Preface

When I first came to the Organisation for Economic Co-operation and Development (OECD) in Paris as a delegate to the Working Party of National Experts on Science and Technology Indicators (NESTI) I was struck by the breadth of the agenda and the mix of policy analysts and statistical experts at the table able to interact effectively and to speak a common technical language then rooted in the Frascati Manual.

When the discussions began on how to measure the activity of innovation, at a time when the subject of innovation studies was emerging I would have welcomed a guide to the measurement issues, the policy issues and how they all fitted together. That was the first glimmer of what became this book.

As the years passed, I heard the need for a practitioners' guide to the subject echoed by new members not just of NESTI but of other committees in the domain of science, technology and innovation. The policy committees have working parties attached to them that deal with more focused matters of policy or statistical measurement. In that sense NESTI is subordinate to the Committee for Scientific and Technological Policy (CSTP). Viewed differently, NESTI is the current incarnation of an expert committee that met before there was an OECD in 1957 and which gave rise to the first edition of the Frascati Manual, drafted by Christopher Freeman, which governed the collection and interpretation of research and development (R&D) data, as the sixth edition does in 2009.

In 2008 I was invited to become a Visiting Fellow at Canada's International Development Research Centre (IDRC), and one of the expectations was that I would use the time to write a book on innovation measurement and policy that would contribute to the discourse in the innovation community and would also serve as a teaching tool for courses the IDRC planned for delivery in developing countries. This was a great opportunity and made more so by an invitation from the OECD to become a member of the management team working on the OECD Innovation Strategy to be delivered in June 2010. This fitted well with IDRC and with my work with the New Partnership for Africa's Development (NEPAD) Office of Science and Technology. It also gave rise to a problem of using privileged information in the preparation of this book. The problem has been resolved by using sources that are in the public domain and

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completing the book before the Innovation Strategy policy principles and policy advice have been decided. Any suggestions for future action in the book are mine, and not those of the IDRC, or the OECD, and any benefits from the publication of the book have been assigned to the IDRC. It will be used as a teaching tool.

In capitals of OECD countries, there are departments of education and research, of innovation, of science and technology and others with titles including various combinations of those words. In the same capitals are statistical offices responsible for producing the statistics for the System of National Accounts (SNA), the best-known SNA indicator, of course, is the gross domestic product (GDP). The GDP has a much longer history than indicators of R&D, such as gross domestic expenditure on R&D (GERD) which, in turn, has been around longer than the propensity to innovate by firms. Some statistical offices venture into the realm of science, technology and innovation (STI) statistics, which are done on the margin of the SNA. They then publish the GERD/GDP ratio which the OECD tabulates for member countries and some others. This is a league table which encourages political leaders to set targets for their country in terms of R&D performed.

Not all official statistics come from statistical offices. Some are gathered by policy departments and some from industry associations or research institutes. However this is done, there are those who produce estimates for indicators and those who use the indicators for policy purposes. The European Union target of GERD/GDP ratio of 3 per cent (with 2 per cent from the business sector) is an example, as is the new US target of more than 3 per cent set by President Obama on 28 April 2009.

While there are policy-makers and statisticians, they each have a limited understanding of what the other does. Addressing this is one of the objectives of this book. If the understanding increases, the likelihood of misinterpretation of statistics declines and their use in the policy process becomes more effective. The statistician will begin to understand the phrase, 'The Minister wants it *now*', and the policy person will understand the reason for the response of: 'We cannot give you the R&D expenditures of the top five firms in the country.'

The book is about innovation, its measurement, the use of indicators in policy and the policy learning that results. There are some recurring themes. One is that indicators of innovation are not much used in policy. That is not an original observation, but it is a disturbing one. It may be that innovation indicators are too new and that politicians and senior bureaucrats are not yet ready to use them. It may also be that there is no one indicator that really describes the innovation system of a country, and that makes it difficult to produce a sound bite. The closest would be the

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propensity of a firm to innovate in a particular sector or industry, but what does that mean? The qualified answer to that can be found in the book.

Another theme, much commented upon by my colleague Anthony Arundel at the United Nations University Maastricht Economic and Social Research and Training Centre (UNU-MERIT), is that more firms are innovating than are doing R&D. This is one of the more robust results to come out of many years of surveying. It even appears in a footnote of the first edition of the Oslo Manual published in 1992. But where are the policies that help firms that have to solve problems to survive, but which do no R&D and cannot claim R&D tax credits or other R&D-related support? The suggestion in the text is that if these firms were supported, and growth was one of the objectives of the support package, they might in fact grow. Larger firms have a higher propensity to do R&D. This is an indirect approach to getting to the 3 per cent targets. It also makes the point that size of firm is a key variable for analysis.

Then there are the users of products who feel obliged to change them to make them suit their needs better; or if they have a need which is not being met by the market, they develop their own products to meet their needs. These can be consumers but they can also be firms that need to improve their production process to put products on the market. These firms are not selling production processes, but they have to make them work to survive.

This introduces another historical theme in the book. In 1987 a senior member of the Canadian statistical office, Statistics Canada visited the US Census Bureau where Gaylord Worden presented a survey questionnaire on the use and planned use of advanced manufacturing technologies. This was an inspired questionnaire that took some years to develop, but was easy for a plant manager to fill out. A copy of the questionnaire found its way to Ottawa and a pilot survey was done and published on Thursday, 15 October 1987. The Canadian press published the story the following day and the market crashed on 19 October, Black Monday. There was no causal relationship, but competitiveness became a policy goal in the downturn and a decision was taken to do a full survey and for me to work with Robert Tinari at the US Census Bureau to produce the first, and the last, Canada–US comparison of the use of advanced manufacturing technologies in five industries. In all five, Canada did not do as well as the US. This result provided motivation for work at the Canadian department responsible for industry policy for some years.

After the 1987 survey, Eric von Hippel published his 1988 book which identified the user, or consumer, as the source of much innovation. As a result of this, the manager of the 1989 survey, Louis Marc Ducharme, added a question on the modification of the technologies that had been

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adopted, by the users – the first measure of user innovation in official statistics that produced population estimates of this activity. The population of technology adopters that went on to modify the technologies was significant.

When the technology use survey was repeated in 1998 there were questions about technology modification and about the development of technologies by users that were not available on the market to solve their production problems. Both activities were significant. When a technology use survey was conducted for 2007, the same questions were there, and this time there was a pilot follow-up survey which asked a number of questions about how the users that modified or developed their technologies funded the activity and protected the intellectual property that resulted. The interesting finding was that a significant number of user innovators chose to give the knowledge away, rather than to protect it with intellectual property instruments. That raises some questions for intellectual property policy.

So far, the themes are the bringing closer together of the policy community and the measurement community, the importance of non-R&D-performing firms to value creation and economic growth, and the significant role of the user innovator in the activity of innovation. While the three themes are important, there are two overarching themes which explain why it is necessary to have a better understanding of innovation and of what governments can do to make it work better. Those themes are avoiding ecological and financial disaster.

There are two aspects of this; the first is to deal with climate change through innovation and to save the planet and the higher life forms that inhabit it, of which the reader is an example. The second is to promote innovation that results in economic growth, rather than the economic decline now being experienced as a result of innovation in financial services, and the rapid diffusion of the monetized debt products, until they lost value and the market crashed. There are other reasons for understanding innovation, but these are high on the list.

Understanding innovation is not just a matter of running surveys and feeding the results into evidence-based policy. The innovation system is global, complex, dynamic and non-linear in its response to policy intervention. This phrase is a leitmotif in the book, along with the other themes, and it poses a challenge that is left to the next generation. However, there is a suggestion about how to proceed.

Jack Marburger came to Ottawa in 2006 to the OECD Blue Sky II Forum and put the case for the development of a science of science and innovation policy. The idea is the creation of a new cross-disciplinary social science that will improve the understanding of the science of policy,

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in this case the science of science and innovation policy. As this book is about innovation, the focus has been on the creation of a science of innovation policy and the book lays out the components of a research agenda that moves in the direction of a new science.

Finally, the book comes at a time when the OECD is developing its Innovation Strategy, as is the European Union (EU), which is considering an Innovation Act in 2010. These events should be seen not as an end but as step towards longer-term goals, to which this book is a contribution.

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