Science and the corporate agenda: The detrimental effects of commercial influence on science and technology[1]

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Overview

Links between science, technology and business are numerous. It is no secret that these links are increasing in number and extent, a reflection of the growing role of science and technology in the drive for competitiveness between the leading economies. Both governments and business assert that this close relationship is generally positive for science and technology on the one hand and society on the other. However, there is growing evidence that this relationship brings with it a range of detrimental effects. This study examines how significant such effects are, how they manifest themselves and where their impact is felt.

We investigate these effects in five industrial sectors: pharmaceuticals; tobacco; military/defence; oil and gas; and biotechnology.

This study approaches the issue primarily from a UK perspective, while drawing on a wide range of sources. In particular, we critically examine the extensive range of government policy initiatives over the last 20 years that have driven much closer links between business and the universities in the UK. Given the transboundary nature of science and technology, we cast a wider net when examining the five industrial sectors, taking account of experiences in the USA – where commercial involvement in academia is more extensive – as well as in some other European countries. We make recommendations for tackling the problems that we identify.

The march of commercialisation

Over the past 20 years, in the UK (and other leading industrialised nations), there has been a concerted effort by policy-makers and commerce to increase the links between business and academic

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science. There have been numerous reviews, white papers and other policy documents arguing that these closer links will improve economic competitiveness and have broader benefits for society. This has led to a swathe of new initiatives, funding programmes and other measures to stimulate these links – from the 1993 White Paper, *Realising our potential*, to the ten-year science and innovation strategy launched in 2004, and most recently the creation of the Department for Business, Innovation and Skills whose responsibilities include science and universities. One recurring theme in these initiatives is the concerted attempt to encourage universities to behave like businesses themselves, and institute a 'corporate' mindset, undermining the traditional ethos of openness, objectivity and pursuit of knowledge.

The sectors

The five industrial sectors covered in this report are large-scale users of science and technology in the UK and internationally. Many of the leading companies in these sectors have strong links to universities. All five of the sectors have been the subject of at least some in-depth independent research of the effects of their activities.

The pharmaceutical industry is the largest private funder of R&D both in the UK and globally. Two of the world's top five companies in this sector are based in the UK. There are extensive links between the industry and academia. While the sector contributes important health benefits, there have been numerous criticisms about the problems associated with their involvement in the research process. These criticisms come from a range of sources, including peer-reviewed academic studies, medical practitioners, researchers and policymakers.

Despite its apparently narrow product base, the tobacco industry is very large, not least because of the recent expansion of its markets in poorer countries. The leading companies in this sector include two based in the UK, British American Tobacco and Imperial Tobacco. The industry has a long and controversial association with health research. Documentary evidence spanning many decades – including company files recently made public – reveal that there have been some very serious detrimental effects due to commercial involvement.

The military/defence industry is a powerful player in science and technology. The UK is home to the world's second largest arms company, BAE Systems. The industry receives high levels of government funding to carry out R&D often in-house, but also within universities. UK government and commercial initiatives in recent years have led to an increase in military involvement in UK universities. The effects of this industry on the research process have only received

limited attention from academics. However, studies by Scientists for Global Responsibility and others have revealed a range of problems related to the industry's involvement in science and technology.

The oil and gas sector is the world's largest industrial sector, with the top five companies earning revenues of nearly £1 trillion in 2008. The UK is home to two of the top five companies in this sector. There are strong links between oil companies and numerous universities in the UK, especially in disciplines relevant to fossil fuel extraction such as geology and chemical engineering. There has been limited academic research on problems related to the influence of the oil companies on R&D. Nevertheless, there is some strong evidence of detrimental effects, especially concerning ExxonMobil's promotion of 'climate scepticism' – the view that scientific research on the threat of climate change is flawed.

Biotechnology is a complex area which raises numerous ethical issues. The biotechnology industry has expanded rapidly in recent years, with the support of major pharmaceutical, chemical and agricultural companies. This has led to a strong focus within agricultural and health R&D on gene-based technologies, including most controversially genetically modified (GM) crops. A close relationship has developed between the industry and academics in the sector, leading to much criticism. Although there is dispute over the scale of the problems in this sector related to commercial involvement, there remains significant evidence of detrimental effects.

The detrimental effects of the commercial influence on science and technology

The main concerns about commercial influence on science and technology uncovered by this study and presented in detail in this report are:

1. There is clear evidence that large-scale, commercial involvement in university-based science, engineering and technology has impacts that can be very detrimental, such as the introduction of significant bias and the marginalisation of work with clear social and environmental benefits. These impacts occur at different levels, including during individual research studies, the agenda-setting process for R&D, and communication of findings to fellow professionals, policy-makers and the public. While academic examination of these impacts has so far been limited, there is nevertheless credible evidence of serious problems across all the five sectors examined in this study.
2. At the level of the individual research study, we found the following problems:

(a) Direct commercial funding of a research study increases the likelihood that the results will be favourable to the funders. Evidence of this mainly came from academic research in the pharmaceutical and biotechnology sectors. One way in which this bias – known as sponsorship bias – happened in the cases under examination was that funders tended to choose scientists who were already sympathetic to their viewpoint. Intentional distortion or suppression of data was much less common, although it did occur, especially in pharmaceutical and the tobacco funded areas, and it may well be more prevalent.

(b) Openness in research can be compromised through the use of commercial confidentiality agreements (including patents) and other intellectual property rights considerations. We found evidence for this in the pharmaceutical and biotechnology areas, but such problems may well be evident at the individual level across other areas in science and technology, which have not been scrutinised as yet.

(c) Conflicts of interest of scientific researchers (for example, financial interests) have the potential to compromise the research process. There is limited monitoring or policing of the problem, so its true extent is unknown. We found evidence of this problem in the pharmaceutical, tobacco and biotechnology sectors.

3. At the level of setting the priorities and direction of R&D, we found the following problems:

(a) Economic criteria are increasingly used by government to decide the overarching priorities for public funding of science and technology, in close consultation with business.

(b) Universities are being internally reorganised so that they behave more like businesses, while key attributes of the academic ethos such as openness, objectivity and independence are being seriously eroded.

(c) Companies have expanded the number and range of partnerships with universities, focusing on business research priorities and goals. The power and influence of some corporations, and the increased pressure on researchers to bring in funding from business, means that academic departments are increasingly orientating themselves to commercial needs rather than to broader public interest or curiosity-driven goals. This is a trend

especially evident in biotechnology, pharmaceutical, oil and gas, and military partnerships.

(d) The growing business influence on universities is resulting in a greater focus on intellectual property rights (including patents) in academic work. Hence knowledge is increasingly being 'commodified' for short-term economic benefit. This can undermine its application for wider public benefit, and produces a narrow approach to scientific curiosity.

(e) A high degree of business interest in emerging technologies, such as synthetic biology and nanotechnology, leads to decisions about these powerful technologies being taken with little public consultation. This is of particular concern because of the major uncertainties regarding these technologies, including the possibility of detrimental health and environmental impacts which they may produce.

(f) There are particular problems within the five sectors examined in this report:

(i) In terms of the scientific response to ill-health, the influence of the pharmaceutical industry can, for example, marginalise investigation of lifestyle changes as a method of disease prevention, or lead to a focus on disease treatments for wealthier communities able to pay for them rather than the more common global diseases.

(ii) In terms of the scientific response to food security, the influence of the biotechnology industry can lead to unjustified focus on high technology approaches to increasing crop yields rather than investigating lower-cost agricultural options or addressing wider problems of food distribution or poverty.

(iii) In terms of the scientific response to climate change, the influence of the oil and gas industry can lead to a focus on fossil fuel-based technologies or controversial biofuels rather than controlling energy demand, increasing efficiency, or a more rapid expansion of widely accepted renewable energy technologies.

(iv) In terms of the scientific response to security threats, the influence of the military/defence sector in science and engineering can drive an undue emphasis on weapons and other high technology approaches, rather than one that prioritises negotiation, arms control treaties, and other conflict resolution or prevention activities.

4. At the level of communication with policy-makers and the public, we found the following problems:

   (a) If threatened by emerging scientific evidence about the health or environmental problems related to their industry, some of the larger companies are willing to fund major public relations campaigns aimed at strongly encouraging policy-makers and the public to support their interpretation of the scientific evidence (even if it is far from that endorsed by most scientists). Tactics uncovered here include funding lobby groups (sometimes covertly) to act on their behalf and presenting industry as being for 'sound science' and opponents as 'anti-science'. Evidence of these practices is especially strong in the tobacco and oil and gas sectors, with some evidence from the biotechnology sector too. Companies more willing/able to diversify from problematic product lines were found to be less likely to take this course of action.

   (b) Some companies can be selective in their reporting of academic findings of efficacy or safety of a newly launched product. This 'marketing bias' was found especially in data from the pharmaceutical and biotechnology sectors.

   (c) Some sections of the pharmaceutical industry 'expand' the definition of human disorders and fund patient-interest groups, which help to increase the market for their products. This can compromise both patient care and the underlying scientific basis of medicine.

Main recommendations

Our recommendations specifically focus on reforms that are relevant across the science and technology sector in the UK. They are:

1. Universities should adopt minimum ethical standards for the companies with which they have partnerships. These standards should include social and environmental criteria, as well as academic criteria and should be overseen by a special committee.
2. Universities should openly publish comprehensive data on the nature of their business partnerships.
3. A new independent organisation should be set up to disburse a significant fraction of business funding for scientific research. The aim would be to fund research which has particular public interest (and includes those areas being neglected by mainstream funding sources). The steering committee of the organisation would include representatives from a range of stakeholders.

4. Business and civil society organisations should undertake more joint work on public interest scientific projects. This could be facilitated by the Research Councils.
5. All academic journals should develop and implement rigorous processes for dealing with potential conflicts of interest, including suitable sanctions for non-compliance.
6. An open register of interests should be set up for academics, particularly those working in controversial areas of science and technology.
7. Advocacy groups on all sides of debates in science and technology (including professional institutions) should publicly disclose funding sources, to allow the public to decide potential sources of bias.
8. University ethical policies on partnerships with business should cover openness and accuracy related to any involvement in science communication activities.
9. More academic research needs to be conducted into the potentially detrimental effects of the commercialisation of science and technology, especially within universities.
10. The newly formed Department of Business, Innovation and Skills – which has responsibility for both universities and science – should be broken up. Public interest science and the universities should be given greater prominence in the government hierarchy.
11. The House of Commons Committee on Science and Technology should investigate the current emphasis on commercialization within science policy, and whether a balance is being achieved between business and the wider public interest.
12. Public involvement in the governance of science and technology should be expanded in a number of ways, drawing on recent experience of policies and activities in this area.
13. Research Councils and other major public funders of scientific research and teaching should have more balanced representations on their boards and committees between business on the one hand and civil society on the other.
14. Steps should be taken to ensure that a balance is struck between the commercialisation of emerging technologies and wider social and environmental impacts. This could include: the setting up of a Commission on Emerging Technologies and Society; the allocation of adequate levels of funding to examine the broad impact of such emerging technologies and make recommendations on their management; and the wider implementation of ethical codes of conduct for researchers.

15. The Sustainable Development Commission should have its remit broadened specifically to cover the role of science and technology in contributing to sustainable development.
16. There needs to be a thorough review of the role of the university in society and the economy – perhaps in the form of a Royal Commission. This needs to include issues ranging from the degree of involvement of business and civil society to patenting policy.

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