

In the last *CentrePiece*, **John Van Reenen** stressed the importance of competition and labour market flexibility for productivity growth. His latest in CEP's 'big ideas' series describes the impact of research on how policy-makers can influence innovation more directly – through tax credits for business spending on research and development.

Big ideas

Innovation policy



Big ideas

In the wake of the Great Recession, the UK is hardly alone in looking for sources of economic growth. Economists and many other commentators agree that technological innovation must be at the heart of long-run growth. It is also widely understood that left to itself the market is unlikely to provide enough incentives for innovation.

This 'market failure' is primarily because only a small proportion of the benefits of invention are captured by the firm or individual who spends money and time on research. Most of the benefits of invention 'spill over' to other firms who can copy the new idea without having to pay the upfront research costs. For example, it took a lot of effort to invent the automobile and the personal computer – but once they were invented, imitators crowded in.

This means that there will be too little spent on research and development (R&D) from the point of view of society as a whole. Intellectual property rights, such as patents and copyright, were designed to protect inventors and increase their incentive to innovate. But in most cases patents can be designed around so they do not fully eliminate the market failure.

So can there be a role for public policy in stimulating innovation? Is it driven by fundamental factors, such as culture and luck, which are beyond the ability of governments to influence except in the most minor ways?

CEP research has challenged the fatalistic attitude that innovation is not amenable to government action. One direct way to influence innovation is through the tax system, in particular by offering a tax break for business spending on R&D.

I started working on fiscal incentives for R&D in the mid-1990s after being shocked to discover that the share of UK national income spent on business R&D had declined since the late 1970s. In just about every other developed country, it had been rising.

The United States introduced an R&D tax credit in 1981 under Ronald Reagan, but the UK Treasury had always resisted the idea, arguing that firms were unlikely to increase their R&D efforts significantly in response. Evaluations of the US system seemed to show, however, that after a few teething problems, American firms had responded to these tax incentives.

Working with Bronwyn Hall of the University of California at Berkeley, our review of all the existing evidence showed that when researchers used good quality firm-level data and tracked companies over time, they found that tax credits stimulated significant American R&D spending (Hall and Van Reenen, 2000). Were UK firms likely to be so much more lethargic than their counterparts across the Atlantic?

At that time, international evidence on the effectiveness of innovation tax policy was almost non-existent. No one had even collected systematic information on the tax benefits to R&D across

countries over time – not the International Monetary Fund, the OECD, the World Bank or the United Nations.

Together with Rachel Griffith (now deputy research director of the Institute for Fiscal Studies), we put together a team and embarked on a major effort to measure the impact of the tax system on the costs of R&D capital across all the major economies over 20 years. A downside of this was that we had to wade through many dusty tomes of rather tedious tax and accounting rules.

Once we had accomplished that arduous task, we were able to show that there had been a major shift towards R&D tax credits and away from direct subsidies. One of the advantages of tax credits over the more traditional grants was that the government could simply set the rules and it did not have to get involved with 'picking winners'.

More importantly perhaps, we combined the tax data with information on national R&D and showed that tax credits had a large effect on increasing business R&D. Although a 10% reduction in the tax costs only increased private sector R&D spending by about 1% in the first year after an R&D tax credit was introduced, in the long run R&D volumes rose by a full 10% (Bloom et al, 2002).

So far, so good. But what we care about is not R&D per se, as this is just an input. We care about economic growth, which will increase wages and consumption. To tackle this problem, we had to develop a new model of

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Big ideas

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'endogenous growth' that took account of not just the obvious effect of R&D on innovation but also the less obvious 'second face' of R&D, which fosters diffusion of existing innovations.

Having more scientists helps the UK catch up with leading-edge countries because they can read and understand new ideas, which can then be 'absorbed' more effectively in the UK economy. For a country like the UK, which is sadly often far from the technological frontier, this is very important. It means that just sitting back and letting other countries – the United States, Germany, Japan and increasingly China – do all the innovation is unlikely to be the right strategy.

A strong R&D base helps a country to imitate as well as innovate. In a speech on the science budget last year, David Willetts, the universities and science minister, quoted CEP's research in this area:

'Some 95% of scientific research is conducted outside the UK. We need to be able to apply it here – and, in advanced scientific fields, it is often necessary to conduct leading-edge research in order to understand, assimilate and exploit the leading-edge research of others.'

'It is this absorptive capacity which is crucial. Indeed, Griffiths, Redding and Van Reenen have shown that higher domestic business R&D spend also leads to greater productivity being generated at home from foreign R&D spend as well. And there are powerful feedback mechanisms on top of this – foreign companies cite the quality of the public research base as one of the main reasons for locating their own internationally mobile R&D here.'

In a series of studies with Princeton University's Steve Redding (who was director of CEP's globalisation programme from 2005 to 2010), we created an econometric model for the whole OECD, which showed how R&D stimulated

productivity growth through both innovation and imitation (Griffith et al, 2004). We combined this with our R&D tax information to simulate the effects of introducing an R&D tax credit in the UK.

We found that the benefits of an R&D tax credit would easily outweigh the costs, which implied that it could be a successful policy (Griffith et al, 1999). But we also cautioned that, as ever, the devil was in the detail: making the tax complicated could unwind its effects.

Our work appeared in academic journals, policy pamphlets and the printed and broadcast media. It was also picked up by Dan Corry (who was to become head of the No. 10 policy unit during Gordon Brown's term of office as prime minister) when he was at the Institute for Public Policy Research. The proposals became part of Labour's 1997 manifesto, which ushered in the first ever R&D tax credit in the UK in 2001 – initially just for small and medium-sized enterprises, but later extended to firms of all sizes.

In an illustration of the close connection between academic ideas and policy-making, our co-author on the tax credit work was Nick Bloom, who was then my PhD student. After graduating, he was seconded to the Treasury to help them introduce the tax credit and its extension to large firms (in 2003). Nick led CEP's research programme on productivity between 2003 and 2006 and pushed forward the Centre's continuing investigations of the ways in which policy can be used to stimulate innovation.

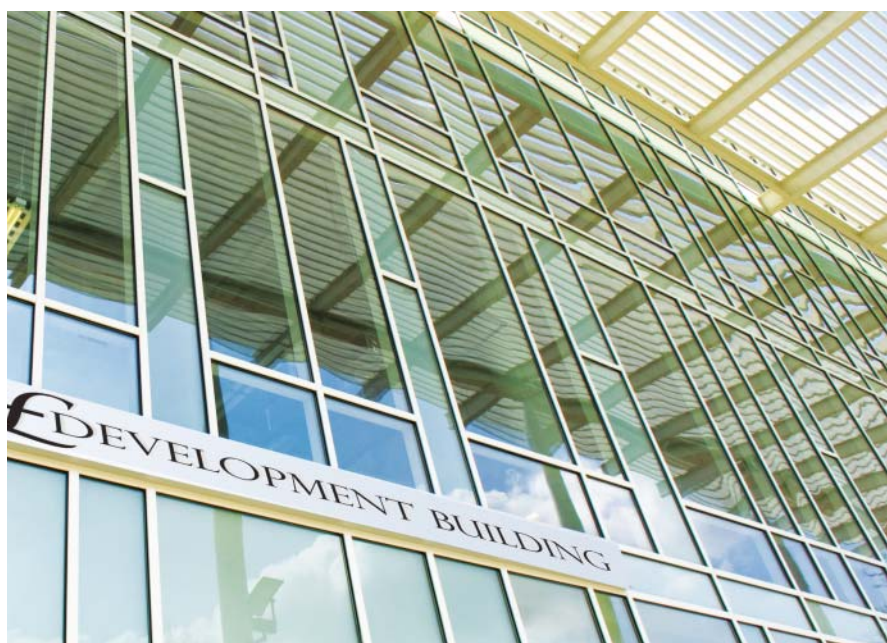
The R&D tax credit is under review by the current government, but it looks like it will remain a permanent fixture of the fiscal scene. The UK's R&D intensity stopped declining in the mid-2000s, which coincides with the bedding down of the R&D tax credit. This could be



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coincidence and more rigorous evaluations of the effects of the fiscal incentives are needed. Nevertheless, the initial findings are encouraging and our work in progress suggests that US R&D tax credits raise firms' market values, productivity and innovation (Bloom et al, 2010).

The R&D tax credit story is a useful parable of the interaction of fundamental economic research with policy development and implementation. It contrasts with the 'patent box', a poorly targeted policy that consists of tax benefits to the royalties on patents: such rewards create few 'spillovers' as the research is already done. The patent box policy was proposed in the dying days of the Labour government and it will waste around £1 billion a year at a time when the country can ill afford it. While this looks like being another of the few Labour policies that the government is continuing, in this case the continuity is unfortunate.



Big ideas

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Further reading

Nicholas Bloom, Rachel Griffith and John Van Reenen (2002) 'Do R&D Tax Credits Work?', *Journal of Public Economics* 85: 1-31 (earlier version available here: http://cep.lse.ac.uk/textonly/people/vanreenen/papers/gvrb15_wp.pdf).

Nicholas Bloom, Mark Schankerman and John Van Reenen (2010) 'Identifying Technological Spillovers and Product Market Rivalry', CEP Discussion Paper No. 675 (<http://cep.lse.ac.uk/pubs/download/dp0675.pdf>)

Rachel Griffith, Stephen Redding and John Van Reenen (1999) 'Bridging the Productivity Gap', *CentrePiece* 4(3): 14-19.

Rachel Griffith, Stephen Redding and John Van Reenen (2004) 'Mapping the Two Faces of R&D: Productivity Growth in a Panel of OECD Industries', *Review of Economics and Statistics* 86(4): 883-95 (earlier version available here: <http://cep.lse.ac.uk/textonly/people/vanreenen/papers/wp0002.pdf>).

Bronwyn Hall and John Van Reenen (2000) 'Fiscal Incentives for R&D: A New Review of the Evidence', *Research Policy* 29: 449-69 (earlier version available here: <http://cep.lse.ac.uk/textonly/people/vanreenen/papers/w7098.pdf>).