions relating to the proportion who bring a parent/friend with them on the trip and the estimated amount of expenditure per person. The assumptions used are summarised in Table 8.7.

Table 8.7: RUG & UMCG: Open Days - Assumptions

Assumption	Value
Number of attendees	52.291
% of additional students bringing a parent	50%
% from outside Groningen	71
% International students	12
Spend per day (National)	€35
Spend per day (International)	€50

Source: RUG and BiGGAR Economics

We can convert this turnover into GVA and employment by using national ratio data as used in previous sections. The wider impacts are found by applying multipliers as with previous calculations. The resulting impact is summarised in Table 8.8.

Table 8.8: RUG & UMCG: Open Days - Impact

	GVA (€m)	Employees (fte)
Groningen	1,4	29
The Northern Provinces	0,8	15
Netherlands	0,6	9

Source: BiGGAR Economics Analysis

8.5 Summary of Tourism Impacts

The contribution of RUG &UMCG to the economy through attracting visitors results in an estimated €7,6 million additional GVA and 159 ftes per year in Groningen, €8,1 million GVA and 151 fte jobs in The Northern Provinces and €4,8 million additional GVA and 76 ftes per year in the Netherlands as a whole (Table 8.9)

Table 8.9: RUG & UMCG: Tourism Impact – Summary

	GVA (€m)	Employees (fte)
Groningen		
Visits to staff and students	0,8	17
Visits to Conferences	1,9	41
Visits to Patients	3,4	72
Open Days	1,4	29
Total	7,6	159
The Northern Provinces		
Visits to staff and students	1,1	20
Visits to Conferences	2,4	44
Visits to Patients	3,8	72
Open Days	0,8	15
Total	8,1	151
Netherlands		
Visits to staff and students	1,8	29
Visits to Conferences	1,6	26
Visits to Patients	0,8	12
Open Days	0,6	10
Total	4,8	76

Source: BiGGAR Economics Analysis. Numbers may not sum due to rounding

9 IMPACT OF TEACHING AND LEARNING

The impact of teaching and learning is a measure of the additional lifetime earnings that are estimated to occur as a direct result of an individual possessing a university qualification.

The impacts of teaching and learning are a different kind of impact, compared to the others described in previous chapters, because the impacts will occur over the working lifetime of graduates rather than in the year of their graduation. These impacts would not have been realised in 2012, which is the year our analysis covers. However, in 2012 graduates from previous years will be creating these impacts and this has not been captured elsewhere in this study. Therefore the future impacts from the 2012 cohort of graduates are quantified and added in to ensure that the cumulative impacts of teaching and learning are included in this analysis.

This aspect has been studied most recently in the UK by London Economics on behalf of the government's Department for Business, Innovation and Skills and their findings are published in the report "*The Returns to Higher Education Qualifications, 2011*". This work estimates that the impact of teaching and learning for a graduate is €122.744 over their working life. This varies significantly by subject area, for example for medicine and dentistry the lifetime earnings premium is €364.733 whereas for creative art and design it is €7.193. For PhD graduates there is a further earnings premium of €84.700 over their working life and we have assumed this applies to Masters graduates also.

Data contained in the OECD Education at a Glance publication[19] for 2011 implies that, the earnings premium for a Netherlands degree holder is 94% of that of the UK, suggesting that the graduate premium effect is similar in the two countries. The UK research has been used but the earnings premium figures have been adjusted to take account of the small difference highlighted in the OECD publication.

The adjusted impact of teaching and learning has been applied to all graduates of RUG in 2012 They have been adjusted for each study area to take account of data on where people live after they graduate.

The starting point for calculating the impact of teaching and learning is the number of RUG graduates from each subject area in one year (Table 9.1).

[19] OECD Indicators

Table 9.1: RUG Graduate Numbers 2012

Graduate Numbers	Undergraduate	Masters
Architecture, Building & Planning	99	199
Other	844	593
Business & Administrative Studies	896	983
Historical & Philosophical Studies	112	47
Law	594	572
Mathematical & Computing Sciences	635	389
Medicine & Dentistry	608	465
Social Studies	798	690
Total	4.586	3.938

Source: RUG

We then apply the adjusted earnings premium for each subject area to these figures and make a further adjustment to take account of data on where people live after they graduate. The key assumptions used are shown in Table 9.2.

Table 9.2: RUG: Graduate Earnings Premium (94%) – Assumptions

Assumption	Value
Architecture, building and planning	€142.558
Biological Sciences	€74.827
Business and administrative studies	€131.136
Creative arts and design	€6.762
Historical & philosophical studies	€24.844
Law	€183.617
Mathematical and computing sciences	€155.402
Medicine and dentistry	€342.849
Social studies	€112.367
Subjects allied to medicine	€165.643
% graduates living in Groningen	65%
% graduates living in Northern Provinces	10%
% graduates living in Netherlands	20%
% graduates living outside Netherlands	5%
% graduates who work at RUG/UMC	7%

Source: RUG and BiGGAR Economics Assumptions

This results in an estimated impact of €274,8 million in Groningen, €584,1 million in The Northern Provinces and €853,6 million in the Netherlands as a whole (Table 9.3).

In a similar way to the staff spending impact described earlier in the report, these enhanced earnings would have an impact on employment when they are spent in

the local economy. It is estimated that this increase in earnings would support over 4,600 job years of employment from the 2012 cohort of graduates. This impact occurs over the working life of graduates and is not an annual impact, which is directly comparable to the other impacts set out in this report.

The overall impact of teaching and learning at RUG and GUMC is summarised in Table 9.3.

Table 9.3: RUG/UMC: Impact of Teaching and Learning

Impact	GVA (€m)	Employees (fte)
Groningen	274,8	178
The Northern Provinces	595,5	1.140
Netherlands	870,3	4.662

Source: BiGGAR Economics Analysis

10 SUMMARY ECONOMIC IMPACT

By bringing together the various sources of impact discussed in this report it can be estimated that RUG & UMCG jointly contribute:

- GVA of €1,9 billion (miljard) and supports 24.154 jobs in Groningen; and
- GVA of €2,6 billion (miljard) and supports 29.733 jobs in The Northern Provinces; and
- GVA of €5,4 billion (miljard) and supports 60.402 jobs in the Netherlands as a whole (including The Northern Provinces).

The employment impact includes a direct impact of 12.579, which means that the employment multiplier in the wider Dutch economy is **4.80**. In terms of GVA impact, the direct GVA of RUG and UMCG combined is €1,0 billion therefore the GVA multiplier in the wider Dutch economy is **5,68.**

A breakdown of this impact is provided in Table 10.1.

Table 10.1 – RUG & UMCG Summary

	Groningen		Northern Provinces		Netherlands	
	GVA (€m)	Jobs (ftes)	GVA (€m)	Jobs (ftes)	GVA (€m)	Jobs (ftes)
Core Impact	**1.029,8**	**13.494**	**1.262,9**	**16.263**	**2.459,1**	**29.997**
Direct Effect	955,5	12.579	955,5	12.579	955,5	12.579
Supplier Effect	27,0	326	113,8	1.314	577,9	6.370
Staff Spending Effect	45,2	558	181,7	2.207	876,2	10.442
Capital Spending	2,0	31	11,9	163	49,5	606
Student Impact	**357,7**	**8.148**	**469,4**	**9.593**	**784,7**	**13.194**
Student Spending	277,0	2.810	321,1	3.278	453.9	4,712
Part-time work	80,7	5.338	148,3	6.315	330,8	8.482
Valorisation Impact	**191,5**	**1.776**	**245.7**	**2.098**	**1.103,9**	**9.076**
Technology Licensing	7,1	92	18,2	221	88,6	982
Start-ups and spin-outs	74,2	1.237	55,6	919	190,5	3.034
Collaborative Research	30,8	400	69,0	879	486,6	4.891
Workforce Training	2,8	46	5,3	79	13,1	169
Social Returns to Medical Research	10,8	-	31,8	-	259,4	-
Social Impact of Staff Time	65,7	-	65,7	-	65,7	-
Catalytic Impact	**25,1**	**399**	**31,1**	**488**	**201,5**	**3.397**
Zernike Science Park	25,1	399	31,1	488	27,9	728
Inward Investment	-	-	-	-	148,5	2.256
Investment retained	-	-	-	-	25,0	412
Tourism Impact	**7,6**	**159**	**8,1**	**151**	**4,8**	**76**
Visits to Staff & Students	0,8	17	1,1	20	1,8	29
Conferences	1,9	41	2,4	44	1,6	26
Visits to Patients	3,4	72	3,8	72	0,8	12
Open Days	1,4	29	0,8	15	0,6	10
Sub-Total	**1.611,7**	**23.975**	**2.017,1**	**28.593**	**4.554,0**	**55,740**
Impact of Teaching and Learning	274,8	178	595,5	1.140	870,3	4.662
Total inc. Impact of Teaching and Learning	**1.886,5**	**24.154**	**2.612,6**	**29.733**	**5.424,4**	**60.402**

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

In order to understand the scale of the economic impact generated by RUG and UCMG it is helpful to consider the numbers presented above within the context of the provincial economy. According to Eurostat, the combined gross domestic product (GDP) of the Northern provinces in 2011 was €61,5 billion. Although not directly comparable to GVA, this suggests that the impact of RUG and UMCG accounts for 4,2% of the provincial economy. At the Groningen level this impact is even more pronounced. In 2011 it was estimated that the GDP of Groningen was €29,2 billion. This report estimates that the impact of RUG accounts for 6.5% of this.

These figures reflect the status of the two organisations as two of the largest employers and main drivers of economic activity in the Northern provinces. Unlike more urban areas, Groningen does not have multiple economic drivers (such as airports, large company headquarters and major government departments) and therefore relies heavily on organisations such as RUG and the UMCG to support economic growth.

This report has demonstrated that RUG and UMCG do this in a number of different ways. Perhaps the most obvious contribution is through the core activities of the University and the Hospital. Together the two organisations directly employ around 16.150 staff, making them two of the largest employers in Groningen. The two organisations also have an extensive supply chain, which helps to support many other jobs in companies that provide them with goods and services.

It is likely that the University and the Hospital's demand for goods and services also play a particularly important role in supporting small businesses, which account for a relatively high proportion of businesses in the Northern Provinces. This is because, large and well-established organisations like RUG and UMCG represent a reliable and consistent source of demand for key suppliers. As there are relatively few organisations of such scale in the Northern Netherlands, it is therefore probable that the two institutions provide an important source of stability for these businesses.

Looking beyond core operations it is clear that RUG and UMCG also play a very important role in maintaining vital workforce skills in the Northern Provinces. In 2012 54% of students at RUG originated from the Northern Provinces. If RUG did not exist then it is likely that many of these students would have left the area to study and may not have returned. Instead RUG has helped not only to retain many of these students within the Northern Provinces but also to attract new talent to the area.

RUG has been successful in doing this because it has focused on providing skills that are highly relevant to growing sectors in the regional economy, such as energy and life sciences. The impact of this is demonstrated initially through the student impacts and in the longer term through the wider impact of teaching and on graduate earnings within the Northern Provinces.

UMCG has also played an important role in supporting the capacity of the health care sector in the Northern Provinces by training health care professionals. If the UMCG did not exist then the Northern Provinces would be reliant on recruiting health care professionals from other parts of the Netherlands.

The valorisation impacts described in this report highlight the extent to which the activity of RUG and the UMCG is aligned with the interests of sectors that are important to the provincial economy. Both institutions have for example been

particularly successful in creating start-up and spinout companies, many of which operate within strategically important sectors for the provincial economy (energy and healthy ageing). This report has also described how, over time this activity has had a wider catalytic impact on the provincial economy by enabling important geographic clusters of activity to develop around the Healthy Ageing Campus and the Zernike Science Park.

10.1.1 International Benchmarks

Perhaps of greater relevance to this study is work undertaken by BiGGAR Economics on behalf of Leiden University and Leiden University Medical Centre in 2012[20]. The Leiden study took a very similar approach to that used in this study and found that Leiden University and LUMC contributed a total of €3,9 billion to the Dutch economy in 2010. This included a direct contribution of €857 million GVA, which implies a GVA multiplier of 1:4.57.

This report considers some additional impacts that were not considered in the Leiden report (contract and collaborative research, impact of staff time and social returns to medical research). If these impacts are excluded from the total impact presented above then the GVA multiplier associated with RUG and UMCG would be 1:4.83, slightly higher than the equivalent multiplier for LU and LUMC.

Another comparator for this study is work undertaken in 2013 by BiGGAR Economics on behalf of the University of Surrey and the Royal Surrey County Hospital. Like RUG and UMCG, the University of Surrey and the Royal Surrey County Hospital are co-located within a single large campus and collaborate extensively across a wide range of activities. The two institutions are also located next to a large science park that is owned by the University. The GVA multiplier for this report was 5.73 and the comparable multiplier for RUG and UMCG is 5.47.

The key reason for the difference in performance between the two studies relates to the impact of the Surrey Research Park. Established in the early 1980s, the Surrey Research Park covers an area of around 70 acres. The Research Park currently comprises around 30 buildings and is home to around 120 businesses. This makes it one of the largest science parks in the UK.

One of the main reasons why the Surrey Research Park has been so successful is that it has maintained close links with the University. This has been possible in large part because the research priorities at the University of Surrey are very closely aligned with those of important sectors in the regional economy, which means that there are ample opportunities for researchers at the University to collaborate with and assist businesses on the Park. As a result, the Surrey Research Park is now the focus of two thriving sectors (computer games and life sciences), much of which can be attributed to the combined effect of the University and the Hospital.

It is not difficult to draw parallels between what has been achieved in Surrey and what could be achieved in Groningen if aspirations for the Campus for Healthy Ageing and the emerging cluster of energy related expertise locate on the Zernike Science Park are realised.

[20] BiGGAR Economics (August 2012), Economic Impact of Leiden University and Leiden University Medical Centre.

APPENDIX A – ABBREVIATIONS AND TERMS

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

Assumptions are the data upon which impact calculations are based.

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

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

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

GVA + taxes on products - subsidies on products = GDP

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

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

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

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

APPENDIX B – ECONOMIC METHOD STATEMENT

The methodology that was used to estimate the economic impact of the UMCs was a constant throughout the report writing process.

Outputs

The economic outputs of this report have been quantified in terms of Gross Value Added (GVA) and full time equivalent (fte) jobs.

GVA is the measure of the value that an organisation, company or industry adds to the economy through their operations. The report used the production approach to measuring this impact, where the GVA is equal to the value of production less the value of the inputs used. Typically this is calculated by subtracting the non-labour costs of the organisation from the organisation's total revenue.

Economic Ratios

The relationship between the level of GVA and the employment support by a given amount of turnover varies between industries. The turnover is the economic driver that is most commonly given in the datasets from the UMC and this measure needs to converted into GVA and employments outputs. The total turnover, GVA and employment data are given by Statistics Netherlands for the whole economy broken down by broad industry categories. This data enabled the turnover/GVA ratio and the turnover/employee ratio to be calculated for each of the 21 industry groups.

Table B.1: Industry Ratios

	Turnover /Employee	GVA/ Employee	Turnover/ GVA
A – U All economic activities	€ 177.370	€ 79.887	2,22
A Agriculture, forestry and fishing	€ 162.029	€ 52.138	3,11
B Mining and quarrying	€ 3.730.857	€ 2.950.286	1,26
C Manufacturing	€ 411.134	€ 90.024	4,57
D Electricity and gas supply	€ 1.528.960	€ 445.240	3,43
E Water supply and waste management	€ 361.500	€ 125.083	2,89
F Construction	€ 167.293	€ 60.343	2,77
G Wholesale and retail trade	€ 112.561	€ 62.223	1,81
H Transportation and storage	€ 164.908	€ 70.825	2,33
I Accommodation and food serving	€ 89.217	€ 45.372	1,97
J Information and communication	€ 215.208	€ 104.000	2,07
K Financial institutions	€ 360.421	€ 203.443	1,77
L Renting, buying, selling real estate	€ 1.023.667	€ 525.850	1,95
M Other specialised business services	€ 128.130	€ 62.323	2,06
N Renting and other business support	€ 90.413	€ 54.395	1,66
O Public administration and services	€ 153.076	€ 87.098	1,76
P Education	€ 91.849	€ 70.479	1,30
Q Health and social work activities	€ 79.079	€ 58.223	1,36
R Culture, sports and recreation	€ 97.610	€ 41.847	2,33
S Other service activities	€ 73.833	€ 44.535	1,66
T Activities of Household	€ 32.500	€ 32.500	1,00

Source: Statistics Netherlands, GDP, production and expenditure; output and income by activity 2012 (2013)

The indirect impacts consider the knock on effects in the supply chains from the initial GVA and employment. These impacts vary based on the industries in which the initial impacts occur. The indirect impacts are calculated by applying an appropriate GVA and employment multiplier. These multipliers were calculated based on the Input – Output Tables of the Netherlands. The Type 1 multipliers include the knock on impacts in the supply chain, while the Type 2 multipliers includes the knock on effects of the supply chain and the spending of staff directly employed. The Type 1 multipliers are used in the report to calculate the indirect impacts of areas where the staff spending has been captured elsewhere.

Table B.2: Industry employment multipliers (Type 1 & Type 2)

	Type 2		Type 1	
	GVA	Employment	GVA	Employment
A – U All economic activities	2,89	2,75	2,22	2,18
A Agriculture, forestry and fishing	3,20	2,25	2,56	1,94
B Mining and quarrying	1,42	8,08	1,32	6,13
C Manufacturing	4,93	4,42	3,84	3,49
D Electricity and gas supply	4,93	4,42	3,84	3,49
E Water supply and waste management	4,93	4,42	3,84	3,49
F Construction	3,78	2,79	2,78	2,25
G Wholesale and retail trade	2,39	1,89	1,76	1,54
H Transportation and storage	2,92	2,73	2,18	2,15
I Accommodation and food serving	2,59	1,79	1,98	1,51
J Information and communication	2,59	1,79	1,98	1,51
K Financial institutions	2,77	3,04	1,97	2,19
L Renting, buying, selling real estate	2,15	2,06	1,62	1,66
M Other specialised business services	2,15	2,06	1,62	1,66
N Renting and other business support	2,15	2,06	1,62	1,66
O Public administration and services	2,42	2,17	1,76	1,66
P Education	1,99	1,61	1,27	1,20
Q Health and social work activities	1,98	1,49	1,34	1,20
R Culture, sports and recreation	2,81	1,96	2,34	1,65
S Other service activities	2,81	1,96	2,34	1,65
T Activities of Household	2,81	1,96	2,34	1,65

Source: BiGGAR Economics based on Statistics Netherlands, Input – Output Tables 2008

Multipliers and Provincial Spending

Provincial Spending

The economic impact of the UMC was calculated at the regional as well as the national level. In order to do this it was necessary to estimate what proportion of the national spending would occur at the regional level. This UMC study was undertaken in conjunction with the even other UMCs in the Netherlands and therefore the assumptions were made to be consistent.

It was assumed that 95% of spending, either staff spending their salaries or the spending in the supply chain, took place within the Netherlands. Both individuals and organisation have an inclination to spend within the region/province where

they reside, if they can. The main determinant of the proportion of spend that is local is the size of the regional/provincial economy. It was assumed that the proportion of Dutch spending in each of the provinces was equal to the province's population share, however people and organisations were 3,5 times more likely to spend money in the province they were in. In this instance, the **Northern Provinces** have **10.2%** of the Dutch population so was assumed to accrue **36%** of the local spending.

If the institution supplied more detailed information about their geographical spend, this information was used instead.

Provincial Multipliers

The economic multipliers, which are used to calculate the indirect impacts, were also adjusted for the provincial multipliers. The multipliers were based on the input output tables of the Netherlands and consider the knock on impacts of the supply chain and staff spending. Therefore the proportion of the indirect impact that was captured in the province of the direct impact was assumed to be the same as the proportion of provincial spending. In this instance, the **Northern Provinces** have **10.2%** of the Dutch population so was assumed to accrue **36%** of the indirect multiplier