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THE ROLE OF UNIVERSITIES FOR REGIONAL LABOUR MARKETS: THE EXAMPLE OF CENTRAL SWITZERLAND

Abstract
The development of a region is not solely dependent on what are known as "hard" location factors. Increasingly, key factors seen as vital to the development of a region are the learning aptitude and the ability for innovation in a region. Universities do not just have an educational function, they are also responsible for research and knowledge transfer. They thus have an effect on the labour market and the development of a region. Using the example of the universities in the canton of Lucerne (CH), we will show which significant regional economic effects the three universities located there have on their canton. In this study, both the quantitative and qualitative effects of the universities on the regional labour market and the regional added value are examined. The universities in the canton of Lucerne do not just provide 1,000 people with jobs and approximately 5,500 people a university spot, its employees and students have closely knit networks with regional businesses, cultural institutions and political organisations. This creates close ties to the universities through which knowledge and skills are transferred to the companies and institutions of a region. In addition, the universities make an important contribution to preventing brain drain and increasing brain gain. With total additional revenues in the amount of approximately € 72 million in 2005, they also contribute to enhancing the economic power of the canton. Overall, the canton of Lucerne benefits not only in terms of education but also in terms of quality of the location.

Key words
Regional labour market, regional economic effects, incidence analysis, universities

1. Introduction

For several years now, the role of universities in economic regional development has been intensively discussed in both the political and academic arenas. Many new universities have been founded with the explicit goal of promoting or strongly enhancing regional development. The increasing significance of universities as an instrument for business development arises from the "new" theoretical concepts of the regional economy. In these new theoretical approaches, regions are no longer considered solely on the basis of hard regional factors such as taxes, availability of raw materials, wage levels, transport infrastructure, etc. Positive economic development in a region is increasingly associated with its learning aptitude. In these theoretical concepts, innovation and knowledge represent key factors in the positive economic development of a region.

Within these concepts of the "learning region", universities play a primary role as regional sources of knowledge because they influence the respective region in a variety of different ways. The impetus provided by the universities - defined here, as universities and universities of applied sciences - is both direct and indirect. The primary responsibility of a university has always been to educate its students, thereby dispersing high-quality knowledge and skills to private, public and non-profit facilities. They thus play a key role in the regional labour market. When the concept of the "learning region" is seen from the point of view of human capital (see Schläger-Zirlik 2003, p.25ff), the universities make a vital contribution to the development of the regional knowledge base, which is comprised of the total of knowledge of each individual worker.

The role of universities in regional development has not just been discussed more intensively than before on the basis of these new regional-economic theoretical concepts over the last few years. There are two primary reasons that the universities have been the focus of attention when it comes to the discussion about regional politics (see Thierstein/Wilhelm 2000, p.14f): first, the increase in the number of students has driven the costs to the state for the universities up. Second, the state expects a higher return on this investment precisely because of the rising costs. This is reflected in part in the calls to make academic institutions more accountable for their contribution to solving social and economic problems. Universities also play a role in the business arena: universities in particular are key factors in determining business locations and they are even economic factors as well as image drivers. The most important effects universities have can be broken down into roughly two categories:

- The financial effects of universities on the region belong to the quantitative effects: universities stimulate the flow of money and goods between the public sector, companies and (semi-) public facilities. They thus represent an economic factor for the region. In this role, they don't just give rise to costs; they also bring about considerable benefits.
- The non-quantitative or qualitative effects of the universities can be found in the economic, environmental, political and socio-cultural environment of the institutions. The values these effects have are external and often difficult to capture. One example of this type of external benefit is spin-offs, i.e. companies formed by graduates and university employees close to or within the general sphere of influence of the university.

2. The current status of research

These public discussions about the economic benefit of universities has led to a series of studies being conducted over the last few years to analyse and quantify these benefits to the extent possible.[1] In general, these types of regional impact analyses examine the effects these facilities have on economic factors such as production, added value, employment and income within specific geographic regions. Most impact analyses thus focus only on financial and hence quantitative effects. The qualitative effects, however, are not usually taken into account. The validity of these regional impact analyses is controversial in the discussion about regional economics. Different authors[2] identify a series of basic problems here. There are, for example, a number of fundamental differences among the methodological approaches that can produce completely different answers to the same questions. According to Crompton et al (2001, p.80): "*Indeed, if a study were undertaken by five different experts, it is probable that there would be five different results*."

In general, the following (quantitative) analysis methods are used to identify the regional economic effects that public infrastructure facilities such as, for example, universities, can have:

- Input-output analysis
- Cost-benefit analysis
- Mathematical finance
- Incidence analysis
- Network theory

The question of the effects that universities have on the regional landscape has already been discussed from an academic standpoint at a global level. The angle of the individual studies is very different. In addition to having an effect on income and employment (see Armstrong 1993), the contribution universities make to regional development is a constant theme (e.g. Goldstein, Renault 2003). The way the role of universities is seen has changed with a shift in values and the increasing importance of knowledge as the primary engine of economic and social development. Since the end of the 1990s, universities have been more strongly associated with innovation and the transfer of skills and knowledge (see Florida, Cohen 1999 and Westlund 2003).

In the German-speaking world, the first studies on the economic effects of universities first appeared in the middle of the 1960s about the University of Giessen (D). In this study, the positive and negative effects of the university were described in qualitative terms and estimated using simple assumptions (see Woll and Schultz 2001, p.7). Fürst (1984) quotes a series of studies conducted in Germany in the 1970s and the beginning of the 1980s. According to statements made by Schultz (2001), these studies used impact chains to more accurately determine the effects universities have on the business locations and regions. The primary focus was on how universities affect demand for personnel, goods and services. Already at this stage, these studies took a look at the direct and indirect effects on income and employment. Almost all of the studies took into consideration how much students spent.

In the studies conducted up to now on the effects universities have on the regional labour market, the direct effect universities have on employment was usually analysed. These analyses look that the number of jobs created directly by the universities. Employment is also affected indirectly by intermediate payments and "induced" effects. These effects, however, can only be quantified in approximate terms on the basis of estimates in relation to the calculated revenues.

In addition to the effects above that can at least be partially quantified, some of the effects universities have can only be expressed in qualitative terms. These effects influence the qual-

1 For example, reference is made to Christof, Kampmann, Schulte, Walter (2000), Fischer, Wilhelm (2001) and Schultz (2002)

2 See in particular Tyrell/Johnston (2001), Crompton et al (2001) or Dietl/Pauli (1999)

ity of the labour force supply in the region. They include, for example, effects on education, knowledge and skills. These "intangible effects" have long-term repercussions and can't really be assigned a monetary value.

The analyses of universities conducted to date have largely been limited to economic aspects with monetary effects being the primary focus. The concrete impact that universities have on the regional labour market has not been extensively researched. Because universities, in addition to having an educational mandate, are also responsible for research and knowledge transfer, the effect universities have on the regional labour market cannot solely be derived based on the number of employees working directly at the universities. The universities are part of various networks in their regions: there are, for example, technology transfer centres. The universities are not just educational facilities, they also provide further education, and the students and professors have a wide range of contacts to the regional business, cultural and political institutions. Hardly any research has been done on this network of relationships. This means that there is a shortage of research both in the analysis of the various relationships a university has in its region and in the identification of causal relationships between the existence of a university in a region and the situation on the regional labour market.

An empirical study carried out in 2006 attempted to analyse in detail the effects of universities in the canton of Lucerne (CH) (see Strauf/Behrendt 2006). In addition to analysing the macroeconomic effects of universities, an explicit attempt was made to identify the qualitative effects universities have on the regional labour market. The results of this analysis are provided below.

3. The universities in Central Switzerland

The canton of Lucerne lies in the heart of Switzerland and is one of the founding cantons of the Swiss Federation. Lucerne, together with the cantons of Uri, Obwalden, Nidwalden, Zug and Schwyz, makes up the region known as central Switzerland. A total of 680,000 inhabitants live in this region, the residential and economic structure of the region is one of contrasts with concentrated urban centres on the one hand and rural mountain regions on the other.
The city of Lucerne is by far the largest urban centre in central Switzerland. The transport link, for example, to the capital of Berne or the city of Zurich is very good, so that many people commute to both of these places. Its proximity to the largest Swiss urban centres does not just affect the commuter situation in central Switzerland, it also has an effect on the movement of the population, in particular highly-qualified individuals. Migration of inhabitants, similar to other rural (mountain) regions in Europe, is one of the biggest challenges in Switzerland. This migration of highly-qualified people is particularly evident when seen over the course of time: between 1995 and 2000 approx. 3,200 highly-qualified individuals left the canton of Lucerne while there were only approx. 2,100 new arrivals.[3]
More than 60% of these new arrivals come from the rest of Switzerland, a good 20% from the rest of central Switzerland and just under 20% from the canton of Zurich. A good one-quarter of those who leave go to the canton of Zurich or to the other parts of central Switzerland and just under half move somewhere else in Switzerland. They are primarily academics, administrators, managers, technicians and their peers from the economic sectors of health care, manufacturing and business-related services and education. The two groups are not much different in terms of age, gender and employment status (male, younger, full-time). The existence of universities in the canton or region can change the ratio between the brain drain and the brain gain. This is a long-term effect that has a positive influence on the regional labour market.
There are currently three institutes of higher learning in central Switzerland:

- The University of Lucerne[4] (founded in 2000)
- The University of Applied Sciences of Central Switzerland[5] (FHZ) (founded in 1997)
- The Teaching Facility of Central Switzerland [6] (PHZ) (founded in 2003)

Even though there is a long tradition of higher education in the canton of Lucerne and in central Switzerland, the three universities mentioned have only existed in their current form for a couple of years.
All three universities have established themselves both nationally and internationally in the meantime. This is evident from the increasing demand for university spots. The numbers of students have risen steadily since the universities were founded.

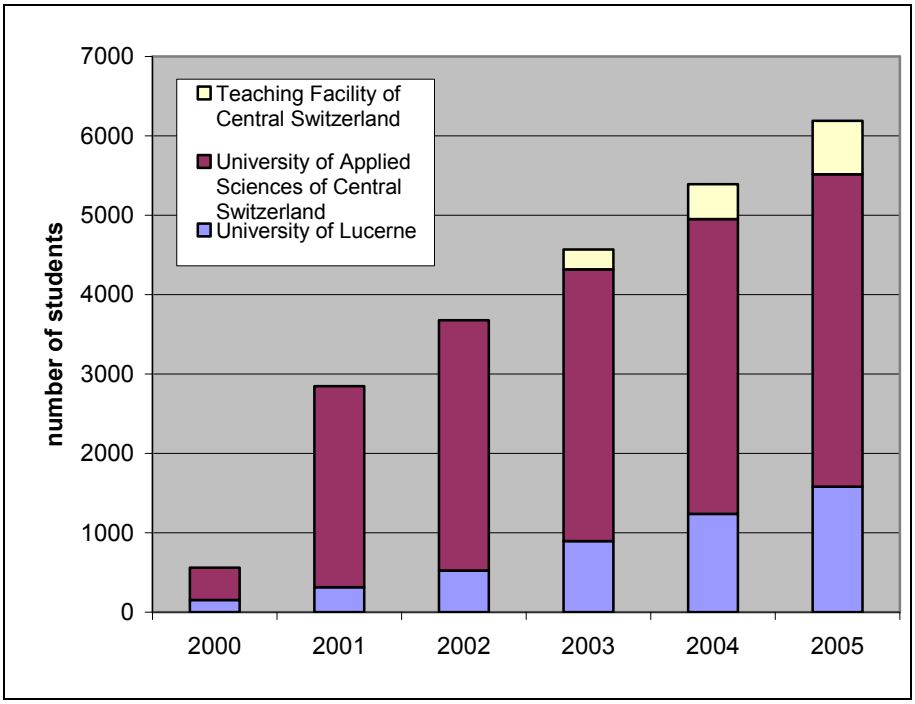
3 Source: http://www.brain-drain.org

4 The University of Lucerne has a theology, humanities and law department.

5 The University of Apply at Sciences of Central Switzerland is made up of five sub-schools: The School of Technology and Architecture (HTA Lucerne), The School of Economics (HSW Lucerne), The School for Social Work (HSA Lucerne), The School of Design and Art (HGK Lucerne) and the Music School (MHS Lucerne)

6 The Teaching Facility of Central Switzerland is made up of the three schools in Lucerne, Zug and Schwyz. The results presented in this paper refer only to the school in Lucerne, as only it was the only school included in the research contract.

Figure 1. Numbers of students at the universities in the canton of Lucerne



Source: University of Lucerne, Federal Statistics Office and Teaching Facility of Lucerne 2005

Within Switzerland, universities in the canton of Lucerne are among the smaller universities and technical institutes but are still important educational facilities for the inhabitants of the canton. Due to the specific degree programs offered by the universities, the students, however, are not just from the canton of Lucerne with 62% and 70% (university and university of applied science respectively) coming from other Swiss cantons. The Training Facility has the greatest percentage of local students with 54%.

4. The method used

In considering the regional economic effects of the universities in the canton of Lucerne, an attempt was made to analyse both the short-term, quantifiable (tangible) effects as well as the long-term qualitative (intangible) effects. To calculate the tangible effects, the "regional incidence analysis" was used. To capture the intangible effects, this method was supplemented by what is called the "network approach". In the incidence analysis, incidences are defined as all of the effects a facility can have, whether they can be valued in monetary terms or not. It is a kind of regional profit and loss statement particularly suited to examining the regional effects infrastructure facilities or the operation of these types of facilities have.
Within the context of the tangible effects, the payment flows initiated directly by the universities, the students and the participants at public events were subject to a regional analysis. These payment flows trigger other advance payments and investments that have to be taken into account using the regional multiplier. In this analysis, it is important to only include additional payment flows triggered specifically in the canton of Lucerne.
In addition to the effects that can be measured in monetary terms, the effects that cannot be given a monetary value (intangible effects) were examined. We distinguish here between competence effects, network effects, structural effects and image effects:

- Competence effects build on the "knowledge effects" that arise from the educational mandate of the universities. Here, both the educational level, the brain drain and gain of (highly) qualified individuals as well as the cooperation with other partners play a role. New knowledge is generated through the cooperation with other universities, companies and public institutions. The skill gains are necessary prerequisites for the innovation and competitiveness of the players involved.
- Network effects describe the effects of cooperation that emerge between various players. Within the context of cooperation of universities among each other, with other universities and with companies, the "added value" is primarily defined as the transfer of knowledge and expertise among the partners involved.
- Structural effects are primarily the long-term effects stemming from what the public university infrastructure has to offer. This includes, on the one hand, material infrastructures and, on the other, immaterial infrastructures such as cultural or educational facilities.
- Image and brand effects include all of those effects that influence awareness of the canton that are brought about by a facility. These effects can be positive but they can also have adverse effects in the case of failures. The image effects have a long-term effect on the positioning of a location for businesses, residents and education.

The following chart provides an overview of the tangible and intangible effects of the universities.

Figure 2. Regional economic effects of infrastructure facilities

	Effects	Examples
Intangible Effects	Competence effects	• Brain gain • Knowledge transfer • Educational function
	Network effects	• Horizontal and vertical networks of the universities • Student networks
	Structural effects	• Infrastructure facilities • Labour market effects
	Image effects	• Media reporting • Location for living, working and learning
Tangible Effects	Direct economic effects brought about by the universities	• Analysis of the success of the universities • Lucerne campus, Student Housing Association (StuWo)
	Direct economic effects brought about by students and participants	• Student expenditures • Participant expenditures
	Induced total revenues	• Regional multiplier

Source: Bieger/Frey 2001

The 2005 annual financial statements for the three universities served as the basis for the calculation of the direct effects. The regional analysis of the financial flows was carried out on this basis. In addition, lots of other information provided by the universities was also incorporated into the study. To capture the spending behaviour of the students and employees of the university, a primary investigation was conducted with both groups by means of an Internet survey. More than 6,300 e-mails were sent in total. 921 surveys were included in the analysis, of which 200 were from employees and 721 from students at the universities. The results of the student survey were extrapolated for the total number of 5,500 students in 2005.
The data provided by the universities, the surveys as well as the secondary statistics were used to determine the intangible effects. In addition, interviews were conducted with 11 individuals from the canton of Lucerne who are either directly or indirectly connected to one of the three universities.

5. The regional effects of the universities on the canton of Lucerne

The effects of the universities on the regional labour market can be broken down into different categories. The universities affect different areas of a region and the regional labour market depending on the mandate and function they have. The following is a breakdown of the university functions relevant to a regional economy:

- The university as an employer
- The university as an educational and further training facility
- The university as a competence centre and starting point for knowledge transfer via employees and students
- The university as a "basic infrastructure" and "magnet" for recruiting future employees of companies (brain gain vs. brain drain)
- The university as a facility that brings added value to the region

Depending on the functions mentioned, the effects of the universities on the regional labour market can be identified using the example of the universities in the canton of Lucerne.

5.1. University as employer

Converted to full-time positions, 1,000 people are employed by the three universities. The universities together are among the five largest employers in the canton of Lucerne. Hence, the universities have an obvious, quantitative effect on the labour market. The qualitative effect the universities have on the labour market structure is even more evident since a large number of employees at the universities have a tertiary educational degree. This means that because of the universities, the canton of Lucerne has been catching up to the federal average over the last few years in terms of the percentage of highly qualified individuals of the residential population.

The students in the canton of Lucerne are also noticeable on the labour market because, according to a student survey, they earn 37.3% of their income (€ 24 million in 2005) by working various jobs. In all of Switzerland, 78% of students at universities and 74% of students at universities of applied sciences hold jobs while they are studying. Some students only have jobs during the semester breaks but most also work during the semester. For more than 50% of students throughout Switzerland, their jobs are not connected in any way to their course of study according to a survey conducted by the Federal Statistics Office. In 37% of cases, however, there is a connection. There is a stronger correlation for students at the FHZ between their jobs and degree programs. This can be attributed to the fact that a higher percent of these students there have already completed professional training than students at the PHZ.

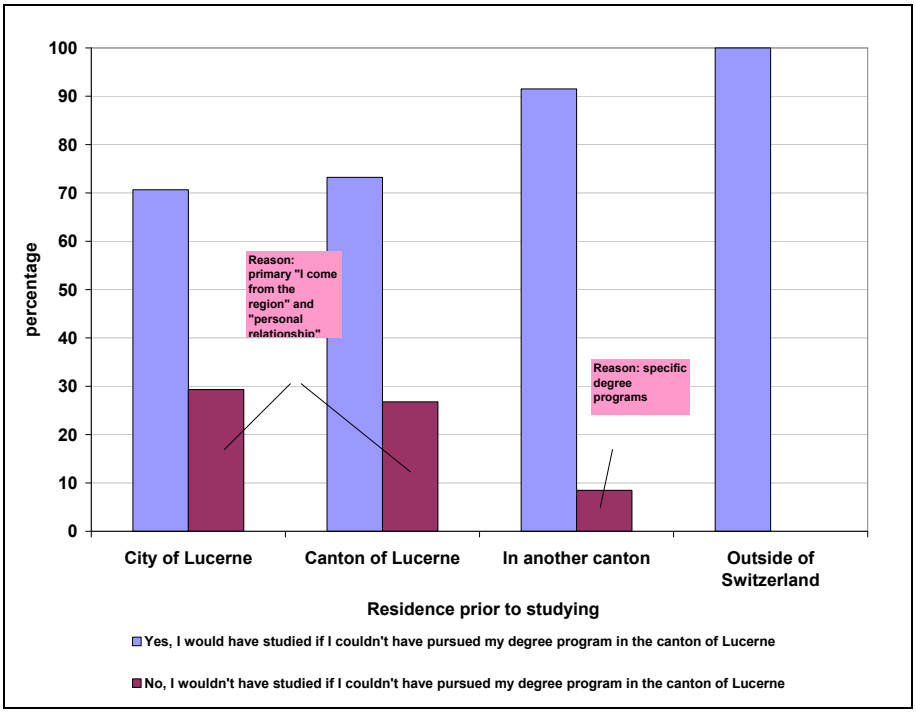
5.2. Education and further educations

Since 1997, three new tertiary educational facilities have emerged with the FHZ, the university and the PHZ. These institutions affect the educational level and the educational predisposition of the population. The student survey at the three universities showed that a considerable portion of students from the canton of Lucerne would not have studied without the existence of the (new) universities: more than one-quarter of students that come from the canton of Lucerne would not have studied if there had not been any universities in the canton of Lucerne (see Figure 3). Their backgrounds and personal relationships give them strong ties to the region. The existence of universities gave them the motivation to study in the first place. 37% of students at the Lucerne universities come from the canton of Lucerne.

In Switzerland, some of the degree programs are only offered in Lucerne. This was an incentive for 8% of students from outside of the canton to actually study at all. This means that

universities increase motivation to begin a degree program at a university and this ultimately boosts the educational level in the canton.

Figure 3. Educational effects in the canton of Lucerne



Source: Own compilation

The existence of the universities thus increases, on the one hand, the educational predisposition in the canton but, on the other, it also prevents students from going to other universities. Of the students from the canton of Lucerne, 72% would have studied if there had not been a university in the canton.
The large educational offering available to everyone in addition to the normal lectures available (courses, public readings, talks, concerts etc.) of the Lucerne universities also increases the educational predisposition of people in Lucerne. Lots of people take advantage of the educational opportunities. In 2005, approx. 75,000 people attended more than 800 events held at the universities.

5.3. Knowledge transfer

The knowledge acquired at the universities is not used only in academia but contributes to knowledge transfer in the region and the transfer of expertise to various companies, facilities and institutions. To accomplish this, it is necessary for universities to be networked with these regional players. The universities in the canton of Lucerne have good regional and interregional networks with the worlds of business, politics, culture and others. The following examples of knowledge transfer and how universities are connected within a region and hence, with the regional labour market, have been identified:

- Several hundred specialists from companies have part-time contracts at the university and thus pass along their knowledge and their experiences to students.
- Companies make use of the universities for further education, some courses are tailored specifically to their needs.
- Universities also have an extensive number of service contracts to work on questions and problems from business. The demand from companies can barely be met.

- The students create networks with companies as well. Contact between students and companies is made possible through project or thesis work as well as internships. This contact also links students to the private sector and public institutions. Companies are given the opportunity to identify future employees.
- The Academy of Applied Sciences runs several testing centres for materials used by companies: sheet metal deformation, compression and tensile strength, etc.
- Companies are active in university committees or juries, university members are active in associations and public committees.
- There are ties to the Micro Centre Central-Switzerland (MCCS) that is committed to promoting industrial skills in micro and nanotechnology in central Switzerland, to the Business Centre D4 as well as to various business development projects some of which are subsidised by the EU.

5.4. Brain gain and brain drain

One way that universities fundamentally affect skills in the region is the migration of (highly) qualified individuals to the area (brain gain). This is, on the one hand, directly attributable to universities themselves because they employ more than 1,600 people who are usually highly-qualified. On the other hand, the university graduates are available on the labour market as potential employees. The student survey provides information on where students choose to live and work after completing their degree. The majority of students from the canton of Lucerne want to stay in the canton after graduation (53%), a large percentage of students from other cantons will leave the canton of Lucerne again (43.9%). More than half of students from outside the canton, however, is undecided (52%) and would stay in the canton if they found the right job (see Figure 4). Strong ties to companies located in the canton through project or thesis work could have a positive effect here.

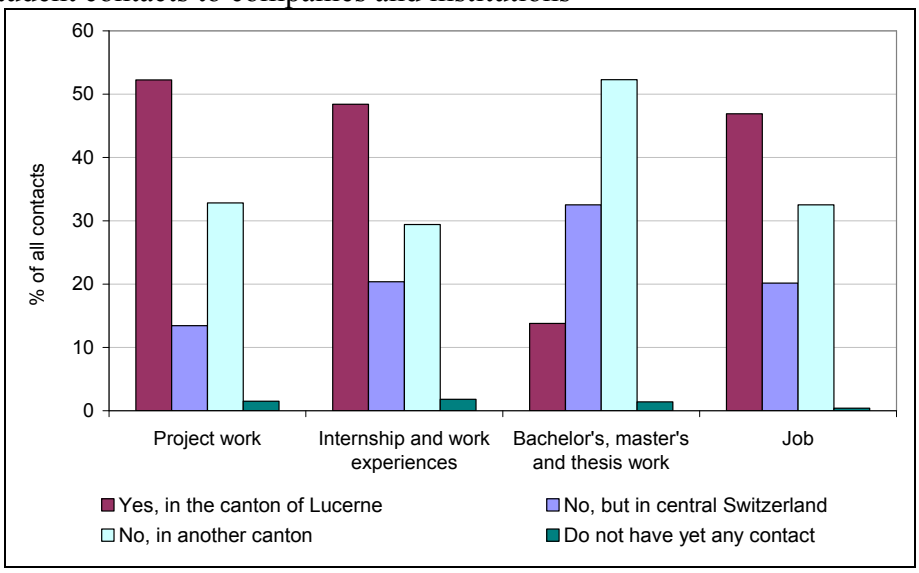
Figure 4. Location of students after graduation

		Where did you live before your degree program?			
		In the canton of Lucerne		In another canton	
		Number	As a %	Number	As a %
Do you want to stay in the canton of Lucerne after graduation?	Yes, I will stay in the canton of Lucerne	114	52.8	16	3.8
	No, I will go to another canton	18	8.3	187	43.9
	I don't know	84	38.9	223	52.3
	Total	216	100.0	426	100.0

Source: Own compilation

A large number of students already have contact to regional companies during their course of study. This contact often occurs, for example, in the form of internships or thesis work. According to the student survey, more than two-thirds of students contacted companies or public institutions in the canton of Lucerne or in central Switzerland for their project work, for an internship or for a semester of practical work experience. Almost half of students had this type of contact for their bachelor's, master's or thesis work, with respect to a future job, two-thirds (see Figure 5). Surprisingly high is the number of contacts for thesis work in other cantons. It appears that students often relied on their "home networks" for this purpose. In addition, thesis work does not necessarily require the physical presence of students.

Figure 5. Student contacts to companies and institutions

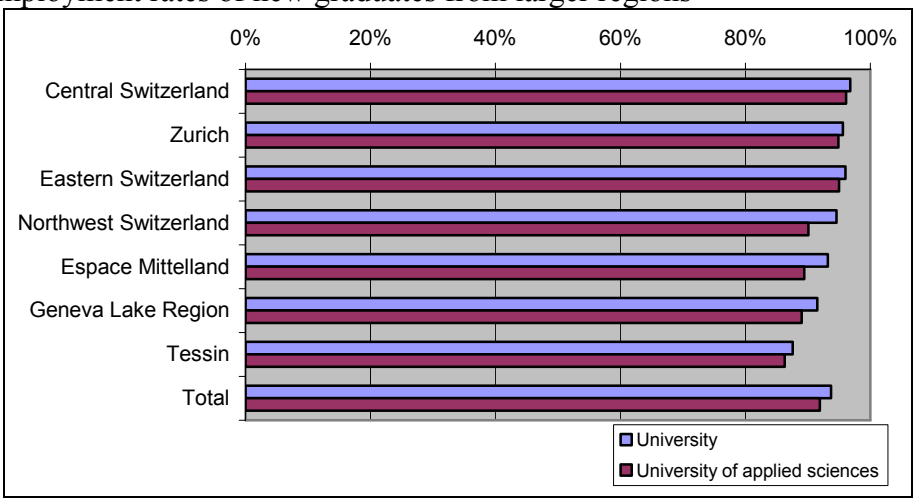


Source: Own compilation

This link to business is not just established by students but also by university graduates. The former students of the university are the most important link between students and companies because, on the one hand, they already have job experience and, on the other, (still) have or would like to have contact to the university.

Whether students actually remain in the canton or leave after graduation, and to what extent, can also be determined using the employment rate of graduates. The employment rate of university graduates measures the percentage of graduates employed of the total workers of the respective graduated cohort, one year after graduation. It gives an indication of the demand for university graduates on the labour market. Central Switzerland has the highest employment rates in all of Switzerland for graduates of both the FHZ as well as the university (see Figure 6). The employment rates of women are above those of men and almost all regions. The graduates of the University of Lucerne, with 99%, have achieved the highest employment rate among the federal average.
Even though a correlation cannot be made in these statistics to the origin of the new graduates, we can assume that a majority of the university graduates working in central Switzerland are from a canton in central Switzerland and completed a degree program at a Lucerne university.

Figure 6. Employment rates of new graduates from larger regions



Source: Federal Statistics Office 2005

The central Switzerland labour market has both good conditions and sufficient capacities to integrate university graduates. The demand for highly qualified individuals has also been identified as part of a company survey. More than half of those surveyed (53%) say that there is a shortage of highly-qualified individuals in the canton of Lucerne. 40% of companies expressed a concrete need for highly qualified employees, with the search for suitable individuals often proving difficult in many cases.

5.5. Regional added value

Universities are infrastructure facilities that make a contribution to added value in the region through their operation, through student and employee as well as through participants in public events. The origin of payment flows (revenues and expenditures) is evaluated in the analysis of the regional added value. This produces a balance for a region that can be positive or negative. If this balance is positive, the regional economy has gained and, if it is negative, the regional economy has experienced a loss, in our example, the canton of Lucerne.

The direct effects of the universities

The total revenues triggered by the universities in the canton of Lucerne in the amount of approximately € 188 million in 2005 were partially generated in the canton of Lucerne, partially in other cantons or outside of Switzerland. The canton of Lucerne can account for more than € 72 million. Because, however, income is also generated from the canton of Lucerne, the balance is ultimately what determines the regional economic effect: for the three universities in the canton of Lucerne, this balance is positive both overall as well as for each individual university: an additional **€ 26.8 million** flowed into the canton of Lucerne as a result of the economic activities of the universities in 2005.

The direct economic effects of students

The students are also a vital economic factor for the canton of Lucerne: their expenditures while studying contribute to an increase in buying power in the canton. Overall, the students spent approximately € 67 million in 2005, of which **€ 22.9 million** was spent in the canton of Lucerne. Some of the students live in the canton of Lucerne and but generate their own income from a job in the canton and some live outside of the canton but spend money in the canton when there.

The economic effects of the participants at public events

All of the universities in the canton of Lucerne offer public (further education) events. The range of these events spans concerts, talks, seminars, excursions as well as professional further education courses, conventions and conferences. In 2005, more than 800 public events were held with at least 75,000 participants at three universities. Some of the attendees come from the canton and some from outside. Overall, we can assume that the outside visitors spend a total of at least **€ 0.6 million** in the canton of Lucerne.

In 2005, the universities, the students and the participants at public events in the canton of Lucerne generated **direct revenues totalling approx. € 50 million**. Since each franc spent triggers additional revenue, the advanced payments and investments can be incorporated using the regional multiplier. The "induced" revenues of approx. € 22 million also contribute to enhancing the economic effects of the universities. Overall, **additional total revenues in the amount of approximately € 72 million** were generated in the canton of Lucerne.

6. Conclusion

In the analysis of the regional economic effects of the universities in the canton of Lucerne, both the short-term effects that can be measured in monetary values as well as the long-term effects that cannot be given a monetary value have been considered. The effects on the regional labour market were a particular focus of the study. A summary of the conclusions:

- The universities increase the educational predisposition in the canton of Lucerne. Highly qualified individuals are attracted (brain gain) and they play a role in preventing the brain drain.
- Knowledge is transferred through university involvement in (international and national) projects, cooperation with companies as well as through the students (internships, project and thesis work).
- There are strong networks that exist between the universities as well as with companies, cultural institutions and other areas both in and outside the canton.
- The structural effects of the universities are particularly noticeable in the labour market: companies make good use of the supply of graduates in both quantitative and qualitative terms.
- Overall, approximately € 50 million in direct revenues were generated in the canton of Lucerne from the economic activities of the universities, the expenditures of the students and participants. Together with the effects from other induced expenditures (regional multiplier) the total additional revenues triggered in 2005 reached € 72 million the canton of Lucerne.

Overall, the canton and the city of Lucerne as a business location benefit from the universities in terms of quality - the regional companies profit, the location is recognised as a place for education and research. In addition, the economic power of the canton increases and the universities contribute to boosting the buying power in the canton of Lucerne. Even though the three universities analysed are in the city of Lucerne, it is not only the city that benefits but also the rural areas of the canton both as a result of the direct economic effects as well as the long-term intangible effects. These effects do not just influence the canton of Lucerne but emanate throughout the cantons in rest of central Switzerland.

The results of the study using the example of the universities in the canton of Lucerne can be transferred to other similarly structured regions. Depending on the university location, the effects of the universities on the regional labour market can be very different. Universities, for example, in a European metropolis, would presumably have a much smaller effect at regional level both quantitatively as well as qualitatively, than in regions with a more rural structure. However, there are currently no research results in this area. Research is necessary both in identifying the regional economic effects of universities depending on the university location, the existing course offering of the respective university as well as the network of the universities in the region. An additional challenge for future analyses is represented by the quantification of the effects mentioned that have until now only been captured qualitatively.

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