12 The OECD Innovation Strategy: science, technology and innovation indicators and innovation policy

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1. INTRODUCTION

Motivation

> OECD countries are at a critical economic and social juncture. Most of the fiscal and monetary levers available to revive the economy have been exhausted, and the scars of the crisis – starting with unemployment and inequalities – are still deep and fresh. In this context, governments have no choice but to swiftly implement far-reaching structural reforms to support growth . . . This imperative makes the case for a more intelligent type of growth, one that is welfare enhancing, inclusive and sustainable, driven by new ideas, new technologies, new entrepreneurs, new business models and new social organisations. The world economy needs traditional 'Schumpeterian' innovation, as well as social innovation.
>
> (Gurria 2012)

A Historical Snapshot of Measuring STI at the OECD

Fifty years after the creation of the OECD, Angel Gurria, its Secretary General, echoes a theme that has prevailed throughout the life of the organization: science, technology and innovation (STI) are essential elements for sustainable growth. A constant companion on this journey has been the role of indicators and the interplay of indicators and policy. In its founding year (1961), the Secretary General of the OECD formed an *ad hoc* group under the direction of Pierre Piganiol that was mandated to produce a report, *Science and the Policy of Governments* (Piganiol 1961), which analysed the importance of 'harnessing science and technology to the broad economic objectives of the OECD' (King 1974: 35). Later this report would be credited with 'providing a starting point for the consideration of science policy as we now know it' (ibid.). The Piganiol Report led to the first Ministerial Meeting on Science in 1963, which recognized science as a 'national investment and as an element of growth', and invited the OECD to start work on comparable indicators of national expenditures on R&D (ibid.: 41). The first edition of a proposed standard practice for surveys of R&D, better known as the *Frascati Manual* (OECD 1963), was produced in 1963 and is now in its sixth edition (OECD 2002). At the second Meeting of Science Ministers at the OECD in 1966, a commissioned report by Professor Christopher Freeman and Alison Young, which contained indicators of the relative position of national efforts on R&D, sparked a debate between the USA versus Europe that fuelled demand for the OECD to intensify its work in measuring R&D. By the third Meeting of Science Ministers at the OECD in 1968, a '*Gaps in Technology*' (OECD 1970) report was delivered to Ministers which was a *tour de force* that covered educational attainment and expenditures, a discussion of the 'brain drain', R&D performance by sector and by size of firm, as well as a section devoted to technological innovation both in terms of diffusion (e.g. significant innovations since 1945, receipts and payments for licences of patents) and the use of specific technologies (e.g. plastics, computers, man-made fibres). Writing in 1971, Harvey Brooks in *Science, Growth and Society: A New Perspective* (Brooks 1971) notes that this Ministerial marked a turning point in science policy where the focus shifted from a preoccupation with science and the pursuit of the endless frontier to a systemic view of STI. Ministers recognized the fact that R&D efforts could not by themselves explain differences in economic performance. Rather, many other factors were involved, 'including capital availability, fiscal policy, management competence and attitudes, entrepreneurship, marketing skills, labour relations, general levels of education and even culture and national psychology' (Brooks 1971: 42).

While the policy dialogue recognized this broader system, the analytical focus remained primarily upon science, technology and technological innovation because the primary methodology and associated data series of the day were based on the *Frascati Manual*. In 1988, the OECD's Technology Economy Programme (TEP) was launched to better understand the interactions of technology, the economy and society (OECD 1992a). While it recognized the endogeneity of technological change and the need to characterize innovation as an interactive, as opposed to linear, process, it still relied heavily on R&D indicators and country snap-shots of scientists and engineers. This report gave a political impetus to the need for improved measures of innovation and its diffusion, and for intangible investment and its components.

This led to a sustained statistical effort to measure innovation that resulted in a new statistical manual, the *Oslo Manual*, dedicated to the measurement of 'technological product and process innovation in manufacturing'. First appearing in 1992 (OECD 1992b), the *Oslo Manual* was revised collaboratively with Eurostat in 1997 (OECD/Eurostat 1997) to cover services and thereby provide a close-to-total economy perspective.

The third edition in 2005 (OECD/Eurostat 2005) significantly broadened the view of innovation to include non-technological innovations such as organizational change, business practices and market development, thereby better reflecting the nature of innovation in services.

These advances were enabled by a series of forums on new indicators for science, technology and innovation dubbed the 'Blue Sky' forums because they offered a place where participants could come to discuss new approaches, unimpeded by the lack of a developed methodology or data series. The first was held in 1996 (OECD 2001) and provided a first stocktaking of the systematic efforts to measure innovation through the Community Innovation Surveys (CIS). This, in turn, contributed to the first revision of the *Oslo Manual* (OECD/Eurostat 1997).

The second Blue Sky Forum in 2006 went further by showcasing new work that measures innovation, especially those innovations that do not directly depend on the performance of R&D. It also highlighted the heightened pace and complexity of change caused by globalization, information and communication technologies and the trend towards 'open' innovation (OECD 2007a). Importantly, John Marburger, the US Presidential Science Advisor, reaffirmed in his keynote address the need for models that can act as a 'pedagogical device' in the formation of science and innovation policy. Pointing to an era of 'dynamic change' that has eroded the utility of old taxonomies and the predictive value of old correlations, he gave support to the concept of 'science of science and innovation policy' (SciSIP) and the development of models that simulate social behaviours and can be used 'to make intelligent guesses at what we might expect the future to bring and how we should prepare for it' (OECD 2007a: 31).

These early developments to better understand and measure innovation, extending back to TEP in the early 1990s, finally began to generate a knowledge base built by a wide range of researchers that enabled an in-depth analysis of innovation and policies for innovation, setting the foundation for the OECD Innovation Strategy.

2. THE OECD INNOVATION STRATEGY

Observing that many countries (e.g. Australia, Finland) were in the process of developing innovation strategies, Ministers meeting at the OECD in 2007 concluded 'that in order to strengthen innovation performance and its contribution to growth, a strategic and comprehensive cross-government policy approach is required' (OECD 2007b), and launched the OECD Innovation Strategy (IS). Developed over a three-year period, the IS marked the arrival of a broader view of innovation policies that included S&T at its core, but which encompassed a broader systems perspective including education, health, entrepreneurship, consumer, general-purpose technologies such as information and communication technologies (ICT), biotechnology and nanotechnology policies as well as 'framework conditions' such as taxation, competition, finance, product and labour markets (OECD 2010a). It marked the adoption and application of the statistical concepts, and the systems approach, launched at TEP and developed in the revisions of the *Oslo Manual* into a high-level policy analysis. For the OECD, the IS marked the first of a new generation of OECD 'horizontal' projects that engaged a large number of OECD committees and different parts of the OECD Secretariat.

The OECD Innovation Strategy: What It Is, and Is Not

The IS sought to take a whole-of-government view of innovation policy, recognizing that while S&T and, more narrowly, R&D policies are essential, they are only one element in a broader system. In fact, much of the earlier focus on R&D and human resources for science, technology, engineering and mathematics (STEM) and infrastructure was a supply-side view and as such represented only half of the system. The IS broadened the perspective to include the demand side, which encompasses entrepreneurship, government regulation and procurement, as well as the need for STI policies to address grand challenges such as climate change, ageing societies and development. Policy makers from a wide range of policy fields – consumer, competition, regional, taxation, environment, education, ICT, trade and development, many of whom never considered themselves players in innovation policy – participated in this project.

The objective of the IS was not to develop a new theoretical paradigm such as national systems of innovation (OECD 1997) or to generate breakthrough empirical results such as international comparisons of e-commerce activity (OECD 2000). Rather, the main new contribution of the IS was on a political level as it helped governments view policies for innovation more broadly and repositioned innovation policy as a core element of the economic policy toolbox, akin to labour, trade or financial policies. This disappointed some observers, especially the core group of S&T policy advisers or those academics involved in developing the concept of innovation who wanted an analysis that pushed the envelope, replete with new findings and new policies. Some critics suggested that the IS was simply 'old wine in a new bottle'. This characterization is not completely wrong, but this narrow, academic focus missed the political value of extending the interest in innovation policy from the converted to a wider audience, and in doing so effectively advancing the mainstreaming of innovation policy and recognizing that other policies – finance, labour, competition – need to be part of the mix of policies for innovation.

Changes in the Economic and Social Environment of Innovation

In the midst of the IS, the worst economic crisis in 70 years hit, and with it a deterioration of the economic environment for innovation characterized by a dramatic drop in finance, especially risk finance; a general decline in consumption and a heightened level of risk adversity. Many governments responded with stimulus packages that had significant pro-innovation elements – indicative of the importance of innovation as a mainstream economic factor (OECD 2009a). To take one prominent example, the USA allocated more than US$100 billion to innovation (about 12 per cent of the total US stimulus package) – or about half of the present-day cost of the Apollo Program of US$180 billion (US Executive Office of the President 2010). This included US$30 billion for renewable energy and energy efficiency; US$20 billion for health information IT; and a US$10 billion increase for the National Institute of Health (NIH) from US$30 to US$40 billion.

As the crisis of 2008 and 2009 extended into 2012, with unemployment remaining stubbornly high, and as attention began to focus on the growing inequality of incomes that afflicts many OECD countries, the focus on how to nurture new sources of growth – new products, new firms, new sectors and especially new jobs – becomes more intense. This is further fuelled by the recognition that while the crisis has severely affected most OECD countries, the period has been one of strong growth for emerging economies such as Brazil, India, Russia and especially China. With their rise, global value chains have become prevalent and with this the global arbitrage of wages and capital (Freeland 2012). To remain competitive, OECD countries look to new sources of growth that provide high-value-added jobs and profits. While many factors can help stimulate new growth – for example investment in human and physical capital – many are reaching diminishing returns or demographic limits. Innovation, as reflected in multifactor productivity growth and as embodied in products or processes, is increasingly sought to improve competitiveness and drive growth that can simultaneously generate employment, tax revenue and provide profits for continuing the cycle of innovation that drives productivity growth and, with it, improvements in standards of living.

As is frequently the case, the crisis was a catalyst for changes that were already under way: the rise of Asia, especially China, as an economic power and a growing source for STI; cost pressures that force firms to adopt new business models including more collaborative STI practices ('open' innovation); and the increased diffusion and application of ICT tools as the digital economy became less of a buzz-word and more the norm. At the same time, grand challenges such as climate change, rapid demographic changes and the rise of neglected infectious diseases, as well as issues such as the growing scarcity of clean water and the security of food, have quickly risen up the policy agenda. While market mechanisms alone, such as removing subsidies or internalizing externalities through taxes on 'bads' such as carbon, might help solve the problem, it is clear – as work by Philipe Aghion and others has illustrated – that this will take a long time at a high price that could limit growth (Aghion et al. 2009). Innovation, combined with market mechanisms, is clearly needed to address these challenges and can create a double dividend of improving social welfare while generating jobs and growth.

3. THE ROLE OF INDICATORS IN FRAMING POLICY DIALOGUES

An essential pillar within the IS was a stream of work to develop new indicators that better reflect the nature of modern-day innovation and the impact of various policies. The crisis, the ascendency of the grand challenges and the search for new sources of growth have added impetus to many of the streams of work that had been launched by the 2006 Blue Sky indicators conference, including developing indicators on health, sustainable development and business/university linkages, and indicators that sought to measure the effect of STI policies. *Measuring Innovation: A New Perspective* (OECD 2010b) went beyond previous work by juxtaposing traditional 'positioning indicators' based on official methodologies and statistics with new, experimental indicators, many of which were based on new data collections or the matching of microdata files to generate new indicators. This work provided an empirical narrative for the key policy messages that framed the study and was instrumental in helping communicate these messages to a wide audience of policy makers and advisers.

This story-line was delivered through roundtables in more than 20 countries as well as to an equal number of high-level events in Europe, Asia, North America and Latin America. These events reached a number of high-level policy makers (e.g. ministers and vice ministers) who would not normally attend official OECD meetings at headquarters, visit the OECD website, or read OECD reports. Many countries used these roundtables as a mechanism for drawing together different ministries to discuss policies for innovation from a whole-of-government perspective, launching efforts to generate a strategy for innovation, or reorienting existing strategies.

A compelling feature of these events was the indicators that provided an evidence base for the key elements of the IS and which sparked a dialogue in capitals as policy makers sought to better understand why their country appeared where it did in various cross-country comparisons.

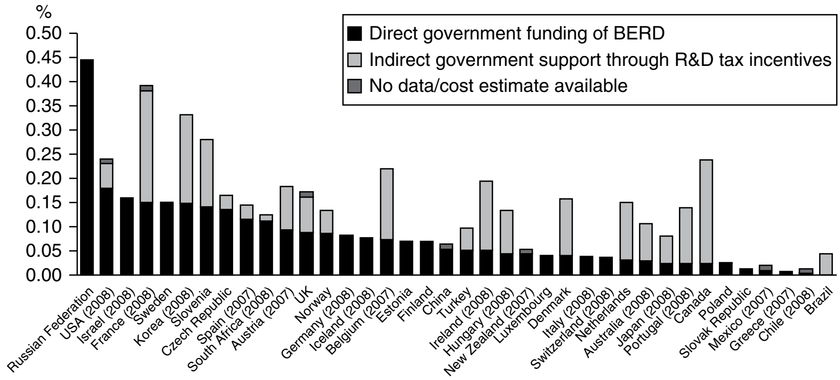
Because no one indicator or composite is deemed sufficient to capture the multidimensional nature of innovation, *Measuring Innovation* contains over 100 indicators covering human capital, innovation by firms, government investments in support of innovation, collaboration and efforts to address global challenges. The report is part of a larger package of deliverables prepared as part of the IS as well as a stand-alone resource for those interested in quantitative measures of STI and international comparisons of performance. In practice, it became the source for presentations at the roundtables and conferences, which typically contained 20 slides of indicators. Seven stand out as having had an important impact on policy and were instrumental in providing the empirical story-line to the presentation of the key findings and the policy implications. These seven indicators provide a basis for demonstrating the linkage between indicators and the impact on policy development.[2]

R&D Funding: Direct and Indirect

As much as OECD IS illustrated that innovation was a broader activity that extended beyond scientific and technological activity, it also reaffirmed the importance of R&D as critical, especially for the realization of radical, break-through innovations such as the invention of the transistor or a vaccine for polio. Because of the well-recognized 'market failure' associated with business investment in R&D where firms have difficulty capturing all the benefits as they 'spill over' to other entities, the bulk of government policy, particularly when it comes to expenditures, is devoted to R&D.

In support of the IS, a measurement initiative was undertaken to better understand the types of government support to business enterprise R&D, comparing for the first time government funding of business R&D through contracts, grants and awards (direct expenditures) with expenditures (foregone tax revenue) associated with R&D tax credits (indirect expenditures) across a wide cross-section of countries.

For the first time, policy makers were able to compare the cost of the two measures, effectively getting a sense of the policy mix and how their country compared with other developed countries. Figure 12.1 started a discussion in several countries, including Germany, Finland, Sweden and Switzerland, about whether or not they needed to add indirect policies to support business R&D both to adjust the policy mix and create a defence against those countries that had introduced generous measures.



Source: OECD, based on OECD R&D tax incentives questionnaires, January 2010 and June 2011; and OECD, Main Science and Technology Indicators database, June 2011.

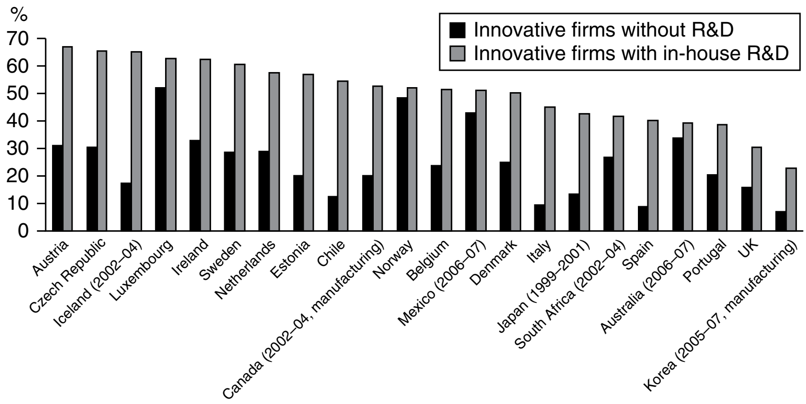
Figure 12.1 Direct government funding of business R&D and tax incentives for R&D, 2009, as a percentage of GDP

In Canada, where the policy mix was heavily orientated towards tax measures, the discussion focused on whether the mix between direct and indirect measures was still appropriate (Expert Panel 2011).[3] In testimony to the US Senate Finance Committee, policy makers looking at the figure questioned whether or not US tax incentives were sufficiently generous (US Senate Committee 2011).[4]

More generally, Figure 12.1 has sparked a renewed interest in indirect measures of support for R&D, which, while philosophically appealing because they provide a 'neutral' policy that all qualifying firms can take advantage of, may be more expensive and hence less cost-efficient than many realized. For example, a review panel of Canadian R&D conducted 'a first of its kind' compilation of federal government support to business R&D that covered 60 programmes, delivered by 17 federal entities, totalling C$4.96 billion. They discovered that that 70 per cent (C$3.47 billion) of the total spending could be attributed to the SR&ED tax credit (Expert Panel 2011) and questioned whether they were getting sufficient return on their relatively expensive investment. The 2012–13 Canadian Budget seeks to rebalance the mix by providing more funding for direct support programmes (Canadian Budget 2012).[5]

Innovation is More than R&D

While it has been recognized for decades that innovation could occur without directly conducting R&D, international comparisons that pro-



Source: OECD, Innovation microdata project based on CIS 2006, June 2009 and national data sources.

Figure 12.2 New-to-market product innovators, 2004–06, as a percentage of innovative firms by R&D status

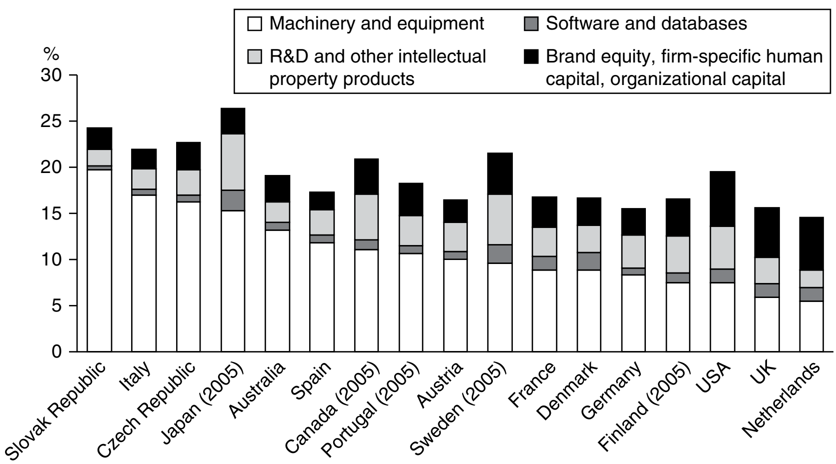
vided evidence of this phenomena had been lacking because it required access to innovation microdata and the creation of a consortium of researchers with access to these microdata who could collectively construct such an indicator using common techniques and methodologies. This exercise – the Innovation Microdata Project – was launched in 2006 and concluded in 2009 with the publication of *Innovation in Firms* (OECD 2009b), which was one of more than a dozen reports that supported the IS. This indicator provided a much-needed balance to the ubiquitous R&D indicators and made the point that innovation can occur without performing R&D (Figure 12.2). Rather, innovators can benefit from R&D done elsewhere, underscoring the need for linkages and adaptive capacity, or from activities other than R&D such as organizational change, design or marketing. This type of innovation is especially important for service sector innovations that, due to measurement challenges, have failed to garner much attention from either the research or the policy community even though services constitute 70 per cent of most OECD economies. Long overdue, this indicator established the need for a broader view of investments that support innovation, going beyond R&D.

Recasting Innovation Activities as Investments that Drive Growth

Extending this observation that innovation and innovation policy involve more than just conducting or supporting R&D was work on 'intangibles' that sought to develop an investment series for a range of knowledge-based assets including R&D but also software, designs, firm-specific human capital and organizational know-how. Initial work on 'investments in knowledge' was developed by the OECD (Khan 2001) in the late 1990s, but the work by Corrado, Hulten and Sichel in 2005 (Corrado et al. 2005) for the USA was more systematic and gained greater visibility, leading to complementary efforts in many OECD countries (COINVEST,[6] INNODRIVE[7] and the Conference Board[8]). The OECD worked to compile this work and incorporate it into the IS.

The international comparisons compiled by the OECD showed that, when aggregated, these investments in 'intangibles' matched or exceeded investment in tangibles such as structures, equipment and machinery. When used in growth accounting models, intangibles contributed as substantially to labour productivity growth in a wide range of countries (e.g. Austria, Denmark, Finland, France, Sweden, the USA) (Corrado et al. 2009) (Figure 12.3).

This provided an important economy-wide extension to the finding that innovation could occur in non-R&D-performing firms – rather a range of innovation-related activities, such as the development of new business models based on an innovative organizational structure (e.g. Easy Jet) or



Source: *OECD Science, Technology and Industry Scoreboard 2011*. Data on intangible investment are based on COINVEST (www.coinvest.org.uk) and national estimates by researchers. Data for fixed investment are OECD calculations based on OECD, Annual National Accounts and EU KLEMS databases, March 2010.

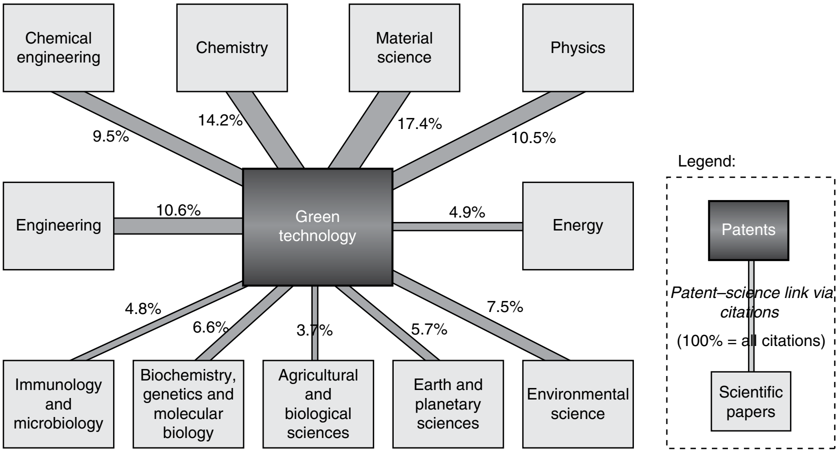
Figure 12.3 Investment in fixed and intangible assets as a percentage of GDP, 2006 the exploitation of mobile phone geo-location data to better optimize bus routes should be considered as innovation investments that are linked to growth. By analysing these investments as a group, as opposed to discrete activities, they can be viewed as a bundle of complementary, interacting investments. Lastly, this work has given added weight to the argument that 'hard' investments in science are not sufficient by themselves to produce innovative outcomes; rather they need to be complemented with 'soft' investments such as marketing and new business models to gain commercial success. This broader perspective echoed the thinking behind the 2005 revision of the *Oslo Manual*.

By adopting concepts used in the system of national accounts, using the growth accounting model and productivity analysis, this analysis and the resulting figures provided a bridge between S&T or industry ministries and ministries of finance and central banks. The macroeconomists could now see, using tools and concepts that they were familiar with, that collectively these intangible investments were on a par with the traditional concept of investment – and that they were the source of badly needed growth. For the S&T and industry ministries, it forced them to recast their work in an economic framework. The intangibles work provided a composite index that many had been searching for that avoided issues of mixing units and assigning proper weights while providing a clear link to a policy objective: growth and labour productivity.

These developments were a twist on the outcome of the 2006 Blue Sky indicators conference, where the focus had been on equipping ministries involved directly in developing innovation policy with useful 'pedagogical' tools similar to those enjoyed by finance ministries. Rather, the intangibles work borrowed these existing tools and in doing so helped to mainstream the concept of innovation and innovation policy as a broader endeavour.

Innovation is Multidisciplinary

The importance of multidisciplinary approaches to science and innovation and their implications for policy have been recognized for some time. Alexander King, the first director of the Directorate for Scientific Affairs at the OECD, devotes a chapter to this subject in his autobiography where he asserts that 'many attempts to solve complex problems failed because one or more facets of the difficulty were undetected or ignored as insignificant' (King 2006: 199). The relevance of this perspective has grown as many innovation strategies have been oriented towards large socio-economic objectives, the so-called 'grand challenges' like climate change mitigation or adaption, addressing demographic challenges or developing new sources of energy.

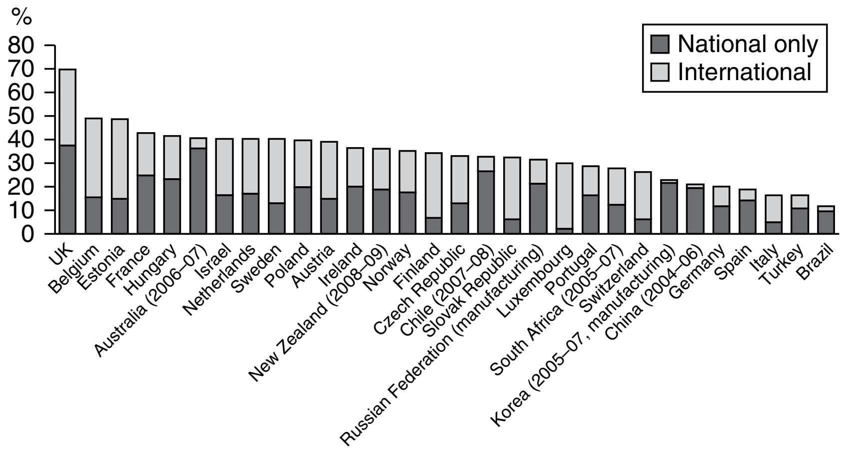


Source: OECD calculations, based on Scopus Custom Data, Elsevier, July 2009; OECD, Patent Database, January 2010; and EPO, Worldwide Patent Statistical database, September 2009.

Figure 12.4 The innovation–science link in 'green' technologies, 2000–2007

Both from a political and from a policy perspective, this linkage to broader objectives is sound, but in many cases the rhetoric did not acknowledge that this shift would require a reorientation of innovation policies away from the traditional focus on specific ministries, scientific fields or technologies to a multidisciplinary, transversal view which required coordination, cooperation and collaboration across areas. This point was underscored by an experimental indicator for 'green' technology patents that used the fields of scientific literature cited in the patent application to quantify the multidisciplinary nature of 'green tech' and found that energy and environmental sciences only accounted for about 12 per cent of all the cited literature. Rather, a wide range of science extending from material sciences to immunology, microbiology and biochemistry is drawn upon to develop green technologies (Figure 12.4).

In the course of the IS roundtables, the implications of 'multidisciplinarity', endemic to addressing grand challenges, were identified. The implications for funding mean less emphasis on specific fields, disciplines and technology and more emphasis on proposals directed to an outcome related to the grand challenge (e.g. carbon-free transportation) as well as the need to develop other policies that 'pulled' innovation through demand-side measures such as standards, performance-based regulations



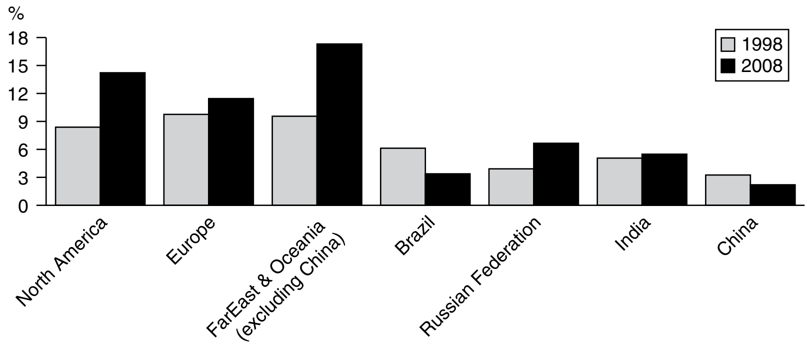
Source: OECD, based on Eurostat (CIS 2008) and national data sources, June 2011.

Figure 12.5 National and international collaboration on innovation by firms, 2006–08, as a percentage of innovative firms

or performance awards achieved through prizes. It also led to discussions on the proper governance structure for organizations that sought to foster multidisciplinary research.

Reflecting the Shift towards 'Open Innovation'

Measuring Innovation uses a series of indicators to show the growth in collaboration between firms (i.e. international and national), between scientists (i.e. scientific co-authorship trends), between organizations (i.e. co-patenting between firms and universities or public research organizations) and especially across borders (i.e. co-patenting where inventors are from different countries, scientific publications where authors are from different countries etc.) Collectively, these indicators illustrated that collaboration was rising, especially across borders. Across a range of countries considered to be innovative – such as Finland, Australia, Sweden, Israel, Estonia and the UK – a third or more of innovative firms were engaged in collaboration with international partners (Figure 12.5). This raises important policy questions about the utility of trying to restrict access to government programmes to domestic firms, the need to facilitate linkages across organizations, especially universities, industries and public research organizations and mechanisms that encourage the mobility of researchers.



Source: OECD calculations, based on Scopus Custom Data, Elsevier, December 2009.

Figure 12.6 Scientific collaboration with BRIC countries, 1998 and 2008, as a percentage of total international co-authored articles

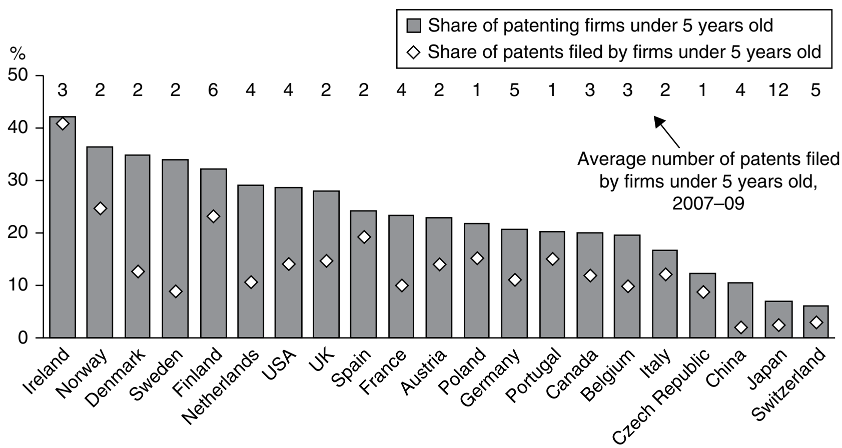
The Changing Topography of Innovation

Key to this notion of collaboration was its changing location, as a number of indicators revealed the shift in innovative activity away from the most developed, G7 countries to a broader array of players, especially in the emerging economies of Brazil, Russia, India, China and South Africa (BRICS). While the rise of China as an emerging force had been documented in terms of R&D spending for some time (OECD 2008), *Measuring Innovation* provides insights into the emergence of a new cluster of scientific collaboration that appears to be forming between the BRICS and the 'Far East and Oceania' (excluding China). In the past, much of the innovative activity in the BRICS countries had been attributed to foreign direct investment or collaboration with leading Western universities, but the identification of a growing network of scientists from the BRICS countries working together with other Asian countries is suggestive of a third pole of scientific expertise rising in Asia. OECD policy makers have interpreted this shift in different ways, ranging from a threat to their dominance to a more enlightened recognition that the size of the global science commons is growing, and with it the need to reorient policies towards gaining access to this research and assimilating the results (Figure 12.6).

Targeting Young, Innovative Firms

The IS devoted significant attention to the 'framework conditions' needed to create an environment conducive to innovation-driven entrepreneurial activity. The role of new firms that are willing to embrace unproven, radical technologies or champion a new business model like Amazon, Skype or Easy Jet are known to be important for establishing new sources of growth and leading to productivity gains through structural change. To date, much of the evidence tends to be anecdotal. In terms of policy making, new firms tend to be subsumed under the much broader category of small and medium enterprise policies. But analysis shows that the vast bulk of SMEs are not particularly innovative and tend to generate jobs only in the early years after their birth. The linking of company information and patents at the firm level provides an opportunity to look at young, innovative firms and focus on the role they play as technology developers, job generators and agents of productivity gains.

Measuring Innovation included an experimental indicator of patenting activity by firms younger than five years – both as a measure of the percentage of all patenting firms these young firms constituted and as a share of all patents filed (Figure 12.7). This figure helped support a debate that was already occurring in many capitals about the relative role of large, small and new firms and their role in the system of innovation. It also generated interest in this subset of SMEs as well as the policies needed to nurture



Source: *OECD Science, Technology and Industry Scoreboard 2011* based on the Worldwide Patent Statistical database, EPO, April 2011; and ORBIS© database, Bureau van Dijk Electronic Publishing, December 2010; matched using algorithms in the Imalinker system developed for the OECD by IDENER, Seville, 2011.

Figure 12.7 Patenting activity of young firms, 2007–09: share of young patenting firms and share of patents filed by young patenting firms, EPO and USPTO this cadre of firms whose innovativeness and fast growth require special financing, skills and linkages to S&T organizations. The EU is exploring the feasibility of developing an indicator that proxies the 'high-growth innovative firms' as one of its 'Innovation Union Headline' indicators and a US National Research Council of the US National Academy panel on future STI indicators has made a recommendation that NSF develop a similar indicator as it revamps its indicator portfolio (NRC 2012). Much work remains to make this experimental indicator more robust since the firm-level economic data available internationally (ORBIS[9]) are not well suited to this type of analysis.

4. CONCLUSION: THE 'MAINSTREAMING' OF INNOVATION POLICY

The OECD IS is part of a longer trend to mainstream STI policy as an element of broader economic and social policies that have their origins in World War II and extend far beyond the work undertaken by the OECD itself. Within the OECD as an organization, the IS is the latest manifestation of this phenomenon, which moves in fits and starts, but because of a confluence of factors including economic pressures to find new sources of growth, the desire to climb up the value chain and the growing importance of grand challenges such as climate change, the discourse surrounding policies for innovation have entered the mainstream policy dialogue of nearly all countries – developed, emerging and developing. Indicators, as described above, have been instrumental in this repositioning.

This is a significant change since, for most of its existence, STI policy has been considered a 'sectoral policy' and failed to achieve the same attention or legitimacy that was devoted to labour, fiscal or monetary policy. But that is changing, providing a large opportunity for the STI research and policy community that needs to be seized. To do this, a statistical system needs to be established that is of the quality of the statistical systems that support other major economic policy fields where, for example, labour policy have data on populations, schooling, training, occupation, wages, unemployment and stocks of labour force. Given the current budgetary pressures, a different path will need to be followed that utilizes non-survey data sources such as administrative records and web sources such as the Conference Board's help-wanted online database, which can provide a source of demand for STEM jobs (Conference Board 2011).

Associated with this is the need to improve the ability to engage in the evaluation of STI policies and codify what works and what does not, and share this information broadly. This field of policy analysis, for many good reasons, not the least of which is the serendipitous nature of innovation and the time lags associated with the process of innovation, makes evaluation difficult. As Brooks (1971: 63) noted, 'Innovation is not, and cannot be, an entirely planned process, because it includes the revelation of the not yet known or understood.' Nevertheless, too much STI policy is based on anecdotes, intuition and the ideas of a few. The usual factors that constitute the political economy around policy limit the ability to learn from policy failures: few countries are willing to discuss their mistakes at the OECD table. As a consequence, STI policies, like many public policies, are susceptible to fads – the proliferation of biotech, nanotech and ICT clusters of excellence or the widespread targeting of R&D to GDP intensities are a testament to this phenomenon. As innovation policy becomes mainstream, more analytical rigour is needed and improved statistics and indicators are instrumental in meeting this challenge. Efforts in many countries to develop a 'science for science and innovation policy' are an important step towards achieving this goal. The OECD itself needs to do more in this area, as a developer of indicators, as an evaluator of policies and as a forum where policies are discussed.

As policy making recognizes the importance of STI policy, it is important that practitioners, advocates and students of the area retain humility about its limits – it is not a silver bullet for all policy problems; rather, innovation can often be worthless or even harmful, as witnessed by financial innovation that has badly damaged many parts of the economy and society. Policy makers need to be reminded that the end goal is not innovation, but the economic performance and social welfare that innovation can generate.

NOTES

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2. Many of the indicators described challenge or provide new insights into many of the conventional wisdoms on innovation, and therefore question standard policies. But rarely can indicators by themselves be used as a basis for new policy; rather a more complete statistical analysis is needed to better understand the determinants.
3. See http://rd-review.ca/eic/site/033.nsf/eng/home.
4. Seehttp://finance.senate.gov/hearings/hearing/?id=ef6a4c10-5056-a032-5212-fbf59e314035.
5. See http://www.budget.gc.ca/2012/plan/chap3-1-eng.html.

6. See http://ec.europa.eu/research/social-sciences/projects/359_en.html.
7. http://www.innodrive.org/.
8. http://www.conference-board.org/data/intangibles/.
9. ORBIS© Database, Bureau van Dijk Electronic Publishing.

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