in brief...

Where top science gets done

The Diamond Light Source synchrotron in Oxfordshire is the largest single investment in basic research infrastructure in modern UK history. **Christian Helmers** and **Henry Overman** examine its impact on the geographical distribution of related scientific output.

Big scientific research facilities like the UK's Diamond Light Source benefit scientists located nearby significantly more than scientists located further away. According to our research, the highly localised effects of scientific infrastructure on research productivity extend even to scientists that do not rely on the facilities directly for their work.

Since scientific facilities often cannot be distributed across multiple locations, our findings suggest that the decision on where to locate a facility has important consequences. Large-scale facilities have the power to create new and highly concentrated geographical clusters of scientific research as well as to reinforce existing clusters.

We examine the impact of the Diamond Light Source, a third generation synchrotron (a circular particle accelerator), which represents the largest single investment in basic research infrastructure in the modern history of the UK.

Large-scale facilities have the power to create concentrated geographical clusters of scientific research

Proximity to Diamond had a positive impact on the output of related scientific research

Quantifying the impact of large-scale scientific infrastructure is generally difficult because the location for the investment is not chosen at random. Instead, policy-makers, just like private companies, strategically place investments in a way that maximises locational benefits – in the case of Diamond, building the facility in an existing scientific hub: the Harwell Science and Innovation Campus at the Rutherford Appleton Laboratory near Oxford.

This then poses the research challenge of how to separate effects from the existing cluster from any additional effects created by the new facility. We overcome this difficulty by capitalising on the controversy that existed in 1998 about where the Diamond Light Source should be sited – and, in particular, the existence of a 'runner-up' location at the Daresbury Science and Innovation Campus in Cheshire.

The government initially planned to build the new facility at Daresbury, which was also home to Diamond's predecessor, the Synchrotron Radiation Source. Effective lobbying led to a change of heart – and a final decision in 2000 to locate the new facility at Harwell. This sparked fierce controversy because of the longstanding debate on the North-South divide in investment in scientific research in the UK.

We analyse how scientific research in the form of journal publications was affected by Diamond's opening in January 2007. Comparison of papers produced by researchers near Diamond to those near Daresbury shows that output from researchers in direct proximity to the synchrotron increased more than it would have done if the facility had been located elsewhere.

We find that scientists located within a 25 kilometre radius of Diamond produced around 11% more scientific articles over the 2000-2010 period as a result of their geographical proximity to the facility. This is the combined result of two effects, one direct and one indirect.

The direct effect results simply from ease of access for nearby researchers who use the synchrotron. The indirect effect is perhaps more surprising: there is also an increase in scientific papers even when that research made no direct use of Diamond. The explanation is that these indirect affects arise as a result of the localised knowledge spillovers that occur when researchers learn from each other, for example, through personal contact.

Both the direct and indirect effects are mainly driven by an increase in the number of scientists working in geographical proximity to the facility. The results indicate that the increase comes from new scientists rather than the relocation of existing scientists.

In the case of the Diamond, locating the particle accelerator close to Oxford reinforced the scientific strength of the so-called 'Golden Triangle' of London, Oxford and Cambridge.

Because clusters tend to create self-reinforcing feedback loops that attract more private and public investment, the results of our study are likely to underestimate the long-run impact of the synchrotron on the geographical location of scientific research in the UK.

This article summarises 'My Precious! The Location and Diffusion of Scientific Research: Evidence from the Synchrotron Diamond Light Source' by Christian Helmers and Henry Overman, *Economic Journal* 127(604): 2006-40 (earlier version available as SERC/Urban and Spatial Programme Discussion Paper No. 131: http://www.spatialeconomics.ac.uk/textonly/SERC/publications/download/sercdp0131.pdf).

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