

P.H. Pellenbarg*

HOW TO CALCULATE THE IMPACT OF A UNIVERSITY ON THE REGIONAL ECONOMY

A case study of the University of Groningen, the Netherlands

* Faculty of Spatial Sciences

University of Groningen, P.O. Box 800, 9700 AV Groningen, the Netherlands

E-mail: p.h.pellenbarg@frw.rug.nl

Paper presented to the Conference on Knowledge and Regional Economic Development, organised by the Regional Quantitative Analysis Research Group, University of Barcelona, 9-11 June 2005.

ABSTRACT

Nowadays universities are no longer regarded as institutions for education and research only, but are recognized to be important regional economic actors as well. They can act as partners of local governments and private firms in the process of regional economic growth, and even play a key role in what is presently conceived as 'the learning region'. Along with this modern view a cataract of institutionally inspired theoretical discourses developed about the role of universities and other knowledge centers. However, at the same time the number of empirical studies that try to visualize and quantify the regional economic impact of universities is relatively modest. In this paper, we list and describe the regional economic models that are available for quantification (input models, output models, and combined models that embrace attraction effects next to input- en output-effects). Finally we choose to apply Vermeulen's 'model of functions and regional scope of education' (Vermeulen 1996) in a case study concerning the university of Groningen, a medium sized city (177,000 inhabitants) in the North of the Netherlands. It is important to note that the quantification includes, on the basis of explicated arguments, the university related hospital. Using a variety of data sources, the functions contained in the Vermeulen model were quantified for the university and its hospital: employment effects, purchasing power, R&D effects, qualification effects, warehousing effects, and location effects, among which the university spin-off of private firms. Taken all together, the university (20,000 students) and the university hospital (1300 beds) produce a regional economic impact of 31,550 jobs. Circa 90% of these jobs are in the directly surrounding region, within 30 km distance of the city. In this surrounding region, between 10 and 11% of all jobs thus are university related jobs. In fact, this is even an underestimation of the regional economic impact, because the university spin-offs and are partly unknown, the location effects are unknown for the greater part, and image effects fall outside the scope of the model. Future research intends to fill in these gaps.

Introduction

Education and research are without doubt the two main tasks of every university. Nonetheless the awareness is growing that apart from being school and laboratory, universities are also enterprises, with a corresponding function in economy and society. Narrowly defined, this pertains to the sale and distribution of knowledge and educational services. Broadly defined, it leads to a vision of the university as partner of government and business, together reaching for regional economic development. (Maskell and Törnqvist 2003). The university even performs a core function if one places this development in the modern concept of the *learning region*, that is, the idea of a relation between knowledge creation on one hand, and economic development of firms and regions on the other, embedded in regional networks.

Florax provides a striking description of the core task of the university in the regional economic developmental process in his book *University: A Regional Booster*, a title that suggests that the university can play the role of tug, auxiliary engine, dynamo, booster, or whatever name one chooses to give to it¹. Many of these sorts of utterances can be found in the nineties of the previous century². The globally repeated success stories of Boston (*Route 128*) and San Francisco (*Silicon Valley*) where the top universities MIT and Stanford are attributed such a booster role, play a large role in the persuasive powers of the authors who write about it. In Europe, *the Cambridge phenomenon* is the classic example of a top university that attracts throngs of highly reputable companies and thus provides the region with an enormous impulse³. The success stories become well known and local and regional politicians are predisposed to do something with this: universities are ‘sexy’ and provide the region prestige. In several countries, the establishment of universities has actually become part of regional policy, such as in Sweden (Lulea, Norlan) and in Norway, Finland, Germany, Ireland and the United Kingdom⁴. In the Netherlands, the establishment of the Technical University of Twente and the University of Maastricht can essentially be regarded in the same context, that is to say that they have also been intended to be instruments of regional development.

Yet there is also ground for scepticism concerning the willing acceptance of the vital role of universities in regional development. The above-cited Maskell and Törnqvist for example, warn against finding a relationship that is too loose, too easily. The network relationships are extremely complex by nature, and a combination of favourable circumstances in one case, does not always work in another. In the US for instance, it is pointed out that several high-quality universities such as Berkeley, Cal Tech, Columbia,

¹ R. Florax, *University: A Regional Booster* (Aldershot 1992).

² For example: M. Bleaney, M. Binks, D. Greenaway, G. Reed, D. Whynes, ‘What does a university add to its local economy?’ *Applied Economics* 24 (1992) 305-311; H.W. Armstrong, ‘The local income and employment impact of Lancaster University’, *Urban Studies* 30 (1993) 1653-1688; E. van der Meer, *Knowledge on the move: the university as a local source of expertise* (Amsterdam 1996); J. Goddard, *Universities and regional development: an overview. Background paper of the OECD project on the response of higher education to regional needs* (Newcastle upon Tyne 1997).

³ D.E. Keeble, ‘High technology industry and regional development in Britain: the case of the Cambridge phenomenon’, *Environment and Planning C* 7 (1989) 153-172.

⁴ R. Florax, ‘De regionaal-economische betekenis van de universiteit’, *Geografisch Tijdschrift* XXI-4 (1987) 354-368; P. Maskell and G. Törnqvist, ‘Universities and the learning region’, in: R. Rutten, F. Boekema & E. Kuijpers (eds.) *Economic Geography of Higher Education* (London 2003)129-144.

Chicago, Harvard and Johns Hopkins have *not* played a role as incubator for high-tech industry in the region⁵. And at the somewhat higher analytical level of the Netherlands in the eighties, it has been shown that regional differences in higher education are *not* reflected in the level of regional economic development⁶. A disrupted labour market and migration flows can easily cause a negative surprise for those who take the role of universities as regional boosters for granted.

The previous makes clear that it is dangerous to paint too rosy a picture of what an institution such as the University of Groningen can economically achieve for her region by offering easy descriptions, associations and comparisons. A solid sketch of the regional-economic impact of the RUG - especially if we want to provide this in quantitative terms - in the first place requires the availability of some kind of mathematical model, a model wherein the various dimensions of the economic impact are catalogued and perhaps connected to one and other. First we shall look at several attempts that have been made at this by various economists of the RUG itself in the sixties and eighties of the previous century, that is, well before the hype surrounding *learning regions*. Because the initial mathematical attempts led to rather limited results, we will examine the possibilities of a broader impact analysis afterwards, first aided with the schemas of Florax and Lambooy, then aided by the spatial function model of Vermeulen, in which we shall attempt to insert known data of the current situation.

Old calculations of the impact of the RUG according to input models

The ideas concerning the regional and social function of universities have particularly grown since the second half of the 1960s, when due to the combined effects of increased wealth and the baby-boom generation leaving secondary schools, the massification of higher and scientific education began to make itself felt - not only in the Netherlands, by the way, but in many countries. Enrolment increased strongly, and concurrently, new and bigger buildings came into existence, often concentrated in new 'growth locations', making universities much more physically visible as institutions of great importance as bases for population growth and employment in their host cities.

In Groningen, this quickly led to the first attempt to determine the actual importance of the university for the economy of the region, by prof. F.J. de Jong of the faculty of Economics⁷. He worked with an integral input model, which means that one looks at the direct effects of the university on the regional income and regional employment via *inputs*, in other words via the expenditures that it makes to obtain means of production (land, real-estate, personnel and capital goods). Moreover, the indirect effects of university employee (and student) spending on regional income and regional employment are taken into account. In the period before 1960, the direct university product, calculated accordingly, embodied merely 0.7% of the net provincial product. In 1967, this share had risen to 2.2% according to de Jong - a clear reflection of the growth

⁵ E.J. Malecki, *Technology and economic development* (Harlow 1997).

⁶ M. Vermeulen, 'Knowledge still travels on foot; an educationalists' perspective on regional development', in: R. Rutten, F. Boekema & E. Kuijpers (eds.) *Economic Geography of Higher Education* (London 2003) 69-86.

⁷ F.J. de Jong, *De economische betekenis van de Rijks Universiteit te Groningen voor de provincie* (Haarlem 1969).

in student and employee numbers so typical of this era, but still not impressive. Finally, a result of 2.5% is achieved through indirect effects. According to de Jong, the difference between direct and indirect results is very small due to the high regional import quota (read: much university spending was done outside the province).

De Jongs calculations are open to critique. Especially criticised are the application of relations from input-output tables of 1953 on figures for 1960 and 1967, and the assumption that consumer spending-, savings- and taxation quotas for Groningen are equal to those of the Netherlands as a whole⁸. Nonetheless, de Jong befalls the honour of being the first to estimate the regional-economic impact of a university in the Netherlands.

In the 1980s the Groningen economists Oosterhaven and Stoffelsma provided another input model calculation of the RUG. This calculation, however, does not account for the expenditures of the university as a whole, but only accounts for student spending and as such, is not directly comparable to the calculations of de Jong. Using interregional input output models (which de Jong did not yet have access to), Oosterhaven and Stoffelsma estimate that the approximately 16,000 students of the RUG generate a net income effect of between 74 and 88 million guilders per year, corresponding to 1250 to 1500 full-time jobs, of which 40% in retail (trade), hotels, cafés and restaurants. Half to two-thirds lands in the city itself. The integral employment effect of the RUG, including the university employees and their expenditures in the region, and the mitigating effect of the investment and exploitation expenditures amount to 8500 to 9500 full-time jobs, that is 5% of employment in the province of Groningen, and 2% of employment of the North as a whole⁹. These are certainly not figures to be ignored, figures that seem higher than those of de Jong for 1967, but they still are not figures suggesting a university that substantially drives the regional economy. Perhaps that is due to the method of calculation, however. We shall see that a broader approach than an input model is possible.

A broader vision on regional-economic impact; attraction effects

In a publication a few years ahead of his earlier cited dissertation of 1992 concerning the university as a regional booster, Florax gave eight aspects of the possible influence of the establishment of a university on the region (table 1).

The distinguished effects cannot really be isolated of course, but are related in various ways. This is especially true for the economic effects, which are strongly related to, for example, demographic developments, infrastructure and the image of the region. Florax then makes clear that there are generally three ways to map the economic effects: through inputs (or *backward linkages* of the university), through outputs (these are the *forward linkages* of the university) or through a model that combines input- and output effects with the so-called *attraction-effects*.

The calculations of Oosterhaven and Stoffelsma are clearly of the input model kind, which depends primarily on the expenditures of a university and its students and

⁸ Florax, 'De regionaal-economische betekenis van de universiteit', 360.

⁹ J. Oosterhaven, 'De betekenis van de RUG voor de regionale employment opportunities', *Universiteitskrant* 10 maart 1983; J. Oosterhaven en R.J. Stoffelsma, *De economische betekenis van bestedingen van studenten in Noord- en Overig Nederland* (Groningen 1983).

employees. This kind of model calculations became popular in the 1960s and 1970s, and many have been made¹⁰. The opposing output method concerns the income and employment effects of graduated students, departing employees, and the effects of regionally relevant knowledge and regional services. Very few examples of this method

Table 1 Classification and examples of regional effects of a university

<i>Regional effect of a university on:</i>	<i>Example</i>
Politics	Change in political structure, increased citizen participation, improved organisation of the political process
Demography	Change in the birthrate and deathrate, greater mobility
Economy	Effect on regional income, the industrial structure, the labour market, labour mobility
Infrastructure	Effect on housing, traffic, medical services, the retail sector
Culture	Greater supply of cultural goods, influence on the cultural climate
Attraction	Influence on the image of the region, the regional identity
Education	Effect on participation, change in quality
Social aspects	Effect on the quality of life, the influence of students

Source: Florax 1987

are known, and it was never used for the RUG. In the third model, which Florax calls the 'encompassing method,' attraction-effects are also taken into account. By this is meant the attraction on visitors and companies (especially high-tech companies), the latter possibly embodied by special research parks or science parks. In this case the influence of the university on the image of the region is specifically at stake. Output and attraction effects are particularly hard to distinguish in the formation of concentrations of high-value business in the neighbourhood of universities. Companies that evolved as spin-offs from the university, founded by former students or employees, fall under output effects. When attracted from elsewhere, they fall under the attraction effects. From the outside one cannot see which of the two effects it concerns¹¹.

It is important to note that in the attraction effect there is no difference between integral and marginal effects. Attraction effects take place or not, related to the presence or absence of a university. With input and output effects, there is a difference between integral and marginal effects. Marginal effects are 'real' effects; to calculate them, from the integral effects one deducts the effects that would have taken place when the available funds would not have been invested in a university or - if it concerns regional effects as is the case here - the university had existed in a different region, in this case outside the

¹⁰ For a survey of the US see also: I.S Fink, 'The economic relationship between institutions of higher education and their local communities', *Planning for Higher Education* 8 (1980) (4) 41-47.

¹¹ Florax, 'De regionaal-economische betekenis van de universiteit'.

Northern Netherlands. The research of Oosterhaven and Stoffelsma takes this into account, for instance. As expected, it shows that by far the greatest part of the integral effect for the Northern region is also a marginal effect, and as such would not have happened if the RUG had been located in the *Randstad*.

The model of Lambooy; the entrepreneurial university

A proper study according to Florax’ ‘encompassing method’ in which apart from income, expenditures and the concurrent direct and indirect employment, also the effect on business in the shape of spin-offs, science parks and such play a role, has never been conducted for the RUG. A contribution to the conference on ‘University and Society’ in 1996 of the European Centre for Strategic Management (ESMU) concerning the RUG where regional network relations were the main focus, is no more than a start to an examination of such an all-encompassing approach¹². In this ESMU paper, the analytical model provided by Lambooy is used, which differs from Florax’ model¹³. The essence of this can be seen in table 2. This model is not actually a model in the economic sense, but a summary of categories of effects affecting labour and income, and as such can be called ‘economic’. Both input and output effects are included in the list, but attraction effects have been left out—unjustly so! Currently, attention *is* being paid in a more fashionable way to two other categories of effects, namely 1) the *spin-off* of ‘high tech’ and ‘high touch’ firms from universities and 2) the economic effects in the shape of commercial sale of knowledge in various forms.

Table 2 Classification and examples of economic effects of universities

<i>Economic effect of university</i>	<i>Example</i>
Employment at the university	Number of jobs at the university and related institutions
Income of the university	State contributions, tuition fees, financial a.o. benefits e.g. from book sales & merchandising
University spending	Purchase of goods and services by the university
Income and spending of university employees	Wages, salaries, and social security costs. Expenditures in shops, on entertainment and culture, and on public transportation
Labour market effects	Delivery of educated labour. Heightened productivity effect.
Spin-off of business	Companies founded by (former) students and university employees, whether or not employing academic knowledge and technology
Marketing of knowledge	The sale of knowledge in a variety of forms: from ideas and courses, to patents.

Source: Lambooy (1996) (modification)

¹² P.H. Pellenbarg, ‘Defining the university region; the case of the University of Groningen’, Paper presented to the conference ‘*University and Society*’ (Veszprem 1996).

¹³ J.G. Lambooy, ‘Knowledge production, organisation and agglomeration economies’, AME-Congress paper (Amsterdam 1996).

In light of the wave of interest in business innovation in the 1980s—regarded as the saviour for the then fumbling economy - the growing interest in the role of universities as commercial knowledge sellers and incubators of high value business is logical. Following the example of American universities, Dutch universities (the TU Twente at the forefront) fully embraced their incubator function, started counting the number of small businesses they generated, and started to establish science parks to house these businesses. There have been a few major studies of the scope of the academic incubator function, commissioned by the Ministry of Economic Affairs by van der Meer and van Tilburg, by the National Planning Service by Vlessert and Bartels, and by the University of Nijmegen by Buck and Roelofs¹⁴. Regrettably, there is no such study available for the RUG.

The modern, business and market-oriented trend of the 1980s befits a modern phrase: the ‘entrepreneurial university’. In practice, it is particularly the Technical University Twente that ascribes to this label, after research had shown that especially here, large numbers of knowledge-intensive spin-off companies had been founded: at the end of the 1990s there are more than 300, providing 2000 jobs¹⁵. Curiously, no such wide-ranging research of spin-offs of the University of Groningen has ever been done because apart from the TU Twente and Leiden University, the RUG was one of the first to provide for dedicated housing for university spin-offs at the Zernike Science Park (at the northern end of the university complex in Paddepoel since 1983.). A collective business building became available that was expanded several times, but also separate firm housing was and are still available.

In the early nineties, the science park organisation was split up. The real estate development largely came in the hands of the SIG (Industrial and Trade Buildings Groningen). The Zernike Park management continued as a private organisation under the name Zernike Group and expanded far beyond Groningen. The Zernike Group currently also manages the Amsterdam Science Park, The Regional Technology Centre of IJmond and two science parks in Australia. Moreover, it also manages a dozen of start-up funds, aimed at Groningen and various other Dutch cities. Worldwide, the group has already helped 400 companies to start up¹⁶.

Aside from the Science Park organisation, there are also other signs of increasing involvement with business by the RUG in the course of the 1980s and 1990s, through a number of initiatives:

- the financing of investment initiatives by the RUG through its ‘Temporary Entrepreneurial Placements’ (a subsidy on wages for start-ups);
- the Zernike Seed Fund, which provides venture capital to young knowledge-intensive businesses (RUG together with NOM, ABN-AMRO and Aegon);
- profit centres started up, aided by ISP subsidies, and other market-oriented groups, for instance in the area of biotechnology;

¹⁴ J.J. van der Meer en J.J. van Tilburg, ‘Spin-offs van de Nederlandse kenniscentra’, *Economisch-Statistische Berichten* 69 (1984) 1170-1173; A.C.J. Vlessert en C.P.A. Bartels, *Kenniscentra als elementen van het regionale productiemilieu* (Oudemolen 1983); R. Buck en B. Roelofs, *Spin-offs van de Katholieke Universiteit Nijmegen; voorverkenning ten behoeve van een science park* (Nijmegen 1985).

¹⁵ J.J. van Tilburg en P. Hogendoorn, *Het succes van innovatief ondernemen* (1997).

¹⁶ J. Dijkema, *Ontwikkelingen in het denken over Science Parks* (Groningen 2003).

- the establishment of the market-oriented Research and Consultancy Centres (RCC's) within the faculties (there were already eight in 1999);
- the establishment of a RUG Holding Company under whose structure the Ltd.'s spawned by the RUG (the former RCC's and spin-offs) function.

There are also important new developments in the area of 'marketing of knowledge' (the last part of Lambooy's model). The 'Academic Education Groningen Foundation' (AOG) is founded at the end of the 1980s as the RUG's organisation for commercial postdoctoral education and quickly becomes market leader of this kind of education in the Netherlands. More about that will follow in the next paragraph.

The spatial model of educational functions according to Vermeulen

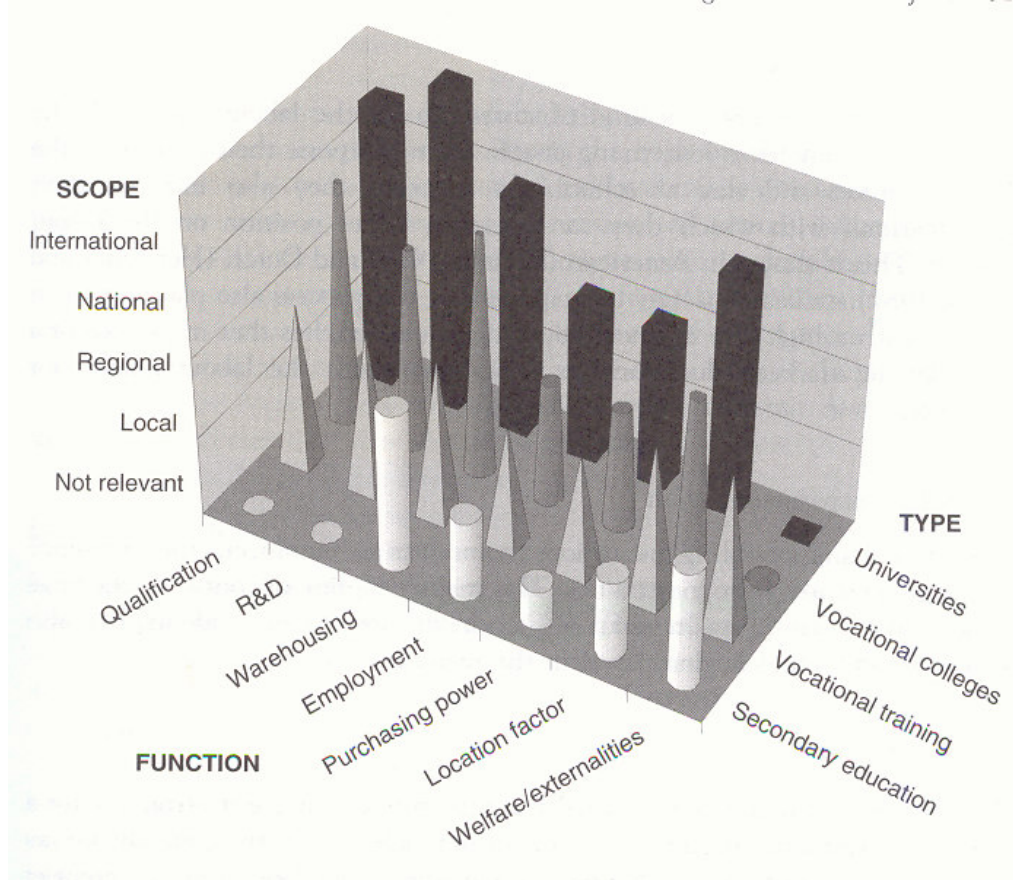
In his doctoral dissertation *Human capital in the hinterland*, Vermeulen presents a model that describes the social meaning of education c.q. educational institutions, specified by type of education and type of effect¹⁷. It is a very complete model, because it describes both the input, output and attraction effects. Moreover, it specifies the *spatial scale* on which the effects take place. Particularly the latter makes it very suitable to our goal, and that is why Vermeulen's model is chosen here to function as vehicle for presenting the most recent data - insofar as it is known - concerning the regional-economic effects of the RUG. The model is depicted in figure 1. First we shall briefly discuss it, after which we shall see what data is available to insert.

For the economy of a city, country or region, the *qualification* that a degree provides to employees is a very important effect of education in the first place. The effect is greater the higher the level of education is. The same goes for (business) activity in the area of research and development (R&D). The great importance of qualification and R&D effects (both are output effects!) is evident from the high columns in figure 1. Both types of effects rise, particularly with universities, far above the regional level, and in fact are at play on a global (international) level. After all, the students and the university derived R&D activities spread across the entire country and sometimes much further. For the region, this effect can also be regarded in negative terms, for know-how disappears elsewhere (brain drain). Remarkably, the qualification and R&D effects for HBO institutions (vocational training and colleges) do remain largely in the region. *Warehouse* effects are a variation of qualification effects. Vermeulen says that education performs a kind of 'storage function' with regards to the job market. If there are few job opportunities, young adults postpone their entrance to the job market and continue their education. Their qualifications thereby increase. This effect is particularly observable in areas of high unemployment¹⁸. The model makes clear that this is really the only type of education effect that is of importance at all educational levels, be it that is most applicable to higher education. The *employment* and *purchasing power* effects of educational institutions in the model are self-evident: these are the direct and indirect economical effects of the money that is spent through universities, their employees, and their students, effects that were central to the aforementioned input models. These are

¹⁷ M. Vermeulen, *Human capital in the hinterland* (Tilburg 1996).

¹⁸ Vermeulen, *Human capital in the hinterland*, 72.

Figure 1
A Model of economic functions of institutes of higher education and their spatial scope



Source: M. Vermeulen, *Human capital in the hinterland* (Tilburg 1996).

exemplary of regional effects. The *location* effects from the model are what we would call attraction effects earlier. They denominate the attraction of the university as knowledge centre on high-value business. The spatial consequences of this clearly reach beyond the region. Finally, the model contains a *welfare/externalities* factor that could also be categorised under attraction effects. This concerns the positive influence that education/knowledge institutions have on the social and cultural life, healthcare etc., which in turn makes a location or region more attractive to study, live, work, or establish a business. Vermeulen calls the spatial level of these effects irrelevant, but that seems to be a mistake: as an attraction factor, they work locally and regionally, for all educational levels, and most particularly for higher education.

Qualification and R&D effects

An attempt at quantifying the qualification effects of the university towards the labour market naturally starts with student data: the intake, total number of students, and the graduates. The yearly intake of the RUG currently holds steady at about 4000, the total number of students is around 20,000, and the annual output of graduates is about 2500

(the exact numbers in 2002 were respectively 3960, 20,120 and 2458¹⁹). To ascertain the regional-economic effect of the stream of graduates that the RUG sends to the labour market, a number of important questions must be answered:

- 1) How many graduates find employment in the Northern region?
- 2) How does the regional spread of attained jobs compare to the regional origins of the students?
- 3) How much of the graduates' income is determined by their education?

Table 3 regional origins of students and employment region of graduates
(% of total)

Region	Origin of students	Employment region of graduates
North	60	35
East	25	15
West	11	42
South	3	5
Other	2	3

Source: LAC 2003, CSA 2004²⁰

Table 3 shows the answers to questions 1 and 2. Not surprisingly, there is a vast difference between the regional origin of students and the location of their jobs after graduation. A large majority of students originates from the three northern provinces, yet only a third finds a job there after graduation. If we take a wider look and include the entire North-eastern half of the Netherlands, which is after all, the recruitment region where the RUG is dominant (that is to say that this is the region where no other university recruits more students²¹) the image becomes even clearer: 85% of all students originate from that dominant recruitment area, but only 50% remains there to work. Almost the entire difference of 35% ends up in the West, where few students come from (11%) but 42% of the graduate jobs are found. Here we can observe the occurrence generally termed *brain drain*, but that probably is an unnecessarily negative term. In his inaugural speech on 'labour market and region', Professor of regional labour market analysis Van Dijk preferred the more positive term 'knowledge export' and argued for the growth of this export stream that is so profitable to the RUG, most preferably on the basis of an increased import stream of western students. He also pointed out the existence of a opposite stream of higher educated people from the West to high quality vacancies in the North, which more or less neutralises the drain of graduates²².

To measure the economic effect of the RUG students on the region, we cannot only look at the number of them who after finishing their studies enter the northern labour market (35% of 2500 = 875) but we must also know the answer to question 3: how

¹⁹ Zie RUG, *Jaarverslag 2002 Rijksuniversiteit Groningen* (Groningen 2003).

²⁰ Loopbaan Advies Centrum, *Resultaten Alumni-Monitor* (Groningen 2003); Centrale Studenten Administratie, *Provincie van herkomst RUG studenten* (Groningen 2004).

²¹ P.H. Pellenbarg, 'Groningen, regional capital of the Northern Netherlands, seeking a new identity', in: P. Kooij & P.H. Pellenbarg (eds.) *Regional Capitals. Past, present, prospects* (Assen 1994), 70.

²² J. van Dijk, *Arbeidsmarkt en regio* (Groningen 2001).

much more are RUG alumni earning and how much more are they spending in the region compared to what they would have done without university education? Of course this is not exactly known, but a reasonable estimate seems to be that they will reach a salary level of twice the national income average ('modal income' = 50 to 60,000 euros) instead of merely the average level (29,500 euros). The difference of $875 \times 25,000 = 22$ million euros can be regarded as the 'annual education contribution' in monetary terms of the RUG to the North of the Netherlands. However great a difference this may be for the alumni, for the Northern Netherlands economy it is only a modest impulse. We have to realise that those 875 RUG alumni represent merely 2.5% of the cohort of 35,000 school leavers that annually enters the Northern labour market²³. Even more doubt is cast on to the importance of the relationship between higher education and regional-economic growth by the recent research project by the Americans Bils and Klenow, who suggest that it seems that economic growth is more likely to influence the level of education than the other way around! In the introduction we already cited Vermeulen, who draws similar conclusions for the Netherlands²⁴.

One must not lose sight of the fact that apart from the mass of students in the age group of 18-28, the RUG increasingly caters to other groups in her academics. There is a steady increase of post-doctoral and senior education. Within this, the commercial contract education provided by the AOG organisation plays a special role. AOG stands for 'Academic Education Groningen'. This is an organisation founded by the RUG and cooperating with the Freia Science Services Company, which provides postgraduate education on a commercial basis under various commercial labels. Since the late eighties the AOG has produced 4500 alumni and the course offerings (particularly in the fields of management and marketing) are growing. Nationally, the AOG has become leader of this segment of the educational market with a turnover of approximately 10 million euros. Just recently it took over the Institute for Business Education (IBO) in Zeist, making the total number of employees reach about a hundred - that is already more than the three small faculties of the RUG have each. The regional-economic effect of the education that AOG provides is small because a national demand is met from centrally locations, but because part of every course is offered in the city, the Groninger character is still emphasised.

The R&D effects of the RUG on the region take us from the educational to the research aspect of the university, and with that also to other faculties: from the education intensive alfa and gamma faculties, to research-intensive beta and medical faculties. Contract-based research is concentrated here, and beforehand, is much bigger in size than contract-based education. In the middle of the nineties, 500 full-time jobs were based on the 'third money stream' (that is all the money that does not come directly from the Ministry of Education or the national research funding organisation NWO) of which 400 jobs were to be found in beta and medical faculties. These numbers have currently become much higher. In the course of the nineties the income of the RUG from the third money stream has rapidly grown from less than 20 million euros to more than 40 million euros²⁵.

²³ L. Broersma, D. Stelder, J. Van Dijk, *Noordelijke Arbeidsmarkt Verkenning 2004* (Groningen 2003).

²⁴ M. Bils & P.J. Klenow, 'Does schooling cause growth?' *American Economic Review* 90 (2000) (5), 1160-1183; Vermeulen, 'Knowledge still travels on foot', 73.

²⁵ H. Perton, 'Contractonderwijs en -onderzoek aan de RUG', *Universiteitskrant* 28-1-1999, p. 9.

To be clear: almost 90% of the third money stream goes towards contract-based research, and only 10% to contract-based education. In 2002 the turnover of contract-based research already amounted to more than 70 million euros, which is 15% of the total university budget of 470 million euros (RUG 2003). Compared to the numbers from the mid-nineties, an estimated 1000 full-time research jobs must be based on this. Coincidentally, the annual report of the RUG puts this figure at a much lower number²⁶. Nonetheless, a substantial part of the direct employment effect of the RUG to be discussed hereafter is directly linked to her R&D efforts on the behalf of third parties. But the actual R&D effect must of course occur within those third parties themselves - of which only a minority turn out to be from the region, by the way. At the end of the nineties, 40% of the third money stream came from government, 30% came from charitable institutions, and only 10% directly from companies commissioning research to the RUG²⁷, of whom we may assume that they are not very often located in the Northern region. Thus, the R&D effect is not exactly massively beneficial to business in the region, which is a confirmation of the assumption in the model of Vermeulen (see figure 1).

The third effect on the function-axis of Vermeulen's model is the 'warehouse effect'. This is really a variation on the qualification effect because it also applies to the education of the working population. The term 'warehouse' denotes the situation wherein adolescents choose schooling over the search for a job, if and when there are few jobs. Vermeulen says that this also occurs in the Netherlands, particularly in areas of high unemployment, and in this regard refers to a study by Herweijer and Blank²⁸. Current data that can confirm this for Groningen (or even the entire North) is not available. What is clear, is that 'warehousing' occurs on the labour market in another fashion, namely in the sense that graduates who are looking for their first job do not immediately leave the city of Groningen. This is a classic explanation for the relatively high unemployment in the city of Groningen - all the academically educated young people of the whole of the Northern Netherlands congregate here to experience their first bout of frictional unemployment! The resulting large labour reserve does attract a certain type of business, exemplified by the concentration of so-called *call centres* in Groningen in the nineties - not specifically academic, but certainly intelligent and linguistically demanding work.

Employment effects

The direct employment effect of the RUG comprises in the first instance of the 4400 full-time positions it offers, divided over a total of 5360 employees²⁹. Many believe that the RUG and her five thousand employees is the largest employer in the Northern Netherlands, and the university likes to boast this herself, but it is no longer true: the Academic Hospital (AZG) is bigger. The AZG's own numbers are not always clear (ranging from 6,5 to 8 thousand) but her official 2002 annual report cites 7000 employees, of which 424 medical specialists, 357 doctor's assistants, 1901 nurses, and

²⁶ RUG, *Jaarverslag 2002*.

²⁷ H. Perton, 'Contractonderwijs en -onderzoek aan de RUG', 9.

²⁸ L. Herweijer en J. Blank, 'Onderwijsexpansie en werkloosheid', *Tijdschrift voor Arbeidsvraagstukken* 3/3 (1987) 80-86.

²⁹ RUG, *Jaarverslag 2002*.

275 volunteers. The remainder is administrative personnel. Together, the RUG and AZG are good for 12.5 thousand jobs, accounting for roughly 10% of the approximately 125.000 jobs in the city of Groningen!

The combined count of the RUG and AZG is debatable, for even without the presence of a university, Groningen may have had another medium-sized hospital in addition to the Martini Hospital. Or would it not? A comparison to other medium-sized cities is easily made, though difficult because the recent mergers of hospitals have altered the historical situation. Whatever the case, at this point in time, of all provincial capitals outside the *Randstad* only Groningen has *two* general hospitals, the rest only have one! Furthermore, the Academic Hospital in Groningen is also much larger than the average general hospital. With its 7000 employees, it far exceeds the Martini Hospital (2700 employees) and the other hospitals in the North (Scheper Hospital Emmen 1550; Wilhelmina Hospital Assen 1175; Nij Smellinghe Hospital Drachten 1130; Diaconessenhuis Meppel 1100; and 6 smaller below 1000³⁰). The number of beds also denotes a more than average function. In the eight provincial capitals outside the *Randstad* the number of hospital beds varies from approximately 350 (in Assen) to approximately 1100 (in Leeuwarden, Zwolle and 's Hertogenbosch). The Martini Hospital has 950 beds, which taken together with the 1060 of the AZG, gives Groningen a combined 2000 beds, almost double that of Leeuwarden, Zwolle and 's Hertogenbosch, and three times as many as in Arnhem (650) and Maastricht (690). This 'comparison of beds' makes clear that the AZG is something 'extra' in Groningen. It provides a higher level of medical service to an area that stretches much further than its own provincial borders, and indeed to a large part of the Northern and Eastern Netherlands. Concluding, the assertion seems justified that the presence of the AZG can be largely attributed to its academic status. The personnel of the AZG will therefore be counted as part of the employment effect of the presence of the university. The recently announced merge of the AZG with the medical faculty of the RUG into an academic medical centre (UMC) only further warrants regarding the AZG and RUG as a whole.

A direct employment effect of the RUG takes place, of course, via her spending on businesses in the region. These expenditures can be found in the section 'miscellaneous expenses' of the operational account of the RUG, which in 2002 amounted to 95 million euros. That is a considerable amount compared to for instance the 76 million the national government spends annually on her regional economic stimulus package for the whole of the North³¹. But unlike the regional funding of the Ministry of Economic Affairs, not all RUG spending finds its way to regional businesses. Local businesses do dominate the catering expenses of the RUG, the expenses for office furnishings, pc's and such. But the massive expenditures on cleaning, construction, and energy are made with a small number of very large companies who usually are established locally, but have their main offices elsewhere in the country, and that's where the payments are going. To what degree that money then re-circulates back to the local offices of the cleaning, building and energy companies cannot be traced. A careful estimate would be that roughly half of the 95 million spent on miscellaneous expenses eventually benefits northern businesses (and particularly in Groningen), but a precise

³⁰ J. Schaafsma, 'Ziekenhuizen doorgelicht', *Dagblad van het Noorden* 12-9-2003.

³¹ Ministry of Economic Affairs, *Nota Ruimtelijke Economisch Beleid* (Den Haag 1999).

estimate of the amount of jobs this entails is a bridge too far. It must number in the hundreds in any case.

In much the same way as for the RUG - and similarly debatable - the indirect employment opportunity effects of the AZG via expenses in the region can be ascertained for the region. These will definitely be higher, for on a total balance that is only a little higher than that of the RUG (500 million euros v. 470 million euros for the RUG) the AZG does spend more on 'miscellaneous expenses', namely 147 million euros³². The part of this amount that can be ascribed to the RUG is the largest part, and would, just as was the case with the personnel of the AZG, form the basis of at least 'some hundreds' of jobs in the region. If one were to add up the spending effects of both the RUG and the AZG, the effect of 1000 jobs in the region and city does not seem exaggerated.

After analysing the direct employment opportunity effects of the RUG (and AZG) that come into existence through personnel and spending, it seems logical to take a look at the indirect employment effects that present themselves in the shape of businesses in the region for which the university has played a critical role in determining the location choice, or those that can pass as RUG *spin-offs*. We will not, however, tackle these here, because they are not, after all, input effects. Academic *spin-off* is in actuality really a kind of *output effect*, and businesses that come from elsewhere are an *attraction effect*. We will review both cases below, when we deal with the current role of the university as factor in determining location.

A last employment effect of the RUG that cannot be ignored is the role the students have on the labour market. In the course of the nineties, an increasing number of students - currently at least 70% - have started to provide for themselves through small part-time jobs. On average, students work 11.5 hours a week. That is just below the threshold of 12 hours that the Central Bureau of Statistics and other research institutions use in their registration and calculations of the labour market. As such, and unjustly, it usually remains unnoticed. A recent study by the Centre for Labour and Policy (CAB) in Groningen concluded that 27,000 out of 35,000 (RUG and Hanzehogeschool) students in Groningen have such a part-time job³³. Based on the ratio between the RUG and the Hanzehogeschool, it would mean that 15,000 of these small jobs belong to RUG students. In terms of their full-time equivalents, that would amount to 4 to 4,500 full-time jobs. Two-thirds of these small RUG jobs are situated in the province of Groningen and more than half (53%, or 8,000 jobs) in the city of Groningen itself. This means that in addition to the 10% of the RUG and the AZG, another 6.5% of all jobs (large and small) in the city are in some way connected to the university!

One still could not call those 6.5% of all city jobs a true employment effect. After all, they do not concern real input effects such as the direct employment and spending of the RUG that are the result of her own financial means. One could even deem the small jobs students have as a negative, since they occupy a part of the labour market that would have otherwise gone to non-students of the city and province. This is debatable, and the debate was indeed instigated by the CAB report. Given the fact that the unemployed that were 'pushed from the labour market' by the students in most cases receive a welfare allowance that students *cannot* expect when they give up their (small) jobs, the presence

³² AZG, *Jaarverslag 2002* (Groningen 2003).

³³ O. Bulthuis en E. Klok, *De effecten van werkende studenten op de Groningse arbeidsmarkt* (Groningen 2004).

of students on the Groninger labour market can actually be regarded as regional-economically beneficial. We do not include this in the calculation of effects, though.

Purchasing power effects

The term purchasing power summons a strong association with purchases in shops and is therefore actually too narrow to properly denote what we are concerned with here, namely all indirect effects for the regional economy that occur via the spending of students of the RUG, employees of the RUG and AZG, and employees of suppliers to the RUG and AZG. Among these can indeed be counted the purchases in shops, cafes and restaurants, but also spending on housing, sports, cultural events and institutions, spending on relaxation and a possible holiday in the region, basically all ‘non basic’ (service) activities that are generated by the ‘basic’ activity of the RUG and AZG. By service is also meant the provision of public services: government, public safety, education and health services, infrastructure and public transportation, all of which must be, after all, financed from taxes that the inhabitants of the region pay from their income, be it that this largely happens through intervention and redistribution of the national treasury.

Some of the service c.q. purchasing power effects appeal more strongly to the imagination than others. Is it not interesting to know that students are responsible for a third of the annual 100 million turnover of the cafes-restaurants-hotel branch in the city of Groningen? The incredibly high density of cafes in the inner city compared to other cities is not for nothing!³⁴ But aside from that, students also count in retail spending, as spenders on sport and cultural activities etcetera, and in determining the population number on which to base government budgets for public services. The question is whether or not we should count them partially or completely when determining the size of the service sector. In their input model in 1983, Oosterhaven and Stoffelsma calculated the indirect employment effect of the (then) 16,000 RUG students as 13 to 1600 full-time jobs, i.e. the ‘multiplier’ here is maximum 10% of the total student number. This will have to be a higher estimate now, but the question is, how much higher. The income position of students has improved over the past 20 years, particularly because aside from parental support and government funding they now work more (in jobs) themselves, and so they spend much more. Their reliance on public services has also increased, particularly due to their massive use of public transport, fruit of the OV card. But the general standard of living has also risen; so more student expenses are needed to ‘carry’ an enabling job. Furthermore, a larger part of student spending is nowadays probably done outside the region. We therefore assume a modest increase in the employment multiplier for students, from 10 to 15%.

For service activities based on spending by the employees of the RUG and her suppliers, Oosterhaven and Stoffelsma estimate a much higher employment multiplier than for students: 54%. Is that number still usable or should we use a higher estimate now? The literature does not provide much information on the present basic/non-basic ration. Empirical research in this area is difficult and time-consuming, and is not often repeated. In his dissertation, Van Dijk³⁵ mentions employment multipliers for all separate

³⁴ F. Tuinman, ‘Groningen niet voor te stellen zonder studenten’, *Dagblad van het Noorden* 16-8-2003.

³⁵ J. van Dijk, *Migratie en arbeidsmarkt* (Assen 1986).

economic sectors. These vary with high value services (banking and insurance, business services, medical services and cultural services) from 20 to 50%. A different example: in the eighties Van Dijk and Oosterhaven calculated that the spending of families that moved to the North of the Netherlands amounted to an employment effect of 0.43 full-time jobs per household with a working head of the family³⁶. In recent studies of the possible regional-economic effects of a high-speed rail service to the North of the Netherlands, those last comparative numbers are still being referred to³⁷. This is a lower number than the 54% of Oosterhaven and Stoffelsma, but that can be defended because the labour migration to the north of the Netherlands pertains to all sectors, including lower educated employment opportunities who, with lower income also have a smaller service effect. The service employment effect of the university would probably rather be lower than the 54% of 20 years ago because increasingly, money is spent on foreign travel, and therefore does not stay in the region.

When taking it all in, it seems justified to assume a current purchasing power c.q. service effect of 50% for the employees of the RUG and AZG (respectively their employees and suppliers) and 15% for the students. That gives us the sum of 50% of (5400+7000+1000=13.400) and 15% of 20.000, which is 6.700+3.000 = 9.700 jobs in the service sector.

The university as location factor

Firms in the region that are 'linked to' the university other than through the purchasing power effect can be separated in two large groups. On the one hand there are the firms that have established themselves in, or moved to Groningen and surrounding areas because of the presence of the university. On the other hand there are firms that have sprung from the university itself: *spin-offs*. Spin-offs are not strictly part of the attraction effects of the university. They are actually output effects. But it is the most logical to regard all firms linked to the RUG as centre of knowledge as one. Therefore we will treat them and all other firms that have to do with the presence of the university as centre of knowledge together. Alternately, we could say these are the firms for which the RUG is not responsible as client, but as location factor.

How important is the *spin-off* of firms by the RUG in the region? The University of Twente (UT) is still regarded as the most 'entrepreneurial' university in the Netherlands. Every year, former students and UT employees found approximately twenty new companies. In total, there are currently already more than 300 such *spin-off* companies in the UT region. The UT even received a prize for this from the Ministry of Economic Affairs³⁸. The RUG cannot compete with those numbers. An undocumented estimate by the office of the university speaks of 150 companies in the region that can be regarded as spin-offs of the RUG. But they are not easy to find. A partial list can be attained through the Transfer and Liaison Group of the RUG (TLG), which since the

³⁶ J van Dijk & J. Oosterhaven, 'Regional impacts of migrants' expenditures', in: P.W.J. Batey & M. Madden (eds.) *Integrated analysis of regional systems* (London 1986).

³⁷ Centraal Plan Bureau, *Ruimtelijk-economisch effect van de Zuiderzeelijn* (Den Haag 1999); J.P. Elhorst, T. Knaap, J. Oosterhaven, W.E. Romp, T.M. Stelder, E. Gerritsen, *Ruimtelijk economische effecten van zes Zuiderzeelijn varianten*, REG-publicatie 22 (Groningen 2000).

³⁸ H. Oomen, 'Kletsland of Kennisland', *Binnenlands Bestuur* 18-7-2003, 35-37.

nineties has functioned as the centre of expertise for marketing RUG knowledge. The TLG manages a great number of activities, not all of which can be discussed here³⁹. For the employment effects towards firms, two cooperative relationships are, however, of great importance, namely the relationship with the technology Centre Northern Netherlands (TCN) and with the RUG Holding Company (RHM).

The TCN is an initiative wherein the RUG participates together with all the HBO institutions (professional colleges) of the North of the Netherlands, and TNO, with the goal of supporting innovation projects for middle and small sized business in the North of the country. An evaluation of the TCN programme reads that over the course of 1998-2001 350 new jobs have been created (and 1500 consolidated⁴⁰). That number will since have risen to about 400-450.

The RUG Holding Company has been active since the late nineteen nineties. She was founded as vehicle for financial participation in enterprises started up by RUG employees, and where the concept of production or service is based on knowledge of the RUG. A Research and Consultancy Centre (RCC) is often a preliminary stage of this kind of entrepreneurial initiatives. The RUG is the sole stockholder in the holding company, which she uses to expressly aim for developing a network of firms around the university and growth of the local economy. At the end of 2003, about 20 companies together with 150 employees were part of the RHM; further growth is forecast in the course of 2004 (for a summary, see table 4).

But the activities of the TCN and the RHM do not mark the limit of the spin-off activities of the RUG. There are many more larger and smaller companies that have been set up by the RUG or its employees outside this network, but the Transfer and Liaison Group have not systematically registered them. Notable are, for instance, Pharma Bio Research (research on the working of medicine) with 450 jobs in Zuidlaren, Assen and Groningen, Ophtec (optical implants and corrective eye surgery; 135 jobs), Syncom (chemical productions; 75), BioMade (nanotechnology; 45) and IQ Company (biotechnology; 25). Separate research would be needed to complete this list, something that has not yet been done before.

As opposed to the firms the university “*spins off*”, there are the firms the university *attracts*, by being a decisive location factor for companies that (re-) establish themselves in Groningen and the surrounding area. We could call these *spin-ons*. There is at least one example of a very large company that has come to Groningen due to the RUG (c.q. the medical faculty and the AZG). That company is Cordis in Roden. With its 1500 jobs, Cordis is one of the largest (if not the largest) foreign employers in the whole of the North of the Netherlands. The company is also one of the most important ‘innovation machines’ in the region; it ranks third in patent requests in the North. The RUG itself ranks fifth in that ranking by the way⁴¹!

Cordis is part of the foreign company Johnson and Johnson; it develops, manufactures and distributes medical equipment, especially catheters and stents. There should be more companies like Cordis for whom the RUG is location factor no. 1, but the story soon becomes monotonous: systematical research into this has never been done. It

³⁹ Transfer en Liaison Groep, *Jaarverslag 2002* (Groningen 2003).

⁴⁰ AVACON, *De economische effecten van de projecten van het Technologie Centrum Noord-Nederland 1998-2001* (Groningen 2001).

⁴¹ F.J. Sijtsma, J. Spits, E. Bos, A. Ekkelkamp, K. Tan, *Uitgevonden in het Noorden* (Groningen 2004).

Table 4 Participation in companies by the RUG Holding Company BV

	<i>Participation in:</i>	<i>Interest.</i> <i>%</i>	<i>turnover</i>	<i>fte</i>	<i>Main activity</i>
	2003				
1	ARC BV	60	1,800,000	30	Archaeology
2	ARGO BV	35	500,000	5	Healthcare
3	BRCC Milieugroep BV	15	1,000,000	13	Water and air purification
4	Decide BV	20	200,000	2	Strategic choices R&C
5	Genoclipp BV	7	0	3	Pharmaceutical research
6	Geschiedeniswinkel BV	40	300,000	5	History R&C
7	Sound Intelligence BV	7	200,000	7	Signal recognition
8	IMenz bioengineering BV	35	400,000	4	Micro organisms
9	Intravasc BV	29	0	4	Heart valve technology
10	KNN Milieu BV	35	400,000	6	Environment and economy
11	Medusa Explorations BV	40	300,000	2	Marine cartography
12	Merska BV	25	0	0	Pharmaceutical kits
13	Polyganics BV	17	250,000	10	Biodegradable devices
14	Pro facto BV	30	600,000	5	Legal and public admin. R&C
15	PSCG BV	65	900,000	14	Polymer chemistry
16	Kiadis BV	2	2,000,000	20	katalyst research
17	The Soil Company BV	13	200,000	3	Agricultural cartography
18	UC Promotion BV	33,3	500,000	7	Motion sciences
19	Q-Modus BV	20	250,000	4	Development in communi- cation
20	Science PLUS Groupe BV	20	300,000	5	IT specials, science softw.
21	Biovec BV	5	500,000	0	Gentherapy
	2004				
22	Virosome Biologicals	9	1,000,000	4	Pharmaceutical research
23	Angtec BV	10	400,000	4	Pharmacology
24	Innocore BV	15	100,000	3	Delivery of polymers
25	Enzis BV	30	100,000	2	Enzyme technology
26	Go North BV	20	400,000	2	telecom/internet
27	Gamma weg BV	45	500,000	2	Optimalisation of tarmac spread and distribution
	Total business		13,100,000	166	

Source: TLG/RUG

is, however, doubtful that they are many. There aren't that many companies that move from other provinces to Groningen (the biggest stream of moves actually heads in the opposite direction⁴² and usually other location factors will be more crucial, such as the labour market, client networks, available real estate or location subsidies.

⁴² P.H. Pellenburg & N.J. Kemper, *Industrial mobility in the Netherlands; patterns, causes and impacts for spatial policy*. SOM Research report 99D34 (Groningen 1999).

An example of a labour market-oriented business establishment for which the RUG is indirectly important as a location factor, (because students and recent graduates are the part of the working population that these companies specifically aim for) is the *call centres*. In recent years, a significant concentration of these call centres has formed in Groningen. BSC, SNT and Transcom are well-known examples of these Groninger call centres. According to the Northern Development Agency (NOM) the province of Groningen currently has 40 of those companies with a combined total of 3500 employees, of which the vast majority (that is, 36 companies and 3300 employees) are in the city. Rated according to the relation between RUG and HHS students, we can ascribe 2000 of those call centre jobs to the RUG.

On the Zernike Science Park, a combination of RUG *spin-ons* and *spin-offs* can be found. Since its inception, some 20 years ago, 40-odd companies have established themselves with a total of 1045 employees. This is a much smaller number than that of the Business & Science Park in Enschede (200 companies) yet as large as that of the successful Science Park of Leiden, and with that the Groninger Science Park can boast a spot in the top 3 of the Netherlands. An extra attraction factor of the Zernike Science Park is the international glass fibre network hub that has come into being with the arrival of the data hotel Tyco in 2001 (since taken over by SIG) whereby the conditions have been created to develop a strong cluster of ICT activity at this location. The Groninger Internet exchange - future gatekeeper of the data traffic in the city - is already established here.

From the review of all the companies related to the RUG it becomes clear that there is a certain concentration of one particular sector, the so-called *life sciences*. That sector has, unsurprisingly, become the vanguard of the development policy of the city and region, embodied by the so-called BioMed City Project. The RUG, the city of Groningen, the Northern Development Agency and a few other larger companies in the sector participate in this project. The NOM, which took care of the management of BioMed City, has recently left from the project⁴³, but nonetheless provides the information that in the entire Northern Netherlands, about 4000 jobs are part of the life sciences sector. This concerns 200 companies, of which 82 in the city of Groningen. A number of these companies, and a significant amount of the employment opportunities are located within the aforementioned companies, such as Cordis, Pharma Bio Research and Ophtec. To avoid double counts, we shall not take this number of 4000 into consideration. Noteworthy here is also the fact that next to the AZG the so-called 'Meditech Center' has been established for the housing of young fast-growing companies in the biomedical/biotechnological sector.

At the end of our (long) survey about companies locationally linked to the RUG we can come to a conclusion that, given the method of data collection, it is not complete, but in any case not an overestimate either. All categories and individual companies together amount to at least 5900 jobs: 1900 at spin-off companies and 4000 at spin-ons: companies for whom the RUG was location factor no. 1. We then counted half of the jobs at Zernike Science Park as spin-on and the other half as spin off. Just as was the case with the earlier mentioned direct employment effects of the RUG and the AZG, we must now add the multiplier effect in the services sphere ('purchasing power effects') to the 5900

⁴³ B. Nielsen, 'Biotechnologie in Noorden loopt averij op', *Dagblad van het Noorden* 17-1-2004.

jobs at RUG-related companies. Most of the business here referred to is high value and as with the RUG and AZG can be counted with a 50% multiplier. For the 2000 jobs with call centres we count a lower multiplier of 30%, and then take half of that again because the concurrent follow-up effects partly occur through the student income that we have already counted with the purchasing power effects of the entire student population. Calculated in this manner, the purchasing power effects amount to 2250 jobs in the service sector and the employment in the category 'university as location factor' comes to a total of $5900 + 2250 = 8150$ jobs.

External effects; the relevant region

The last part of Vermeulens spatial model of educational functions are the so-called external effects, described by him as 'the positive effect on all manner of social aspects in a region (social, cultural, health care etc.), which have in an indirect way, positive repercussions on the socio-economic development of a region'⁴⁴. He calls these effects *difficult to identify and difficult to quantify*. This is surely true and not something we will attempt to do here. It should be pointed out, however, that external effects are determined in large part by the image of the region. After all, the image of a region being less or more positive with most of its audience (such as entrepreneurs, inhabitants, visitors, tourists, and last but not least: students) is of great importance for economic development. For the province of Groningen we possess quite a reasonable idea of the external image since the late 1980s, gathered from the measurement of effects of the provincial promotional campaign 'Er gaat niets boven Groningen' (Nothings tops Groningen). It shows a clear increase in importance of the RUG and AZG in the public image⁴⁵. These measurements also show that the 'educational opportunities' in Groningen is the aspect of the image that is associated most positively by far (namely by 90% of all Dutchmen). It takes away all doubt as to the crucial economic importance of the RUG for the image effect of the region of Groningen.

Because the city, the province and the university all carry the name 'Groningen', it is almost inevitable that the province will be regarded as the region belonging to the university. With regard to image, this is indeed correct. But in the regional-economic effects of the university discussed earlier, a *variety* of spatial scale levels have been looked at. When talking about the meaning of the student population for the cafes and restaurants sector, the city was the main focus; for the purchasing power effects of the RUG employees and the image effects the province was the main focus; for qualification effects on the labour market, the North of the Netherlands was referred to; and R&D effects cover the entire Netherlands. It begs the question whether or not there is just one specific region that is economically linked to the RUG. The answer is: not really. It depends on the economic function you focus on. Florax has also pointed out that the determination of economic effects of universities heavily depends on the region you look

⁴⁴ Vermeulen, Knowledge still travels on foot, 72.

⁴⁵ W.J. Meester, J. Waalkens, P.H. Pellenbarg, *Effectmeting 1996 Er gaat niets boven Groningen* (Groningen 1996); W.J. Meester en P.H. Pellenbarg, *Effectmeting 2000 Er gaat niets boven Groningen* (Groningen 2000); W.J. Meester, P.H. Pellenbarg, P.J. de Graaf, W.F.H. Kiel, R.L. Osinga, B.A. de Vries, *Effectmeting 2002 Er gaat niets boven Groningen* (Groningen 2003).

at⁴⁶. It does not seem too complicated for the RUG. Considering the sum of the different sorts of effects, it mainly seems to concern the province of Groningen and the top part of Drenthe, because it is here that the vast part - that is, 90% of employment - and purchasing power effects of the university has its effect, and it is here also that the vast majority of RUG-related companies is located. For our conclusion concerning the economic effect of the university, we shall therefore regard Groningen and the North of Drenthe as the relevant region.

Conclusions

In his contribution of the celebratory collection of essays for the occasion of the quartercentennial of the province of Groningen, Professor of cultural history Klaas van Berkel argues that 'the economic importance of the university (is) only interesting the last half century. Before the Second World War, the university was small and economically inactive and before 1815 (when the RUG was converted from a provincial to a national university; PHP) there was certainly no financial injection from outside the region'. Using some of the same sources of regional-economic impact from the last half century, like De Jong and Florax, Van Berkel then states that in the current period we should not have 'too many expectations of the catalysing effect of the university for the regional economy'⁴⁷.

Van Berkels assessment that the university has only had an economic impact over the last half century is certainly correct. But even then 'not too many expectations of the catalysing effects'? That surely seems too negative. This qualification may be warranted for the results of De Jong, whose 1967 input model estimated the economic effect of the RUG at no more than 2.5% of the provincial product. But when Oosterhaven and Stoffelsma come up with 5% in 1983, it is already a number that can no longer be ignored⁴⁸. Our broader estimate aided by Vermeulens function model even gives us a much higher number for the current situation. In table 5 all functions from that model for which we could ascertain a number of concurrent employed persons are collected and accumulated, leading to a total of 31.550 jobs directly or indirectly linked to the RUG and the AZG. We estimate that 90% of that, or 28,400 jobs, are situated in the city and province of Groningen and the North of Drenthe. By the North of Drenthe we count the municipalities of Noordenveld (including Roden), Tynaarlo (including Zuidlaren) and Assen. The province of Groningen contains 220,000 jobs (of 12 hours and more) and the North of Drenthe 48,500, totalling 268,500 jobs⁴⁹. The 28,400 jobs linked to the RUG and AZG are 10,6% of that total.

A regional economic effect that runs between 10 and 11% of total employment in the direct surrounding region (and half of that number for the entire northern Netherlands, i.e.

⁴⁶ Florax, *De regionaal-economische betekenis van de universiteit*, 362.

⁴⁷ K. Van Berkel, 'De regionale betekenis van de Groningse universiteit. Een verkenning van vier eeuwen geschiedenis', in: P.Th.F.M. Boekholt, A.H. Huussen jr., P. Kooij, F. Postma, H.J. Wedman (eds.) *Rondom de reductie. Vierhonderd jaar provincie Groningen* (Assen 1994), 190.

⁴⁸ Florax, *De regionaal-economische betekenis van de universiteit*, 362.

⁴⁹ L. Broersma, D. Stelder, J. Van Dijk, *Noordelijke Arbeidsmarkt Verkenning 2004. Achtergrondrapport* (Groningen 2003)

Table 5 Total direct and indirect employment linked to the RUG and AZG
(number of jobs with a minimum of 12 hours)

<i>Effect type</i>	<i>Number of Jobs</i>	<i>Explanation</i>
RUG	5,400	direct employment
AZG	7,000	direct employment
Suppliers	1,000	employment with suppliers of the RUG and AZG combined
Qualification-effects	200	employment effect of the € 22 million regional education impulse
R&D effects	PM	
Spin offs	1,900	half of ZSP* companies, and 50 wp AOG
Spin on's (attracted firms)	4,000	half of ZSP* companies; call centres 2000 wp
Purchasing power c.q. service effect - for RUG, AZG, suppliers and students - for <i>spin offs</i> & <i>spin on's</i>	9,800 2,250	incl. 50% multiplier of the qualification effects 50% multiplier; with call centers (half of) 30%
External (image) effects	PM	
Total	31,550	*ZSP=Zernike Science Park

5.2%⁵⁰) cannot be disregarded. In fact, this is actually an underestimate because some posts have been added pro memoria - such as the not unimportant image effect - and the location effects could only partially be determined. And particularly in the area of location and external effects lie the prospects for further growth of the regional-economic significance of the RUG for the region. New projects in which knowledge relationships between northern business and the RUG play a part are constantly presenting themselves. A current example is the Energy Valley project, where the aim is to develop an infrastructure for energy knowledge in the North. The RUG participates in this since 2002 by means of the Energy Delta Institute, which strives to become an international academic knowledge centre on matters of energy. More initiatives of this kind, more *spin-offs*, more biotechnological and other high value businesses that come to the Science Park or to other parks developed in and around the city, and last but not least, more students, probably increasingly from abroad, can make the economic significance of the university grow even further in the fifth century of its lifetime.

⁵⁰ 5,2% is 31.550 as percentage of total employment in the northern Netherlands. According to Broersma et al., *Noordelijke Arbeidsmarkt Verkenning 2004*, the total employment in 2002 runs to 605.449 jobs of 12 hours and more.