Service of tertiary education for regional development in Switzerland

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Introduction

The competitiveness of regions is increasingly being acknowledged as a crucial factor to the success of the national economy. Although the concept of competitiveness has been criticized as not being helpful (Krugman 1994), it still reveals some areas of consistency. So it is widely agreed on that competitiveness is tightly connected with productivity (Porter 1998) and with the success of the regional or the national economy. In this paper we define competitiveness as the consequence of a process that leads to increased economic success, measured in higher employment levels, an increasing number of new businesses, and last but not least in an increase of GDP per capita. According to Parkinson et al. (2004) the following elements can be considered as the causes of competitiveness:

- Innovation
- Economic diversity
- Skills
- Connectivity
- Strategic capacity (leadership)
- Quality of life

It is evident that institutions of tertiary education can have a significant influence on such issues as innovation, skills development, and strategic capacity. Consequently, within the last decade, institutions of tertiary education have been facing continually growing expectations concerning their contributions to the economic and cultural development of the region or the country they are situated in. Universities in particular are increasingly expected to add to the skills level and to the strategic capacity by preparing an ever increasing part of the population to become productive members of the high tech workforce (Alexander 2000; Carroll/Smith 2006). Further on they are asked to deliver services that will increase the innovative capacity of the enterprises in that region (Nilsson 2003) as well as to support and motivate the spirit of potential entrepreneurs which should eventually result in the foundation of new enterprises and start-ups.

As a result, the role of the university as a knowledge generator has become a generally accepted model. The importance of universities has been illustrated in such examples as the Cambridge High Tech Cluster (Wicksteed 2004) or the “High Technology Boom” in the area of the Massachusetts Institute of Technology (Dorfman 1982). Today, we can find an almost

blind consensus among politicians that the universities should collaborate with different economic and cultural players and contribute to the further growth, welfare and development of the society accordingly.

In this paper we will illustrate and discuss the services of tertiary education to regional development in Switzerland by referring to the region of Northwestern Switzerland. It is a geographically rather small but economically important area covering the four cantons Aargau, Basel-Stadt, Basel-Land and Solothurn. The region has recently made a noteworthy effort to strengthen the university system by merging a great number of small colleges into only one University of Applied Sciences Northwestern Switzerland. In this paper we will make some comments on the consequences of this rearrangement and on the current influence of tertiary education institutions on regional development in the area. We close by making a few suggestions how the interaction between institutions of tertiary education and private or public organizations could be improved in the future in order to enhance the services and their impact on regional development.

Tertiary Education in Switzerland

Among the OECD countries Switzerland was one of the last who started a reform of tertiary education. Given the highly developed vocational training system and the federalist structure of the country there were more barriers than incentives to start a fundamental transformation process. Consequently, entry rates into tertiary level education remained low well into the 1980's. At the same time the vocational training system was maintained largely at the same level for several decades far into the 1990's, and the underlying structure underwent very modest changes as the millennium neared.

This picture has substantially been changed within the last few years. In 1995, Switzerland started an extensive reform which resulted in a modification and modernization of the vocational training system as well as in the establishment of a second sector of higher education as a supplement to the traditional university structure. In this reform more than sixty small colleges which covered such fields as engineering, general management, tourism, hotel management, arts and design, applied psychology and social work were transformed into seven "Universities of Applied Sciences" (UAS). They cover all the regions of Switzerland. The UAS in Central Switzerland, Eastern Switzerland, Northwestern Switzerland, Berne and Zürich offer their courses mainly in German (some in English). The UAS Western Switzerland covers mainly the French speaking, and UAS Southern Switzerland the Italian speaking region of the country.

Since 1998 the tertiary education system thus consists of the ten traditional universities (Bern, Basel, Fribourg, Geneva, Lausanne, Lugano, Lucerne, Neuchâtel, St. Gallen, Zürich) that are mainly funded by the responsible canton, the two Federal Technical Institutes (ETH Zürich,

EPUL Lausanne) which are supervised and funded by the Swiss Confederation and the Universities of Applied Sciences that are mainly funded by the cantons but mainly supervised by the Swiss Confederation.

Recently (May 21, 2006) Swiss people have decided in public vote that the Government should establish “an integrated "Swiss Higher Education Landscape" by enacting legislation regulating the entire tertiary education sector (cantonal universities, universities of applied sciences, federal institutes of technology). This integration should help to improve or at least to ensure the quality of the higher education system over time (as of today there are two different laws, one regulating traditional universities, the other regulating the Universities of Applied Sciences). The draft law is now in political discussion and the final version should become effective by 2010 latest.

Table 1.1 illustrates the growth of tertiary education within the last 12 years and particularly shows the rapid expansion of the seven newly established Universities of Applied Sciences.

	1995	2003	2004	2005	2006	2007
Students						
Traditional Universities	88'243	109'334	111'099	112'396	115'149	116'906
Universities of Applied Sciences	...	43'569	49'054	54'140	57'179	60'809
Total	88'243	152'903	160'153	166'536	172'328	177'715
Human Resources (Full time equivalents)						
Traditional Universities	24'402	28'896	29'595	29'848	30'609	
Universities of Applied Sciences	...	7'646	8'015	9'724	10'336	
Total	24'402	36'542	37'610	39'572	40'945	
Operating Expenses (Mio. CHF)						
Traditional Universities	3'744.9	4'734.8	4'914.3	5'089.2	5'111.3	
Universities of Applied Sciences	...	897.8	1'357.4	1'440.4	1'528.8	

Table 1.1 Numbers of students

Source: Bundesamt für Statistik http://www.bfs.admin.ch

The Universities of Applied Sciences in Switzerland differentiate from the traditional Universities as they *offer practical university-level education and training* on the Bachelor and the Masters level (but not the Doctorate level). According to the law, the Universities of Applied Sciences have to focus on the education of highly qualified professionals as well as on innovation promotion and knowledge transfer. The UAS provide study programs for architects, engineers, managers, musicians, artists, industrial designers, hotel managers, social workers, industrial psychologists and some others.

Tertiary Education in Northwestern Switzerland

Although the Federal Statistics Office defines the region of Northwestern Switzerland (see Table 1.3 below) there are actually no commonly agreed and well defined boundaries of the region. There are inter-cantonal co operations in different fields and including different subjects and each of them usually defines the region in a slightly different way. On the level of tertiary education the region of Northwestern Switzerland includes the cantons Aargau, Basel-Stadt, Basel-Land, and Solothurn.

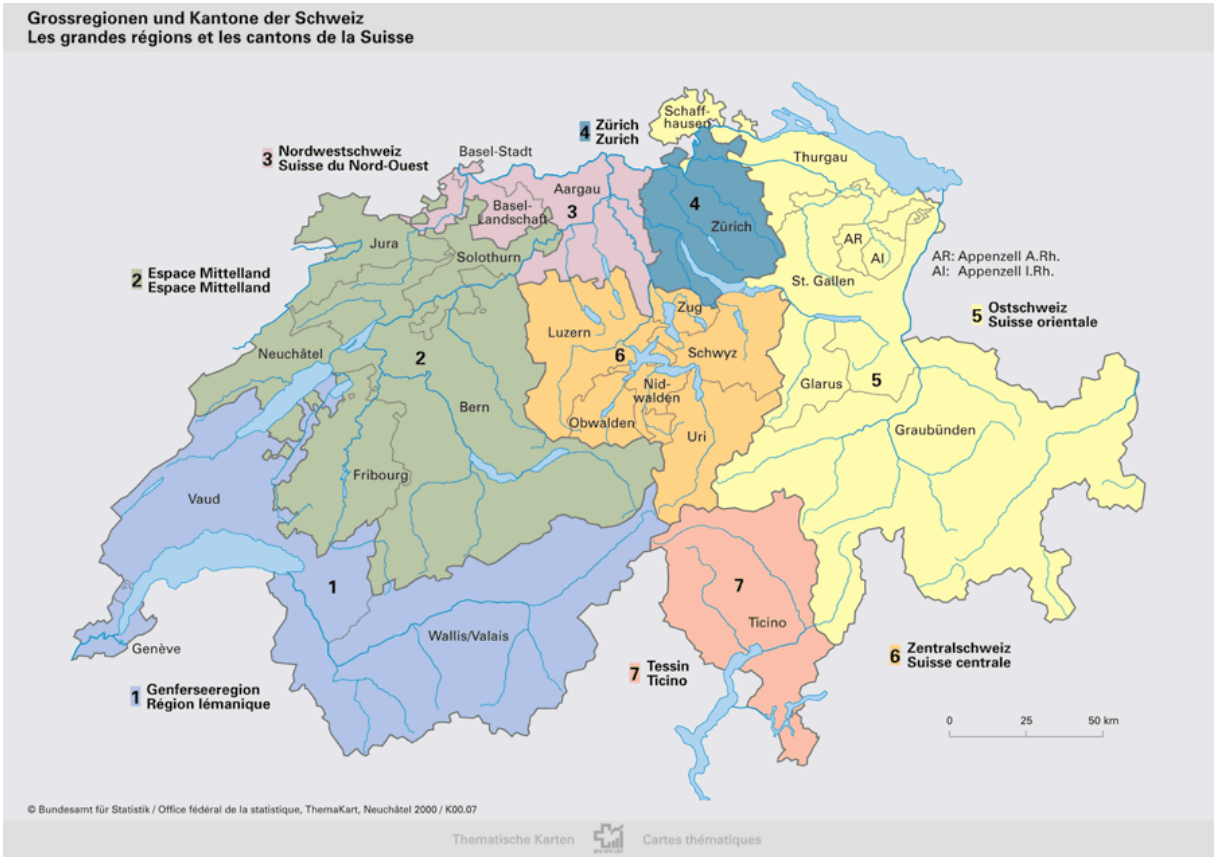

Table 1.2 Regions of Switzerland

Source: Bundesamt für Statistik

From this map we can see that the region only covers a relatively small part of the country. But economically it is one of the most prosperous regions in Switzerland.

Within these four cantons several institutions of tertiary education are located.

The University of Basel is the oldest university in Switzerland. It has been founded as early as 1459. Today it covers theology, law, medicine, humanities, science, business and economy and psychology, and runs some interdisciplinary institutes such as the Centre for African Studies, the Centre for Jewish Studies, and the European Institute. Associated institutes are the Swiss Tropical Institute and the Friedrich Miescher Instiute of Biomedical Research.

The Paul Scherrer Institute

The Paul Scherrer Institute PSI is a multidisciplinary internationally renowned research institute for the natural sciences and engineering tightly connected with the Federal Technical Institutes (ETH). It has been founded in 1988. The PSI has extensive, many-sided, and complex research facilities and thus plays a special role in Switzerland as a user lab. Within the last 20 years, a great number of researchers in the fields of physics, chemistry, biology, material sciences, energy technology, environmental science and medical technology have performed experiments in the institute. About 1’500 researchers have successfully completed their doctorates at the PSI. The institute has gained international recognition in many fields, especially in energy and material science.

The University of Applied Sciences Northwestern Switzerland

The UAS Northwestern Switzerland was formed from the merger of seven former institutions in 2006 (3 Universities of Applied Sciences, 3 Teachers Colleges, and the Academy of Music Basel) Out of these seven institutions at least three were organizations that had already merged several smaller organizations before, especially between 1998 and 2006. In this multiple step process more than twenty formerly autonomous organizations have been finally merged into the UAS Northwestern Switzerland.

Today, the university has nine schools (Applied Psychology, Architecture-Civil Engineering-Geomatics, Art and Design, Business and Economics, Engineering, Life Sciences, Music, Teacher Education, Social Work) which are distributed in the region of Northwestern Switzerland (covering the four cantons Aargau, Basel-Land, Basel-Stadt, Solothurn) with campuses in Aarau, Basel, Brugg, Liestal, Muttenz, Olten, Solothurn, Windisch and Zofingen. The focus of all the schools within the UAS is to provide university level professional education by offering degree-level study programs (Bachelor, Masters), training programs for professionals (Masters of Advanced Studies, Certificates of Advanced Studies) as well as applied research and consulting.

This orientation also reflects the change of the role of universities in our society. Within the last decade, the Universities of Applied Sciences have taken over more vocational forms of higher education and research. While traditional universities to some extent still represent the

pure research for new knowledge, Universities of Applied Sciences are much more expected to stimulate wealth creation and to contribute to the competitiveness of the region or the nation in a more proximate way.

Services to the regions: the role of the CTI

In a knowledge economy, results of scientific research usually have an important influence on innovation (Arvantis, Sydow, Wörter 2005). This is why knowledge and technology transfer from the tertiary education system to the industry level typically is one of the supporting pillars of any national innovation policy. A considerable body of research indicates that the contribution of academic research to industrial innovation has been significant (Mansfield 1998). “Innovation” defined as the successful introduction of new goods, services and processes to the market, is widely accepted as one of the most important pillars of prosperity. GDP, labour market conditions and economic growth, all depend on flourishing companies respectively on innovations. This is particularly true for Switzerland, with its highly export-driven economy.

As innovation requires smart people and excellent ideas, both in public research and in enterprises, the Government has decided more than sixty years ago to establish the Commission for Technology and Innovation CTI and thus to support a national innovation system in order to reinforce the capacities of the tertiary education system to transfer knowledge and technology to the industry level.

A national innovation system is usually defined as a network of institutions in the public and private sector whose interactions initiate, import, modify and diffuse new technologies (Freeman 1987). Such systems are considered as being the breeding ground of innovation, which makes their design one of the most important issues in any growth oriented economic policy.

As other national innovation agencies, CTI tries to contribute to the rapid conversion of laboratory know-how into products and services. “Science to Market” is the slogan that stands for a well-organized and speedy transfer of research findings. CTI initiatives usually focus on the support of market-oriented innovation processes, on the development of practice-oriented qualifications for researchers in universities and generally on the enhancement of academia-industry relationships. As a general rule CTI is open to projects out of any discipline. However, given the limited resources and the technology oriented concept of innovation that is prevalent in developed societies, the main focus of its promotional activities is on life sciences, engineering, nanotechnologies, micro-systems technology and enabling sciences. These are topics that are of special importance to the Universities of Applied Sciences. Recently, CTI also launched “venturelab”, a training program for young entrepreneurs as well as the CTI-Start-up, a coaching program for young entrepreneurs.

In heterogeneous countries such as Switzerland, in which regions neither have a common language nor share a cultural identity it might be advisable to focus more on regional innovation systems. However, as CTI is closely cooperating with the institutions of tertiary education, the “regionalization” of their services is guaranteed. The Universities of Applied Sciences with their more than fifty campuses spread within the different regions of the country play a special role in covering the regional needs of the industry.

In 2006 the Universities of Applied Sciences (UAS) accounted for 44% of the total of 227 approved project applications and received 40% of the federal government contributions. In this context it is worth mentioning that the total support of CTI of 32 million CHF released more than 40 million contributions from the industrial project partners. The UAS Northwestern Switzerland was particularly active in this process with 23 projects with Federal funding of nearly CHF 10 million.

Service of tertiary education to regional development in Northwestern Switzerland

The impact of project oriented and organized knowledge and technology transfer activities on the innovation performance at the firm level is only one of several possible services the tertiary education system can provide to the region. Another group of services can be referred to as “spillover effects”. Institutions of tertiary education influence the “knowledge environment” of the region and thus of the industry and the firms of that region even if there are no explicit links between firms and the institutions of tertiary education. A third group of services includes some further offerings of the institutions of tertiary education such as Bachelor- and Master-Thesis (in co-operation with companies or public organizations), advanced training on offer for mainly managers and public officials, as well as the accomplishment of consultancy mandates by professors or other professional staff of the tertiary education institution.

Given the relatively high density of institutions of tertiary education in Switzerland and in the Northwestern part of Switzerland in particular there are good reasons to assume that all these services to regional development are well developed. At the moment, however, there is little access to any systematic data that could prove our assumption, partly due to a not yet consolidated structure after the reorganization of the system of tertiary education that has not come to an end yet.

The extent and intensity of the relationship between institutions of tertiary education and industry has been considered, however, to be of major importance for the innovation performance of a region or a country (OECD 2002). Out of a body of research, many studies investigating the impact on economic performance found a positive effect (Arvanitits, Sydow,

Wörter 2005, p.5).

What we can certainly observe is that co-operation and openness in relation to the tertiary education institutions surroundings in Northwestern Switzerland have generally increased in recent years. The University of Basel does in no way hide in the ivory tower and the University of Applied Sciences proudly advertises its “applied research” and its activities to improve relationships with business enterprises as well as with non-profit organizations. It is thus fairly safe to conclude that tertiary education in the region of Northwestern Switzerland does provide service to regional development by supporting innovation and by providing skills and strategic capacity (leadership).

In 2006 a total of more than 3’000 students have graduated (about 1’850 from Universities of Applied Sciences) and a similar number of Master- and Bachelor thesis had to be written. Notably at the University of Applied Sciences most thesis papers are related to practical problem for private firms or public organizations, resulting in a knowledge transfer that should not be underestimated. In addition to this skills- and knowledge transfer by student works, a great number of research projects annually contributes to the promotion of innovation in the region. As mentioned earlier, the UAS Northwestern Switzerland was particularly active in acquiring research money from CTI (23 projects and about CHF 10 million in 2006).

From all this we can certainly draw the conclusion that services of tertiary education institutions in Northwestern Switzerland contribute appreciably to the development of the region.

How can the effectiveness of services be improved?

However, among experts there is still some skepticism concerning the quality of the “normal” industry-science interface. Recently, in Switzerland there have been attempts to submit suggestions for the improvement of the “innovation policy” and implicitly for the improvement of the services of tertiary education institutions but also the attitudes and activities on the side of the industry (Zinkl, Strittmatter, 2003).

Drawing from our own experience we believe that the improvement of the services of the tertiary education institutions in Northwestern Switzerland requires the examination of the following problems:

1. One important problem refers to the structures and skills of the tertiary education institutions. They need to be further developed in order to engage in regional development. First, it is evident that universities need to adopt new skills in service,

communication, and network management when collaborating with partners from different operational cultures. Many university members do have little experience in communicating with stakeholders outside the university. Adequate training could be necessary. Second, up to this day it is still difficult for private and public enterprises to establish contact with the competent person within the university. The internal structure of the universities, which usually still follows a disciplinary segmentation, is not very appropriate and does not reflect the demand of the market. Practical problems do usually not fit into disciplinary boundaries. In order to improve their services, the universities will have to find ways to abolish “entry barriers”, for example by establishing a centralized “transfer-unit” or by improving existing organizational solutions.

2. Secondly, the institutions of tertiary education must learn even better to facilitate and mediate cooperation with SME. Persons from small and medium size enterprises typically face some difficulties when it comes to establishing contact to a research person or a professor in a university. This basically means that the university must take an active part in facilitating cooperation instead of waiting for the regional stakeholders to take the initiative. Much too often current university cultures still are in conflict with the appropriate roles and behaviors of professors and other university representatives. Although helping industry and contribute to the enhancement of economic growth is implicitly part of the mission of many institutions or tertiary education, professors usually have few incentives to comply with this request, as their reputation is much more dependent on publications in recognized journals than on their contribution to the strengthening of an SME’s market success.

3. A next problem is how the institutions of tertiary education should communicate their services to their stakeholders? Very likely face-to-face contact is the most vital technique of communicating university services to regional stakeholders. A network of mediators can help in delivering information on university services to entrepreneurs. The mediators must know the firms and their business environment, and be familiar with educational and R&D services provided by universities. There is often no need to introduce a new network of mediators: the existing structures of e.g. business advisors, public development authorities and NGO’s working with entrepreneurs are capable of communicating university services to the region.

4. A fourth problem consists in gathering the information that is necessary to be able to contribute to the regional development. First of all, this requires an adjusted perception of the competences and the key players of the tertiary education institutions. Secondly, there must be ample knowledge about the needs of the region, and the essential operational environment they work in. Crucial variables would include such things as R&D capacity (number of researchers, quality and size of research

infrastructure, skills and levels of regional labor force) as well as R&D accessibility (size of spill over effects such as patens and spin offs, number of graduates, level of communication of research results, number of consultancy contacts, number of spin-off companies, university-industry interaction, facility sharing, joint facilities etc.). In Northwestern Switzerland (and most probably in other regions as well) the appropriate data base is still very weak and needs significant improvement.

5. A fifth problem is the consistent use of new media and state-of-the-art communication tools. Although we have entered a new era with the use of electronic media for sharing results and other information, in Northwestern Switzerland we certainly are still in the fledgling stages. Of course an internet portal can serve as an entry point for regional actors interested in the services of tertiary education institutions. However, the portal should be adapted to the needs of the users. An entrepreneur is likely to have little knowledge on university disciplines, faculties and their competencies. Therefore, the portal must contain thematically organized information on cooperation possibilities and concrete examples on past collaboration.
   A related communication medium is also the video conference, which helps to reduce the number and cost of actual face-to-face meetings. Up to now little use has been made of this new tool. Roughly the same is true for the tools that enable computer-supported cooperative work (groupware).

6. Last but not least, tertiary education institutions have to improve their efforts to develop thematic focuses, which should evolve as an amalgamation of both the institutions academic strengths and interests and the needs of the region. The building of such focuses asks for a close cooperation among researchers, enterprises, political authorities and other stakeholders.

Summary
The competitiveness of regions is increasingly being acknowledged as a crucial factor to the success of the national economy. As institutions of tertiary education can have a significant influence on such issues as innovation, skills development, and strategic capacity, these institutions have been facing continually growing expectations concerning their contributions to the economic and cultural development of the region they are situated in.

About ten years ago Switzerland started an extensive reform of the university system and merged a great number of colleges into seven “Universities of Applied Sciences” (UAS). These Universities of *Applied Sciences* in Switzerland are different from the traditional Universities as they *offer practical university-level education and training* on the Bachelor and the Masters level (but not the Doctorate level) and focus on the education of highly qualified professionals as well as on innovation promotion and knowledge transfer.

In Northwestern Switzerland four cantons have merged their colleges into one such University of Applied Sciences. This newly founded institution (2006) today plays an important role in the process of distributing services for the development of the region. Although reliable data are not yet available there is some strong indication that services of tertiary education institutions in Northwestern Switzerland contribute appreciably to the development of the region.

In order to even improve the services of tertiary education institutions for the development of the region a number of measures should be taken.

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