

## **R&D goes global; a cause for concern for the UK?**

UK firms increasingly locate their research and development abroad. Helen Miller examines whether this is bad news for the UK.

Globalisation is not a new phenomenon; we are accustomed to the increasing ease with which goods and services move across national borders. It is no longer surprising to see that our clothes were produced in China or that our banks' customer support networks operate via India. To many, this represents the positive benefits which result when countries open their economies and engage in international trade.

What may be more surprising is that the trend towards off-shoring services has extended to research and development (R&D), which is the part of firms' activity directed towards creating new ideas, products and processes. Increasingly, we have seen firms locate some of these high skilled, technology intensive activities outside of their home economies. This has certainly been the experience of the UK where around half of the innovative activities associated with UK firms are carried out abroad.

Should we be concerned about the impact this may have?. Does off-shoring innovation mean fewer high skilled jobs for the UK? Will the UK be in a worse position to benefit from new technological developments? Does this pose a threat to the UK's position as a high skill, knowledge driven economy? This article presents evidence suggesting that the internationalisation of innovation is not all bad news for the UK.

### The importance of being innovative

UK firms invest billions of pounds in R&D each year. Such activity not only ensures that firms remain competitive but plays a key role in the economic prosperity of the country. The creation of new ideas, products and processes drives economic growth. Indeed, technological development has been a key component in driving the wealth of nations since, well, forever, and certainly since the industrial revolution. Just think of the wheel, light bulbs, the telephone, even the humble biro; the list goes on.

In addition to this, R&D and the new knowledge which results produces substantial *externalities*. Externalities, also sometimes termed spillovers, result when an action produces costs or benefits which are borne not by the agent undertaking that action but by a third party. The classic example of a negative externality is pollution. A company that pumps toxins into the air reduces the air quality and thereby imposes a cost on many individuals.

R&D creates positive externalities or knowledge spillovers. Take the example of a new invention, say Apple's iPhone. While the firm will benefit from being able to exploit this new technology, other firms will also benefit from observing and learning from the invention. While intellectual property rights, such as patents, allow the inventor to benefit from a temporary monopoly on using the new technology, this mechanism also makes the new information available in the public domain.

The spillovers from R&D can also be more subtle. Inventors, or innovators, may gain knowledge by interacting with each other. This can be an important mechanism for transferring ideas and information since much of the knowledge embodied in

inventors is tacit. That is, it has not yet been formalised or written down anywhere. Moreover these externalities are likely to be greatest when such individuals are in close proximity. This leads directly to the conclusion that having R&D located in a country is good because it facilitates the operation of informal information networks.

We see then that R&D is important and that there are good reasons to want it to locate in your country. At the same time, we observe that innovation is increasingly crossing national borders.

#### The international nature of innovation

The off-shoring of innovation is just one facet of globalisation, in which goods and services move more easily across national borders than they used to. This ease of movement in turn reflects rapidly falling communication and travel costs, along with other changes to the world economy, such as the economic integration of the European Union and the growth of emerging economies. The result is that, when conducting R&D, firms are able to choose between a wide range of international locations.

But how do we know how much activity firms conduct offshore? The most common measures of R&D, such as firms' expenditure or employment in this area, tend to be based on activity within national borders and fail to capture activity offshore. In the research cited below patents are used as a proxy for innovative activities. Often, when a firm has a new idea it will seek to protect the intellectual property using a patent. Importantly, patents provide the location of the inventors who worked to create the new knowledge. Patents therefore can be used as an indicator of innovation while location is revealed by where the inventors were working.

As Figure 1 shows, since the early 1990s the growth in the innovative activities of UK multinationals has been stronger offshore than at home. While home based activity in 2002 had increased by around 25% compared with the early 1990s, the activity based abroad had more than doubled. Consequently, a higher proportion of UK firms' activity has been located overseas.

When UK multinationals locate offshore, where do they invest? Well, all over the world. The US is the most important location for foreign investment in innovation but some of the larger European countries are also significant hosts. More recently, a growing number of firms have established R&D centres in emerging economies such as India and China.

As this trend continues is the UK losing high skilled jobs to the Americans; are important knowledge spillovers being lost? Recent research conducted at the Institute for Fiscal Studies (IFS) suggests three reasons why things might not be as bad as they sound; (1) there is little evidence that foreign jobs displace domestic jobs, (2) there are positive benefits from firms locating in foreign centres of excellence and (3) location matters less in a more globalised world.

To begin, it may seem intuitive that if firms conduct R&D in a foreign location this will come at the expense of domestic activity. However, the idea that activity offshore displaces activity at home implicitly assumes that firms first decide on a fixed amount of innovative activity that they wish to carry out and then simply choose where to do

it. This isn't quite right. The level of activity undertaken will respond to the opportunities provided by the characteristics of various locations, such as costs and the pool of available skills. R&D may also be driven by a desire to gain access to a new market. As a result, it is not necessarily the case that had activity not been located abroad it would have been conducted in the UK.

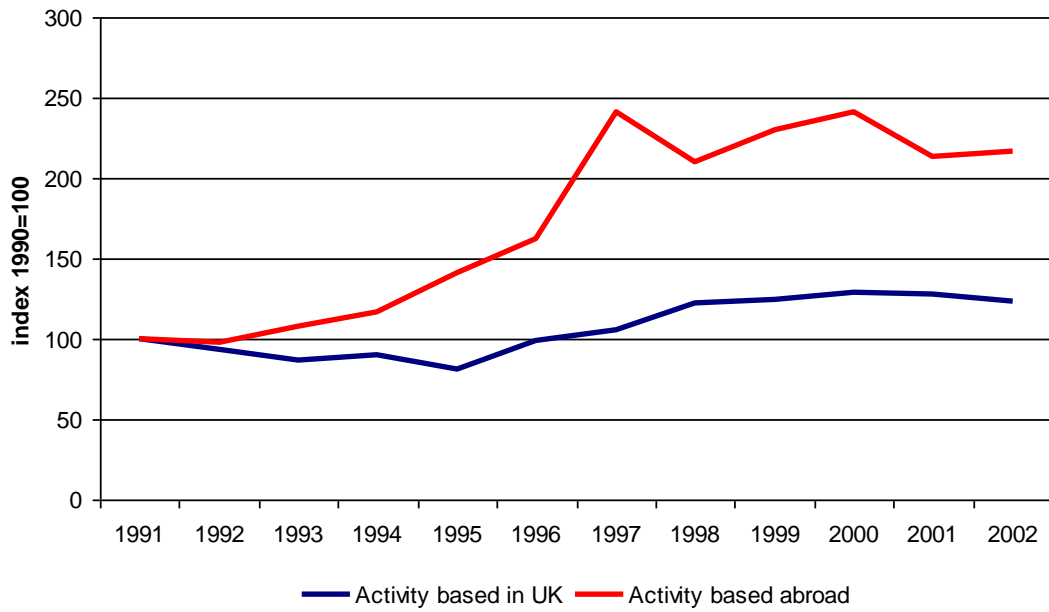
What does research suggest? Figure 2 plots firms' growth rate of innovative activity at home against that abroad. Each dot represents an individual multinational firm in a given industry. The comparison takes account of many other factors that might influence the amount and location of innovative activity, including the characteristics of the firm, the industries in which the firm operates, and macroeconomic conditions. If foreign R&D were displacing home R&D we would expect to see a negative correlation, indicating that firms with fast growing offshore activity have slower growth at home. In fact, we find the opposite: those firms that increased their innovative activity most rapidly abroad also tended to increase it most rapidly at home. This suggests that there is little evidence that when UK firms locate innovative activity offshore it comes at the expense of UK based activity.

In addition, important benefits may be derived by combining research activities undertaken in different locations. By establishing activity in foreign centres of excellence firms are able to act as listening posts and gain knowledge regarding local technological developments. There can be substantial benefits when this knowledge is transferred back to the domestic economy. In other words, many of our firms are bringing positive benefits to the UK as a result of locating at the technology frontier in countries such as the US. This is supported by IFS research which finds evidence of benefits accruing to UK based firms when a high proportion of the inventors they employed were located in the US.

What about spillovers? The traditional view, outlined above, cites substantial benefits from having researchers located in your own country, since this facilitates the interaction with other researchers and the exchange of knowledge through informal networks. This means that the positive externalities of R&D accrue to a foreign country when activity locates offshore, right? Well, yes and no. It is certainly true that knowledge spillovers occur in the foreign location. However, falling communication and travel costs not only allow goods and services to flow more easily across national borders than they used to, they allow knowledge to flow more easily too. IFS research which considers the time it takes for patents to be cited abroad lends support to the "death of distance" in innovation. As knowledge is disseminated more widely and more quickly, access to new ideas relies less on location. Again, the UK can derive benefits from the knowledge which is created offshore.

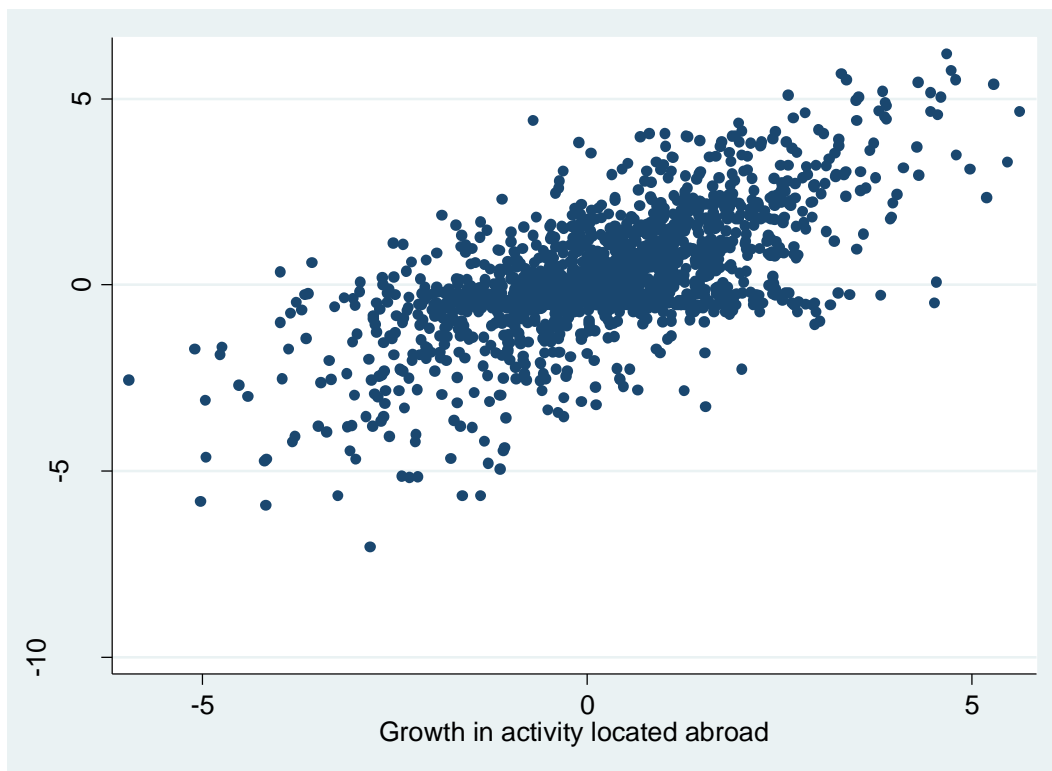
In summary, while off-shoring may be an emotionally charged issue, there is little evidence to support the most common concerns. There is little evidence that locating R&D abroad displaces UK based activity. Moreover, there may be positive benefits from locating in centres of excellence, especially in an age of globalised information.

**Figure 1: UK firms' innovative activities at home and abroad**



Note: Innovative activity is measured using data on the location of inventors listed on patents taken out by firms at the European Patent Office.

**Figure 2: Firm growth in innovative activity at home and abroad**



Note: Growth rates are calculated for multinational firms from 15 European countries over the period 1991 to 2002.