Innovation across the OECD: a review of recent studies

Gene Tunny

Innovation is a key determinant of economic growth and improvements in living standards over the long run. Several recent OECD studies explore the determinants of innovation across OECD countries, and also consider the role of policy in promoting innovation. The OECD researchers argue that specific innovation policies and framework factors, both independently and jointly, explain cross-country differences in innovation. While this is a reasonable general conclusion, there are some issues around the analysis and interpretations of the innovation process, framework factors, and the effectiveness of specific innovation policies. Despite these reservations, the OECD studies confirm that geographical context plays a large role in explaining Australia’s levels of R&D and innovation, and are consistent with a view that cross-country differences are a function of differing contexts rather than inappropriate policies.

1 The author is from the Macroeconomic Policy Division of the Australian Treasury. This article has benefited from comments and suggestions provided by Graeme Davis, Vanessa Lapthorne, Paul O’Mara, David Parker and Jyoti Rahman. The views in this article are those of the author and not necessarily those of the Australian Treasury.
Innovation across the OECD

Introduction

Innovation is a broad concept, including product innovation, plus all the process innovations firms continually employ in their workplaces to increase efficiency and productivity. It therefore encompasses a vast array of activities in the economy, including workforce skills, management, venture capital, technology uptake, work reorganisation, and research and development (R&D).

Several recent OECD working papers (Jaumotte and Pain 2005a, 2005b, 2005c, 2005d) explore the determinants of innovation across OECD countries, and also consider the role of policy in promoting innovation. Jaumotte and Pain argue that specific innovation policies and framework factors, both independently and jointly, explain cross-country differences in innovation. While this is a reasonable general conclusion, there are some issues around their analysis and interpretations.

This article provides a critical review of the Jaumotte and Pain studies. The next section considers Jaumotte and Pain’s analysis and interpretations of the innovation process. Following this, the article reviews the role that framework factors, which define the general economic framework of a country, play in influencing the level of innovation in an economy. The article then considers the influence of specific innovation policies.

The innovation process

Jaumotte and Pain (2005b, 2005d) use R&D expenditure and patents as proxy measures of innovation. These measures are found to be related to a number of factors, including the share of scientists and engineers in the workforce and the foreign exposure or openness of the economy. The Jaumotte and Pain analysis suggests that these factors are significant in explaining Australia’s lower-than-OECD-average R&D intensity (R&D expenditure as a per cent of GDP). But these findings need to be interpreted carefully, as there are significant limitations in Jaumotte and Pain’s use of R&D and patents as proxy measures of innovation.

Typically, various measures of R&D and patents have a close relationship with each other within countries, but their relationship with innovation more broadly is less clear. Jaumotte and Pain may be interpreting a lower business R&D intensity (or patents per capita) in a country as evidence of lower innovation, when it may be that the lower business R&D intensity is offset by other innovating activities, including learning-by-doing and work reorganisation. After all, R&D is only one of many inputs into innovation.

Jaumotte and Pain (2005c) find a significant relationship between R&D measures and innovation as measured by the European Community Innovation Survey, but this is
unsurprising. The relationship between R&D measures and innovation is likely to be similar across European countries, given that they mostly have similar geographical contexts and factor endowments. This relationship would be weaker if non-European countries such as Australia and New Zealand were included. Australia and New Zealand have a geographical context that is different from European countries; for example, both countries are remote from the bulk of world economic activity.

Moving across countries with changing contexts it is likely that the role of R&D in the innovation process will change, as context will influence industry structure and this will affect the level of R&D undertaken in an economy. Across the whole OECD, the business sector R&D intensity (as a per cent of GDP) may not be strongly correlated with more direct measures of innovation — for example, the percentage of businesses that innovate — as discussed in Davis and Tunny (2005).

Davis and Tunny (2005) demonstrate that, to a significant extent, Australia’s industry structure explains our lower-than-OECD-average business R&D intensity. Australia does not have large pharmaceuticals or electronics industries, for example, that perform large amounts of R&D.

Australia’s industry structure is an outcome of our context as a remote economy with abundant natural resources, but it is also influenced by framework factors, which have indirect impacts on innovation through industry structure and more direct impacts that are considered in the next section.

Framework factors

Framework factors influence the broad nature of the economy, and include policies and conditions affecting product market competition, trade and investment barriers, labour market flexibility, and financial market structures. Jaumotte and Pain (2005d) stress the importance of competitive markets in promoting innovation and improving policies that raise the absorptive capacity of the economy — the capacity to understand and make use of new knowledge.

Framework factors also include factors that are not amenable to government policy, however, and thus the role of framework factors should be interpreted carefully. For example, Jaumotte and Pain (2005b) could have distinguished between countries that are less open because of protectionist policies and countries where geography explains the closed nature of the economy.

Jaumotte and Pain (2005b, p 14) argue that ‘the diffusion of knowledge developed outside the country is likely to be an important element of the generation of new research ideas’; and their analysis suggests that Australia’s relatively low exposure to foreign R&D through trade is why Australian businesses do less R&D than businesses
Innovation across the OECD

elsewhere. Exposure to foreign R&D is measured in their analysis by a trade-weighted average of R&D stocks in each OECD country’s trading partners. That is, estimated stocks of R&D knowledge in our trading partners — for example, Japan and the United States — are weighted by the magnitude of Australia’s trade with these countries and then added together.²

The lower-than-OECD-average foreign exposure is the single largest factor underlying Australia’s lower business R&D intensity (Chart 1). Australia’s relatively low foreign exposure, as measured by Jaumotte and Pain, is driven by our relatively low levels of trade with the rest of the world. This in turn is largely due to Australia’s remoteness compared to other OECD countries — with the exception of New Zealand, Australia is the most remote OECD economy in the world.

Chart 1: Decomposition of R&D intensity relative to OECD average, 2000, percentage deviation, multiplicative

Notes: IPR: Intellectual property rights; PMR: product market regulations; BERD: business expenditure on R&D.
Source: Jaumotte and Pain (2005b).

The OECD includes many European countries, whose high trade intensities are explained partly by their co-location on the same continent, and further by European Union members who share free trade arrangements, and in the case of euro area members, a common currency. Australia is at a natural disadvantage here given its remoteness, which increases factors such as transport costs for exports and imports, and so our relatively low trade intensity is unsurprising.

² It is arguable whether this is the best measure of the stock of foreign knowledge available to a country. While trading partners are one source of knowledge, flows of capital and highly skilled labour also affect a country’s ability to access knowledge from other countries.
There is evidence that Australia’s trade level and patterns are as expected given its factor endowments and remoteness from world economic activity (see, for example, Battersby and Ewing 2005). If Australia were located instead where the United Kingdom is, our trade with the rest of the world could be around 50 per cent higher according to modelling by Battersby and Ewing (2005). As Battersby and Ewing (2005) note, the contextual factors that influence Australia’s openness, and hence foreign exposure to international R&D, are not amenable to government policy. Thus, Australia’s business R&D intensity, which Jaumotte and Pain have shown is closely related to our foreign exposure, may be seen as a reflection of our context rather than a result of policy.

**The effectiveness of specific innovation policies**

These recent OECD studies draw attention to the cost effectiveness of specific policy interventions. As Jaumotte and Pain (2005a) note, any innovation policy will likely have costs as well as benefits, highlighting the need for accurate evaluation. Jaumotte and Pain’s findings raise questions about the role that policy can play in influencing innovation beyond promoting a sound framework in the form of an open and competitive economy. Although Jaumotte and Pain (2005b) find some evidence supportive of policies that specifically promote innovation, the evidence is either weak or open to another interpretation.

For example, Jaumotte and Pain (2005b) find evidence that education and labour market policies affect the innovation process through the availability of human resources for science and technology, and that having a proportionately smaller number of scientists contributes to Australia’s lower business R&D intensity. However, as Jaumotte and Pain (2005b) themselves note, this is, at least in part, endogenous — that is, related to the nature of the economy itself. The number of scientists is not a factor that determines R&D itself, but, along with R&D, is determined by deeper underlying factors. This is especially so given that scientists are very responsive to international job opportunities.

Evidence is mixed on the possible effectiveness of other innovation policies. Jaumotte and Pain (2005b) find that, generally, the overall impact of fiscal incentives on innovation appears to be quite small. Indeed, as Davis and Tunny (2005) show, there appears to be a negative correlation between the generosity of R&D tax subsidies and business R&D intensity, which would suggest reverse causality.

An additional perspective is provided by Luintel and Khan (2005) who find that the process of knowledge production (measured by patents) and the relationship between stocks of knowledge and productivity are diverse across the OECD. The OECD is split between countries that do a large share of total knowledge production, such as the
Innovation across the OECD

United States and Japan, and other countries that are more reliant on knowledge produced elsewhere. This led Luintel and Khan (2005, page 23) to conclude that ‘it is important to account for country-specific factors when designing R&D and innovation policy; a one-size-fits-all approach is unlikely to be effective’.

One of Luintel and Khan’s (2005) main findings is that, for countries with large R&D sectors already, there was only a small contribution of knowledge production to productivity. Countries with low knowledge stocks, however, can benefit significantly from knowledge produced in the leading countries, as knowledge produced overseas can enhance knowledge accumulation domestically. Knowledge produced in any one country can diffuse to other countries through a variety of channels, including trade, scientific journals, and the mobility of skilled labour.

Luintel and Khan (2005) suggest that policy in low-knowledge stock countries could focus on enhancing the country’s accumulation of knowledge, including knowledge produced elsewhere, but do not offer explicit policy prescriptions. Open trade and investment policies may be one set of policies that promotes the acquisition of knowledge produced abroad.

Conclusions

The OECD studies reviewed in this article suggest that to influence innovation in an economy it may be desirable to focus on policies that improve framework conditions, such as product market or financial market competition, for which there may be a wide range of benefits to the economy and a more likely pay-off. As Jaumotte and Pain themselves find, framework conditions and policies are more important than specific innovation-targeting policies for boosting innovation. For example, to the extent that fiscal incentives for R&D are important only when firms face financial constraints, relieving those constraints through financial market reforms may be more beneficial.

As a general conclusion, the OECD working papers confirm that Australia’s geographical context plays a large role in explaining our levels of R&D and innovation, and are consistent with a view that cross-country differences are a function of differing contexts rather than inappropriate policies.
References


