

# THE IMPORTANCE OF SCIENTIFIC RESEARCH



## **Bleak prospects**

Today I take a break from my usual blogging on scientific research to highlight an issue of more immediate concern: the threat to the scientific infrastructure in the UK and elsewhere.

The 2007/2009 recession hit us all. Those that own houses had their value reduced. Those that are just about to finish university have to worry about possibly being part of a lost generation of highly educated graduates not being able to find employment. Those that always had to struggle making ends meet are affected by savings to government services and by problems arranging bank credits. And some of our governments now find themselves in deep budget deficits.

This is the broader reason why some governments, like the US, like Japan, like the UK, are now considering cuts to their budget. In the UK, the situation is

particularly severe, and this is why here I like to focus on this example even though the same principles would apply elsewhere as well.

The UK government aims to implement a cut of 25% in overall government spending across all areas, even though out of a total annual government budget of about 670 billion pounds, science has only a share of 6 billion. The implications could be severe. A scenario where the science budget is cut by 20% has been described by a Royal Society analysis as “game over”.

### **Why science is important**

If we really want to cut the science budget excessively beyond the 10% described as “slash and burn” by the Royal Society report, we will have to ask ourselves serious questions about the value that we as a society put in science and higher education more generally.

There is of course human curiosity and the desire to learn more about nature and scientific laws. And then there is an economic factor. In an interconnected world everyone competes globally, and there are broadly and perhaps slightly naively speaking three options to power an economy: either you are able to offer a unique service or are blessed with natural resources (e.g. Swiss banks, oil-rich states), or you compete in manufacturing by fabricating products cheaper than anyone else, or you are a driver of innovation.

Obviously, the latter scenario is what seems to best fit to a larger country like the UK, absent of major remaining natural resources and already at a high standard of living. A necessary prerequisite for such economic success is of course education. But high-quality education in itself does not translate into economic wealth. There are many highly qualified engineers available world-wide, from all regions, including Latin America, India, and Africa. What is additionally needed is a sufficiently strong and independent industrial base along with that powerful ingredient that I mentioned keeps you ahead of everyone else in the game: innovation. Innovation on a larger scale can only come from a strong base of scientific research.

So this is the economic value of science, a spearhead for innovation and progress that plays a huge leverage on the economy. Studies have found that every pound spent on research yields a return of 30 pence every year to the GDP. For medical research it is even estimated to be 39 pence.

### **A dilemma**

Of course, if a government has overspent and the budget deficit is a serious problem, actions have to be taken. The question is what, and when. Playing different sections of the society against each other won't be very useful. It won't make much sense to take money from underprivileged government employees such as nurses and teachers to maintain funding in science. At the same time, there is no

hope for outside the government as there will be no additional money from industry or charities.

What will be the best long-term strategy for a country like the UK? There could be different options, ranging from the proposed austerity measures to a continuing overspending at least until the crisis is over. But in my view the situation probably asks for a bit of both, spending cuts along with a prolonged period of somewhat increased public spending to bring the economy back on track and not to endanger progress and innovation.

The danger is that if we cut the science budget now, the implications on the long-term scientific and economic progress could be severe. Scientific research is not something that can be arbitrarily ramped up and down, let alone if entire research facilities or universities will be shut down. Research capability and knowledge once lost takes a long time to rebuild. The danger is furthermore that if we cut too deep we might easily end up in a downward spiral where budget cuts lead to reduced innovation, leading to further economic downturn, leading to more budget cuts and so on.

According to the OECD, the overall funding of R&D in the UK is only about 1.88% of GDP, much less than for example Germany's 2.53%. And the public funding of science is less than 1% of the government budget. At this low level of

funding there are already a fierce competition for research money and the majority of science funding explicitly goes only into research that is internationally competitive. For this reason, it won't make sense to impose tougher restrictions.

Nor does it make sense to attempt to prioritize research according to perceived potential for economic impact. It is impossible to forecast which area of science in the long-term will yield the most economic benefits. Technological revolution will always arise from unforeseeable, fundamentally new technology. Silicon transistors are fundamentally different to vacuum tubes, light-emitting diodes fundamentally different to incandescent lamps, computer hard disks have nothing to do with paper as a medium to store information, and so on.

### **Time to act now**

Science funding in the UK is already rather low in comparison to developed nations such as Japan or Germany, and it is a testament to the efficiency of UK science that it still can compete on the highest international level. To cut the budget even further could mean a significant threat to the international competitiveness of the UK.

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