

CHAPTER 5

The social and political Responsibilities of research- intensive Universities: University Policies or Politics for Universities?

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INTRODUCTION

This paper attempts to come up with possible answers to the question: “What do universities consider to be their most important priorities and responsibilities in 1) addressing the challenges facing their institutions; and 2) expectations arising from their societies at the local, regional or global level?” Specifically, I wish to address some possible inconsistencies between a university’s strategy and external societal and political constraints.

During a recent visit by French university presidents to the Weizmann Institute, its president, Professor Daniel Zajfman, started his speech with a provocative sentence: “*We have no scientific strategy!*” Then he explained how, in their quest for excellence, he does not fix quotas, or abide to top-down plans. Of course, this is a strategy in itself, and a quite successful one. What he probably meant through this witticism is: “Our strategy is pragmatic and cannot be fixed top-down by external stakeholders.” It points out that the way academics conceive basic science and related education, and the way our governments or research organizations see it, are sometimes conflicting.

This paper will try to analyse some aspects of this gap between academic basic values and the way politicians and other external stakeholders consider them, or try to influence them, but also propose some tools and strategies that could bridge the gap.

THE DIVERSITY OF UNIVERSITIES: CHALLENGE OR ASSET?

My first assumption is that the answer to the basic question of this paper is highly dependent on the type of university. Universities are diverse by nature; this should be considered as an advantage, and one can speak about an academic ecosystem, even if this biological metaphor might be riskier than it seems. But is this diversity well known to external stakeholders, and is it perceived as an advantage when lobbying government, industry or philanthropists for academic interests?

I will thus concentrate here on the specific characteristics and responsibilities of the research-intensive university, and not attempt to generalize to other types of higher education institutions.

Universities are diverse by nature, but university-directed regulations are not

The public of the Glion Colloquium will find this assumption that universities are diverse as rather commonplace. However the politicians very often do not consider these differences as relevant. We thus have to remind them that universities will differ by many parameters such as the place and level of research, the importance of graduate education, the level of graduation, national and regulatory specificities, etc.

Unfortunately, in France, recent legislative changes concerning universities still have a uniform range, targeting the wide diversity of situations with only a single set of measures. For example, the budget allocated to universities is based on a single algorithm, whatever the specific profile of the university. The additional costs induced by research in research-intensive universities are not well taken into account. Even the basic notion of “research university” (see below) is seen as not acceptable by some unions or civil servants, precisely because it introduces diversity into the system.

The French strategy of pushing forward 10 world-level campuses through the “Excellence initiative” is probably the right one. However there was a major flaw in this national policy. It led to “forcing” small universities, engineering schools or other *grandes écoles* to join these federations under a single model, without having the courage to redefine their roles, their goals or their assets.

Decision-makers lack information and cultural knowledge about universities

National or international policies that affect directly the life of universities are sometimes designed or supervised by people that do not have the clear answer to some basic questions such as: What is a university? What types of universities exist? And, even more obviously: what are universities for? In France, this is in part caused by the fact that high-level civil servants have for the most part *not* been trained in universities! Also, the French government counts only about 50% university graduates (the others are from *grandes écoles*), and not one single Ph.D!

Science advisors or advisory boards could provide this information to decision-makers (for a recent review, see Wilsdon & Doubleday, 2015). They can play a key role in improving policy-making in relation to science and research, by contributing independent expert advice. They exist in many countries (U.K., Scotland, U.S., India...). European academics have sometimes looked with envy at the U.S. situation, beginning in 1933 with President Franklin D. Roosevelt's Science Advisory Board, where each U.S. President has established an advisory committee of scientists, engineers and health professionals. But Pielke and Klein (2009) have regretted "a long-term decline of the influence of the president's science advisor, while, at the same time, the importance of expertise to government has increased tremendously". This is exemplary of the general opinion considering that the issue is now too important to be left to a single advisor.

On the other hand, the position of science advisor is only theoretical in France. Academics have been present in the cabinet of most French ministers, but their number has recently gone down.

The recent debate on this subject within the European Commission also illustrates the complexity and importance of this issue. Jean-Claude Juncker had first abolished the position of Chief Scientific Advisor to the President of the European Commission. This had sparked a vast movement of protest in the academic community. Finally, the Commission proposed to create a new "Scientific Advice Mechanism" (SAM), aiming for an integrated approach to science-based E.U. policy-making (Wilsdon & Doubleday, 2015).

Clearly, stakeholders have to drive the agenda, and we have to design efficient strategies to embed science into the democratic process.

Can research-intensive universities speak globally in defence of universities?

Lacroix and Maheu (2015) have recently reviewed some criteria, especially those of the Carnegie Foundation, that define research universities:

- offer a broad and rich array of undergraduate studies. These form the base of their diversified pyramid of teaching programs,

- show a peak of their teaching pyramid that reflects the weight they assign to teaching at the upper graduate level,
- award a certain number of Ph.D.s every year,
- carry a large amount of basic research, and are able to secure for that activity significant amounts of research grants.

It is clear that most universities in the world are *not* research universities. Thus we should question the fact that they are sometimes (including by us) seen as the gold standard, towards which all universities have to aim. This is a major mistake that has a strong negative impact on academic policies, but also national policies. The research university is essential in a national academic network, but this model is *not* a universal paradigm. We require political strategies that give more consideration to the rich variety of the universities in a given country.

The Glion Colloquium is mainly concerned with research-intensive universities, which have a specific approach to these matters. Precisely because of their widespread interests and capacities, research universities also have a leading role for the global academic community. They should stand up as leaders in the defence and promotion of academic values, of university diversity, and of the global role of universities in our society. Along these lines, the League of European Research Universities (LERU) has always advocated global academic values, instead of just lobbying for its own members.

THE POLITICAL DEFENCE OF UNIVERSITIES

Philanthropy

Leszek Borysiewicz (2015) addresses this point in detail during this meeting. My purpose here is just to underline the political and even strategic role of philanthropy, which can complement, or even sometimes replace, a flawed political system. This has been summarized by Rohe and Hausmann (2015): “As forces of a pluralistic democratic society, foundations are able to introduce subjects to the political agenda that require treatment and yet may be familiar to only a few experts, or are perhaps ignored because they are politically inconvenient”. This is precisely one of the points raised by Borysiewicz: “Funders (...) can afford to engage in a relationship driven less by financial calculations or time pressures, and more by a shared sense of purpose”.

Many of the top U.S. universities were founded through philanthropy, such as the University of Chicago in 1890 by John D. Rockefeller, Stanford University in 1890 by Leland Stanford and Carnegie Mellon University in 1900 by Andrew Carnegie. On the other hand, most of our European universities are public, and do not (yet?) rely on philanthropy to provide their core resources. In such a situation, philanthropy cannot (and should not)

substitute for public funding, but it can help universities to be ambitious about what they want to achieve (LERU, 2014).

Thus philanthropy is not just a question of money; it was historically based on strong beliefs by the donors that they were doing something essential for the future of their country. In present times, the level of philanthropy also reflects quite accurately how issues and values carried by universities are shared by the general public, and is a good indicator of the public's and stakeholders' general interest in universities.

The level and acceptance of philanthropy are not equivalent in different countries. French universities certainly have a long way to go, when you consider that the University of Strasbourg is proud to lead the pack with a record four-year first campaign that raised 22.5 million euros, with a third as endowment. These figures are of course very far away from those achieved in many European and, of course, American universities. But we are mostly proud of the new and wider relationship this campaign has created with the public, a benefit that goes far beyond the amounts that were raised. This will be certainly a major benefit of this campaign.

Are universities a political issue or should they be?

The study "Research Universities and the Future of America" (National Research Council, 2012) highlights some threats to the future of top U.S. research universities and to the prosperity and security of society. The basic line of this paper is to reaffirm the central role of research universities. It starts with a very direct statement: *"Our nation's primary source of both new knowledge and graduates with advanced skills continues to be our research universities. However, these institutions now face an array of challenges (...). It is essential that we as a nation reaffirm and revitalize the unique partnership that has long existed among research universities, the federal government, the states, and philanthropy, and strengthen its links with business and industry."* It supports, in part, the idea that the high level of excellence attained by U.S. research universities is the result of national policies, which can indeed profoundly and durably shape the academic landscape: *"America's research universities, through education and basic research, have emerged as a major asset (...). This did not happen by accident; it is the result of prescient and deliberate federal and state policies that have powerfully shaped these institutions"*.

In this situation, the role of the academic community is essential (through reports, lobbying etc.), in order to provide inspiration to decision-makers, and suggest directions for action. But we rely also on the personal beliefs and commitment of first-rank politicians.

Our colleague James Duderstadt has just been awarded the prestigious Vannevar Bush Award from National Science Board (NSB) (2015).

Duderstadt said: *“It is a great honour to receive this award named for Vannevar Bush, who defined the role of the American university in serving the needs of this nation through science and technology(...).”* Vannevar Bush indeed helped establish federal funding for science and engineering as a national priority, and played a pivotal role in the creation of the National Science Foundation. It is not in my capacity to comment on Bush’s detailed proposals and plans. As a European academic, I am clearly not familiar with his legacy; I could, however, say that France, and maybe even Europe, has not often had the chance to benefit from a similar political vision.

The state of Israel was founded in 1948, which is much later than some of its main research-intensive academic institutions such as the Technion (1912), the Hebrew University (1918) or the Weizmann Institute (1934). This is not to say that science or technology necessarily determine history and the creation and destiny of nations; it is just to underline that pioneers such as Haim Weizmann or Albert Einstein wanted research universities to be the cornerstone of the new nation. And apparently they succeeded, at least on academic matters. For example, Israeli institutions lead the pack in their ability to secure competitive European research funds such as the ERC.

Which leads us to Europe. One could think that the old Europe, where universities were born, where the widespread model of the Humboldtian university originated, would be built upon the same basic values and the same visionary spirit that Haim Weizmann or Vannevar Bush had for their country. However we know that the European Union was first built from a major political idea (bring permanent peace after two bloody wars), but upon an economical platform (“coal and steel community”). It created a “common market” aimed at economic expansion, growth of employment and a rising standard of living, not a “common campus”. More than 60 years later, the founding values are still valid, but we know that neither steel nor coal can be pointed as Europe’s assets. Europe is now pushing for the establishment of a European research area (ERA). But support for universities and research has not really replaced coal and steel as a first-row goal for the European Commission.

Europe is, on this subject, at a crossroads. We do have a Commissioner for research, Carlos Moedas, who is indeed very supportive of the cause of a major role of universities in the construction and wealth of Europe. But he has no role for the supervision of higher education, which is under the dependence of another official, the commissioner for education. Moreover, the commissioner is under political control of the Vice-President for Jobs, Growth, Investment and Competitiveness. With some exaggeration, this could be interpreted as: “Higher education and research are here to serve economic growth and competitiveness, but they are not a primary objective”.

One recent episode supports this point of view. One of the main projects of the Commission is EFSI (European Fund for Strategic Investments), a major

investment plan designed to boost European economy (so called “Juncker plan”). It is a very ambitious plan that could foster jobs, growth and innovation, but which requires significant contributions from many parts of the European budget. Cuts of 2.7 billion € from the Horizon 2020 budget were therefore decided, including contributions from major and valuable research tools such as the European Research Council (ERC) and the Marie Skłodowska-Curie system, which are exemplary funding mechanisms for basic science. The European Commission or the national finance ministers saw nothing to say to this, while it clearly meant that long-term support for basic science could be sacrificed for the benefit of more short-term economical development. Thanks to continuous action of many stakeholder organizations, the European Research Council and the Marie Skłodowska-Curie scheme have finally been safeguarded, but it remains clear, as LERU communicated to the press, that “*it is a bad and wrong signal, one year after the launch of Horizon 2020, that 2.2 billion € is plundered from its budget. The daily rhetoric about investments in research and innovation has a very cynical ring to it.*” (LERU, 2015a).

Universities as political actors?

If we want the university to remain (become?) a major political issue, we should stimulate academic personnel to participate widely in the public debate and not remain in the “ivory tower”. As stated by Boulton and Lucas (2008) in the LERU paper “What are universities for?": “*It is timely that this aspect of university capacity should be better cherished and rewarded by the universities themselves and recognized and supported by government. The increasing priority for ‘evidence-based’ public policies depends on access to a wide range of specialists, many based in universities, and the willingness of academics to be called upon for advice and involvement in the policy process.*”

We see, for example, that, at the University of Strasbourg, the creation of the position of Vice-President in charge of “Science and society” has been very productive in creating new types of dialogue with external stakeholders, private, institutional or corporate.

THE ROLE OF RESEARCH-INTENSIVE UNIVERSITIES IN THE INNOVATION/TECHNOLOGY TRANSFER SCENE

Universities and economy: a complicated relationship

The present European situation shows too well that universities are now expected to deliver, in a short-term time frame, economics goods, employment and innovation. For some politicians, this role on the innovation-technology transfer scene is now considered as our major (only?) task and duty for

the society. In this sense universities are sometimes just seen as “innoverities” (Lucey, 2014).

Of course we do not reject this responsibility. We all know that universities have a major duty in the economic field. Economic achievements by research-intensive universities have been numerous. But, precisely, it is the success of these endeavours that now puts us at risk of seeing our basic goals and duties being neglected by political authorities. As was stated by Boulton and Lucas (2008): “Universities are not just supermarkets for a variety of public and private goods that are currently in demand and whose value is defined by their perceived aggregate financial value. We assert that they have a deeper, fundamental role that permits them to adapt and respond to the changing values and needs of successive generations, and from which the outputs cherished by governments are but secondary derivatives. To define the university enterprise by these specific outputs, and to fund it only through metrics that measure them, is to misunderstand the nature of the enterprise and its potential to deliver social benefit.”

It is not the purpose of this paper to analyse in detail how research-intensive universities have a direct and positive influence on the economy. Other speakers will have a more detailed and documented view on this matter. But we can ask ourselves why this goal is now so much overrated, and if there are some solutions.

First we have to look at our own flaws. It is true, especially in France, that some academic circles have treated with great contempt the possibility that their intellectual production could, or should, have any effect on the national or global economy. They showed the same contempt for any demand about the effect of the education they provide on the future professional status of their students. The French situation on this matter is even made worse by the existence of the *Grandes écoles*, engineering schools that train most of the top executives of major French companies, and that consider the field of the economy as their own preserve (“*chasse gardée*”). This has also led to the fact that the managers and government officials have sometimes looked down on the societal role of universities, thinking that they are a necessary evil, train only teachers, are a source of civil trouble, but certainly not an asset for society outside the service to universities themselves.

Return on investment: do we have the data?

We all feel, more or less spontaneously, that allocating resources to higher education and research delivers a high return on investment to society. We need strong messages such as the one delivered recently by Drew Faust, president of Harvard University, at the World Economic Forum: “*Higher education is essential for a thriving society: it is the strongest, sturdiest ladder to increased socio-economic mobility.*” (Faust, 2015).

But strong messages are not enough, we also need data! We suspect, or at least wish, that the economic return of universities is several fold the value of the public funds allocated, since universities produce much of the human and intellectual capital that is the source of indigenous economic growth.

There are many sources of economic impact of universities, but politicians seem to narrow their attention to only a few, such as the number of spin-off companies, hoping for their own Silicon valley. There are many other fields for this economic return, such as graduate productivity benefits, or shorter term impacts such as spending by staff and students in the local economy and support for other sectors (such as tourism and construction). Some long-term benefits are often overlooked, because the politician wants results for the next election. The positive image that a major research-intensive university casts upon its local community is also very valuable and can yield significant indirect economical returns.

But this discourse should be based on evidence, rather than anecdotes. Therefore, to defend our case, we should rely on scientific data, not just on opinion papers, even if issued by a group of distinguished university presidents! This is not an easy task. Actual methodological approaches of impact studies may have many pitfalls, as pointed by Siegfried *et al.* (2006): "*If these economic impact studies were conducted at the level of accuracy most institutions require of faculty research, their claims of local economic benefits would not be so preposterous, and, as a result, trust in and respect for higher education officials would be enhanced.*" This is why we need to increase the number of studies of the impact of research universities on our society, such as Star Metrics, a U.S. project to create a repository of data and tools that will be useful to assess the impact of federal R&D investments (Lane & Bertuzzi, 2011).

LERU has recently commissioned a study of the economical impact of its members. Briefly, the study estimates that in 2014 the 21 LERU Universities generated a total economic value of €71.2 billion in GVA and 900,065 jobs across Europe. For each €1 in GVA directly generated by the LERU Universities, there was a total contribution of almost €6 to the European economy and every job directly created by the LERU Universities supported almost six jobs in the European economy (LERU, 2015b). Even if we are not totally confident about these figures, this is the type of data we need to convince external stakeholders that universities are not an expense, but an investment.

INNOVATIVE TOOLS FOR STRATEGIC LEVERAGE

Because of their prominent role, universities are now confronted with demands from the society and decision-makers that do not always fit with their values and strategies. Research-intensive universities are, for the most, considered to be able to respond to global or national issues, while vocational institutions

would have a stronger local importance. However, as was mentioned by Lacroix and Maheu (2015): “*When government regulation is joined with preponderant, even quasi-exclusive, public funding of universities, its influence is much more constraining and ubiquitous, with serious strategic fallout*”. To be able to resist to this “top-down” pressure, universities can rely on their fundamental values, but also make optimal use of innovative tools.

These innovative tools, designed by governments, can indeed represent major cornerstones for the development of the role of universities and research in our society, by providing a unique platform for strategy development. I will only cite two examples.

Excellence funding schemes, focused on the development of wider institutional strategies, have been implemented in many European countries (Bennetot-Pruvot & Estermann, 2015). For example, the “excellence initiative” program in France has been designed to allow both a competitive research strategy *and* new cutting-edge research. This program is exemplary of possible complementary approaches of national and university policies. For the university of Strasbourg, it is one of our main tools to fulfil our external responsibilities. There are two “magic ingredients” in this program: long-term financing through a public endowment mechanism, and a great degree of freedom for strategic choices.

The European Research Council (ERC), which provides generous individual grants for basic research, is another example of these innovative tools. One of its main qualities is that it is open to any topic, and remains light on bureaucracy. “*The ERC has become a recognised success of the 7th Framework programme, having established itself as an indispensable component of the European Research Area with a high reputation for the quality and efficiency of its operations*” (ERC, 2011). This is certainly why the scientific community was recently so active in lobbying against the planned budget cuts on this program.

It is interesting that Jean-Pierre Bourguignon, president of ERC, is now speaking about the idea of transforming the ERC into an endowment-based agency, precisely to be less dependent on political variables, and to secure its financing over the long time frame that is intrinsic in the ERC’s goal and duties.

What those two examples stress is that top-down policies for research-intensive universities can be successful only if they use trust as a basic value, building on the autonomy that universities should all be granted. Money without trust and autonomy will not reach the goal. A striking example is that the flux of governmental funding and strong top-down incentives are still not enough for Chinese universities to reach the top level, because, as pointed out by Rhoads *et al.* (2014): “*(...) limitations in the area of academic freedom posed one of the most significant barriers to the nation’s leading universities joining the elite of the world*”. These authors also point out to the problem of “*(...) imposing a research culture from above and not at the same time growing it from below*”.

CONCLUSION: PLAYING THE GAME WITH RULES AND STYLE

The second Glion declaration summarized the social compact of universities, which is discussed in this paper: “Universities must reaffirm and continue to fulfil their role in the unwritten social compact by providing new knowledge, educated leaders, informed citizens, expert professional practitioners, services and training, as well as individual certification and accreditation in these fields. In exchange for the responsible and effective provision of these services, society supports higher education, contributes to its finance, accepts its professional judgment and scholarly certification, and grants it a unique degree of institutional autonomy and scholarly freedom” (Rhodes, 2009).

This declaration of principles, to which all can adhere, is too often questioned by universities and governments alike; both sides can show a tendency to put their own interest and priorities forward, and try to force the other party to abide to them. To avoid this situation, universities have to go forward and explain their positions to external stakeholders, staying away from the academic arrogance that is sometimes so common (Weber, 2015). This positive attitude could use some of the tools and arguments described in this paper, and summarized in Table 1.

Universities have apparently nothing to do with football. However this metaphor may reveal a parallel between both worlds. Heldin (2008) had written that ERC (one of the tools described in this paper) “*will create a ‘Champion’s League’ for Europe’s scientists*”. This prediction came true; but one should remember that those teams playing the Champion’s League also have a responsibility to set an example, so that smaller clubs play the game with pleasure, while respecting the rules.

Professional football, with its extraordinary commercial stakes, should still rely on basic human values, just like universities. Arsène Wenger, manager of Arsenal football club in London, is an alumnus of the University of Strasbourg, where he graduated in economics. He said in recent a interview on BBC: “*I believe that our sport has moved forward a lot on the technical side, on the physical side, on the tactical side but as well we must not forget the values that our sport carries through the generations... I believe big clubs have a responsibility to win, but to win with style.*” (Wenger, 2015). Probably, research universities have the same responsibility.

Table 3: Summary/recommendations

1. Universities are diverse by nature, this should be considered as an asset. A national university policy aimed at “one for all” model is doomed to failure, as would be the ambition of all universities in a country to become world academic leaders.
2. No national university system can develop without a stable core of ambitious research universities, carrying innovative strategies.
3. Economical and societal impact of universities are not just political issues, they are part of academic duty. It is our responsibility to sponsor research and teaching on economical and societal impact of universities.
4. The future of European research universities stands clearly in ambitious, specific European policies, designed at making those universities one of the major assets of the continent
5. Science/academic advisors or advisory committees should counsel decision-makers. Academics should show high motivation to participate in these activities.
6. A national, and even more a European policy should be based on two major complementary ingredients: trust and autonomy.

REFERENCES

- Abbott, A. (2015). “European Commission unveils long-awaited science advice plans”. *Nature Breaking News*, Available from: <http://www.nature.com/scd-proxy.u-strasbg.fr/news/european-commission-unveils-long-awaited-science-advice-plans-1.17557> [Accessed: 19 August 2015]
- Bennetot-Pruvot, E. & Estermann, T. (2015). “Define Thematic Report: Funding For Excellence” [Online] Available from: http://www.eua.be/Libraries/Publication/DEFINE_Funding_for_Excellence.sflb.ashx [Accessed: 19 August 2015]
- Borysiewicz, L. (2015). “The importance of philanthropy”, in: Weber, L. E. Duderstadt, J. J. (eds) *Glion colloquium Series No 9*. London, Paris and Geneva (this book.)
- Boulton, G. & Lucas, C. (2008). “What are universities for?” (LERU paper). Available from: [http://www.leru.org/files/general/What%20are%20universities%20for%20\(September%202008\).pdf](http://www.leru.org/files/general/What%20are%20universities%20for%20(September%202008).pdf) [Accessed: 19 August 2015]
- ERC (2011). European Research Council Task Force. Final report. [Online] Available from: http://erc.europa.eu/sites/default/files/document/file/erc_taskforce_report_2011.pdf [Accessed: 19 August 2015].
- Faust, D.G. (2015). 3 forces shaping the university of the future. *World Economic Forum* [Online] Available from: https://agenda.weforum.org/2015/01/three-forces-shaping-the-university-of-the-future/?utm_content=buffer011b7&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer [Accessed: 19 August]
- Heldin, C. H. (2008). The European Research Council — a new opportunity for European science. *Nature Reviews Molecular Cell Biology* 9, 417-420.
- Lacroix, R. & Maheu, L. (2015). *Leading research universities in a competitive world*. McGill-Queens University Press.

- Lane, J.I. & Bertuzzi, S. (2011) Measuring the results of science investments. *Science* 331 pp. 678-680.
- LERU (2014). Philanthropy at research-intensive universities. Available from: http://www.leru.org/files/publications/LERU_note_Philanthropy_at_research-intensive_universities.pdf [Accessed: 19 August 2015]
- LERU (2015a). *Press release. EFSI: Stalemate avoided, time to get down to business* [Online] Available from: <http://www.leru.org/index.php/public/news/efsi-stalemate-avoided-time-to-get-down-to-business/> [Accessed: 19 August 2015]
- LERU (2015b). *Press release The economic impact of LERU universities* [Online] To be published 7 Sept, 2015
- Lucey, B. M. (2014). "Why the rush to replace Universities with Innoversities...?" [Online] Available from: <http://brianmlucey.wordpress.com/2014/07/12/why-the-rush-to-replace-universities-with-innoversities> [Accessed: 19 August 2015]
- National Research Council (2012). *Research Universities and the Future of America: Ten Breakthrough Actions Vital to Our Nation's Prosperity and Security*. The National Academies Press, Available from: http://www.nap.edu/catalog.php?record_id=13299 [Accessed: 19 August 2015]
- National Science Board (2015). *Press Release 15-050 James Duderstadt is NSB's 2015 Vannevar Bush awardee* [Online] Available from: http://www.nsf.gov/nsb/news/news_summ.jsp?cntn_id=134981 [Accessed: 19 August 2015]
- Pielke, R. & Klein, R. (2009). The Rise and Fall of the Science Advisor to the President of the United State. *Minerva* (47) pp. 7-29 (2009).
- Rhoads, R. A, Wang, X., Shi, X. & Chang, Y. (2014). *China's Rising Research Universities*, Johns Hopkins University Press, Baltimore.
- Rhodes, F. (2009). The second Glion declaration [Online] Available from: <http://www.glion.org/?p=736> [Accessed: 19 August 2015].
- Rohe, W. & Hausmann J. (2015). "The role of foundations at the science — policy interface" in: Wilsdon, J. & Doubleday, R. (eds.) (2015), *Future Directions for Scientific Advice in Europe*. Centre for Science and Policy, University of Cambridge, Available from: <http://www.csap.cam.ac.uk/projects/future-directions-scientific-advice-europe/> [Accessed: 19 August 2015]
- Siegfried, J., Sanderson, A. & McHenry, P. (2006). *The Economic Impact of Colleges and Universities*; Department of Economics, Vanderbilt University Working Paper No. 06-W12, [Online] Available from: <http://as.vanderbilt.edu/econ/wpar-chive/workpaper/vu06-w12.pdf> [Accessed: 19 August 2015]
- Weber, L. (2015) *L'université au XXI^{ème} siècle*. Economica, Paris, pp. 104-105.
- Wenger, A. (2015), Interview on BBC's World At One, [Online] Available from: <http://www.goal.com/en-gb/news/2896/premier-league/2015/05/28/12165592/big-clubs-have-a-responsibility-to-win-with-style-wenger> and <http://www.bbc.co.uk/programmes/p02s7w79> [Accessed: 19 August 2015]
- Wilsdon, J. & Doubleday, R. (eds.) (2015). "Future Directions for Scientific Advice in Europe". Centre for Science and Policy, University of Cambridge, Available from: <http://www.csap.cam.ac.uk/projects/future-directions-scientific-advice-europe/> [Accessed: 19 August 2015]