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The Regionalization of Swedish Knowledge Society: Some preliminary consequences

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ABSTRACT

This paper reviews existing empirical findings regarding the regionalization of the Swedish university system and its impact on regional and national innovation systems. The conclusion is that the regionalization of the Swedish system for higher education and research has been driven by a multitude of factors and interests, both external and internal to the system itself. The result is a system that seems to raise regional production due to direct and indirect causes, i.e. through the work and consumption of employees and students of universities, more than raising regional productivity through the exploitation of knowledge. In the wake of these developments, more recent universities and university colleges have developed two strategies for legitimisation, one traditional relying on the international academic system of peer-review (normal science) and one alternative relying on regional innovation systems (post-normal science). Consequences of these strategies for legitimisation are discussed.

Keywords: Higher education policy, regional policy, knowledge policy, regional innovation systems,

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I. Introduction

The aim of this paper is to sketch some features of the regionalization of knowledge production and knowledge use in Sweden from the mid-1970s to the present. The point of departure is the rhetoric of the so-called knowledge society including statements about:

i) increasing knowledge content of products and services,
ii) increasing need for better and more advanced education for a country's population in order for free enterprise to compete on international markets, and
iii) increasing possibilities of information retrieval and processing as well as communication.

The main problem addressed in this paper is how the ideologically and policy driven process of building regional universities and university colleges for knowledge production, often in close contact with regional trade and industry, affects the legitimisation of knowledge claims. Within the traditional university system, legitimisation is most commonly built on social authority. In contrast, a strive for raise of regional, hence national, productivity has led to a process of building and strengthening regional institutions for knowledge production. Often enough, smaller regional universities and university colleges pool their resources to profile themselves trying to make their primary activities, research and education, relevant to regional business. To some extent this may result in small, sometimes interdisciplinary, research groups whose methods and results are of little or no interest outside their own university and business collaborators. What mechanisms can then be used in order to test and confirm the knowledge claims made?

In order to describe the symbiosis between different regional institutions such as knowledge producing institutions and regional business that is the explicit goal of many of university colleges and smaller and more recent universities, the concept of regional innovation systems has been used among many others.[1] The problem addressed here is how the regionalization of traditional university systems affects the compatibility between the existing socially based authoritative knowledge legitimisation, usually viewed as academic, and the legitimising institutions outside the academic ones, for instance industry evaluating knowledge production on the basis of use and application, sometimes named mode 2 or post-normal science, in the context of regional innovation systems.[2] Does the trend towards a regionalization of knowledge legitimisation imply that the role played by the international social authority of academic peers is to be shouldered by the local Rotary section?

Over the years, many observations have namely been made suggesting that knowledge claims often enough seem to be legitimised by use outside of the social system of academia.[3] More seldom though, have these observations been related to the regionalization of research and higher education. I will therefore outline the development of a national Swedish innovation system, i.e. the collaboration between public or semi-public knowledge producing institutions and the users, before turning to the development of some features of the regionalization of Swedish knowledge society and the question of legitimisation more specifically.

[1]Bengt-Åke Lundvall, *National Systems of Innovation: Towards a Theory of Innovation and Interactive Learning* (London, 1992); David Doloreux, "What we should know about regional systems of innovation", *Technology in Society* 24:3 (2002), 242-263.
[2]Michael Gibbons et al., *The New Production of Knowledge: The dynamics of science and research in contemporary societies* (London, 1994); Peter Weingart, "From 'Finalization' to 'Mode 2': old wine in new bottles?", *Social Science Information* 36 (1997), 591-613; Helga Nowotny, Peter Scott & Michael Gibbons, "Introduction: 'Mode 2' Revisited: The New Production of Knowledge", *Minerva* 41 (2003). 179-194.
[3]Thomas F. Gieryn, *Cultural boundaries of science: Credibility on the line* (Chicago, 1999).

II. The development of Swedish national systems of innovation

Historically, in Sweden, bridges between knowledge producing and consuming institutions have been supplied by state agencies. One form of solution has been the creation of research institutes dealing with innovations within an industrial sector or branch and jointly financed by industry and government such as the Institute for Metals research (*Metallforskningsinstitutet*). Another form of solution has been the forming of so-called development pairs, i.e. long-lasting business relations between private suppliers and government customers for instance regarding telephone equipment (the National Board for Telecommunications and Ericsson) or power equipment (Vattenfall and ASEA). Over the past decades however, these innovation systems solutions have been undermined in the name of deregulation and liberalization. How they are to be substituted is still an unresolved issue.

During the first half of the 20th century, a Swedish innovation system was launched with the founding of sectorial industrial research institutes, jointly financed by government and private interests.[4] Institutes were mostly formed within branches where there were no distinguishable governmental agency acting as major customer, typically industrial branches related to natural resources such as pulp and ore. In other branches, typically those with competent public customers, bridges were created between private suppliers and government agencies through long-lasting business relations, so called development pairs.[5] Industrial research institutes and development pairs constituted two major forms of collaboration between public and private actors in the Swedish innovation systems of the 20th century.

Within both these forms, the universities and engineering schools such as the Royal Institute of Technology, acted as generators of competent individuals for both the public and the private spheres and, as a result, producers of useful personal networks. In this way, the institutions for higher education in Sweden throughout the 20th century supplied glue for the national innovation systems. The role of universities and engineering schools was further strengthen by the founding of research councils in the middle of the 20th century, from the perspective of the innovation systems, primarily the National Board for Technical Development.[6]

With the three components of the Swedish innovation systems in place—industrial research institutes, development pairs and research councils—with universities and engineering schools supplying the necessary glue, the functions of these innovation systems was to be tested during the 1950s and 60s, especially with the military sector as a competent public customer (half of the governmental support for research in the beginning

[4]Bo Sundin, *Ingenjörsvetenskapens tidevarv: Ingenjörsvetenskapsakademin, Pappersmassekontoret, Metallografiska institutet och den teknologiska forskningen i början av 1900-talet*, Acta Universitatis Umensis 42 (Umeå, 1981); Peter Stevrin, *Den samhällsstyrda forskningen: En samhällsorganisatorisk studie av den sektoriella forskningspolitikens framväxt och tillämpning i Sverige* (Stockholm, 1978).

[5]Mats Fridlund, *Den gemensamma utvecklingen: Staten, storföretagen och samarbetet kring den svenska elkrafttekniken*, Stockholm Papers in the History and Philosophy of Technology, TRITA-HOT 2036 (Stockholm/Stehag, 1999).

[6]Hans Weinberger, *Nätverksentreprenören: En historia om teknisk forskning och industriellt utvecklingsarbete från den Malmska utredningen till Styrelsen för teknisk utveckling*, Stockholm Papers in History and Philosophy of Technology 2030 (Stockholm, 1997); Thorsten Nybom, *Kunskap, Politik, Samhälle: Essäer om kunskapssyn, universitet och forskningspolitik 1900-2000* (Hargshamn, 1997).

of the 1960s was granted to the military).[7] That the national innovation system fulfilled demands was indicated by the production of Swedish fighter aircrafts and the building of domestic nuclear power plants during the Cold War.

The Swedish innovations systems seemed to run efficiently until the late 1970s and early 80s, when a fast divestiture seems to have taken place. It was primarily spurred by the deregulation of markets for commodities such as electricity and telecommunications earlier run as state monopolies.[8] In this way, old and established institutions such as development pairs were abolished. Simultaneously, the public debate and innovation policy became more focused on markets for consumer products and the bridges between public and private did not seem as important any longer.

In this context, a lot of new regional university colleges and engineering schools were created, much for the sake of regional policy. As a result, the personal networks earlier supplied by a few national universities no longer gave full coverage. Destructing cost reductions and a following paralysis due to the end of the cold war also meant that problems arose within the until then perhaps most important sector for innovation, the military. Towards the end of the 20th century, Sweden became a member of the European Union, which in addition led to formal obstacles for the creation of a national growth policy through the protection of certain markets.

To sum up this short review, the national innovation systems in Sweden that were built during the first half of the 20th century have been substantially strained from the 1980s and onwards. It is clear that the innovation systems developed until the 1950s no longer are functional, at least not without major alterations. It is not clear, however, what the alternatives are. There are hints that university-based research groups and innovation-intensive enterprises may take on major roles on the production side of future innovation systems. It is less clear though, what institutions will fill the gaps left by industrial research institutes and development pairs characterized by competent public customers such as the National Board for Telecommunications. In general though, the focus seems to be on regional innovation systems rather than national ones. It is time, however, that this important problem is made central within Swedish innovation research.

III. Knowledge production and resource allocation in regional contexts

Towards the end of the divestment of national innovation systems in Sweden, the few and national institutions of higher education were transformed correspondingly. The regionalization of higher education and research in Sweden is usually claimed to have started in the 1970s.[9] At that time, five universities existed: Uppsala University had been founded in 1477 as a clerical education centre of the late Middle Ages. Some argue that it remains one to this day. Lund University was founded in 1666 in order to nationalize Scania, the southernmost part of Sweden that had just been conquered from the Danes. Some argue that it remains to be its purpose to this day.

[7]Jan Annerstedt, *Makten över forskningen: Om statlig forskningsorganisation och forskningsplanering i dagens Sverige* (Lund, 1972).

[8]Magnus Karlsson, *The Liberalisation of Telecommunications in Sweden: Technology and regime change from the 1960s to 1993*, Linköping Studies in Arts and Science 172 (Linköping, 1998).

[9]The regionalization of secondary education had started long before that and can be said to have accelerated during the decades of the early 20th century, see: Thomas Kaiserfeld, *Vetenskap och karriär: Svenska fysiker som lektorer, akademiker och industriforskare under 1900-talets första hälft,* Arkiv avhandlingsserie 46 (Lund, 1997). 66-72.

In the late 19th century, university colleges were founded in the two biggest cities Stockholm and Gothenburg. These were both transformed to universities in the mid-20th century. The fifth university in Umeå was founded in 1965. Soon after, Stockholm University established a branch in Linköping, which became a university of its own in 1976. In the same way, branches of other universities were formed in Örebro, Karlstad and Växjö. Through a government bill in 1977, these were transformed into university colleges and in the 1990s they became full-fledged universities. Simultaneously, locally organized teacher education and other programmes were upgraded to university colleges. Today, there are all in all universities available in 11 different cities and each and every county has a university college.

This pattern can be said to follow theoretical models developed within the economic geography of Alfred Marshall, who pointed out that industrial branches and sectors seemed to agglomerate geographically, creating local or regional clusters including relevant services and subcontractors, labour markets and institutions supporting relevant competence.[10] Marshall‘s observation of agglomeration may be combined with new growth theory of the 1980s and 90s where it is stated that certain types of investments, specifically those made in human capital, raise output and growth that can be sustained also over extended time periods due to prime-mover advantages and temporary monopoly effects.[11] Taken together, they indicate that regional knowledge production may be a way to create a higher and sustained productivity in regional industry and trade.[12] To sum up, since economic growth relies on the exploitation of knowledge production according to state-of-the-art economic theory and regional growth is the main objective in Swedish regional policy-making, it becomes important indeed to distribute higher education and research and development from the big old universities to new regional universities and university colleges.

However, Swedish regional policy is also plagued with yet another overarching goal. Apart from creating regional economic growth, it is a main objective of policy-making to distribute resources and services, such as higher education and research and development, to different territorial regions.[13] The problem is that these two goals in Swedish regional policy, to create economic growth regionally and to distribute resources between regions, often are in conflict with each other. The first goal is usually best achieved by specialization, which of course has bearing on the activities in a regional university or university college, especially in knowledge-dense sectors of industry and trade. The other would usually imply that also smaller regional institutions of research and higher education should house a rather broad set of programmes and research departments although this may prove inefficient on a national level in a population-wise small country like Sweden. In this sense, these two overarching goals of regional policy-making often turn out to be conflicting. This conflict is unfortunately not eliminated by the fact that these policy goals often are mixed and pursued without clear strategic planning.

In this context, it was to some extent discouraging when a Dutch economist found that regions surrounding Dutch universities failed to show lasting effects on other indicators of economic growth than income and job opportunities.[14] The general ideas of agglomeration

[10]Alfred Marshall, *Industry and Trade* (London, 1919).
[11]Paul M. Romer, ”Endogenous Technological Change”, *Journal of Political Economy* 98:5 (1990), S71-S102.
[12]Maryann P. Feldman, *The Geography of Innovation*, Economics of Science, Technology and Innovation 2 (Boston, 1994).
[13]Bjarne Lindström, *Regionalpolitiken som tillväxtpolitik: Retorik och substans i den regionala utvecklingspolitiken*, Institutet för tillväxtpolitiska studier A2005:011 (Stockholm, 2005).
[14]Raymond Florax, *The University: A Regional Booster* (Aldershot, 1992).

and new growth theory were, however, strengthened by another study of different regions in the USA. Here it was concluded that a strong correlation existed between university research and innovations in larger metropolitan regions with a population exceeding one million and with more than 30,000 students enrolled in higher education.[15] The conclusions have been confirmed for the Swedish case with reservations regarding the relatively short-term data collection.[16]

However, theoretical economic models have been of limited (academic?) interest to policy-makers when using the system of higher education and research as an instrument for regional policies. For them, one important reason for the regionalization of Swedish higher education was instead the shutting down of regiments in the wake of the fall of the Berlin wall 1989 and the end of the Cold War. Already earlier, it had become obvious how expensive and ineffective the Swedish defence system was with military personnel and equipment distributed all over the country. But the military system was not only of military interest. In addition, it had always been an important instrument for distributing central resources regionally and locally. When this proved too expensive and also of questionable use, many regiments were shut down and instead institutions for higher education emerged. In many cases, the buildings of regiments were actually soon taken over by a regional university college. In essence, the buildings owned by the National Fortifications Administration (*Fortifikationsverket*) were simply turned over to Akademiska Hus AB, the property holder of Swedish universities and colleges.[17]

IV. Higher education and production of human capital in regional contexts

While the regional system of universities and regional university colleges was rigged, a government bill in 1993 introduced a system for resource allocation in which each university and university college was compensated proportionally to the number of students enrolled up to a maximum level. For most university colleges as well as for some universities, this resulted in practice in a situation where economic soundness depended on the ability to attract students from the same region, alternatively creating undergraduate programmes that were so unique in a national perspective that it attracted students from all over the country. But also the older universities are to a large extent dependent on regional enrollment.[18] For instance, Chalmers technical university in Gothenburg traditionally enrol students from western and southern Sweden while the Royal Institute of Technology in Stockholm mainly enrols students from the northern and eastern parts.[19]

One important object of the regionalization of higher education in Sweden is also to raise the number of students enrolled. The policy goal is that more than half of the population

[15]Attila Varga, *University Research and Regional Innovation: A Spatial Econometric Analysis of Academic Technology Transfer* (Boston, 1998).
[16]Sverker Sörlin & Gunnar Törnqvist, *Kunskap för välstånd: Universiteten och omvandlingen av Sverige* (Stockholm, 2000). See also the debate induced by the book: Roland Andersson, *Ekonomisk debatt* 28:5 (2000), 483-493; Roland Andersson, ”Skall forskare sikta mot internationella publiceringar eller lösa praktiska problem”, *Ekonomisk debatt* 28:7 (2000), 691-694; Sören Wibe, ”Ovetenskapligt om forskningens lokalisering”, *Ekonomisk debatt* 28:7 (2000), 695-703; Sverker Sörlin & Gunnar Törnqvist, ”Rekviem över en granskningsrapport”, *Ekonomisk debatt* 28:7 (2000), 704-710.
[17]Roland Andersson, John M. Quigley & Mats Wilhelmson, ”University decentralization as regional policy: the Swedish experiment, *Journal of Economic Geography* 4 (2004), 371-388.
[18]Sverker Sörlin & Gunnar Törnqvist, *Kunskap för välstånd: Universiteten och omvandlingen av Sverige* (Stockholm, 2000), 137.
[19]More specific information regarding enrollment is given in: Sverker Sörlin & Gunnar Törnqvist, *Kunskap för välstånd: Universiteten och omvandlingen av Sverige* (Stockholm, 2000), 137.

older than 25 years shall have entered higher education. Already today, the figures are not actually so far off showing that 40 percent or more are already enrolled before the age of 25. Statistics show that higher education is also expanding fast on many different levels including graduate education.

There are indications that the regionalization of higher education in Sweden has played an important part in making university studies more accessible to a larger portion of the population. Student enrollment has become more evenly spread geographically, if not socially.[20] Not only that. Regionally, university colleges have functioned as employment generators, both directly through the number of college employees and indirectly through the consumption of both employees and students enrolled who usually finance their living through, from an international perspective, rather generous loans supplied by a government agency.[21]

In addition, empirical studies show that students are willing to enrol in undergraduate programmes that are organized locally or regionally in order to move to other regions later, where they can get employment according to their training. If this is correct, the regionalization of higher education in Sweden has indeed enhanced professional competence, functioning as a knowledge pump selecting and enrolling students locally in order to distribute the educated work force according to demand and supply of competence and employment opportunities.[22]

In other words, much of the changes of the Swedish system of higher education has been geared towards a higher output of students, and thus human capital, rather than other quantifiable entities that can be measured in order to weigh institutions of higher education and research against each other such as articles, Ph.D. dissertations, employed researchers and entrepreneurial firms. From this perspective, reformations have been successful indeed, although human capital, in the form of examined competence, does not seem to stay in regions where it was produced to the extent predicted, at least not in other regions than those around the major cities.

But critique has also been raised against the regionalization and expansion of higher education. The university colleges are said to be not much more than upgraded secondary schools devaluating the value of the university degrees that are handed out. Others argue that teaching as well as research resources are diluted by the introduction of regional university colleges, resources that could be used more efficiently if they were focused to a smaller number of bigger universities.

The regionalization does not only affect the higher education, but also that of graduate education and research. In this field, it has long been the official policy that regional university colleges should seek partners among regional industry and trade as well as regional public authorities such as health care etc. Together with external research commissioners, the university colleges as well as larger universities are prompted to form regional systems or clusters of innovation, where the knowledge produced regionally may also be used (or consumed) regionally as an injection for industry and trade as well as public life.[23]

[20]Kent Eliasson, *University Enrollment and Geographical Mobility: The Case of Sweden*, Umeå Economics Studies 558 (Umeå, 2001); Maria Wikhall, *Universiteten och kompetenslandskapet: Effekter av den högre utbildningens tillväxt och regionala spridning i Sverige*, SISTER skrifter 3 (Stockholm, 2001).
[21]Hans Westlund, *Regionala effekter av hägre utbildning, högskolor och universitet: En kunskapsöversikt*, SISTER Arbertsrapport 2003:28 (Stockholm, 2003), 17-18.
[22]Sörlin & Törnqvist, 140-144.
[23]For a survey of how universities may influence regional economic development, see: Michael I. Luger & Harvey A. Goldstein, "What is the Role of Public Universities in Regional Economic Development", in:

Along these lines and in addition to activities in connection to higher education, regional colleges are starting to acquire more of the centrally distributed research resources. According to one empirical study where regional productivity in Sweden was correlated with number of students at regional university colleges and more recently founded universities as well as the number of university-based researchers, there was a connection between the number of students enrolled and the regional productivity. Moreover, the connection was stronger between productivity and the number of university-based researchers. Especially the number of university-based researchers at regional university colleges and more recently founded universities proved to correlate stronger with productivity.[24] Other more recent studies have pointed in the same general direction.[25] In this context, it is also worthwhile to mention that many universities and university colleges themselves have noted a large interest among regional actors.[26]

These results have been contested in other studies of the Swedish case showing that institutions of higher education have little or unclear importance for the location of enterprise.[27] If this is correct, it seems as if Swedish universities and university colleges have been successful in attracting geographically distributed students and less successful in supplying profitable knowledge for regional agglomerations of trade and industry. The Swedish system for higher education and research seems to have raised production in certain regions just as any public agency or regiment presumably would have, but not productivity, at least not as much as projected. It is, however, important to stress that such conclusions can only be preliminary. There is a great need for further and more differentiated data collection.[28]

V. The regionalization of higher education and public research in Sweden

To summarize the development of the Swedish system for higher education and research, it is clear that it has been driven by a multitude of factors and interests. The result is a system that is gradually more regionalized, although still more so in higher education than in research. The reasons behind this is the general idea, mirrored in new growth theory of the 1980s, that knowledge production play a more important part in the development of trade and industry, also when regionally organized. When such ideas hit a relatively large and thinly populated country such as Sweden, where most of job opportunities occur in cities and bigger towns leading to unemployment in less densely populated regions, they are bound to lead to ideas of regionalization of higher education in order to help further regional economic growth.[29] At least as long as distribution of resources remains an important goal of regional policy, besides economic growth.

This trend was further strengthened by the shutting down of regiments distributed over Sweden both preceding and following the end of the Cold War. In addition, the university

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Dilemmas of Urban Economic Development: Issues in Theory and Practice, eds., Richard D. Bingham & Robert Mier, Urban Affairs Annual Reviews 47 (London, 1997), 104-134.

[24]Andersson, Quigley & Wilhelmson, 380-381 &385-387.

[25]Westlund, 31-43.

[26]*Tillväxt genom samverkan? Högskolan och det omgivande samhället*, Riksrevisionen rapport 2005:2 (2005), 23-24.

[27]Karl-Johan Lundquist, *Företag, regioner och internationell konkurrens: Om regionala resursers betydelse*, Meddelanden från Lunds universitets geografiska institution, avhandlingar 129 (Lund, 1996).

[28]Westlund, 31-33.

[29]These ideas also occur in other countries, see: Roger L. Geiger & Creso Sá, "Beyond Technology Transfer: US State Policies to Harness University Research for Economic Development"; *Minerva* 43 (2005), 1-21.

colleges´ focus on attracting students rather than pursuing research, has became even stronger after 1993, when the funding for higher education was made dependent on the number of students more than anything else. That university colleges have since then received only seed-money for research tasks does not change their strong orientation towards higher education. Many of the university colleges also have ambitions to become full-fledged universities. In the Swedish system, this implies research and education of internationally acceptable quality within the humanities or social sciences, technology, sciences or medicine. Again, striving to become universities tend to reduce university colleges' ambitions to profile themselves in accordance with regional demands.

The trend is further strengthened by the fact that a lot of private resources are funnelled to research within companies and enterprise, while most public funding of research is channelled to universities and university colleges. In addition, Sweden has, compared to other western countries, less problem-driven research in research institutes and other organizations acting as bridges between private and public interest. This Swedish phenomenon, namely few alternative regional institutions and authorities, apart from the system of higher education and research, to stimulate research for regional growth, has been labelled the bipolarity of the national system of innovation.[30] Vice versa, higher education must rely on research according to regulations issued in 1908, implying that resources for higher education must be distributed together with resources for research leaving less room for public investments in regionally organized research.

The result is a system that seems to raise regional production due to direct and indirect causes, i.e. through the work and consumption of employees and students of universities, more than raising regional productivity through the exploitation of knowledge as often expected. Generally, this lack of raised productivity, if recognized at all, is often explained by time-lag, i.e. that university colleges have not been in place more than a few years, at least not with research funding, and that more time is needed in order to evaluate results on a regional level. Other explanations include the bipolarity of the Swedish innovation system as well as a lack of developed institutional instruments to create knowledge transfer between academia and industry on regional as well as national levels in Sweden. Since raised productivity, however, was one of the more important arguments behind the regionalization of higher education and research in Sweden, the other being a geographically more even distribution of resources, further explanations of these shortcomings are much desired.

Taking all these different aspects into account, it is no wonder that Swedish higher education is being regionalized, especially regarding undergraduate education. Given the geographical conditions of Sweden, with a relatively small population spread over a large area, as well as historical and social processes that have created today's situation, the lock-in effects creating a regionalization of higher education and research are very strong indeed. As a preliminary result, the effects of this process seem to include a regional raise in production rather than productivity thereby fulfilling the goal of national distribution of resources, but simultaneously not contributing as much as predicted to that of raised regional productivity, i.e. the one the regionalization of higher education and research was actually claimed to fulfill.

[30]Henrik Sandén & Ulf Sandström, "Forskningsinstituten: Det glesa landskapet", i: *Det nya forskningslandsakpet: Perspektiv på vetenskap och politik*, ed., Ulf Sandström, SISTER skrifter 5 (Stockholm, 2002), 195-213; Sverker Sörlin, *Institutssektorn, högskolan och det svenska innopvationslandskapet: Observationer och analys av utförande och finansiering av behovsmotiverad forskning i det svenska FoU-systemet*, SISTER Arbetsrapport 2004:31 (Stockholm, 2004).

VI. Two strategies for regional universities—traditional academic or collaborative regional

It should be obvious that Swedish higher education is being decentralized due to a vast number of reasons external as well as internal to the system itself. This process has created a lot of stress on the more recent, smaller universities and university colleges acting within the system. From a very broad and simplified perspective, there are two different strategies to follow for smaller and more recently established universities and university colleges in order to seek legitimisation.

The first strategy is to try to act as much as possible as old, big and established universities with academic traditions. In order to succeed with such a strategy, a lot of time would probably be needed, decades or even centuries. This venue is perhaps only open to those ten or fifteen Swedish universities and professional schools that have already existed long enough to acquire larger amounts of public funding for research. For smaller university colleges, this strategy usually includes applying for one or more of the four scientific fields (*vetenskapsområden*) one for each of natural sciences, medicine, social sciences and technology defined by the government. Once this has been granted, the focus has to be on building up yet another scientific field so as to merit the university college the right to grant Ph.Ds given by government. Parallel to the development of research and education in line with mode 1 or normal science, the university college also needs to build up its infrastructure including laboratories and libraries. For a smaller university college, this may prove a risky and narrow path to embark upon. Pitfalls are numerous as some examples have proven, the best known perhaps the formidable expansion of science and medicine at Södertörn University College leading to deficits of historical proportions.

The other strategy open for more recently founded universities and university colleges is to find ways of legitimising their activities other than to count the number of students and Ph.Ds examined as well as articles published in international journals. There are different ways of doing this. For instance, it is possible to make money by selling tailor-made education programmes to regional trade and industry or to sell research and development to specific enterprises or industrial sectors represented regionally.[31] Almost all strategies alternative to traditional academic legitimisation, i.e. mode 2 or post-normal science, have one feature in common in the Swedish system, they depend on regional actors rather than international or global ones. In this way, they strive for better integration in regional innovations systems.

This simple observation can be related to one of the most important findings regarding scientific research that has been named social studies of science or science and technology studies comprising of social, historical, philosophical and other perspectives on science and technology. Here, it has been stated for some time now that scientific knowledge is, contrary to what is usually assumed, quite often not only produced in local contexts, but also used and verified here. Different fields of knowledge have different methods of acquiring knowledge, which in its turn leads to different ways of acknowledging findings or observations. The fragmentation continues down the social structure of science and may characterize the work in separate departments and research groups.

The reason is that it is in many cases hard to formalize methods used in order to acquire knowledge, for instance with help of a specific apparatus. In practice, methods such as the handling of experimental equipment or specific analytical tools etc. are often enough well

[31]Examples are given in: Maria Lönn, *Högskolan samverkar*, Högskoleverkets rapportserie 2004:38R (2004); *Tillväxt genom samverkan? Högskolan och det omgivande samhället*, Riksrevisionen rapport 2005:2 (2005).

mastered by only a few persons in a specific department. In order to have scientific methods exported to other research groups, it is usually not enough to publish articles on how to build and operate a certain piece of machinery or use a mathematical method. Instead, it often requires visits from those who have hands-on experience or, vice versa, that researchers are sent to a department where the method has been used successfully. Taking this into account, it is perhaps no surprise that the concept of tacit knowledge has been used in order to characterize scientific methods.[32]

This goes against the traditional view within philosophy of science where it is usually assumed that legitimisation of scientifically produced and verified knowledge occur in an international context of publishing of articles and conference papers.[33] More generally, knowledge production is assumed to occur locally in laboratories or seminars, it is supposed to be used regionally or internationally while funded nationally, through career systems and public research funding, and legitimised internationally as mentioned above. Cultural studies of science do not deny this, but point to the fact that what counts as observations, proofs, verifications etc. differs not only from speciality to speciality, but also between different laboratories and departments within the same speciality.[34] In fact, the heterogeneity of scientific cultures has been listed as one of the more important observations within cultural studies of science.[35] Therefore, strategies of legitimisation depending on regional actors rather than international or global ones can be supported by results of cultural studies of science.

But there are also philosophical findings that can be referred to for support in this context. The fragmentation of knowledge legitimisation was already observed and dwelt on by one of the founders of philosophical postmodernism. Jean-François Lyotard, who claimed that knowledge is becoming a commodity and thus the subject of transactions between producers and consumers who buys and sells it as any other consumer product.[36] In addition, Lyotard claimed that knowledge legitimisation can't be disconnected from power relations. In his eyes, they are two different sides of the same coin.

If Lyotard is correct, and there are quite a few signs in his favour, his insights are likely to influence our understanding of the regionalization of the Swedish system of higher education and research as well as its consequences. Obviously, for instance, the legitimisation of scientific knowledge may indeed become more of a regional or even local matter, rather than international. The reason is that smaller regional university colleges trying to legitimise their activities only seldom include the possibilities to show high turnouts of articles and Ph.Ds, quantifiable entities that traditional academic institutions usually refer to when boasting their (presumed) excellence. They simply do not have the resources needed in order to compete against older and bigger universities on their own home ground, i.e. to choose the first of the two strategies mentioned above.

[32]Harry M. Collins, "Tacit Knowledge, Trust and the Q of Sapphire", *Social Studies of Science* 31 (2001), 71-85.
[33]For a more detailed analysis of how knowledge claims are spread, see: R.G:A. Dolby, "Sociology of Knowledge in Natural Science", *Science Studies* 1 (1971), 3-21.
[34]Karin Knorr-Cetina, "Epistemic Cultures: Forms of Reason in Science", *History of Political Economy* 23 (1991), 105-122; Peter Galison & Andrew Warwick, "Introduction: Cultures of Theory", *Studies in the History and Philosophy of Science Part B: Studies in the History and Philosophy of Modern Physics* 29 (1998), 287-294.
[35]Jospeh Rouse, "What Are Cultural Studies of Scientific Knowledge?", *Configurations* 1 (1992), 1-22; Peter Dear, "Cultural History of Science: An Overview with Reflections", *Science, Technology, & Human Values* 20 (1995), 150-170; Sarah Franklin, "Science as Culture, Culture of Science", *Annual Review of Anthropology* 24 (1995), 163-184.
[36]Jean-François Lyotard, *The Postmodern Condition: A Report on Knowledge*, French orig. 1979 (Manchester, 1984).

Instead, smaller and more recent institutions of higher education and research will have to find other ways of making their existence legitimate. In this situation, they tend to turn to their interaction with regional trade and industry, i.e. integration in regional innovation systems, more than anything else. Doing so, they choose the second of the two strategies mentioned above. In this way, not only the Swedish system of higher education and research has been regionalized, but also the legitimatisation of the knowledge produced within that system.

VII. Consequences of the regionalization of knowledge legitimisation

This transformation of legitimisation has some interesting corollaries. First, and perhaps most importantly, this implies that academic institutions may be judged very important indeed without having research capacities on their own. A university or university college, which seeks legitimacy primarily within the own region, is often content with supplying students that either start enterprises themselves or are well equipped to be employed with existing regional business. It is also enough to supply existing knowledge of relevance to other regional institutions, public as well as private. If this doesn't necessarily imply research activities, there is really no need for a small university or university college to house such expensive endeavours other than as a way to ”keep up” in order to understand how new results are acquired and may be used.

Secondly, turning to local business as well as industry and trade for legitimisation for their activities puts a lot of responsibility on these non-academic institutions. Their systems of measurement are bound to be quite different from those applied by traditional academic institutions such as research foundations, other universities or academically appointed evaluation boards. Here, originality as well as technical sophistication are ideal goals to aim for. In regional innovation systems, it is more likely that these goals are substituted for others such as comprehensibility or applicability (read patentability).

In addition, this general trend seems to imply a transformation of currency within the system of measurement. Earlier, academic and intellectual prestige was measured by the number of internationally recognized researchers attracted to a certain research institution or the number of articles produced by its teachers. To some extent, these quantities relied on social authority among researchers exercised through the system of peer-review or in other ways. Undisputedly, money matters in this system in many ways. For instance, external research grants could be counted in order to measure excellence.[37] But in the end, it was never money or material values themselves that were the currency. Instead, money was used as the means to acquire the people or the instruments needed in order to get higher output of research results etc. that counted.[38]

In other words, it may be that the regionalization of higher education and research in Sweden and in other countries slowly transforms the way academic quality is measured or at least introduce new sets of parameters to measure it against. The social authority earlier supplied internationally, for instance through the system of peer-review or through the number of external projects granted and thereby supported by reviewers, is being

[37]Robert K. Merton, “The Matthew Effect in Science”, *Science* 159:3810 (1968), 56-63.
[38]For a more penetrating analysis of this, see: Karin D. Knorr-Cetina, “Scientific Communities or Transepistemic Arenas of Research? A Critique of Quasi-Economic Models of Science”, *Social Studies of Science* 12 (1982), 101-130.

downplayed and to some extent substituted for a more local or regional alternative relying on money as the currency.[39]

This is of course a reasonable consequence when a system is consciously geared to collaboration and interaction with local business and industry. It simply follows when regionalized universities and university colleges have as their task to interact with local and regional business in order to boost productivity and when they manage to meet this demand successfully. Concretely, legitimisation may include the number of patents accepted or the turnover of the holding companies funded by the university college. The key issue here is that the money made no longer is used to boost other quantities in order to measure and achieve excellence, but constitute the measured quantity itself. It seems as if money is becoming the more important currency to evaluate academic excellence and to legitimise the activities at regionalized universities as well as university colleges. In short, money supplies the mechanisms used in order to test and confirm knowledge claims made regionally.

Since regional universities and university colleges following the second strategy above, profiling their research activities to fit regional innovation systems, thus becoming a valuable asset regionally, run the risk of neglecting goals that are traditionally ranked higher in the academic system, they never get the chance to achieve recognition within that system. Using the conceptual framework developed in cultural studies of science, regional universities and university colleges following the second strategy outlined above may in due time form a new set of legitimising achievables. In practice, this means that local or regional cultures of science, changing from laboratory to laboratory over experimental set-ups used to theoretical models applied, not only include the way observations are made and confirmed, but are expanded to also include how legitimisation is sought within or without the academic system. In this way, cultures of science are stretched in order to include not only cultures of knowledge production, but also cultures of knowledge confirmation. All of them being just as local or regional as cultures can be.

It is important to remember, however, that although the alternative system of measurement, i.e. money, patents etc., makes it possible to benchmark academic institutions across the world, it is, contradictorily enough, in the end not seldom regional business that acknowledge the activities of regionalized universities and university colleges by supporting research alliances or employing the students who have graduated. This makes it possible and even probable, actually desirable according to nationally prevailing research and education policies, to sustain two different systems of legitimisation. Each one of them adapted to one of the two strategies discussed above. The first one is the traditional academic system, where quality is measured by the output of academic articles and monographs as well as awards etc. The other one has the output of money as the foremost yardstick, focusing not only on the production of knowledge, but also on the linking of new knowledge from academia to regional business and trade.

VIII. Conclusions

The two separate processes of regionalization of knowledge production and increasing strive for a more efficient use of knowledge produced regionally may have important consequences for how knowledge claims are legitimised and perhaps also to some extent

[39]There is a voluminous literature on the "new economics of knowledge", both descriptive and normative. See for instance: Corynne McSherry, *Who Owns Academic Work? Battling for Control of Intellectual Property* (Cambridge, Mass., 2001); Dominique Foray, *The Economics of Knowledge*, French orig. 2000 (Cambridge, Mass., 2004).

verified. If research executed at a smaller and more recent university college is of utmost importance to regional business, but simultaneously does not merit the researchers any important publications and citations, will it be legitimate? On good grounds, it may be assumed that it will be legitimate among representatives for regional business, but not among representatives for the traditional university system. In the best of worlds, this does not need to be a problem. On the other hand, since the status of a university and university college depends on the traditional university system rather than regional business, the mismatch may cause confusion at best and decreasing resources at worst, thereby risking the possibilities to pursue activities usually associated with a university college, i.e. education and research.

This is more likely, since knowledge production that is geared towards regional use in collaboration with institutions outside of academia hardly will substitute traditional scientific knowledge production. Instead, it will probably exist as a complement, although presumably become more common. Still, the traditional system of social authority for the legitimisation of knowledge claims is so well established and with such a momentum that it will not only prevail, but also continue dominating the legitimisation of knowledge claims.

Here, some ideas regarding issues that may arise as a consequence of the regionalization of knowledge production in combination with an increasing strive to find use for knowledge produced regionally have been outlined. Next step is of course to check them against empirical observations. One way of achieving this would be to compare how knowledge claims are used and legitimised in different regions where universities or university colleges exist. Suitable regions could be Blekinge with Blekinge Technical University and central Mälardalen with Mälardalen University. Other regions may include Karlstad with the recently founded Karlstad University or Gävle with Gävle University College. Also Halmstad and a number other candidates are suitable for studies of how knowledge claims made at smaller regional universities and university colleges may be legitimised through regional use outside of academia.

Focusing on links now formed regionally between smaller universities or university colleges as the knowledge producing institutions on one hand and consuming partners on the other, the empirical questions that arise are how persistent these regional alliances need to be in order to launch and maintain successful long-term collaboration? What are the resources needed for advanced regional development-work? How can regional relations regarding knowledge production and knowledge be made strong enough to legitimise the knowledge claims made also within the traditional academic system? Problems such as these are unquestionably important to address given the developments over past and future decades.