

Combining excellence in education, research and impact: inspiration from Stanford and Berkeley and implications for Swedish universities

ARTHUR BIENENSTOCK

SYLVIA SCHWAAG SERGER

MATS BENNER

ANNE LIDGARD

SNS FÖRLAG

SNS Förlag
Box 5629
SE-114 86 Stockholm
Sweden
Phone: +46 8 507 025 00
Fax: +46 8 507 025 25
info@sns.se
www.sns.se

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Combining excellence in education, research and impact: inspiration from Stanford and Berkeley and implications for Swedish universities

Arthur Bienenstock, Sylvia Schwaag Serger, Mats Benner and Anne Lidgard

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Graphics and cover design: Allan Seppa

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About the authors

ARTHUR BIENENSTOCK is Professor emeritus of Photon Science, Special Assistant to the President for Federal Research Policy and Director of the Wallenberg Research Link at Stanford University. He also currently serves as Member of the National Science Board, the Governing Board of the National Science Foundation and Policy Advisors to the President and Congress. He has been a member of Lund University's Scientific Advisory Board. He received his B.S. and M.S. degrees in Physics from the Polytechnic Institute of Brooklyn, and his Ph.D. degree in Applied Physics from Harvard University in 1962.

He joined the Stanford faculty in 1967 and has served as Professor of Applied Physics, Professor of Materials Science and Engineering, Vice Provost for Faculty Affairs (1972-77), Director of the Stanford Synchrotron Radiation Laboratory (1978-97), Associate Director of the Stanford Linear Accelerator Center (1992-97) and Vice Provost for Research and Graduate Policy (2003-6). From November, 1997 to January, 2001, he served as Associate Director for Science of the Office of Science and Technology Policy while on leave from Stanford.

Prior to joining Stanford, Bienenstock was a National Science Foundation Postdoctoral Fellow at the Atomic Energy Research Establishment, Harwell, England (1962-3) and an Assistant Professor in Harvard University's Division of Engineering and Applied Physics (1963-7).

SYLVIA SCHWAAG SERGER is adjunct professor in science policy studies at Lund University and Executive Director International Strategy at VINNOVA. She is also a member of the Expert Group in Public Sector Economics (Expertgruppen för Studier i Offentlig Ekonomi, ESO) under the Finance Ministry. Since 2013, she is Guest Professor at the Chinese Academy of Sciences Institute for Policy Management (CASIPM) in Beijing. Sylvia has a Masters Degree in International Economics and International

Relations from the Paul H. Nitze School of Advanced International Studies (SAIS) of the Johns Hopkins University and a PhD in Economic History from the London School of Economics.

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MATS BENNER is a professor in science policy studies at Lund University, and vice dean (research) at Lund University School of Economics and Management. He is permanent member of the Royal Swedish Academy of Engineering Sciences, and has been a member of the Swedish government's research advisory board.

ANNE LIDGARD is Director of VINNOVA's Silicon Valley Office and also Visiting Scholar at Stanford University. She holds a MSc in Engineering Physics from The Royal Institute of Technology in Stockholm (KTH), and a PhD (Tekn Dr) in Physics (Laser Physics), also from KTH. Lidgard started her career in corporate R&D at AT&T Bell Laboratories and at Ericsson, working in Lightwave Communications and later also in Mobile Communications. She has also spent many years working with small tech companies in various positions; as founder and CEO, in operations, and as board member. She joined VINNOVA in January 2006, and has been part of the management team since May 2009. She is a board member of CIAM, The Center for Industrial and Applied Mathematics at KTH.

Preface

Numerous people have provided valuable inputs and comments to our work. Among others, the authors wish to thank Stacey Sorensen (University of Lund), Braden Penhoet (University of California Berkeley) and Per Krusell (Stockholm University). None of the aforementioned persons are responsible for any remaining shortcomings or for any of the conclusions drawn. The views expressed in this report are those of the author(s) alone.

Executive Summary

Universities are operating in a rapidly changing global context. Growing mobility, intensifying global competition for students and talent, changing demands and new methods of education are some of the factors that are forcing universities to re-examine their role, functioning and position both in their surrounding society and in the global arena.

In Sweden higher education and research are still primarily discussed within a national context, without sufficiently considering that both will increasingly be affected by the global competition for both students and faculty: “Swedish universities compare themselves and compete primarily with each other, not with their equivalents in other countries” (Strömbäck 2013, p.38). This is one of the reasons we decided to carry out a comparison of Swedish universities with Stanford and the University of California Berkeley. We are well aware that there are significant limitations to such comparisons and that Stanford and Berkeley, and the US university system in general, face their own challenges. Nonetheless, as we argue in this paper, they form a useful basis for comparison and assessment of Swedish universities in a global context.

In particular, we have identified factors which have allowed Stanford and Berkeley to combine excellence in teaching, research and impact. We argue that some of these factors, such as linking research and education, the importance attached to education and teaching, recruitment mechanisms, and career development paths, ensure that these universities attract the best students and faculty and contribute significantly to societal development both in their region and globally. These factors seem critical in ensuring universities’ future relevance and competitiveness.

When comparing Swedish universities with Berkeley and Stanford according to what we argue are key determinants of universities’ excellence, relevance and global competitiveness, we find a troubling picture. Faculty recruitment and promotion processes at many Swedish departments are closed and still not transparent, leading to a large degree of staff being re-

cruited from among PhDs from within the department, a behavior that stands in stark contrast to many of the leading universities. Furthermore, PhD students are to a large extent recruited from within the university and, often, the department from which they obtained their undergraduate degrees. Thus, the talent pool for recruiting future professors and heads of department is effectively often limited to the population of students accepted at the undergraduate level.

The recent introduction of tuition fees for students from outside the European Union and the European Economic Area (EEA) and Switzerland and the resulting dramatic drop in student enrollment from Asia and Africa have revealed that Swedish universities are currently finding it difficult to attract the best students on an international level. We believe that it would be misleading and mistaken to blame the drop in students from outside the European Union mainly on a shortage of scholarships or other funding sources available to these students. Instead we would argue, and we have shown in this analysis, that other factors explain why globally mobile students, or their families, seem to be more willing to pay, often quite heavily, for their tertiary education in the US, UK and Australia, rather than coming to Sweden. One of these factors, we argue, is the quality and focus of teaching and education. In addition to identifying high-quality teaching as perhaps their most important task, many world-leading universities, like Stanford and Berkeley, focus on ‘educating the whole student’ and on providing students with a range of transferable and interdisciplinary skills that are intended to give them a basis for continued professional and personal development. This is often done by offering a liberal arts education at undergraduate level. In contrast, Swedish universities generally force students to specialize early in an academic field or discipline, thus limiting the range of skills most students acquire during their studies.

We also find that Swedish universities have shifted their emphasis strongly towards research at the expense of teaching with disconcerting effects on teaching quality, and, the international attractiveness of Swedish universities. This research bias is partially explained by the fact that in Sweden academic excellence is often equated with research excellence, neglecting the importance of teaching. Furthermore, it indicates an under-appreciation of the key role of students, and thus teaching, in determining regions’ and countries’ competitiveness and innovation capacity. In addition to a growing emphasis on research at the expense of teaching, we see an increasing disconnect between teaching and research with adverse consequences for both activities. One of the ironies of the Swedish system com-

pared to other countries is that, on the one hand, publicly funded research is more concentrated in universities (as opposed to research institutes), while, on the other hand, teaching seems to be more disconnected from research.

Finally, we argue that the discourse on universities' role in society in Sweden has been based on a very narrow focus on commercialization of knowledge generated at universities in the form of patents and spinoffs. In particular, funding patterns, promotion criteria and policy measures confirm a neglect or denial of the key role that education, teaching and, most importantly, students play in a university's contribution to its surrounding society.

Swedish universities have undergone a dramatic expansion in recent decades. Student enrollment numbers and faculty size have exploded, propelling universities from a sheltered place of learning and knowledge that was reserved for a privileged elite, to a mass institution permeating society through the large share of the population educated at universities and by being one of the largest employers in Sweden (universities employ 30% of all government employees). Investments in research have also expanded rapidly in the last decade. In addition, the world around the universities has changed, with increased global competition for talent, new labor market dynamics and changing and growing expectations of how universities interact with and contribute to society.

Swedish universities are currently not doing poorly or at least they could be doing a lot worse: they have seen a rapid expansion in enrollment and faculty in recent years and decades, Swedish publicly financed research – the large majority of which is carried out at universities – is good in terms of citations, and there has been a significant increase in their budgets, particularly for research. However, we show in this paper that some current characteristics of the Swedish university system are suboptimal and risk becoming serious challenges for Swedish universities and for Sweden as the global research and education landscape changes. In particular, Swedish universities are weakly organized, with a disjunction between teaching, research and interaction, with a strong tradition of internal recruitment, with unclear promotion patterns, with career paths heavily skewed towards research achievements, with a similarly skewed understanding of the meaning of 'societal interaction', and with teaching environments that are not sufficiently attractive to compete at the top level internationally. If these issues are not addressed in their totality, Swedish universities risk becoming unattractive for students, faculty and collaborative partners.

After two decades in which Swedish universities have expanded rapidly in terms of quantity, there is now a need for a qualitative transformation.

In this paper, we have shown that pivotal areas such as recruitment, teaching and the link between teaching and research in Swedish universities are uncompetitive in a global and open university system where students, staff and funding are increasingly 'de-nationalized'. Addressing these challenges, and turning them into strengths, will require a serious rethinking and redefinition of leadership, both academic and collegiate leadership, rather than a dogmatic insistence on maintaining or abolishing one or the other in their current form.

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In the future, universities can no longer take for granted that they will be the natural choice when people in their region are looking for higher education. Furthermore, they need to work harder to ensure that the education and experience they provide, and that the skills and competencies acquired, will make their students employable and attractive on a future labor market, rather than just focusing on conferring degrees.

Recommendations

Recruitment:

1. Sweden should introduce a tenure track, starting at the assistant professor level, for faculty who combine outstanding research with high quality teaching.
2. An international search should be initiated for all tenure track positions. Those performing the selection should show evidence that the search performed was likely to reach virtually all potential candidates and that the person selected was the best for the position.
3. Only those who demonstrate consistent performance in both research and teaching should be promoted to tenure. At the same time, there should be a tenured position available for any person hired into a tenure track position who meets tenure standards.
4. Get more serious about ensuring mobility; The Swedish university system and the Swedish innovation system would benefit considerably from greater mobility of people, firstly among universities, secondly, between academia, industry and policymaking, and, thirdly, by attracting more students and faculty from abroad. In particular, more should be done to acknowledge the importance of relevant competence (from industry and public sector) for both teaching and research and to bring it into the universities. Bengtsson (2011) advocates that the number of 'boundary spanners', i.e. people who move between

different sectors, be increased in the Swedish university system (p.51).

Funding:

5. Sweden should modify its university funding mechanisms so that sufficient funds are provided for teaching and the tenure track system of Recommendation (1) is fully supported.

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Enhancing the focus on teaching and on linking research and teaching:

6. Strengthen the focus on teaching and on linking research and teaching by realigning teaching and research in all positions.
7. Carry out more systematic evaluations of teaching (at University level) and offer support for improvement of teaching skills.
8. Consider changing curricula to focus more on skills rather than specific qualifications or degrees
9. Increase links between undergraduate and Masters education and research, involve undergraduate and graduate students more systematically in ongoing research
10. Ensure that all universities' websites contain lists of each course being taught during the academic year. The listing should state who will be teaching it as well as the time and location at which it will be presented.

Leadership:

11. Strengthen leadership of academic institutions, by building durable structures from below (departments that join teaching, research and interaction) and by embedding and regulating these by supportive and visionary faculty and university leaders who support and sustain competitive recruitment and promotion strategies and entice strong academic leadership at all levels.
12. Rectors and pro-rectors must provide the leadership to drive the university towards excellence in both teaching and research

Other:

13. Acknowledge and allow for a greater diversity in the Swedish HEI landscape through a transparent, though diversified funding mechanism

Introduction

Universities around the world are coming under increasing pressure to combine excellence in education and research with social and economic impact. Local, regional and national governments are expecting or demanding that their universities not only educate students and drive the advancement of knowledge but that they also contribute to societal and economic development. At the same time, the global competition for recruiting the best talent (both faculty and students) is intensifying.

Swedish universities play a large role in Swedish society and economy, as employers, educators, and performers of research and development. They employ nearly one third of all state employees, they are educating a rapidly growing share of the Swedish population – in 2012, one fourth of the Swedish working age population had some form of post-secondary education – and they account for the highest share of expenditure on research and development (R&D) in the OECD measured as a percentage of GDP (OECD 2011, p.78). In recent years, both Swedish and international commentators have pointed to a number of weaknesses or challenges at Swedish universities. These include a decline in research excellence (Öquist and Benner 2012, Vetenskapsrådet 2012 and 2010), concerns about the quality and usefulness of the education offered at institutions of higher education in Sweden, lack of clear career paths, weak mobility and non-transparent recruitment mechanisms (Berggren 2012). Furthermore, with a growing share of the population educated at universities and as knowledge becomes an increasingly important driver of innovation and growth, the role of universities in contributing to society and economic development is increasingly debated both in Sweden and internationally.

Against this backdrop, in this paper, we have selected two prominent American universities and identify some key elements which allow them to combine successfully excellence in education, research and societal impact. We then compare them to Swedish universities. Thus, we examine how the goals of combining excellence in education, research and societal impact

Box 1: Dealing with budget cuts at Stanford

As Vice Provost for Faculty Affairs, Arthur Bienenstock participated in the budget cutting that took place under the leadership of Provost William F. Miller in the 1970s as a consequence of significant financial exigencies. As part of that process, the Department of Extractive Metallurgy and the Schools of Architecture and Nursing were closed. Yet, during the same period funds were set aside for the initiation of new undergraduate educational programs and the recruitment to the faculty of outstanding women and under-represented minorities. Similarly, financial crises were faced and addressed vigorously in the early 1990s and after the recent economic crisis when the endowment declined markedly.

are met in two institutional settings: Sweden with its comprehensive and unified university system, and the US, exemplified by one private university, Stanford University and one public, the University of California, Berkeley. Both Stanford and Berkeley have successfully combined excellence in education, research and societal impact. The fruitful combination and interaction of these elements actually appear to be a vital prerequisite for ensuring excellence in each of the individual components. Swedish universities on the other hand struggle to combine education, research and societal interaction in a coherent manner. While excellence and outstanding achievements can be found in parts of the Swedish system, the systemic interaction among the three is rarer.

We realize that there are many difficulties with picking one university and particularly Stanford University as a benchmark for world class universities in Sweden and elsewhere in Europe. Stanford is a private university, it is located in a unique region, and it has one of the largest university endowments in the world. It is important to remember, however, that Stanford has risen to its present stature only over the past half century. Even within this period, it has experienced several serious financial set-backs that, surprisingly, left the university stronger because of strong academic leadership by Stanford's presidents and provosts who eliminated weaker and non-central programs rather than cutting across the board. Consequently, it offers interesting lessons for Swedish universities.

Throughout much of its 145-year history, the public University of California, Berkeley, has faced significant, and recently, dramatic, reductions

in direct state and federal funding. The example of Berkeley is, perhaps, particularly interesting since it is an example of a public university that has maintained excellence throughout a period of increasing financial austerity.

Stanford's and Berkeley's long-standing strengths – as two of the world's leading institutions for research and education but that also have significant social and economic impact – are, to a great degree, based on a few fundamental strategic choices or priorities, which are not primarily dependent or explained by large endowments or their locations in or near Silicon Valley. These priorities include:

- * selecting and attracting the very best and most promising students from around the world
- * selecting and attracting the very best faculty possible from around the world
- * educating the whole student
- * strongly linking education and research
- * encouraging interdisciplinary endeavors while maintaining strong disciplines
- * maintaining healthy and mutually beneficial contacts and interchanges with other universities as well as the government and corporate sectors, and society at large

These characteristics and priorities are not unique to Stanford or Berkeley. As implied above, they are shared, to a greater or lesser degree, by virtually all world-leading universities, be they public or private. We have focused on Stanford because we know it well and can provide detailed information about it. One of the authors, Arthur Bienenstock has a long career at Stanford, both as a professor and in various top management functions, including vice provost and dean for research and graduate policy, enabling us to provide unique insights into Stanford's principles and policies. Where possible, we also include Berkeley to broaden the basis for analysis.

One of the common responses to criticism of the Swedish university system is that it is 'unique' and fundamentally different, thus making it difficult to compare with other systems, particularly the US system. We are aware that the majority of Swedish higher education institutions differ significantly from US universities when it comes to funding and governance structures – both at national and university level – but also with regard to institutional conditions, such as labor market rules and laws regulating the ownership of intellectual property. However, in this analysis, we focus on elements which can be argued to be at the core of the academic exercise

globally. This is illustrated by the fact that the features described above correspond closely to key characteristics identified in a joint statement by some of the most prominent universities in the US, Europe, Australia and China as defining features required to “make research universities effective” (see Appendix 1). While national contexts and institutional features can significantly affect or shape these characteristics within universities, this should not distract from their importance or from the need to address threats to their fulfilment.

In Table 1 we compiled a few key indicators of Berkeley, Stanford, Lund and Uppsala universities to provide a rough frame of reference. We have selected Lund and Uppsala because, like Berkeley and Stanford, they are comprehensive universities. Furthermore all four universities are ranked among the top in their respective countries. In addition to being the two oldest universities in Sweden, Lund and Uppsala together account for a significant share of the total student population (17% of full-time students, 25% of full-time PhD students), faculty (20%) and research revenue (25%) at Swedish universities.¹ Thus, while it would be wrong to say that they are representative of Swedish universities in general, the analysis of key elements at these two higher education institutions covers a substantial share of the total Swedish university system in terms of education, research and economic and social impact.

With nearly 16 000 full time students, Stanford has the smallest student population of the four, with Lund and Uppsala’s student population nearly twice as big and Berkeley the largest at 36 000. Graduate students (PhD and Masters students) account for one third of total students at Berkeley, Lund and Uppsala, while they account for more than half at Stanford. At Berkeley, PhD students make up 57% of total graduate students while at Lund and Uppsala their share is only around one fifth. The comparison of faculty is not straightforward since Berkeley’s and Stanford’s figures include full- and part-time faculty while for Lund and Uppsala the figures are full-time equivalents. The research budgets for Berkeley, Lund and Uppsala are similar in size, while Stanford’s budget is nearly twice as large. The most remarkable difference can perhaps be found in the size of research revenue as a percentage of the universities’ total budget. Whereas research accounts for less than 30% of the total budget for Stanford and Berkeley, for Lund and Uppsala, the corresponding share is around 70%, something which we will come back to in the section ‘focus on teaching and linking teaching to research’.

¹ Figures for 2012 based on data from Universitetskanslerämbetet (2013)

Table 1: Comparison of Berkeley, Lund, Stanford and Uppsala, selected indicators

| | Students ¹ (of which grad. students, incl PhD students) | Faculty ² | Revenue (M SEK) ³ | Research revenue (M SEK) ³ | Professors | Income from tuition ⁷ | Research budget (share of total) |
|----------|--|----------------------|------------------------------|---------------------------------------|------------|----------------------------------|----------------------------------|
| Stanford | 15 877 (56%) ⁴ | 1 995 | 29 920 | 8 636 | 864 | 17% | 29% |
| Berkeley | 35 899 (28%) | 2 082 | 16 320 ⁵ | 4 413 ⁶ | n.a. | 28% | 27% |
| Lund | 28 587 (30%) | 2 798 | 6 953 | 4 672 | 708 | 31% | 67% |
| Uppsala | 23 331 (30%) | 2 624 | 5 546 | 3 871 | 575 | 30% | 70% |

Notes: Data are for the following years unless stated otherwise: Stanford: 2012/2013, Berkeley: 2011, Lund and Uppsala: 2012. Berkeley enrolment data for 2012.

1 full time students

2 for Lund/Uppsala: research and teaching staff, full-time equivalents, excluding PhD students; for Stanford/Berkeley: full- and part-time faculty

3 figures for Stanford and Berkeley converted at 1\$=6.80SEK

4 excl Stanford University Hospital but incl SLAC

5 data for 2010/2011

6 data for 2009

7 for Lund and Uppsala: revenue from education; for Stanford: 'student income'

Sources: university websites and annual reports, UKÄ annual reports

The paper is structured as follows. First we describe the Swedish university system and briefly present Berkeley and Stanford. After that we analyze Berkeley and Stanford according to the key characteristics and priorities listed above, namely recruitment of students and faculty, educating the whole student, focus on teaching and linking research and teaching and societal interaction and benefits. For each of these we look at how these issues are handled at Berkeley and Stanford and then compare them with the situation at Swedish universities. Finally, we draw some conclusions and provide a number of recommendations for Sweden. We have used a variety of sources: universities' own evaluations, data for faculty and student recruitment and mobility, secondary sources and interviews. Where relevant, we have complemented the text with anecdotal evidence (generally found in boxes throughout the text) which we believe enhances the analysis through unique insights.

Swedish context

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Before we start looking at specific aspects of Stanford and Berkeley, and comparing them to Swedish universities, it is important to understand how the Swedish university system has evolved over the past 50 years. Sweden's universities have seen a dramatic expansion in recent decades, as a result of a well-defined political ambition formulated towards the end of the 1970s that every citizen should have access to higher education. There is now at least one Higher Education Institution (HEI) in each county, with a total of 14 national universities and 21 national university colleges, plus 17 so-called 'other providers of tertiary education'. Some well-known examples of the last category are Chalmers University of Technology and Jönköping University – both of which were national universities that have been converted into foundations – and the Stockholm School of Economics. As expressed by Berggren (2012), "[f]rom having been a marginal activity on the fringes of society in numerical terms the university has become an activity which involves more people daily than most traditional Swedish industries" (authors' translation, p.11). Today staff at universities account for around 30% of all state employees, and 26% when measured in term of full-time equivalents (Universitetskanslerämbetet 2013a). Between 2001 and 2011, the number of people employed for teaching and research activities at Swedish universities increased by 31.4% (full-time equivalents) (Swedish National Agency for Higher Education Database). The number of students in Swedish universities increased from 12 000 in 1950 to 400 000 in 2008/2009 (Berggren 2012). As a result of this rise, the share of the Swedish population between 25 and 64 years with a tertiary education of 3 years or more has grown from 11% in 1990 to 25% in 2012 (SCB 2013). In other words, today one out of four persons has a tertiary education compared with only one out of ten 30 years ago. The move from elite universities to mass universities – which is a common phenomenon that can be seen in many countries in the past decades – has created a number of tensions and pressures, to which we return below.

Spending for research and development (R&D) at Swedish universities as a share of GDP is the second highest among all OECD countries, after Denmark, at 0.9% of GDP in 2011, compared with the EU27 average of 0.49% (Eurostat).

Sweden also differs from most EU countries and the US in that between 2005 and 2011, R&D expenditure in the higher education sector as a share of GDP increased from 0.78% to 0.90%, at the same time as R&D expenditure in the business sector, declined from 2.59% to 2.33%. By comparison, R&D expenditure in the higher education sector in the US was 0.39% of

GDP in 2009. Thus, research expenditure in the Swedish higher education sector as a share of GDP is significantly higher than in most, if not all, industrialized countries.

According to the most widely accepted international rankings, the Swedish university system seems to be performing relatively well (although it is important to point out that the parameters used to compile these rankings do not generally include useful measures of teaching quality). In the Times Higher Education ranking for 2013/2014, Sweden had more universities ranked among the top 200 in the world in relation to its population size than Finland, Austria, Norway, Canada and Belgium but less than Denmark, the Netherlands and Switzerland.

At the same time, Swedish universities are coming under pressure for the following reasons:

1. *A decline in breakthrough research and world-class excellence.* Recent reports point to a relative decline in Sweden's performance on breakthrough research, indicating that while Swedish research still can be considered to be of high quality, it is losing ground when compared with countries such as Denmark, Netherlands and Switzerland (Öquist and Benner 2012 and Vetenskapsrådet 2010 and 2012).
2. *A growing pressure to produce 'impact' and the growing importance of universities for a country's competitiveness and innovative capacity.* Partially as a result of their expansion, but also due to the increasing importance of knowledge and learning for economic development and competitiveness and for addressing global challenges, there is growing pressure on universities to contribute to economic development (Berggren 2012, p.52 and Bengtsson 2011, p.10). In their "Agenda for reforming European universities", Aghion et al (2008) argue that "the upgrading of universities is one of the key levers for improving Europe's growth performance" (p,vii) and that "...the major investment in knowledge which Europe needs to make if it is to thrive in a fast-transforming global context cannot be achieved, or at least cannot yield results, without developing first-class higher education institutions" (ibid).
3. *The growing global competition for talent* (both students and faculty) and the growing importance of universities in attracting talent (see box below) on the one hand, and, on the other hand, the decline in foreign students in Sweden.

The growing importance of attracting global talent stands in stark contrast to the dramatic decline in foreign students in Sweden following the recent introduction of tuition fees for students from out-

side Europe. Since the introduction of tuition fees for students from outside Europe, the number of free mover students (these are foreign students who organize their studies in Sweden on their own, i.e. they are not part of a university exchange program) from outside Europe has fallen by 79%, and the number of new foreign students from Africa and Asia has dropped by around 70% (Swedish National Agency of Higher Education 2012d). Referring to both students and faculty, the OECD (2013) identified an “[i]ncreasingly fierce competition for top international talent in Swedish universities” as one of the threats to the Swedish innovation system (p.20). The situation highlights the need for Swedish universities to devise strategies and means for increasing their attractiveness to foreign students and scholars.

4. *The changing nature of education:* The recent developments in digital learning, not least the rapidly growing deployment of Massive Open Online Courses, MOOCs, have caused a vivid debate regarding the future role and structure of universities (New Yorker 2013 and New York Times 2013). The New York Times coined 2012 “The Year of the MOOC”, as massive online courses so comprehensively dominated the conversation in higher education. Over the course of the last two years, digital learning and, in particular, MOOCs have gone from grassroots experiments to strategic areas at some of the top universities in the world, including Stanford, Harvard, and MIT. At the same time, large venture capital investments have propelled the nascent MOOC industry into millions of users and, potentially, billion dollar markets. Many of the Swedish universities have a long experience with digital learning. There are demographical reasons for this: Sweden is by and large a sparsely populated country, and offering distance learning has been a means of facilitating the access of third tier education to a wider part of the population. Some Swedish universities, e.g. Dalarna University College, pride themselves of having half of their students enrolled this way. The online courses offered by Swedish universities have also attracted a substantial number of students from abroad in the past.

Although it is too early to draw any definite conclusions about where the MOOC movement is going, it seems likely that the competition for (international) talent will intensify in the future as the decoupling between locality and learning is increased. The role of the professor and the added value of face-to-face interaction are also likely to evolve and perhaps be refined,

Box 2: a changing global context

One development affecting universities worldwide is the intensifying competition for global talent. Altbach (2006) points to an 'expanding global market place' for scholars and students. At the same time as the number of students and scholars who study or work outside their home country is rising, increasingly countries outside Europe and North America are becoming attractive destinations for globally mobile human capital. In the case of China, strong economic growth combined with government initiatives aimed at attracting global talent create powerful incentives both for overseas Chinese to return home and for foreign experts to work in China. Thus, the government has been running a 'Thousand Talent Program' which offers attractive financial packages for working in China.

As a result of growing mobility, there has been a rapid increase in the number of students studying outside their home countries. According to the UNESCO Institute for Statistics, between 2000 and 2010 the number of students studying outside their home country increased from 2 million to 3.6 million, corresponding to a 78% increase (UNESCO UIS homepage <http://www.uis.unesco.org/Education/Pages/international-student-flow-viz.aspx>).

Related to the increasing competition for global talent is a growing importance of universities in attracting human capital to a region or country, not only as faculty or students for the university but as resources for companies and, more generally, as sources of economic development. As stated by Richard Florida (2000):

The university plays a magnetic role in the attraction of talent, supporting a classic increasing-returns phenomenon. Good people attract other good people, and places with lots of good people attract firms who want access to that talent, creating a self-reinforcing cycle of growth (p.370).

Similarly, Hoffman and Quigley (2002) show that the universities play an important role in attracting human capital and in stimulating entrepreneurship.

as techniques such as flipped-classroom and blended learning (i.e. where a MOOC developed elsewhere is used as coursework) become increasingly deployed. Clearly, both insightful strategies and resources will be needed in the Swedish universities in order to remain competitive (Strömbäck 2013). Status quo will not be an option for the future, but Swedish universities

have so far reacted rather hesitantly to the MOOC challenge.

Perhaps one of the most fundamental changes affecting universities is the growing pressure on universities to meet, what some consider, conflicting goals:

The transition from elite to mass universities in the Western world has... led to most countries having a large and heterogeneous system for higher education and research which is expected to fulfill the most diverse and varying demands: creating new knowledge, generating discoveries and innovations, contributing to economic growth and equality, solving societal and economic problems, providing a well-educated labor force, promoting learning and personal development (authors' translation from Berggren 2012, pp.33-34).

Policymaking in Sweden has responded to these growing pressures and challenges in several ways. Swedish universities traditionally receive a large share of their funding through direct budgetary allocations from the government and while the share has decreased over time (from 70 per cent in the 1970s to 50 per cent today) the role of floor funding is larger than in the United States, where the federal and state governments have cut back direct and 'base' funding of public universities. The Swedish government has also significantly increased research funding for Swedish universities in recent research bills, particularly in 2008 and in 2012, with most of the additional funding allocated in competition-based form, i.e through calls for proposals. Traditionally, higher education at Swedish universities has been tuition-free, even though this may change in a not-too-distant future. As a harbinger, the government introduced tuition for non-EU students in 2011.

Stanford's Founding and Goals

Stanford University was founded in 1891 by Governor and Mrs. Leland Stanford in memory of their son who died of typhoid at age 16. The purpose of the University, was stated by them in the Founding Grant as "Its object, to qualify its students for personal success, and direct usefulness in life; "And its purposes, to promote the public welfare by exercising an influence in behalf of humanity and civilization, teaching the blessings of liberty regulated by law, and inculcating love and reverence for the great principles of government as derived from the inalienable rights of man to life, liberty, and the pursuit of happiness."

More recently, Stanford President John Hennessy has restated those goals more concisely as “Stanford University prepares students to take on the great challenges of the day and become the next generation of leaders.”

University of California Berkeley

The University of California Berkeley was founded in 1868 as a public institution and Berkeley was the first of what would eventually become a state-wide system comprising 10 campuses. On Berkeley’s homepage, the history and driving force in the creation of the university are described in the following way:

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The roots of the University of California go back to the mid 19th century, when hundreds of thousands of fortune seekers came west in the gold rush, California became a state, and farsighted drafters of the 1849 State Constitution dreamed of creating a university that ‘would contribute even more than California’s gold to the glory and happiness of advancing generations’. (<http://www.berkeley.edu/about/hist/foundations.shtml>)

Berkeley has consistently been ranked as one of the best universities in the world according to various rankings. It was in 8th place, for example, in the 2013/2014 Times Higher Education Ranking. According Vice-Chancellor and Provost George Breslauer, (2011), Berkeley’s “march to sustained greatness occurred despite periodic, severe shocks to the university” (p.2). These shocks included drastic cuts in public funding, for example during the Great Depression in the 1930s but also more recently in the 1970s, the 1990s and since the onset of the Global Economic Crisis since 2008. As a result, “[t]he State today allocates to the University one half of the number of dollars (constant value) per student that it allocated twenty years ago” (ibid). Overall, similarly to many other public universities in the US, the University of California has seen a dramatic decline in federal and state direct funding for education. Thus:

At UC, the state now contributes 60% less to student education than it did in 1990 (in inflation-adjusted dollars). The university has responded with measures including higher student fees, fewer classes, salary reductions, and expanding the number of out-of-state students (who, in contrast to in-state students, pay full tuition) (BASIC 2012, p.5).

Berkeley's founding was accompanied by a battle over what kind of institution of higher education it should be (see Breslauer 2011 and Gardner 2012). While there were strong advocates for creating a 'trade school' which would focus on "training students in the practical skills required in agriculture, mining and 'the mechanic arts'", the President of the University at the time, Daniel Coit Gilman, persevered with his vision of setting up a "scientific research enterprise with a broad, liberal-arts curriculum" (Breslauer 2011, pp.3-4). Gilman "saw the university as serving the interests of the state best by conducting scientific research on the practical economic challenges facing the state, and by educating citizens broadly" (ibid).

Breslauer (2011) identifies five factors that he argues "made Berkeley great". These are, firstly, "wealth from many sources", i.e. the fact that Berkeley's funding has come from the State, federal agencies and foundations, and private philanthropy, secondly, political leadership in the form of "supportive and skilled governors" of the state of California, thirdly, strong leadership by a succession of Presidents of the University of California, fourthly, "California's culture and the idea of a public university", and, fifthly, "the redistribution of decision rights". He argues that Berkeley's 'greatness' comes from a combination of, on the one hand, strong leadership and presidents who have put their mark on the university and, on the other hand, the decentralization of decision rights.

Selecting and Attracting the Very Best Students

Stanford

Each year, Stanford University's Dean of Admissions admits an undergraduate freshman class of fewer than 2000 students. It receives approximately 18 applications for each place in that class. Almost every applicant stands close to the top of his or her class and has high Scholastic Aptitude Test (SAT) scores. In selecting members of the class, Stanford seeks students who are both academically gifted and who also have quite significant achievements indicative of outstanding capabilities. For example, a student

Box 3: Recruitment at Stanford - an example

While Arthur Bienenstock chaired the Undergraduate Admissions and Financial Aids Committee during the 1969-72 academic years, for example, the University received an application from a Venezuelan who was the youngest person ever to win a gold medal in the national orchid growing contest and the youngest person ever to serve as a judge in that contest. After learning of the serious and important nature of that contest, the University was pleased to admit him based on those achievements. During the same period, it admitted a young woman from Southern California who had a novel accepted for publication by a major publishing company. Faced with such outstanding achievements, Stanford placed less emphasis on grades and test scores, as such achievements show evidence of great capabilities and effort that promise outstanding accomplishments in the future. Accepting students based on criteria other than test scores and grade point averages alone requires an admissions committee with the mandate, skills, confidence and time to assess the promise and achievements of applicants.

musician would be expected to have received recognition at the state-wide or higher level. Stanford seeks, as well, a class that is diverse with respect to geography, gender and ethnicity as a means of enhancing the educational process through direct student interactions.

Students who are U.S. citizens or permanent residents are selected for undergraduate admission in a “needs-blind” manner. That is, the students are selected without consideration of their financial needs. Once the students are admitted, Stanford provides financial aid to meet each student’s needs. Thus, in 2011-12, Stanford provided its undergraduates with \$172,000,000 of financial aid. 93% of this was in the form of scholarships, 4% in the form of loans and 3% as jobs. Stanford takes great care to ensure that its undergraduate students do not build up large debts as a result of their Stanford studies.

Limited financial aid funds are also available to undergraduate applicants who are not U.S. citizens or permanent residents. These students are not, however, admitted in a “needs-blind” manner. Foreign students formed 7% of the undergraduate body in 2012-13.

Consistent with this central selection process, the students are admitted to the University, rather than to a specific school, department or program. They need not declare their majors until the end of their second year.

In contrast to the central admission of undergraduates, graduate students from around the globe are selected among the applicants by their department or school. Financial aid practices vary from school to school, but there is typically little or no distinction between U.S. and foreign students. In 2012-13, there were slightly less than 9000 graduate students at Stanford of which 67% were US citizens or permanent residents while 33% were foreign. As with the undergraduate body, the graduate body is highly selected as a consequence of Stanford’s international appeal.

Berkeley

At Berkeley, admissions follow a so-called holistic review process, which means that all applications are read in their entirety. The reader has to consider the full spectrum of the applicant’s qualifications according to six criteria which are well defined and posted on the website. Just like at Stanford, admission to Berkeley is needs-blind. The Financial Aid and Scholarships Office administers a wide variety of student aid for those unable to afford the tuition fee. Similar to Stanford, there is a strong emphasis on qualities

other than purely academic merits, which is illustrated by the following quotes from the Berkeley website (<http://admissions.berkeley.edu/selects-students>):

The goal of our selection process is to identify applicants who are most likely to contribute to Berkeley's intellectual and cultural community and, ultimately, to the State of California, the nation, and the world.

...Other evidence of achievement. This criterion recognizes exemplary, sustained achievement in any field of intellectual or creative endeavor; accomplishments in extracurricular activities such as the performing arts or athletics; leadership in school or community organizations; employment; and volunteer service.

In its self-assessment, Berkeley prides itself on the fact that it selects students based on their potential not just their documented academic achievements, which allows it to recruit a very diverse student body, in terms of ethnicity and social background:

Instead, we consider the broad accomplishments of our applicants in the context of the opportunities that have been available to them, and their educational goals. In other words, we consider the potential of our applicants. Particularly at the undergraduate level, we admit many students who have been overlooked by other highly ranked universities and benefit, for instance, from the most promising applicants from the community college pipeline (UC Berkeley 2013a, p.52).

Though not required, it is recommended that prospective students indicate their interest in a specific major already at the time of application, and that they therefore apply to a specific college at Berkeley. There are 100 different majors to choose from. Generally, students do not need to actually declare their major until after their second year, e.g. in the College of Letters and Sciences. In the College of Engineering, however, students are strongly encouraged to declare their major already after your freshman year. This is to ensure that they will not take classes that may not count towards their degree. While in the College of Chemistry students declare their major already as a freshman, there is still room in the program for electives in the humanities and social sciences.

14,103 students were offered admission to the 2013-14 freshman class,

following evaluation of 67,665 applications. Of these, 4,300 were expected to enroll for the fall of 2013. 2012 had similar numbers, and of 4,100 freshmen, approximately 13 percent were international students. Of these, most came from China (27%) followed by South Korea (20%) and Hong Kong (8%).² As for graduate studies, of the 36,000 students at Berkeley, nearly 30% are pursuing doctoral and master's degrees in more than 100 disciplines. Approximately 22% of these students are of international origin, from over 80 different countries.

The foreign students attracted by Stanford, U.C. Berkeley and the other Bay Area universities have had a major impact on the Silicon Valley economy. In their paper, "America's New Immigrant Entrepreneurs", Wadhwa et al. (2007) state that of the 126 Bay Area companies responding to their survey, "52.4% reported that their key founders were immigrants – significantly higher than the California average of 38.9%." They indicate, as well, that "In 2000, 53% of Silicon Valley's science and engineering (S&E) workforce was foreign-born."

In recognition of their important potential contributions, a Presidential proposal and Senate action could make it still easier for those who receive advanced degrees in science, technology, engineering and mathematics from accredited U.S. universities to remain in the country. President Obama has urged that a green card be "stapled" to such degrees (White House 2013). The Senate's immigration bill contains measures along the same lines (<http://www.gpo.gov/fdsys/pkg/BILLS-113S744es/pdf/BILLS-113S744es.pdf>). Among the strongest supporters of the bill are the Bay Area high-tech leaders. At the time of this writing, however, it is unclear whether the House of Representatives will support the Senate bill or something close to it.

Sweden

Swedish universities' student recruitment differs significantly from that of Stanford, Berkeley, and the US universities in general. Undergraduate students are, by and large, selected for admission through a centralized process

² Data from Berkeley website : <http://newscenter.berkeley.edu/2013/04/18/campus-announces-2013-14-freshman-admissions-decisions/> (accessed February 21, 2014)

administered by the Swedish Council for Higher Education, based on their high school grades, complemented by scores on the Swedish Scholastic Assessment Test, SweSAT. The students apply to Study Programs leading to a degree, or to individual courses by selecting their first, second, etc. priorities. The system is, therefore, to a large extent supply and demand-driven. The most sought-after programs, like Medical School, Architecture, and Engineering Physics, receive the students with the highest grades. Special aptitude tests may be conducted for certain programs, for instance for Musical Programs and for Medical School. Higher education institutions (HEI) in Sweden are free to structure courses and programs according to their own needs, but using a common credit system. Programs are structured and national funding is allocated in response to student demand. HEI have during the past years adopted the Bologna Process³ for degrees and credits, which stipulates three initial years for a Bachelor Degree, and two additional years to qualify for a Master's degree. The Swedish University system is open to applicants from all over the world. However, while there is no tuition for Swedish, European Union, European Economic Area (EEA) and Swiss citizens, tuition fees for students from other countries were introduced in 2011. Especially at graduate level, a vast number of programs and courses are taught in English in order to attract foreign students.

In 2012, 126 000 persons (who had not previously attended university) applied for admission to Swedish universities and university colleges. Of these 59 800 were admitted, corresponding to an admission rate of 47 %. Of the 92 300 students that began their studies in Sweden 2011/2012, 20 800 or 22.5% were from outside Sweden. The previous year, before the introduction of tuition fees for students from outside Europe, the share was 27.8%. The decline can be explained by a dramatic drop in the number of students from outside Europe, while the number of students from other EU and EES countries and Switzerland has increased somewhat though not enough to compensate for the decline in non-European students. Foreign students accounted for 7.2% of all graduate and undergraduate students enrolled at Swedish universities.⁴ The 7.2% is considerably smaller than the 22.5% of students admitted for the first time because the latter number includes a large number of students who only attend Swedish universities for a very

3 For information about the Bologna process, see, for example, http://ec.europa.eu/education/higher-education/bologna_en.htm

4 Foreign students are defined here as students who come to Sweden to study, i.e. people who have not previously lived in Sweden.

limited period, for example 6-12 months, as part of an exchange program.

Lund University had 31540 enrolled students at undergraduate and graduate level in 2011/2012, of which 10.5% were from outside Sweden. At Uppsala University, 27039 undergraduate and graduate students were enrolled in the same year, of which 7.8% were from outside Sweden. Among the PhD students, about 39% are foreign, a considerably higher ratio than for undergraduate and graduate students (Universitetskanslerämbetet 2013b). The high share of foreign PhD students can be partially explained by the fact that the introduction of tuition fees was not applied to foreign PhD students and the majority of PhD students actually are paid to do a PhD, rather than having to pay themselves. Thus 61% of PhD students are employed by the university and receive a salary during their studies.

While universities such as Stanford and Berkeley have financial means – both university scholarships and loans and external scholarships (financed, for example, by large foundations) – that allow them to attract the most talented foreign students, the current Swedish system of fees but with limited availability of scholarships has drastically reduced the number of foreign applicants as compared to earlier when tuition was free. Since the introduction of tuition fees for non-EU/EES and Swiss students, the number of new incoming foreign students to Sweden dropped by one third in the fall of 2011 compared with the fall of 2010 to 14700 students (HSV 2012b). The number of free mover students, i.e. students that are not part of a university exchange program, from outside the EU/EES and Switzerland has decreased by a staggering 79% and the number of new students from Asia and Africa has declined by 70% and 71%, respectively (ibid).

The drop in students from outside Europe directly decreases the number of international links created by students during their formative years, and the added value which that brings culturally, economically etc. Attracting good international students is a declared goal of most if not all Swedish universities and it is widely regarded to contribute to bringing new talent to research, but also to providing the surrounding society with vital and strategically important human capital. This need is further accentuated by the growing number of MOOCs.

In contrast to the Bay Area and to many other North American regions, we would argue that the contribution of foreign students in Swedish universities to the Swedish economy is not only much more modest but also much smaller than it could be. Although Sweden has recently changed its immigration regulations to make it easier for foreigners to come to Sweden to work, current regulations are biased

against foreign students who would like to stay in Sweden to start a company. After completing their studies, students from outside the EU who wish to work in Sweden are required to apply for a work permit, which in turn generally requires that students can show that they have secured employment which provides them with an income corresponding to at least 13000 SEK per month (as of 2013) (Swedish Immigration Office homepage)⁵. As pointed out in a recent article entitled 'Foreign entrepreneurs not welcome' (translated from Swedish) by Ragnar Ahlström Söderling, a professor in entrepreneurship in Lund: "We attract foreign entrepreneurship students and teach them everything we can, but when they have finished their education and want to start a company in Sweden we send them home" (authors' translation) (Entreprenör 2013). In addition to immigration regulations, several experts have recently pointed to the difficulty encountered by foreign-born academics seeking to enter the Swedish labor market, due to various forms of regulations and discrimination (see for example Svensk Näringsliv 2013).

5 <http://www.migrationsverket.se/info/6092.html>

Selecting and Attracting the Very Best Faculty

Stanford

Stanford University's School Deans control the size of each department's faculty carefully through a billeting system. For most of the institution, the size of the tenure-line faculty is determined by educational needs. (The School of Medicine and the SLAC National Accelerator Laboratory have special needs which are not included in this discussion.) Generally, billets that become available through the resignation, retirement or death of a faculty member revert to the dean. The involved department must then prove to the dean that the position is needed in the general scholarly area of the person to be sought. This is usually accomplished by means of a careful departmental planning process in which future needs and opportunities are assessed.

In contrast, billets that become available because the department decides not to promote an untenured professor to tenure usually revert to the department. This policy ensures that departments will not seek to tenure a person who is perceived to not be truly outstanding in order to keep a faculty position. The tenure decision is considered to be the most important mechanism for maintaining an extremely capable faculty. A tenured appointment or promotion commits the university to the individual for an entire career. If the commitment were not so great, the university would be likely to keep those who are just very good.

Normally, people are sought at the untenured assistant professor level unless there is a perceived need for senior leadership. To achieve tenure, the assistant professor has 5-6 years to demonstrate that he or she meets Stanford's faculty standards. Typically, assistant professors are appointed initially for three years with an expectation of a three year renewal given appropriate teaching and research performance.

Because of this expectation of flow from assistant to associate to full professor, Stanford searches nation- or world-wide for faculty at all these

levels in a very systematic manner. After approving the position, the school dean reviews the letter and advertisement announcing the search to ensure that the position is defined sufficiently broadly so that an outstanding person is likely to be attracted. The search letters are sent to departments likely to provide candidates and the advertisements are placed in several relevant journals. After receiving applications, the search committee typically presents the top half-dozen candidates to the department for consideration. This is followed by invitations to the candidates to speak to the department. Once the top candidate is chosen, the department prepares papers for review by the school Dean, the Provost and the Advisory Board (an elected board of senior faculty). The papers must prove to these reviewers that the department searched in a manner likely to yield the very best candidates, that it selected the best candidate and that the candidate's performance thus far indicates outstanding research productivity and very good teaching capabilities.

In spite of the rigorous search and selection procedures applied when assistant professors are to be brought to Stanford, only approximately 60% of those assistant professors who remain at the University long enough to be considered for tenure actually gain tenure. The department proposing tenure must provide strong evidence to the reviewers discussed above that the faculty member is among the top people in his or her field in the nation, that the faculty member has made truly important research contributions and that he or she is a good teacher. The standards for tenure are clearly stated on the publicly available (<http://facultyhandbook.stanford.edu/pdf/B3.pdf>) reappointment or promotion forms. They are:

1. *Scholarship*: For recommendations of reappointment or promotion of a member of the Stanford faculty to tenure status, the department or school is obliged to present evidence that the candidate's overall performance justifies the award of tenure, including that the candidate has achieved true distinction in scholarship. The scholarship must clearly reveal that the candidate is not only among the best in his or her experience cohort in a broadly defined field, but is also likely to become one of the very best in the field. In short, the judgment is both comparative and predictive. It focuses on issues such as whether the candidate is performing the kind of innovative, cutting-edge research on important questions in the field that breaks new ground, changes the way the field is viewed, broadens our understanding of the field, or opens up new methods or new areas of investigation, and thereby has (or is likely to have) the fundamental impact

on the field that is expected from the very best scholars in the field.

Factors considered in assessing research performance or promise include (but are not limited to) the following: scholarly activity and productivity; impact, innovation and creativity; recognition in the field; ability to work effectively as part of a research team (if relevant); effective communication with colleagues, staff and students; and professionalism, institutional compliance and ethics.

2. *Teaching*: Teaching is an important component of professorial appointments at Stanford, and the University is dedicated to outstanding achievement in this area. The teaching record must clearly reveal that the candidate is capable of sustaining a first-rate teaching program during his or her career at Stanford. Teaching is broadly defined to include the classroom, studio, laboratory, or clinical setting, advising, mentoring, program building, and curricular innovation. The teaching record should include, as appropriate, undergraduate, graduate, and postdoctoral instruction, of all types.

Factors considered in assessing teaching performance or promise include (but are not limited to) the following: knowledge of the material; clarity of exposition; positive style of interaction with students; availability; professionalism, institutional compliance and ethics; effective communication skills; helpfulness in learning; and ability to stimulate further education.

Berkeley

Similarly, U.C. Berkeley states on its homepage that “The academic excellence of the University of California at Berkeley depends on the quality of our faculty and academic staff. Recruitment and selection are among the most important investments we make in the future of the University” (http://facultyequity.chance.berkeley.edu/resources/fsg_intropurpose.shtml). The Berkeley policy document “Search Guide for Ladder-Rank Faculty Recruitments: Policies, Procedures and Practices” furthermore states that: “Broad and inclusive recruitment is a key component of building an excellent faculty.”

The University of California Academic Personnel Manual APM 210-1 governing faculty appointment and promotion sets forth the standard for evaluating the academic achievements of faculty: “Superior intellectual attainment, as evidenced both in teaching and in research or other creative

achievement, is an indispensable qualification for appointment or promotion to tenure positions (APM 210-1.d.)” Something which is worth noting with Berkeley is its openness to recruiting faculty without holding a PhD or prior research experience as has occurred in the Business School, as long as other experiences are valued as exceptional. This is particularly interesting as Berkeley otherwise often is more restrictive than Stanford in allowing faculty a leave of absence to pursue business outside the university.

As we show in Figure 1 below, the vast majority of Berkeley’s faculty has obtained their PhD outside Berkeley. A recent analysis of faculty recruitment for the University of California as a whole confirms firstly, that the majority of faculty are recruited externally (i.e. not from within the university), and, secondly, that a significant share of the faculty are recruited from world-leading universities (Legislative Analyst’s Office 2012). In 2010-11, 75% of all new faculty were recruited from outside the University of California. The remaining 25% were recruited from within the University of California but it should be remembered that the University of California today encompasses 10 self-contained campuses and universities, adding up to a total of around 235 000 students (full-time equivalents) and 121 000 faculty and staff (University of California Website). By comparison, in 2012 there were 311 000 full-time students and a total staff of 73 400 or 58 900 full-time equivalents at Swedish universities (Universitetskanslerämbetet 2013b).

Sweden

The systems for recruitment at Stanford and Berkeley are in stark contrast with those of many Swedish universities where rigorous selection procedures apply at the full professor level, but where search activities vary from proactive (à la the US top universities) to symbolic, with positions announced mainly to employ or promote a preselected candidate (often somebody from within the institution itself). In addition, a large share of positions are not announced at all but are filled on the basis of temporary contracts (primarily for teaching) which are turned into permanent positions after three years. To make things even more complex, many positions are not fully funded by the universities; in some instances, universities announce positions with no funding at all but where the faculty employed are expected to raise their entire salary. Traditionally, Swedish universities have had no tenure track-system; instead, positions have been announced and filled independently from one another (i.e. an assistant professor has not been considered for promo-

tion to associate professor but has instead been forced to apply for such a position, if one was announced, which was not always the case). The unsystematic and erratic way of recruiting and promoting faculty in Swedish universities has had the negative side-effect that mobility is very low. To learn and work the system, people tend to stay within their respective universities to understand the often informal methods of employing and promoting faculty. Recent attempts to instigate a tenure track system have not been able to rectify the situation. First, the tenure track path varies significantly between universities, where some offer permanent employment from day 1 (Linköping), while others like the Karolinska Institute do not offer a coherent path between assistant and full professor but maintain a wide variety of ways of recruiting and promoting their faculty. In addition, even universities which do offer a tenure track model similar to the US do not guarantee full funding of their positions; in reality, this means that promotion is contingent on the capacity for raising money.

The striking differences in search and selection procedures employed by major American research universities and Swedish universities are most clearly illustrated by two statistics. The percentage of Stanford and University of California Berkeley physics faculty that obtained their PhD degrees at the university at which they are employed is 15 and 23, respectively. The same percentages for Lund and Uppsala are 67 and 55, respectively, according to a tally by Sylvia Schwaag Serger (see Figure 1). For history, the percentages are 7 and 14, respectively, while for Lund and Uppsala they are 88 and 74. Thus it appears that, whereas leading American universities recruit their faculty from the global talent pool, the top comprehensive universities in Sweden recruit their faculty not only from within Sweden, but primarily from within their own departments. The American universities benefit greatly from the influx of new ideas and techniques that are brought by faculty from other institutions, whereas the recruitment patterns in Swedish universities reflect the opaque promotion patterns and the need to ‘hang around’ and learn the political environment of the respective departments to be hired and promoted. This does not necessarily mean that Swedish universities make poor recruitments, only that they constrain the selection process.

These findings are confirmed by a recent analysis by the Swedish National Agency for Higher Education (Högskoleverket) which shows that up to 70% of professors and 83% of lecturers have their highest degree from the same university where they are currently employed (see Table 2). Furthermore a recent report by Öquist and Benner (2012) points out that “[i]nter-

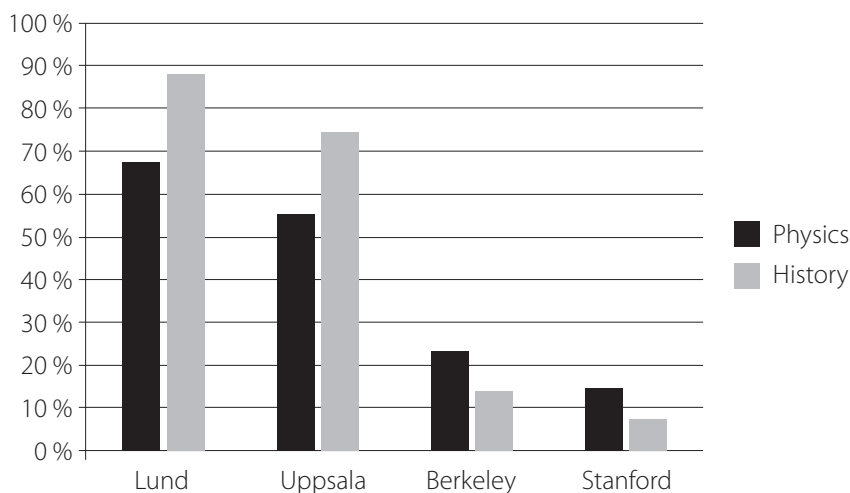


Figure 1: Percentage of staff at the Physics and History faculties of Berkeley, Stanford, Lund and Uppsala universities that received their PhD at the same university as where they are currently employed

Notes: The data cover only academic staff and exclude the following categories: administrative staff, professor emeritus, honorary fellow, guest researchers, visiting professors, research engineers, senior research engineers, postdocs and research assistants.

Sources: university homepages, web searches, LinkedIn, www.avhandlingar.se and other sites. For Berkeley and Stanford, the searches were conducted in November 2012; for Uppsala and Lund the searches were conducted in January 2013

Table 2: Share of professors and lecturers which have their highest degree from the same university where they are currently employed, 11 largest universities

| Akademic institution | Professorer | Lektorer |
|-------------------------------------|-------------|----------|
| Lund University | 70 % | 81 % |
| Gothenburg University | 68 % | 82 % |
| Karolinska University | 64 % | 74 % |
| Uppsala University | 64 % | 75 % |
| Umeå University | 63 % | 83 % |
| Stockholms University | 55 % | 67 % |
| Swedish Agricultural University | 52 % | 72 % |
| Royal Institute of Technology (KTH) | 51 % | 62 % |
| Chalmers Technical University | 51 % | 58 % |
| Luleå Technical University | 48 % | 67 % |
| Linköping University | 47 % | 69 % |

Source: Vetenskapsrådet (2013) adapted from Högskoleverket (2012).

nal promotion accounts for the great majority of appointments, with only a fraction of new professors being recruited from outside the universities concerned and an even smaller fraction from outside the country (sources show that only some 10% of faculty members at the larger universities are non-Swedish)” (pp.27-8).

The lack of mobility and problems of current recruitment systems are confirmed, and identified as significant problems, in a number of evaluations of research quality at selected Swedish universities conducted in recent years. In Appendix 2, we have compiled excerpts from recent expert evaluations carried out at Gothenburg University, Lund University, Karolinska Institute and Uppsala University. The excerpts show that the international experts considered lack of mobility and weak recruitment systems to be a serious challenge which is shared by the four universities. It should be mentioned that several other universities, particular those that have been founded more recently than the ones listed below, are likely to have a higher degree of inward mobility for numerous reasons, one being that they are younger and do not have as large a base of PhDs from which to recruit their faculty. However, the compilation of the assessments of the four universities selected here may nonetheless be considered relevant for the following reasons: they are among the top ranked in Sweden (and globally), they account for a significant share of Sweden’s total academic staff (33%), research and students (26% undergraduate and graduate students, excluding PhD students). Furthermore, they have all recently commissioned external evaluations of their research quality.

In the evaluations, the experts state that “internal recruitment is a trait that is too dominant to be healthy for the University” (Gothenburg University 2010, p.21-22), and express their dismay “by the extent to which the processes of appointment, promotion and funding militate against the University’s capacity to recruit from the international pool of talent and minimise the extent to which young post-doctoral researchers in particular feel free to obtain vital, formative experience in the international research community” (Lund University 2008, p.49). The evaluation of Karolinska Institutet (2011) points out that “[r]ecruitment is almost exclusively internal, which has led to inbreeding on a scale that would be unthinkable in most countries with an advanced science base” (p.20), and, in the case of Uppsala, the experts “were surprised at the extent to which the department appears to be dominated by its own alumni” (Uppsala University 2011, p.36). The experts warn that “[a]n internal recruitment tendency clearly has negative consequences for innovation and credibility”, and point out that “[a]s the inter-

national and European research communities become ever more networked and increasingly work together in transnationally financed programmes requiring mobility, national structures that inhibit mobility constitute an ever more serious disadvantage” (Gothenburg University 2010). They conclude that while “[f]oreign scientists bring in much-needed fresh blood and new ideas”, (Karolinska Institute 2011), “[i]nbreeding is still prevalent in the Swedish university system” (Uppsala University 2011, p.36).

Interviews with policymakers, university administrators and researchers indicate an increasingly strong awareness of the problems identified above, and several universities are working hard to address them. Thus, several university faculties and presidents have launched initiatives specifically aimed at recruiting international talent. The University of Linköping and the Institute of International Economics at Stockholm University are examples of universities and entities within universities that are working actively and successfully with professional and international recruitment. The Swedish Research Council organized a seminar on mobility in 2013 to discuss some of the challenges identified above, and recently launched two programs to support international recruitments at the full and assistant professor levels. The Wallenberg Foundation has also launched similar schemes. However, these programs will only marginally influence the recruitment in Swedish universities, and the main responsibility for making recruitments more transparent and competitive reside with the universities.

Some senior researchers and decision-makers have also voiced their concern that the lack of mobility, even if it were not a problem for excellence, points to a potentially more serious problem of opaque, even nepotistic, recruitment processes (see for example the interview with political science professor Bo Rothstein in Curie 2013). A recent evaluation of Uppsala University also identified lack of mobility as a problem: “The Panel was surprised by the small number of international PhD students. Student mobility is connected with visibility. An attractive image is important. The [...] Institute could serve here as a vehicle for enhancing the international visibility of the strong graduate programs that exists in Uppsala and in Sweden more generally. (ST Panel). Most of the PhD students, however, are from Sweden and in particular undergraduates from Uppsala University...” (Uppsala 2011, pp32-3).

In addition to the large number of faculty recruited from within the same institution at many departments in Swedish universities, a large share of PhD students are recruited from the undergraduate students at the department. A website of the Swedish Council for Higher Education (Universitets- och

Högskolerådet) established to provide guidance for PhD states that “most PhD students receive their research training [PhD education] at the university where they completed their undergraduate education” (authors’ translation). In an analysis of patterns of recruitment of PhD students and deans at Swedish universities, Sandstedt (2013) finds that, in both cases, candidates are not infrequently handpicked from within the institution or department and by a relatively small group of people. Thus, the recruitment of both heads of department and PhD students at many university Swedish university departments seems to be based on undocumented, informal and vague criteria – one criterion being mentioned a lot is that the PhD student has to ‘fit in’. According to Sandstedt, knowledge about how PhDs are recruited is ‘tacit’ rather than open and transparent, but, he argues “everybody seems to know how it works” (pp.177 & 180). One of the consequences of this recruitment system is that it effectively limits the pool of prospective candidates to people that are already known to and/or work or study at the faculty (p.182). Data from the Swedish National Agency for Higher Education showed that in the early 2000s, 8 out of 10 PhD students at Lund University had their undergraduate degree from the same university (Lundagård 2008).

According to Sandstedt, “[i]t seemed as if the heads of department were picked from within an inner circle of suitable professors or lecturers and there were signs of a similar pattern regarding the circle of potential PhD students” (ibid). The desire to find PhD students who ‘fit in’ might make the faculty in charge of the recruitment more predisposed to select candidates from among one’s own students (p.174). Sandstedt also finds that the professor who is likely to be supervising the student plays the key role in the recruitment of the PhD student, leaving it very much up to the professor in question to select his or her students according to personal preferences. The discretion of the professor to handpick his or her students is particularly pronounced when he or she has secured research funding which can fund the student. In contrast to the US and the UK where PhD students pay tuition fees, in Sweden, the majority of PhD students are employed by the university to do their PhD, and, as such, receive a salary.

Overall, Sandstedt finds that the way Swedish university departments recruit heads of department and PhD students has a long tradition, that it is ‘unbureaucratic’ and that it has been proven to be successful. We would disagree, arguing that the system shuts a large population of potential PhD students out of the recruitment process thus depriving Swedish universities of access to potentially brilliant students and future faculty, simply because they are not known to the recruiting faculty, not to mention that

it is a non-transparent and discriminatory process. While several universities, policymakers and research councils are trying to address the problems identified here, we still see a worryingly large occurrence of recruitment which is highly path-dependent and where the most likely path to become a professor in Sweden seems to be to stay at the same university department from undergraduate through PhD to professorship. We would argue that this potentially creates an inward-looking, conservative and self-preserving faculty body, which is not transparent, closed, uncondusive to renewal, and, in addition, sends a negative signal to outsiders, that is people from outside the Swedish university system that they shouldn't bother trying to enter.

Much has been done to improve recruitment systems at Swedish universities in recent years, particularly to make recruitment more transparent and open. However, at the risk of being polemic, we would argue that still today the safest strategy to become a professor in Sweden is to be white, male – given that only 25% of all professors in Sweden are women (Universitetskanslerämbetet 2013a) –, to be born in Sweden, to stay in the same university from undergraduate through PhD and professorship and to be on good terms with the right professors at your undergraduate institution, especially the ones that have the funding to be able to employ PhD students. This relatively closed system in a sector which employs nearly one third of all government employees does not correspond to the open and diverse society and economy that characterizes Sweden otherwise. In its recent review of Sweden's innovation system, the OECD (2013), recommended that Sweden should “[f]oster international academic openness through stronger inward internationalization” and “[m]ake better use of universities' role in hosting foreign students and researchers” (p.27).

In contrast to most departments at Swedish universities, just across the Öresund from Malmö, the Department of Business and Politics of the Copenhagen Business School, has a policy of not employing PhD candidates after their dissertation. The Head of the Department explains the policy in the following way:

At the Department we started this policy when the department was created as a small international research center in 2004. At that time this was natural because the center was small. When we became a department in 2011 (we grew very quickly and run successful teaching programs) I decided to continue this policy, which is the policy of most prestigious universities and departments in the US and Europe. We want to signal that mobility is important.

We put a lot of emphasis on our PhD candidates to develop a network that can allow them to have access to possible jobs in other universities.

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An important aspect of our policy is that, if the PhD gets a post-doc position (by his/her direct application to the Danish research council), and he/she wishes to stay with us, that is fine with us. We do not close the door to people who have found their own funding. What the policy is about is, that PhDs should not expect that I will open a position they can apply for. If they want to stay they are welcome, but have to find their own financing. But this is also a signaling device telling them that they need to be strategic about where they want to be, as it is best in their CV that they have experience in different (good) universities.

Educating the Whole Student

Stanford

As indicated above, Stanford President John Hennessy recently restated Stanford's goals as "Stanford University prepares students to take on the great challenges of the day and become the next generation of leaders." A recent Study of Undergraduate Education at Stanford elaborated on this goal in the following way:

If our graduates are to assume the responsibilities of local, national, and global citizenship, they need not only deep knowledge and well-honed skills but also a wider set of characteristics and competencies: a sense of personal and social responsibility; ethical and moral reasoning skills; an appreciation of cultural difference, as well as of human commonality; the ability to work collaboratively in diverse teams; tolerance, generosity, and a broad capacity for empathy. (Stanford 2012).

For these reasons, all Stanford University undergraduates face General Education requirements in addition to those of their major. As stated in the Stanford Bulletin:

The General Education Requirements are an integral part of undergraduate education at Stanford. Their purpose is: 1) to introduce students to a broad range of fields and areas of study within the humanities, social sciences, natural sciences, applied sciences, and technology; and 2) to help students prepare to become responsible members of society. Whereas the concentration of courses in the major is expected to provide depth, the General Education Requirements have the complementary purpose of providing breadth to a student's undergraduate program. The requirements are also intended to introduce students to the major social, historical, cultural, and intellectual forces that shape the contemporary world.

For more information on these requirements, the reader is referred to the Stanford Bulletin (<http://www.stanford.edu/dept/registrar/bulletin1112/4877.htm>).

The general education program is typically reviewed about every 20 years to ensure its vitality and appropriateness. Course requirements for majors are also reviewed regularly. The major, itself, need not be selected until the end of the second year, although engineering and natural science students typically decide on a major earlier to ensure that they take prerequisites for advanced courses during their first and second years.

Berkeley

Since its founding, Berkeley has had a strong commitment to providing its students with a broad range of skills. As stated in its self-assessment:

At the heart of the undergraduate experience is the development of depth and expertise in a discipline through the major coupled with the enrichment obtained from a liberal education, i.e., the development of the capacity to engage broadly with ideas through the study of a wide range of concepts through the breadth curriculum (UC Berkeley 2013a, p.13).

One of the tenets of Berkeley's undergraduate education is the liberal arts model which encourages and requires students to take courses outside their chosen major subject area. In its Strategic Plan from 2002, Berkeley set as one goal to "[ensure all undergraduates become literate, numerate and capable of creative thinking in a broad range of disciplines]" (UC Berkeley 2008, p.5). 74% of all undergraduate students major in programs in the College of Letters and Sciences, which is based on a requirement that students take at least one course in each of the following areas as a basis for their liberal arts education: Arts and Literature, Historical Studies, Biological Sciences, Physical Science, Social and Behavioral Sciences, Philosophy and Values, and International Studies (UC Berkeley 2013a, p.14).

Sweden

Swedish universities differ significantly from the US system in that university education in Sweden requires students to specialize in a field or subject

from the very beginning. Moreover, once students have chosen their field or subject, usually they do not have much freedom to choose which courses to take. Thus, the model of a general education program or liberal arts education – applied at Stanford and Berkeley and a large number of US universities – is largely absent in the Swedish university education system.

Undergraduate programs usually contain a mix of compulsory, recommended and optional courses; however the first two-three years are often dedicated to compulsory courses. Each program has a program manager who, together with the program council, consisting of representatives from students, teachers, and someone from outside the university (this varies from university to university), decides on the design of the program. The idea of broad representation has certain virtues, although it has proven very difficult to change the core compulsory courses of programs. An advantage of the system is that it allows institutions to combine courses into full programs, offering varying levels of individual choice. A disadvantage is the huge number of different programs offered, with often small differentiation, and leading to less flexibility for the student to change orientation during the course of his or her studies.

According to Goldfarb et al 2001, the fixed program common in Sweden, rather than “a flexible accumulation of requirements and credits” that defines a large part of university education in the US, makes it more difficult to “change courses quickly and to introduce new fields in the old Swedish universities”, and thus to respond and adjust efficiently and effectively to changing needs and demands for education (p.18).

Focus on teaching and on linking teaching and research

Stanford

Such a forward-pressing education is possible only when strong scientific research is a vital part of the institutions and individuals that educate and inspire. Education that is not continually enriched by the freedom of research and ever-deepening understandings will fade into an uninspiring endeavor of imposed ideas and outdated concepts

...the co-location of research with education gives rise to large, positive synergies, ensuring that graduates carry with them into industry knowledge of cutting-edge research, techniques, and instrumentation
(Executive Office of the President of the USA 2012, pp.18&23).

It should be noted that virtually all regular Stanford faculty outside of the School of Medicine and SLAC are expected to teach unless they have major administrative responsibilities. Stanford believes that teaching enhances research. One gains, often, much deeper understanding of one's field by teaching it and responding to the questions of very bright students. Similarly, research enhances education and helps to maintain teachers' enthusiasm for their teaching and their knowledge of current advances in the field.

This focus on teaching prevails throughout Stanford. Detailed analyses of the websites of the History and Physics Departments indicate that virtually all faculty teach undergraduate and/or graduate courses. Considerable emphasis is placed on introducing first year students to some of Stanford's most distinguished faculty in high quality introductory courses. In History, for example, Professor Mark Lewis, the holder of the Kwoh-Tiong Chair in Chinese Culture and winner of several awards for his studies of Chinese history, teaches a first-year course on war, in addition to upper level undergraduate and graduate courses. This course "examines some classic approaches to war as an intellectual problem, to how a matter of such great

Box 4: Emphasizing teaching at Stanford

In spite of the fact that Stanford is a major research university, teaching is stressed and assessed. Arthur Bienenstock still recalls being called to a lunch of newly arrived Stanford School of Engineering tenured faculty in 1967. The Dean of Engineering stated that all the faculty present were highly accomplished researchers or they would not be tenured Stanford faculty. He wanted us to know that Stanford takes teaching very seriously and that faculty were expected to develop new curricula, teach courses well, and write the textbooks that would be used throughout the world.

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physical violence and passions can be subjected to understanding and used in art, philosophy, or politics”. In Physics, Professor Andrei Linde, National Academy of Science member and winner of many awards for his theoretical cosmological research, in addition to more advanced courses, teaches the introductory modern physics course and laboratory that deal with “relativity, quantum mechanics, atomic theory, radioactivity, nuclear reactions, nuclear structure, high energy physics, elementary particles, astrophysics, stellar evolution, and the big bang”.

Stanford’s academic year faculty salaries are guaranteed by the University on the basis of teaching. Indeed, the faculty size, which is carefully controlled by the school deans, is largely determined by perceived teaching requirements. This, too, is in contrast to Sweden where the funds allocated for teaching are insufficient to provide the academic year salaries of the universities’ faculties, as discussed below.

As indicated in the section on faculty appointments and promotions earlier in this paper, Stanford typically appoints new assistant professors for three years, with the expectation that they will be reappointed for an additional three years. During the third year, their teaching is assessed and the University provides assistance to those whose teaching should be improved. Teaching is also assessed at all promotions. These assessments include student evaluation of courses as well as graduate student evaluation of mentorship.

Stanford makes its commitment to high quality teaching in many ways, the most visible of which are teaching awards made by the University and the individual schools that provide both recognition and significant amounts of money. For example, among the recipients of the highest Uni-

versity teaching award, the Gores Award is the Nobel Laureate physicist Douglas Osheroff. Osheroff and David Kennedy, the Pulitzer Prize winning historian, were also named University Fellows in Undergraduate Education in recognition of their “truly outstanding contributions to Stanford’s undergraduate experience”.

As a consequence of this clear and strong emphasis on teaching, Stanford students show very high levels of satisfaction upon graduation. In turn, they have turned out to be very generous donors. For example, Stanford received over \$1 billion in gift support for the University and Stanford Hospital and Clinics from nearly 79,000 donors during the 2011-12 fiscal year.

Berkeley

Teaching is also taken very seriously at Berkeley, and special resources are available for faculty, such as the Center for Teaching and Learning, which reports to the Office of the Vice Provost for Teaching, Learning, Academic Planning & Facilities. Teaching is the first criterion listed in for appointment or promotion in the University’s guidelines for review of faculty performance reviews and its Academic Personnel Manual (APM), the others being research and creative work, professional competence and activity and university and public service. Strong emphasis is given to teaching assessment and evaluations by students and peers, but also quantitative indicators, such as enumerations of the types, numbers and levels of courses taught their enrollments and teaching awards.

Teaching is formally considered in the review of faculty performance, which normally occurs every two, three or four years, depending on rank and step, for all faculty, non-tenured and tenured. The continual focus on teaching performance reflects the commitment of the institution and its faculty to deliver the highest quality instruction and to meet the needs of students at all levels (lower division, upper division, Masters and Ph.D.). In order to make a principled case for teaching effectiveness, the Academic Personnel Manual (APM) allows for a broad range of evidence, although traditionally departments have tended to rely most heavily on end-of-term student course evaluations. (UC Berkeley 2013a, p.47)

In order to guarantee the reliability and accuracy of students’ course evaluations, the Academic Senate issued a “Policy for the Evaluation of Teaching”

in 1987, which, among other things required a two-third minimum response rate (ibid). A Berkeley policy document states:

Tenure-track appointees should have the opportunity to review formally with their chair/dean at least once a year their teaching, research and service in relation to their progress towards tenure. These reviews should be constructive and diagnostic. They should address areas of strength and areas for improvement in the faculty member's teaching, research and service and should make suggestions about goals and strategies for improvement. (UC Berkeley 2013b)

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In addition to emphasizing the importance of teaching, Berkeley is continuously trying to link research more closely particularly to undergraduate education. In the 1990s, the university introduced so-called 'Freshman Seminars', where faculty members who are well-known for their outstanding research give lectures to first-year students. The purpose of this initiative is to allow entering students to establish "close intellectual contact with faculty as part of their first-year experience" (UC Berkeley 2013a, p.89). Furthermore, one of the goals of Berkeley's strategic plan is to "[e]ncourage all faculty to contribute to undergraduate education" (UC Berkeley 2008, p.6).

It should be pointed out that the emphasis on teaching and on linking teaching to research that we can see in the practices and policies of Stanford and U.C. Berkeley are not necessarily representative of American universities or even America's so-called 'Research Universities'. In its report in 1998, the Boyer Commission on educating undergraduates in the research university pointed out that at many American institutions of higher education, "[a]dvanced research and undergraduate teaching have existed on two quite different planes, the first a source of pleasure, recognition, and reward, and the latter a burden shouldered more or less reluctantly to maintain the viability of the institution" (p7).

Sweden

We spent considerable time trying to identify who teaches which courses in Swedish universities, by looking at the websites of faculties and faculty members and by speaking to researchers and administrators at several Swedish universities. In spite of significant efforts, it seems virtually impossible – at least for non-faculty members – to get this information in a more than anecdotal fashion. In a few cases one can click on course syllabi

and then see who is responsible for teaching that course in that semester/trimester.

As mentioned earlier, Swedish undergraduate (and graduate) education differs from US education in that students have less freedom to choose their own courses because of a more program-oriented curriculum. This might provide one explanation why there is less incentive for Swedish university faculties to list systematically who teaches which course or for faculty members to list the courses for which they are responsible. Another possible explanation is that this is symptomatic of a culture where the role of the individual as a teacher is considered less important than his or her research. Furthermore, the relatively meager allocation of resources for teaching (in itself partially a reflection of the fact the universities don't charge tuition and that the state has forced through cost reductions in waves since the 1990s) combined with the above mentioned factors create a motive for faculty to 'buy themselves out' of teaching by means of external research grants; only the ones who are unsuccessful at securing external research funding are saddled with the task of teaching. Nevertheless, the failure to provide such information is striking, especially since, as Clark (1953) describes, publication of universities' lists of courses, with lecturer clearly indicated, was well-established in the German universities upon which Sweden's are modeled, by the end of the 19th century.

In contrast to Stanford, where the size of the faculty (and thus its funding) is based on the teaching needs, budgets for teaching and research are completely separate at Swedish universities. This separation can be traced to a university reform carried out in the 1970s, when the responsibilities for teaching and research were divided up between faculty committees (responsibly for research) and program committees (responsible for teaching), and their budgets came from different sources. According to Berggren (2012) this was a consequence of increasing access to higher education or the transition from elite to mass education in Sweden: "At the same time as higher education was streamlined, the links with research were weakened" (p.69).

Yet another origin of the divide between teaching and research in Sweden can be found in a policy reform introduced in the 1950s, when a new profession was established, the 'university lecturer' (universitetslektor). The idea was that they should focus on undergraduate education while professors should concentrate their teaching on graduate and PhD students (Berggren 2012, p.65). The proponents of this policy argued that this change did not threaten the link between research and teaching as long as both activities took place under the same roof (ibid.) According to Berggren (2012), this

reform had the advantage of allowing advanced research to be maintained within the university instead of it being moved to independent research centers or institutes, which was happening in many other countries. However, a fundamental disadvantage was that this categorization “strengthened a general tendency within the academic system to view research as more important and more ‘noble’ than teaching” (ibid, authors’ translation).

In the 1980s in response to growing criticism of what was perceived as a prioritization of research at the expense of teaching at Swedish universities, the government appointed a commission to make proposals on how to strengthen the quality and recognition of teaching in higher education (SOU 1992:1). However, the recent evaluations of Swedish universities and other evidence indicate that the separation of research and teaching and the prioritization of research at the expense of teaching are still a significant challenge for Sweden (see, for example Berggren 2012, pp.75-76 and 86-90, and Lindh et al 2010). Goldfarb et al 2001 confirm that the separation of teaching and research at Swedish universities is a problem:

First, there is a greater separation of teaching and research. The bulk of undergraduate teaching at Swedish universities is carried out by lecturers who do not do research. This is likely to slow down the pace at which important new research findings are integrated into the curricula. If there are strong complementarities between teaching and research, teaching is likely to benefit when research-oriented faculty delivers it. Also, research is probably better when it is carried out in association with advanced students in an intellectual environment that encourages and rewards informed criticism. (p.16)

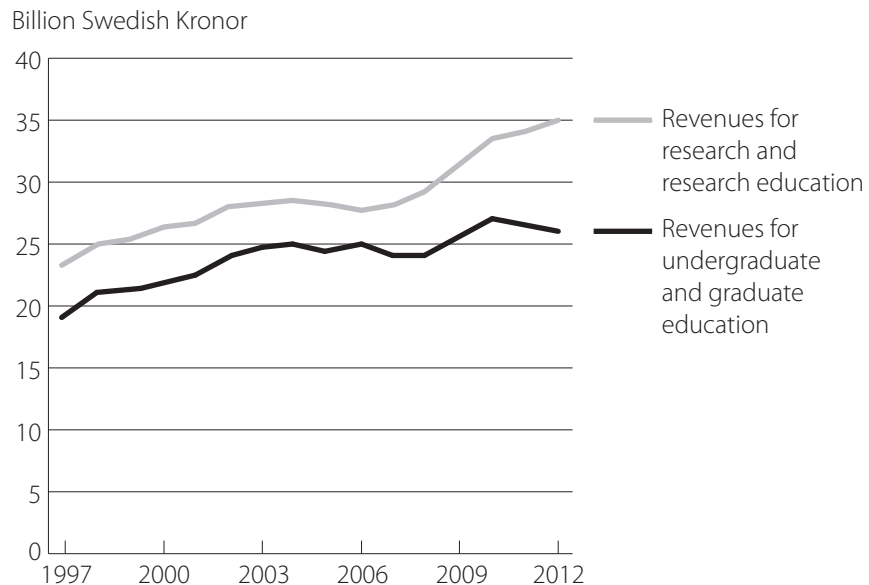
Looking at the link between teaching and research in England, Coate et al (2001) identify a “paradox of managing teaching and research separately whilst intellectually desiring synergies” (p.173), arguing that “[t]he day-to-day management of academic departments are often based on systems that treat teaching and research as distinct activities” (p.172). This analysis can also be applied to the current situation in Sweden

Whereas public funding for research at Swedish universities has increased significantly in the past decade, the budget for teaching has not. Figure 2 below compares Swedish Higher Education Institutions’ revenue for undergraduate and graduate education (purple line) with revenues for research and research education (PhD or ‘third cycle’ education) (yellow line). The figure shows, firstly that the latter has consistently exceeded the former since 1997, and, secondly, that since 2010 the gap between the

two has widened significantly, further strengthening the prioritization of research over teaching in terms of funding. In particular, the increase in government spending on universities since 2008 has occurred primarily in research funding, while the budget for teaching has declined. In 2012, government appropriations for teaching decreased by 2.4% while funding for research increased by 2.7% (Universitetskanslerämbetet 2013b).

The decline in teaching is partially, but not entirely, explained by a drop in the number of students enrolled, since the government pays universities per student enrolled. However, we would argue that the decline in student enrollment explains a small part of the growing gap between teaching and research funding at Swedish universities, the rest being explained by an implicit reorientation of priorities, with funding for teaching (in real

Figure 2: Swedish Higher Education Institutions' (HEIs) revenues for undergraduate and graduate education (black line) compared to revenues for research and research education (PhD) (grey line) 1997-2012, billion Swedish Kronor in 2012 prices



Source: Universitetskanslerämbetet (2013b)

terms per student) stagnating while funding for research has been growing. The Swedish Higher Education Agency observed in its annual report on Swedish universities that the consequence of this shift is that “[Swedish] universities have become more research-heavy” (ibid., p.81). This ‘research heaviness’ of Swedish universities becomes very clear when comparing the budgets at Lund and Uppsala University with Stanford and Berkeley. At the former two, research revenue is reported to account for close to 70% of the total annual budget, while at Stanford and Berkeley, it accounts for 30% (see Table 1). We have not been able to find data on the size of PhD education as a share of universities’ total research budget, but according to Jacobsson & Rickne (2004), salaried PhD students can account for around one half of the entire research cadre in some areas like engineering (p.1364). While one should be careful to compare these numbers uncritically, the significantly greater, and increasing, weight of research in Lund and Uppsala Universities’ budgets, compared to Stanford and Berkeley, might both confirm that, and explain why, policy makers, university management teams and faculty focus more strongly on research than on other activities, in particular teaching.

One result of the above described situation, according to several professors we interviewed, appears to be that teaching at Swedish universities is “underpaid, underappreciated and generally under-incentivized”.

The separation of the budgets for teaching and research in Sweden and the reduced government spending on teaching combined with the increased government spending on research have a particularly strong impact in Sweden, where direct budgetary allocations from the state budget account for a much larger share of universities’ total funding than at most US universities. Thus, 87% of teaching at undergraduate and Masters level at Swedish universities in 2012 was funded by direct government allocations (Universitetskanslerämbetet 2013b). Overall, direct budgetary appropriations accounted for over 60% of Swedish universities’ total revenue in 2012. In addition, Swedish universities can apply for additional state funding at research councils and foundations created by the government which are funded with government revenue from so-called ‘employee funds’ (‘löntagarfondstiftelser’). In total, therefore, 85% of total universities’ funding in 2012 came from public funding sources (ibid).

In comparison, U.C. Berkeley receives around 35% of its direct funding from public sources, i.e. from the US government and the State of California.

When it comes to research funding, around 75% of funding come from federal and state grants. This share is similar to Swedish universities, on

average, the fundamental difference being that the share of research funding that is directly allocated to Swedish universities, i.e. primarily not in competition, is significantly larger.

Although good teaching skills are nominally part of the requirements for faculty promotion, significantly more attention is paid to research achievements. Very little support is given to faculty to advance their teaching skills, or for developing teaching material. Even though courses are evaluated by the students after completion and special student bodies are in place to monitor the quality of the courses, it appears that in reality in most places this has little effect. We know from our own teaching experience at Swedish universities that the response rates to course evaluations can be very low, especially at Masters level, often too low to allow to draw general conclusions about student satisfaction. This could, at least partially, be explained by the fact that students don't expect that their evaluations will make a difference and therefore have little incentive to fill out the evaluation forms.

It is perhaps for the above reasons quite common for faculty to 'buy' themselves out of teaching with research grants, as research is more highly rewarded from a career standpoint, and instead leave the teaching to PhD students, to lecturers with a lesser degree of research ambition, or to assistant professors who not yet have acquired the recognition to attract research grants. One of the people we interviewed referred to teaching at Swedish universities as a 'female trap', arguing that teaching and research was divided along gender lines, with men doing research and women 'confined' to teaching.

As of January 2011, a new system for evaluating the programs was put in place, under the responsibility of the Swedish Higher Education Authority. An earlier system had been terminated prematurely, because of political criticism that it failed to assess accurately quality in education. The new system, which is based primarily on an assessment of the quality of candidate and masters theses, has in its turn been subject to controversy and debate, with opponents criticizing that it lacks legitimacy, that it does not cover a large share of higher education in Sweden, that it is focused on the wrong criteria, that it is resource-intensive and arbitrary (Adamson 2013). Both of these views have in common a distrust of universities' own capacity for setting and implementing quality standards; the state tries to force universities to support and sustain quality, which somewhat paradoxically forces universities to adapt to similar pressures rather than nurturing their own 'quality culture'. At the same time, one could argue that universities have failed to show that they take teaching quality seriously enough – one

example being that while universities have commissioned comprehensive evaluations of research quality these have not covered the research-teaching nexus at all; in addition, attempts to systematically assess and/or evaluate teaching quality are scarce and primarily exercises in self-assessments, thus prompting the government as the main funders of teaching to take on the role of quality auditor and guarantor. The result is a suboptimal national system for assessing teaching quality and weak or inexistent university-wide attempts at monitoring and evaluating teaching.

Overall, there is a growing awareness of the importance of delivering quality education among universities. Real change will however require substantial reforms in the current incentive and funding system of Swedish universities. Berggren (2012) summarizes the problem as the following: “Teaching has a low status in the Swedish university system (...) and the incentives for teachers to channel their creativity and talent to seminar rooms and lecture halls are weak” (translated from Swedish, p.85). Some of the recent research evaluations echo the concern that teaching is being neglected. In the evaluation of Karolinska Institute, the evaluators went so far as to claim that teaching risks becoming “an endangered species”, going on to say that “[t]he attitude of the faculty towards teaching is indifferent or even negative” (Karolinska Institute 2011, p.31). A further illustration of the prioritization of research over teaching can be found in the fact that while the largest and highest-ranked universities in Sweden have commissioned comprehensive reviews of their institutions’ research quality, none have so far commissioned similar evaluations of their teaching quality.

Today, university presidents and management are under pressure from different ‘interest group’ or ‘lobbyists’: “researchers and teachers want to maximize their own research, the government wants useful results and companies want profitable cooperation” (translated from Berggren 2012, p.36). The question is who in Sweden is lobbying for promoting and ensuring the quality and continuous upgrading of teaching?

Summing up, we see two challenges in Swedish universities with regard to teaching. Firstly, in spite of attempts to strengthen the focus on and quality of teaching, we see a prioritization of research over teaching. This prioritization can be argued to be reinforced by recent decisions regarding the public funding of research and teaching. Furthermore, the bias against teaching seems to be illustrated and reinforced by the prioritization of research merits for career advancement. The bias is not unique to Sweden. Barnett (1992) speaks of a “distortion in academic life”, explaining that “academic excellence comes to be defined in terms of research excellence,

irrespective of an academic's qualities as a teacher. Correspondingly, high level achievements in research all too easily serve as a sufficient criterion for academic excellence" (624).

The second challenge relates to what we perceive to be a worrisome separation of teaching and research at some Swedish universities. There is a clear distinction between research and teaching in terms of budgets and personnel, with significant shares of faculty only engaged in either teaching or research. This separation is troubling, not least because a close link and interaction between teaching and research has been shown to be mutually beneficial and because it is one of the key aspects that distinguishes universities from, say, research institutes. Salter and Martin (2001), for example, identify the training of skilled graduates as a key benefit of publicly funded research and argue:

Since graduates provide a key mechanism for the benefits of public funding to be transferred to industry, it is vital that government funded basic research and student training are conducted in the same institution (p.522).

Based on the insights from Stanford and Berkeley, we would go even further and argue that research and student training should be conducted by the same people, not just be connected through people with a shared institutional basis. The importance of teaching is further underlined by research that indicates that access to high quality human capital in the form of well-educated students is more important to firms' location decisions than proximity to academic research (Andersson et al 2006).

Societal Interaction and Benefits

Stanford

Stanford University is regarded world-wide as a technology-transfer leader. Indeed, it is partly as a result of Stanford's success that many countries throughout the world, including both the U.S. and Sweden, are emphasizing IP licensing as a means to create new products, industries and jobs while also enhancing universities' revenues significantly (Merrill and Mazza 2010).

The magnitude of Stanford's technology licensing success is illustrated in the 2010/11 Annual Report of the Office of Technology Licensing, (Stanford Office of Technology Licensing 2011). That report states that "Stanford received \$66.8M in gross royalty revenue from 600 technologies, with royalties ranging from \$1.80 to \$44M." 101 new licenses were concluded and 8 new companies were started up. Approximately \$32M were shared by the University's departments, schools and Vice Provosts of Research and Graduate Studies, funding graduate and post-doc stipends as well as the acquisition of advanced instrumentation.

While these contributions are both superb and extremely important, they are dwarfed by other economic contributions of Stanford University's faculty and alumni. The great magnitude of these contributions is illustrated vividly by the Eesley and Miller (2012) report where the authors state that:

The report on 2011 survey, sponsored by the venture capital firm Sequoia Capital, estimates that 39,900 active companies can trace their roots to Stanford. If these companies collectively formed an independent nation, its estimated economy would be the world's 10th largest. Extrapolating from survey results, those companies have created an estimated 5.4 million jobs and generate annual world revenues of \$2.7 trillion.

Box 5: Consulting as important inspiration for teaching and research

Faculty consulting enhances the University's educational and research programs. Through consulting, faculty are exposed to new problems and ideas which they bring back to the University. Often, faculty recognize in projects some basic problem worthy of faculty/student research. For Arthur Bienenstock personally, it was consulting that introduced him to the field of amorphous semiconductors. This, in turn, led to a great deal of Stanford research by his students, as well as those of his colleagues. That research played a significant role in the early development of the Stanford Synchrotron Radiation Laboratory.

These 39,000 companies exceed greatly the number of companies started by means of OTL licensees. While some of these companies were started by Stanford faculty, the very large number indicates the enormous contributions of Stanford's students.

The success of these students leads, in part, to the extreme magnitude of gifts to Stanford. These amounted to over \$1B from ~79,000 donors in 2012. Thus, while nations may seek to emulate Stanford's IP-related activities, it is ultimately Stanford's highly motivated, well-educated students that make the most significant contributions to new products, companies and job creation. These contributions arise, in turn, because highly selected faculty provide education and guidance to highly selected students in the almost unique Silicon Valley environment to which both are relatively strongly linked.

While the student contributions are emphasized here, it should be noted that Stanford faculty participate in these and other companies in a variety of ways. They often license the intellectual property that they have developed on government-financed research and start companies. The faculty may take leave for up to two years to start up and/or manage a company. They cannot, however, take on a management position while they are full-time faculty.

Faculty can and do serve as consultants for as much as 13 days per quarter. Many of the companies that license Stanford's intellectual property depend on these faculty consultants to assist in the further development of the associated products. In addition, most startups and small court companies cannot hire all the expertise that they need full-time. Faculty consultants

offer them the opportunity to obtain that expertise at minimal expense and commitment. Indeed, one view of the benefits of government funding of research is that it provides an “expertise bank” upon which government and industry can call upon when needed.

The Alumni Survey and Stanford’s policies in general show what could be described as a ‘broad approach’ to striving for impact. Rather than limiting their focus on commercialization and technology transfer, Eesley and Miller (2012) widen the concept to include various kinds of social impact and interaction with society. Thus, for example, they estimate that over 30 000 non-profit organizations have been created by Stanford alumni, faculty and staff.

Berkeley

Similar to the study of Stanford’s impact, a study commissioned by the Berkeley in 2001 took a broader approach to measuring impact, including among other things, Berkeley’s contribution to the regional workforce and community service and volunteerism (Sedway Group 2001).

The role of Berkeley in its surrounding society has been argued very eloquently by its Executive Vice-Chancellor and Provost George Breslauer (2013):

The University is often referred to as a “public good.” That concept extends beyond matters of access, the quality of research and education, and political accountability, to the “public service” functions performed by the university. In this realm, the university is more public than ever before. About 8,000 of UC Berkeley students annually engage in community service of some kind. We have several heavily enrolled programs that send students overseas to help alleviate global poverty. We send more of our graduates to “Teach for America” (teaching in primary and secondary schools in disadvantaged neighborhoods) than does any other university in the country. More than 3,600 of our graduates have entered the Peace Corps since its inception, the largest number of any university in the country. Moreover, public discourse, campus literature, and leaders’ speeches continuously valorize grass-roots public service of these kinds. “Public service” is widely viewed as integral to the UC Berkeley ethic of responsibility of students, faculty, and staff. The latest emphasis is “service learning,” community engagement, and “engaged scholarship.” None of these themes have changed as a result of the financial crunch of the past decade.

And the sheer quantity of “public service” is far greater than had been the case in the 1960s.

The University also contributes to the public good through the large number of companies that its graduates found, and the economic impact of its inventions and discoveries. The University of California as a whole is often referred to as both an engine of social mobility and a locomotive of economic growth in the State. On this score as well, UC Berkeley is significantly more of a contributor to the public good than it was in the 1960s. (pp.8-9).

In recent years, there has been increasing focus on the responsibility and role of research in addressing societal challenges and the importance of interdisciplinary research in finding solutions to the problems our planet and societies face today. Thus, for example, the Lund Declaration prepared by the Swedish Presidency of the European Union in 2009 proposed that “European research must focus on the Grand Challenges of our time moving beyond current rigid thematic approaches”.⁶ However, experience not least in Sweden has shown that interdisciplinary research, while advocated by many, can be very difficult to realize in practice. A combination of funding mechanisms, incentive structures and differences in culture and networks between academic disciplines form powerful obstacles. The emphasis placed by both Stanford and the University of California on multidisciplinary research are telling examples of both an ability and willingness to pool resources around faculty-transcending themes and a commitment to addressing societal challenges. In Box 6 below we describe some of these interdisciplinary initiatives and also provide some telling examples of a culture of intellectual interaction and discourse across academic disciplines, which furnish an important foundation both for interdisciplinary research and for addressing societal challenges.

The examples of Berkeley and Stanford show several things. Firstly, both universities have been able to combine excellence in teaching and research with a significant interaction with and impact on surrounding society of both institutions. Secondly, the interaction with society is seen as a mutually beneficial and integral part of university life at the same time as both institutions have safeguards in place to ensure that academic freedom and the university’s integrity are maintained. Thus it is interesting to note that

⁶ The full text of the Lund Declaration can be found at <http://www.vr.se/download/18.7dac901212646d84fd38000336/>

Berkeley forbids the naming of departments, colleges, schools, or buildings after corporations, even if this means having to renounce significant donations from companies who request this in return for their gift. Thirdly, the interdisciplinary initiatives and culture described in Box 6 indicate a strong commitment by both universities to tackling societal challenges by pooling resources around critical issues which transcend academic disciplines. Finally, both universities are careful not to limit their focus for interaction and impact to the commercialization of their research but rather adopt a broad view of economic and social impact and interaction with surrounding society.

Box 6: Interdisciplinarity

Interdisciplinarity: the 'Stanford culture'

One could argue that part of the 'Stanford culture' is that it nourishes a culture of intellectual interaction across academic disciplines that is lacking in many other universities. Interdisciplinary and multi-disciplinary research has been strong at Stanford for many decades. It is enhanced by the co-location of all of the University's schools within very easy biking and relatively easy walking distance. There are virtually no administrative barriers to this type of research. Graduate students admitted to one department, for example, often obtain their research supervision from faculty in other departments. Interdisciplinary research is also enhanced by the many opportunities for faculty to meet informally. About half the faculty live right on campus so that they meet over lawnmowers, at Parent-Teacher Association meetings, at the faculty swimming-tennis club and at the Faculty Club. These informal meetings provide opportunities to learn more about the research of faculty in other departments and schools and identify common interests that often lead to joint research programs.

Arthur Bienenstock's personal experiences illustrate the long-standing cooperation and mutual respect of the various departments and schools. In 1967, he was offered, and accepted, a joint appointment in the School of Engineering's Department of Materials Science and the School of Humanities and Sciences (H&S) Division of Applied Physics. He also became a member of, and had his laboratory space in, the Center for Materials Research, which had faculty from Applied Physics, Chemistry, Chemical Engineering, Electrical Engineering, Geology and Physics. Soon, collaborations with some of these faculty from different disciplines developed.

Soon after his arrival, the chair of Applied Physics had a party at his home which was attended by the great Stanford Medical School radiation oncologist, Henry Kaplan. Arthur Bienenstock learned that he was friendly with the accelerator scientists in the department because of their assistance in developing the radiation sources required for his pioneering work.

Perhaps the most vivid demonstration of the mutual respect and friendship that abounds at Stanford was a phone call Bienenstock received from the chair of the English Department several years after his arrival. The chair stated that one of their best students was coming up for his final PhD oral examination. According to the chair, his thesis was about a novelist of whom Bienenstock had probably never heard, but the Department thought he would be quite interested. Would Bienenstock chair the oral examination?

Opportunities for interdisciplinary and multidisciplinary research are strongly enhanced by the 16 Independent Institutes that report to the Vice Provost and Dean of Research. Faculty from a number of different schools participate in each of these institutes. The Woods Institute for the Environment, for example, has faculty participants from every school of the University, with research that ranges from environmental Law and policy to detailed engineering studies. A list of the Independent Institutes is provided in Appendix 3. Most of these institutes have office and laboratory space so that faculty from various disciplines work in close proximity and interact readily. Interactions are enhanced by strategically placed lounge areas with coffee machines.

In 2006, the University initiated a successful five-year \$3B fund-raising initiative. The campaign was driven by the following insights: :

- Many of the most important and challenging scholarly and societal problems are best addressed with interdisciplinary or multi-disciplinary approaches,
- Most government funding agencies are divided in disciplinary divisions which were not yet well-prepared for financing such research, and
- The expense associated with maintaining strong disciplines while actively encouraging these approaches is appreciable,

That campaign included four broad research components: 'Environment and Sustainability', 'Human Health', 'International Initiative', and 'Multidisciplinary Research'.

The commitment is illustrated by the University's statements and actions. For example, the University stated the following about the Initiative on the Environment and Sustainability: "With natural resources stressed as never before by the demands of human activity, Stanford embraced the challenge of ensuring that people can live well on our planet now and in the centuries ahead." In the Initiative on the Environment and Sustainability, teaching and research focused on five areas: freshwater, land use and conservation, climate and energy, oceans and estuaries, and the sustainable built environment. \$432.8M were raised for the Initiative in the Campaign and were used for the following purposes: interdisciplinary research and programs (\$246.0M), facilities (\$ 92.3M), faculty support (\$ 60.2M) and graduate student support (\$ 33.4M).

As part of the initiative, the university established the Stanford Woods Institute for the Environment, the Precourt Institute for Energy, the TomKat Center for Sustainable Energy and the Steyer-Taylor Center for Energy Policy and Finance. It also constructed the Jerry Yang and Akiko Yamazaki Environment and Energy Building which houses many of the faculty, staff and students participating in these institutes. These endeavors include participants from every school of the University to address critical global environment and energy problems. They cover broad areas including transformation of the world's energy systems, technologies that make renewable energy economically competitive and environmentally friendly as well as a focus on the finances and regulation needed to achieve deployment.

In addition to funds gained in this campaign, the Stanford president receives alumni contributions each year that can be, and are, employed to facilitate interdisciplinary research. Income from intellectual property is used for the same purpose by the Vice Provost and Dean of Research. These funds are particularly important because they often enable research in interdisciplinary areas for which funding programs have not yet been established by the U.S. government.

Interdisciplinary centers at the University of California

The recognition of the importance of multidisciplinary research is also illustrated by the initiative taken by the University of California System in 2000, to ensure California's premier standing in knowledge-driven high tech and bioscience industries and to provide the technological underpinnings for the state's future economic growth. Named for the former Governor of California, The Governor Gray Davis Institutes

for Science and Innovation, are comprehensive basic research centers concentrating on complex scientific challenges that demand multidisciplinary strategies and state-of-the-art equipment and facilities. They are established on some of the University of California state university campuses. Strong partnerships have also been created with industry to help move early-stage research developments into the commercial R&D pipeline, for more rapid delivery of public benefits to the marketplace.

The institutes draw some of the best researchers and students from throughout UC's 10 campuses and three national laboratories, as well as other California research institutions. The leaders are recruited among the world's best scientists and engineers. The institutes have sought to create a new environment for industry scientists to collaborate in fundamental research and to educate future scientists.

Four centers were created: The Center for Information Technology Research in the Interest of Society (CITRIS), which creates information technology solutions for many of the most pressing social, environmental, and health care problems; the California Institute for Quantitative Biosciences (QB3), dedicated to integrating our understanding of biological systems at all levels of complexity; the "CalIT2" California Institute for Telecom and Information Technology (CalIT2), which focuses its work in the context of telecommunications and information technology as related to the evolving Internet; and the "CNSI" California Nanosystems Institute (CNSI), which focuses on new nanotechnology systems. QB3 is now the central point of a whole new development in Mission Bay, just south of San Francisco, and has attracted the establishment of some of the world's leading pharmaceutical companies (*SF Gate* 2011).

Sweden

The idea that Swedish universities should be 'useful' and contribute to societal and economic development is not new, but is something that government bills and laws have stipulated in some form at least since the 1970s (Lidhard and Petrusson 2012). Similarly, the government has required that universities interact with the surrounding society since the 1980s (ibid). Since 2009, universities' so-called 'third mission' – in addition to teaching and research – requires Swedish universities to "cooperate with the surrounding society and inform about their activities, as well as to undertake steps that will allow that universities' research findings can be put to use" (authors' translation

from Swedish) (Ejermo 2012).⁷ In recent years, policymaking has shifted from a general notion of interaction with society and economic impact to an increasing focus on universities' role in the commercialization of research results and, among other things, on how new companies can be started in order to commercialize new technology (ibid). Confirming an over-focus on "counting patents and spin-offs", Jacobsson et al (2013) argue that the notion of a European or Swedish 'paradox', i.e. that Europe or Sweden invest a lot in research but get little economic returns on the investment is erroneous since it is based on "too narrow a conceptualization of how science is made useful" (pp.27&29). Mowery and Sampat (2005) criticize an obsession by policymakers on the "countable" rather than the "important aspects of university-industry interaction". More specifically, they observe that, starting in the 1980s, policymakers have implemented policies aimed at strengthening the "contributions of university-based research to innovation and economic performance". They question this policy focus as not being grounded in evidence:

These initiatives all share the premise that universities support innovation in industry primarily through the production by universities of "deliverables for commercialization" (e.g. patented discoveries) despite the modest support for this premise in the research... (p.225).

Bengtsson (2011) claims that policymaking and research on universities role in society have been excessively focused on what is only one of many forms of interaction, namely the commercialization of knowledge and research produced at universities. The commercialization debate has in turn revolved around patenting and licensing of knowledge and research and the creation of new companies with the aim of commercializing university research (ibid).

Similar to the situation described above, we would argue that the Swedish discourse on universities' interaction with surrounding society has focused increasingly on making university-generated research and knowledge economically and societally useful. The strong focus – by policymakers but also university management – on commercialization through patenting, licensing and technology start-ups is illustrated, among other things, by the

7 The Swedish original legal text is "att samverka med det omgivande samhället och informera om sin verksamhet samt verka för att forskningsresultat tillkomna vid högskolan skall komma till nytta".(SFS 1992:1434, quoted from Ejermo 2012, p.8).

prominent role assigned by policymaking to incubators, technology transfer offices and science parks linked to or located in the proximity of Swedish universities, but also by the government-decreed establishment of so-called innovation offices at selected Swedish universities as a result of the research and innovation bill from 2008.

While such efforts may be laudable in principle, our concern is that this approach is rather narrow and has tended to overshadow other forms of interaction and societal and economic impact. Examples of other forms would be to encourage and invite the involvement of stakeholders in the design of new courses and programs, strengthening research and innovation cooperation with mature and not necessarily high-tech firms (one successful example is “Produktionslyftet” or the ‘Production Lift’), bringing people with relevant competencies from industry and civil society into the university, and generally encouraging greater mobility of people in and out of university.⁸ In their research evaluation at Lund University, the experts expressed their concern and surprise at the underutilization of mobility of PhDs as an instrument for cooperation and interaction with industry:

Another distinctive pattern of concern is that the PhD route appears to be dominated by those who aspire to permanent university posts, with very few going into business or the public services. This contrasts strikingly, for example, with the USA, where a large proportion of PhD graduates, particularly but not exclusively in science, engineering and technology, enter industry, particularly high technology industry. This is not only a means of bringing new research-based ideas into industry, but it perennially re-invigorates the university-industry connection, much to the benefit of business innovation. We advocate the introduction of processes that stimulate awareness, enthusiasm and support for such a route. If this were to be a priority, it would also be necessary to address the slow progress to the PhD degree..., that is typical of many disciplines in Lund and in Sweden more generally. (Lund University 2008, p.50)

Perhaps most worryingly, the comparison with US universities shows that Swedish universities emphasize the importance of knowledge flowing out of the university to the benefit of the surrounding society but that they lack a realization or appreciation, or even have a negative view, of the potential benefits to research and education of knowledge, skills and experience from

8 For more information see www.produktionslyftet.se

the surrounding society flowing into the university. Thus, there is a lot of talk in Sweden about the role of universities in their respective regions, but relatively little discussion about how universities' core activities can benefit from impulses, knowledge and dynamics that exists in the world outside their campus. At a workshop on trends in innovation systems organized by the National Academies of Sciences and Engineering in the US in 2013, experts on universities' role in the innovation system observed that the US university system, in contrast to many other countries, is characterized by "the flow of ideas and people occurs in two directions, not just one" (National Academies of Sciences 2013, p.6).

The strong focus on commercialization and on deriving measurable economic gains from intellectual property generated through publicly funded research is not unique to Swedish universities and policymakers but forms part of a general trend in research and policymaking in recent decades. Thus, Breznitz and Feldman (2012) argue that:

Current studies of economic growth that emphasize the role of universities and other institutions of higher education have increasingly focused on technology transfer. Attention has shifted towards easily quantified metrics such as the number of patents issued, licenses signed, licensing revenues received, and the formation of new companies based on university technologies (p.135).

They claim that "universities' impact on economic development is analyzed today through technology transfer" and that "[t]his emphasis ignores the larger contribution of universities to the economy as agents of economic and social development" (pp.135 & 136). Similarly, Bengtsson (2011), points out that research on universities' role in society has focused excessively on, firstly, the link between university research and regional economic growth – and on the transfer of knowledge to industry through patents, licenses or technology startups, and, secondly, on the role of technology transfer and licensing offices at universities and their role in regional and national innovation systems. As a result, universities' other activities, such as education and research cooperation with industry, and particularly the importance of well-educated students and the transfer of tacit knowledge, have been neglected (pp.6-7&9). The strong focus on commercialization of research as the most important form of impact on society has both reinforced and been reinforced by the separation between teaching and research and the prioritization of research over teaching. The example of the Swedish competence center initiative illustrates this point well. The initiative has been considered

a successful policy instrument, perhaps one of the most successful policy instruments, for strengthening university-industry collaboration, particularly between large firms and academia (VINNOVA 2013).⁹ However, even in this case, the evaluators pointed out that Master's and undergraduate education should have been more involved and included in the initiative.

In Sweden, the European Union and the United States, there has been considerable emphasis on transferring technology arising from publicly-funded research carried out in universities to industry to enhance economic development. In the US, The Presidential Memorandum *Accelerating Technology Transfer and Commercialization of Federal Research in Support of High-Growth Businesses* (White House, 2011) to Heads of Executive Departments and Agencies declares that:

One of the goals of my Administration's 'Startup America' initiative, which supports high growth entrepreneurship, is to foster innovation by increasing the rate of technology transfer and the economic and societal impact from Federal research and development (R&D) investments.

The highly influential Kauffman Foundation similarly states on its website (http://www.kauffman.org/advancing_innovation/university_innovation_and_commercialization.aspx):

Because university-based research plays a central role in the innovation process, the Kauffman Foundation is working to identify and remove barriers that inhibit the transformation of knowledge into products and services that improve the way we live, work, and play. Solutions that will allow an abundant flow of discoveries into the marketplace are critical will continue to drive economic growth. Finding and advancing these solutions is the focus of the Foundation's University Innovation and Commercialization initiatives.

It is the belief of these authors that far greater societal benefit to countries and regions would be obtained from an emphasis on selecting faculty and

⁹ In this initiative, which started in 1995, 28 Centre consortia received 10 years of funding for pre-competitive research. By the final stage, there were about 200 companies involved, with the proportion of SMEs growing over time. The long term economic impact from the initiative was estimated to amount to somewhere between 5 BSEK and 11 BSEK per year, which should be compared to the total investment (in cash and in kind) of approximately 5 BSEK over the entire program period. Over 500 PhD students received their degrees in the program. For more information and a comprehensive evaluation, see VINNOVA (2013).

educating university students well, and on encouraging knowledge and people to circulate in and out of the university rather than on mainly seeking economic gain from intellectual property. In this section we have tried to show that Stanford and Berkeley's experiences and their track records in this regard substantiate this view.

The broader approach to societal interaction and benefits that we argue for in this paper is supported by Florida (2000) who warned that policy-makers neglected the importance of knowledge creation and education as sources of impact::

Universities have been naively viewed as “engines” of innovation that pump out new ideas that can be translated into commercial innovations and regional growth. This has led to overly mechanistic national and regional policies that seek to commercialize those ideas and transfer them to the private sector. Although there is nothing wrong with policies that encourage joint research, this view misses the larger economic picture: Universities are far more important as the nation's primary source of knowledge creation and talent.

...If federal, state, and local policymakers really want to leverage universities to spawn economic growth, ... they must focus on strengthening the university's ability to attract the smartest people from around the world — the true well-spring of the knowledge economy. By attracting these people and rapidly and widely disseminating the knowledge they create, universities will have a much greater effect on the nation's economy as well as regional growth. (Florida 2000, p.364).

Similarly, the OECD (2007) cautioned that “[t]he focus on the “hard” contributions of higher education ignores what is arguably one of the most effective mechanisms for knowledge transfer, knowledge which is embedded in students and graduates and is subsequently absorbed – via the regional labour market – into the regional knowledge economy” (p.144). The OECD defines “hard” contributions as “the inputs to and infrastructure for firm-based innovation, including patenting/licensing activity, consultancy and knowledge transfer and provision of specialist facilities such as laboratories, science parks and incubators” (ibid.) In its review of Mexico's innovation system the OECD makes the following generally valid point:

It is important to understand the contributions that HEIs [Higher Education Institutions] make to innovation. All too often, policy attention is overly

focused upon the production of codified knowledge through research and its subsequent diffusion and exploitation through various ‘third stream’ activities and industry-academic linkages. However, the innovation studies literature makes clear that the most significant contribution of HEIs to innovation often lies in the creation of capabilities through teaching and research training activities. (OECD 2009, p.139)

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This point is confirmed by Bengtsson (2013) who states that universities’ most important contribution to a country’s competitiveness and innovative capacity are students, both those that have graduated and those that are still being educated. He argues, therefore that while the importance of linking research and innovation in the knowledge triangle (consisting of research, education and innovation) is recognized and supported by policy efforts, the link between innovation and education is still underappreciated and neglected by policymaking (p.7).

As we pointed out at the beginning of our analysis, universities are under increasing pressure from their surrounding society. In his excellent analysis of the academic freedom, Berggren (2012) identifies numerous external pressures that are being exerted on universities, but he also goes on to emphasize that this external pressure is both “good and necessary”:

If universities were isolated from the surrounding society, knowledge development would stagnate. Furthermore, higher education and research are accountable to society, not just because these activities are often financed through taxes, but because knowledge is a natural resource that belongs to all citizens. But if academic freedom is to survive this massive pressure from the world around it Swedish higher education institutions must have a stronger integrity – not to shut out the outer world, but to cooperate and interact with it on their own terms. And perhaps most importantly – their unique role as social and intellectual meeting place between science and citizens (through students) must be defended and strengthened (authors’ translation, pp.102-102)

Similarly, Malmberg (2013) argues that “the question is not if universities shall be useful to society but rather how that usefulness can be maximized, in the short and in the long term. Autonomy and integrity are not about shielding us from the world around us. On the contrary, independence is a prerequisite for our cooperation with industry and society. It is when one is confident and comfortable with one’s own role that one is in a good position

to interact with others” (authors’ translation, p.81).¹⁰ We couldn’t agree more.

¹⁰ The original text is:

Vi värnar vår autonomi och vetenskapliga integritet men får aldrig glömma att vi ytterst finns till för att bidra till samhällets utveckling. Frågan gäller inte om universitet och högskolor ska vara samhällsnyttiga, utan hur nyttan blir störst, på kort och lång sikt.

Autonomi och integritet handlar alltså inte om att vi ska avskärma oss från omvärlden. Tvärtom är oberoendet en utgångspunkt för vår samverkan med näringsliv och samhälle. Den som är trygg och säker i sin egen roll har goda förutsättningar att växelverka med andra.

Conclusions

In this paper we have identified some factors which have allowed two world leading universities, Stanford University and the University of California Berkeley, to combine excellence in teaching, research and impact. We argue that some of these factors, such as linking research and education, the importance attached to education and teaching, recruitment mechanisms, and career development paths, ensure that these universities can attract the best students and faculty and contribute significantly to societal development both in their region and globally. These factors seem critical in ensuring universities' future relevance and competitiveness.

We are well aware that Stanford and Berkeley are not perfect or immune to challenges that constantly arise due to economic, societal, technological or other changes. Avoiding becoming a catalyst of inequality rather than an instrument for social mobility, increasing cost efficiency, containing the rise of tuition fees, and coping with quite severe funding fluctuations are some examples of the challenges facing Stanford and Berkeley, and US universities in general. However, the challenges facing US universities are not the focus of this paper. Furthermore, we argue that some of the characteristics which define both universities which we examine here have enabled them, so far, to maintain academic excellence and relevance even in the face of serious adversity. Both Stanford and Berkeley, and not least the co-existence of and cross fertilization between the two, provide examples of universities with exceptional capabilities for renewal and reinvention which allow them to respond effectively to growing competition and changing circumstances. The fact that perhaps one of the most groundbreaking and system-changing and challenging innovations in education, Massive Online Open Courses (MOOCs), as well as digital learning in general very quickly have become a central part of the strategic effort at Stanford could be seen as a further testimony to its capacity for renewal.

When comparing Swedish universities with Berkeley and Stanford according to what we argue are key determinants of universities' excellence,

relevance and global competitiveness, we find a troubling picture. Faculty recruitment and promotion processes at many departments are closed and still not transparent, leading to a large degree of internal recruiting, with staff being recruited from among PhDs from the same faculty, a behavior that stands in stark contrast to many of the world's leading universities. Furthermore, PhD students are to a large extent recruited from within the university, and often from within the department. Thus, the talent pool for recruiting future professors and heads of department is effectively often limited to the population of students accepted at undergraduate level.

We also find that Swedish universities have shifted their emphasis strongly towards research at the expense of teaching. This has disconcerting effects on teaching quality, and, the international attractiveness of Swedish universities. The increasing bias towards research neglects the importance of teaching for academic excellence, which we would argue is too narrowly defined as research excellence. Furthermore, it indicates an under-appreciation of the key role that students play in determining regions' and countries' competitiveness and innovation capacity.

In addition to a growing emphasis on research at the expense of teaching, we see an increasing disconnect between teaching and research with adverse consequences for both activities. One of the ironies of the Swedish system, compared to other countries, is that, on the one hand, publicly funded research in Sweden is significantly more concentrated in higher education institutions (as opposed to research institutes), while, on the other hand, teaching seems to be more disconnected from research.

Finally, we argue that the discourse on universities' role in society has been based on a very narrow focus on commercialization of knowledge generated at universities in the form of patents and spinoffs. Funding patterns, promotion criteria and policy measures confirm a neglect or denial of the key role that education, teaching and students play in a university's contribution to its surrounding society.

We would argue that the dramatic drop in student enrollment from Asia and Africa cannot be explained solely by the introduction of tuition fees and a shortage of scholarships. Rather our concern is that other factors explain why globally mobile students, or their families, seem to be more willing to pay, often quite heavily, for their tertiary education in the US, UK and Australia, rather than coming to Sweden. One of these factors, we argue, is the quality and focus of teaching and education. In addition to identifying high-quality teaching as perhaps the most important task of the university, many world-leading universities focus on 'educating the whole student'

and on providing students with a range of transferable and interdisciplinary skills that are intended to give them a basis for continued professional and personal development. This is often done by offering a liberal arts education at undergraduate level. In contrast, Swedish universities generally force students to specialize early on an academic field or discipline, thus limiting the range of skills most students acquire in their studies.

In conclusion, Swedish universities display weaknesses or challenges which risk becoming serious threats to Swedish Higher Education Institutions in an increasingly fierce global competition for talent, but also for Sweden as a country as the global research and education landscape changes. Furthermore universities' different roles and tasks are poorly integrated, we see no clear or coordinated leadership and above all we see an inability in the universities to shape and take charge of their own destiny. If these challenges are not addressed, there is a risk that Sweden's ability to attract promising students, teachers and cooperation partners, is undermined.

In the debate on challenges facing Swedish universities, for example regarding low mobility, non-transparent recruitment systems and unclear career tracks, some observers point out that Sweden is 'unique' or different, arguing that there is limited benefit of comparing Swedish higher education institutions to universities in other countries. We are fully aware that there are a number of institutional, historical, legal and other factors, as well as resource allocation mechanisms, that might explain why, for example, large parts of the faculty are still recruited internally, why mobility among universities is limited or why research is prioritized at the expense of teaching. Our concern is that insisting on the 'uniqueness' of the Swedish system cements some of the problems by, in essence, accepting them as 'inevitable' rather than seeking ways to address them. Furthermore such a path-dependent and passive view will not guarantee that Swedish higher education institutions will be attractive, excellent and competitive institutions of research and learning in the rapidly changing global arena. In addition, Öquist and Benner (2012) show that 'unique' and idiosyncratic systems can and have been reformed in other countries, making them more open and quality conscious, thus illustrating that policy and institutional change is possible and, we would argue, necessary.

After two decades in which Swedish universities have expanded rapidly in terms of quantity, there is now a need for a qualitative transformation. In the future, it cannot be assumed that a continuous increased of research funding on its own will guarantee that Swedish universities will be competitive, attractive and world class. Addressing these challenges, and turning

them into strengths, will require a serious rethinking and redefinition of leadership, both academic and collegiate leadership, rather than a dogmatic insistence on maintaining or abolishing one or the other in their current form. What will be required are structural changes in several areas, for example, to ensure that education makes students employable and attractive in a future labor market.

Recommendations

Recruitment

1. Sweden should introduce a tenure track, starting at the assistant professor level, for faculty who combine outstanding research with high quality teaching.
2. An international search should be initiated for all tenure track positions. Those performing the selection should show evidence that the search performed was likely to reach virtually all potential candidates and that the person selected was the best for the position.
3. Only those who demonstrate consistent performance in both research and teaching should be promoted to tenure. At the same time, there should be a tenured position available for any person hired into a tenure track position who meets tenure standards.
4. Get more serious about ensuring mobility; The Swedish university system and the Swedish innovation system would benefit considerably from greater mobility of people, firstly among universities, secondly, between academia, industry and policymaking, and, thirdly, by attracting more students and faculty from abroad. In particular, more should be done to acknowledge the importance of relevant competence (from industry and public sector) for both teaching and research and to bring it into the universities. Bengtsson (2011) advocates that the number of ‘boundary spanners’, i.e. people who move between different sectors, be increased in the Swedish university system (p.51).

Funding

5. Sweden should modify its university funding mechanisms so that sufficient funds are provided for teaching and the tenure track system of Recommendation (1) is fully supported.

Enhancing the focus on teaching and on linking research and teaching

6. Strengthen the focus on teaching and on linking research and teaching by realigning teaching and research in all positions.
7. Carry out more systematic evaluations of teaching (at University level) and offer support for improvement of teaching skills.
8. Consider changing curricula to focus more on skills rather than specific qualifications or degrees.
9. Increase links between undergraduate and Masters education and research, involve undergraduate and graduate students more systematically in ongoing research.
10. Ensure that all universities' websites contain lists of each course being taught during the academic year. The listing should state who will be teaching it as well as the time and location at which it will be presented.

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Leadership

11. Strengthen leadership of academic institutions, by building durable structures from below (departments that join teaching, research and interaction) and by embedding and regulating these by supportive and visionary faculty and university leaders who support and sustain competitive recruitment and promotion strategies and entice strong academic leadership at all levels.
12. Rectors and pro-rectors must provide the leadership to drive the university towards excellence in both teaching and research.

Other

13. Acknowledge and allow for a greater diversity in the Swedish HEI landscape through a transparent, though diversified funding mechanism.

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Appendix 1: Characteristics of research universities¹¹

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1. The pursuit of excellence across all its operations, calibrated through informed, independent, disinterested assessments from peer organisations and individuals from outside the university; and a commitment to transparent, meritocratic systems for selecting faculty, staff and students, creating an internal environment that nurtures learning, creativity and discovery, and will unleash and develop the potential of its staff and students, both undergraduate and (post)graduate.
2. A major research effort which has both depth and breadth, producing internationally recognized research results which are broadly disseminated through publication, teaching and community engagement.
3. A commitment to research training, especially through PhD programs, which provides a continuing flow of highly competent and respected graduates (as assessed by researchers of international standing) who are able to advance the frontiers of knowledge and understanding and to contribute to national and international innovation and development across all sectors.
4. A commitment to teaching at both the undergraduate and (post)graduate levels, to produce broadly educated graduates able to contribute to the national welfare across a wide range of activities.
5. A dedication to the highest standards of research integrity and its associated ethical obligations, which ensures the probity of data collection, assessment and analysis independent of any considerations of funding source or of personal or institutional benefit, and which is supported by explicit and effective processes to investigate and respond to any allegations or perceptions of unethical research or behaviour.
6. The responsible exercise of academic freedom by faculty to produce and disseminate knowledge through research, teaching and service without undue constraint within a research culture based on open inquiry and the continued testing of current understanding, and which extends beyond the vocational or instrumental, sees beyond immedi-

11 'Hefei Statement', signed on October 9 by the Association of American Universities (AAU), the Consortium of China 9 Research Universities (C9), the Group of Eight Australia (Go8), and the League of European Research Universities (LERU). http://www.leru.org/files/news/LERU_AAUC9_Go8_Joint_Press_Release.pdf

- ate needs and seeks to develop the understanding, skills and expertise necessary to fashion the future and help interpret our changing world.
7. A tolerance, recognition and welcoming of competing views, perspectives, frameworks and positions as being necessary to support progress, along with a commitment to civil debate and discussion to advance understanding and produce new knowledge and technologies.
 8. The right to set its own priorities, on academic grounds, for what and how it will teach and research based on its mission, its strategic development plans, and its assessment of society's current and future needs; and the right to determine who it will hire and admit, including an ability to recruit internationally to attract the best people to achieve these priorities.
 9. A commitment to support its local and national communities and contribute to international wellbeing by taking actions and developing a culture which works to maximise the short and long-term benefits of the research and education it performs.
 10. An open and transparent set of governance arrangements which protect and support a continuing commitment to the characteristics that define and sustain world-class research universities, and, at the same time, assure that the institution meets its public responsibilities.

Appendix 2: mobility and recruitment – excerpts from recent evaluations of research quality at selected Swedish universities

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Weak mobility and recruitment systems:

GOTHENBURG UNIVERSITY (2010): Many of the RED10 panels were dismayed by the extent to which the processes of appointment, promotion and funding work against the University's ability to recruit internationally. This appears to work in both directions: Overall, there are relatively few hires of talent from outside Gothenburg, and it is unclear how many young post-doctoral researchers are able to obtain vital, formative experiences in the international research community.....Overall and across departments, recruitment of academic staff into the University of Gothenburg appears to be predominantly internal. There are notable and important exceptions to this rule, but it is our general view that internal recruitment is a trait that is too dominant to be healthy for the University. (p.17 and pp.21-22)

LUND UNIVERSITY (2008): We have been dismayed by the extent to which the processes of appointment, promotion and funding militate against the University's capacity to recruit from the international pool of talent and minimise the extent to which young post-doctoral researchers in particular feel free to obtain vital, formative experience in the international research community. This appears not to be a problem exclusive to Lund University, but a feature of the Swedish University system as a whole. (p.49)

KAROLINSKA INSTITUTE (2011): Recruitment is almost exclusively internal, which has led to inbreeding on a scale that would be unthinkable in most countries with an advanced science base. This problem is common in Nordic universities, but for an institution like KI, with global leadership ambitions and global reputation, much more could be done to tap the international talent pool more effectively. (p.20)

UPPSALA UNIVERSITY (2011): We were surprised at the extent to which the department appears to be dominated by its own alumni. Only one out of 40 teaching staff was previously not linked to the department at an undergraduate or PhD level, and frequently both...Similar to the situation in the KoFo7-evaluation, the vast majority of the faculty has pursued their scientific careers from undergraduate studies to professorships, except for the postdoctoral periods, at Uppsala University. (p.36)

Why is this a problem:

GOTHENBURG UNIVERSITY (2010): As the international and European research communities become ever more networked and increasingly work together in transnationally financed programmes requiring mobility, national structures that inhibit mobility constitute an ever more serious disadvantage ... An internal recruitment tendency clearly has negative consequences for innovation and credibility (that is the reputation of the University), and there must be a greater focus on recruitment from outside the University and preferably internationally. (p.17 and pp.21-22)

LUND UNIVERSITY (2008): As the international research community becomes better networked, as it increasingly works together on major international issues and programmes, and as the nascent European Research Area takes shape, with its proper emphasis on researcher mobility, national processes that inhibit mobility are becoming a national disadvantage. (p.49)

KAROLINSKA INSTITUTE (2011): Foreign scientists bring in much-needed fresh blood and new ideas, because inbreeding is clearly a negative phenomenon. This is not only an intuitive conclusion based upon experiences of genetic degradation in inbred population groups, but there is some empirical evidence to support it. (p.9)

UPPSALA UNIVERSITY (2011): Inbreeding is still prevalent in the Swedish university system. Research faculty should be encouraged to move between universities early in their career to enhance their experience... Undoubtedly, bringing in novel experience would contribute to the scientific milieu and is expected to increase the overall attractiveness of Uppsala University. Although the panel noticed that among the newest recruits, the number of scientists without Uppsala background is substantial, the panel recommends an extra effort to be put to attract faculty also from outside the 'Uppsala breed' to renew the university. (p.36-37)

Appendix 3: Stanford Independent Institutes¹²

EXPLORING FUNDAMENTAL SCIENCE

Geballe Laboratory for Advanced Materials (GLAM)

E. L. Ginzton Laboratory

W. W. Hansen Experimental Physics Laboratory (HEPL)

Kavli Institute for Particle Astrophysics and Cosmology (KIPAC)

PULSE Institute for Ultrafast Energy Science

Stanford Institute for Materials and Energy Sciences (SIMES)

PROTECTING OUR ENVIRONMENT

Stanford Woods Institute

Precourt Institute for Energy

UNDERSTANDING THE HUMAN CONDITION

Freeman Spogli Institute for International Studies at Stanford (FSI)

Center for the Study of Language and Information (CSLI)

Stanford Center on Longevity (SCL)

Stanford Humanities Center

Stanford Institute for Economic Policy Research (SIEPR)

Center for Advanced Study in the Behavioral Sciences

IMPROVING HUMAN HEALTH

Bio-X, the interdisciplinary program related to bioengineering, biosciences, and biomedicine

Spectrum (formerly the Stanford Center for Clinical and Translational Education and Research)

¹² <https://doresearch.stanford.edu/research-scholarship/interdisciplinary-laboratories-centers-and-institutes>