

Developing the linkage between policy and innovation measurement¹

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Abstract

The linkage between policy, statistics and analysis is the subject of debate currently in many countries. This is of concern not only for increasing the policy relevance of data and of research based on these data, but also for making more effective use of the public resources devoted to data collection, analysis and the formulation of policy initiatives. The interface between these areas varies between countries, depending upon institutional factors, process factors, and human capital factors (training and mobility of personnel).

This paper relates this debate to the field of innovation measurement, and raises the question of how issues of concern for research and innovation policy can best be injected into innovation statistics and analysis. It reviews some recent studies which analyse innovation survey data in order to shed light on specific policy issues, and draws some general conclusions. It is proposed that there may be much to learn from identifying good practices in the field, and a number of concrete areas where this might be done are presented.

The paper concludes with some future directions for innovation measurement which would be of interest for the development of European research and innovation policy.

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1. INTRODUCTION

It is widely agreed that one of the key aims of measuring innovation is to help in the formulation of public policy. Establishing a strong linkage with policy, in terms of ensuring the policy relevance of the data collected and of the analyses performed on these data, is therefore crucial. However, in practice this linkage involves highly complex mechanisms, and the way in which it is handled varies enormously from one country to another. This paper puts forward the suggestion that it may be beneficial to compare across countries good practices in the policy linkage of innovation statistics and analyses.

The following section places this issue in the context of a broader ongoing debate in statistical and policy circles on how best to ensure that statistics respond to policy needs. Section 3 narrows the focus to the field of innovation measurement, and reviews some examples of the use of innovation data to shed light on policy issues. Some concrete suggestions are made in section 4 on some interesting areas where it could be beneficial to foster international comparisons and exchanges of information concerning the use of innovation survey data for policy purposes and policy linkage mechanisms. Some conclusions are drawn in section 5.

2. STATISTICS, RESEARCH AND POLICY

The debate on the policy relevance of statistics and research has almost certainly been going in one form or another since the emergence of official statistics. It is also one of those issues that will never go away, since policy needs are continually changing, and statisticians and researchers are in a permanent position of trying to catch up with the latest priorities. It is difficult to judge whether this debate has intensified in recent years, but it is increasingly set against the background of the desire of governments to assess the costs and benefits of public investment, including that devoted to these activities.

In most countries the importance of gathering statistics that respond to policy needs is enshrined in statistical legislation and protocols. Statistical agencies are more aware than anyone of these obligations, and have made considerable efforts over the years to establish mechanisms for promoting the interface with policy, the most obvious example of which are the various producer-user groups (such as the CEIES at European level, and the Advisory Committee on S&T Statistics of Statistics Canada). Other elements that can help to promote policy linkage include institutional structures, government-university cooperation, project management, training and mobility schemes.

There is of course the non-trivial question of identifying who the policy makers are (this term usually encompasses a much broader population than the group of politicians in government), and, for that matter, who we mean when we speak of statisticians and researchers. What we are dealing with in reality is a very complex system involving many different institutions, players and linkage mechanisms.

Complex though it is, the policy linkage issue, continues to receive a lot of attention from the different actors involved, be they policy makers, researchers or statisticians.

A recent report by the Performance and Innovation Unit of the UK Cabinet Office (UK Cabinet Office (2000)) explored how data and analyses can better feed into government decision making. Among the key findings of the report was the relatively weak demand for good analysis, resulting from constraints on the scope for analysis due to detailed political manifesto commitments, tight ministerial deadlines for the delivery of analytical work, and the problem of embarking on research that may yield unwelcome results. The report identified a number of areas where improvements could be made, including strengthening interaction between policy departments and the academic sector, better anticipation of the forthcoming policy agenda, and the more creative use of different data sources to derive the “big picture”.

The issue of joint working between specialists and policy makers received particular attention. It was concluded that the best balance could be obtained through a combination of “bedding out” specialists to policy teams and retaining some central specialist units. Training policy makers to know more about specialist disciplines and analysis, and training analysts to work effectively with policy teams were also felt to be crucial requirements.

This debate is not just taking place within government policy departments, but one hears the same issues echoed in the research community, and especially in the economic and social sciences. Shove and Rip (2000) discuss the very real difficulties of identifying the users of research, and remark upon the similarity between users and unicorns : “both are easy to imagine and both are difficult to track down in the real world”².

A recent conference on social science and governance, organized under the aegis of UNESCO, had as its core theme the research-policy interaction, and concluded that it would be useful to carry out cross-national studies on the institutional arrangements to link research and policy, on the role of social scientists in government and on the various forms of decision making (Henke (2000)). Other good examples of the policy linkage debate in the social sciences can be found in Cross et al (2000) and in OECD (2001).

To complete the policy-research-statistics triangle, it is important to reiterate the ongoing efforts of national and international statistical institutes to reinforce the policy-relevance and use of the data they produce. Their efforts include trying to improve information about available statistics and their quality, access to and better exploitation of existing data, and dealing with gaps in available information. Users groups have been in place for many years to advise statistical offices. At European level, for example, the CEIES (The European Advisory Committee on Statistical Information in the Economic and Social Spheres) has provided an interface between users and producers of a broad range of statistics over the last ten years (see for example Eurostat (1999)).

Turning to the field of innovation measurement, it is clear that the issue of policy use and policy relevance has been high on the agenda from the first efforts to produce meaningful data in this area. Significant efforts have been made to assess the implications for policy of research results, and to stimulate feedbacks into the design of new surveys and analyses. A very useful debate about the policy relevance of results from the CIS can be found, for example, in the proceedings of the Conference on Innovation Measurement and Policies held in Luxembourg in 1996 (European Commission 1997).

² Other interesting papers relating to the use of socio-economic research can be found in the special issue of *Science and Public Policy* devoted to interactive social science (volume 27, number 3, June 2000)

An interesting paper by Nyholm et al (1999) looks at the role of academic research in guiding innovation policy in the knowledge-based economy. The authors advocate more research on improving techniques for measuring the effects of policies as well as research on new cooperation patterns between academic researchers and policy makers and diffusion of best practice.

One might argue that this kind of debate on the linkage between statistics, research and policy is the prerogative of the more mature fields of study. Innovation measurement (and innovation surveys in particular) is not as well established as other domains, and until recently was still very much in its infancy. However, over the last decade, innovation surveys have undergone a series of significant methodological improvements, which have been accompanied by a burgeoning of increasingly sophisticated analyses of these data. Over the same period, and to a large extent as a result of these efforts, our understanding of innovation and the development of policy responses have evolved considerably.

Now that this field is starting to mature, it may therefore be a good time to take stock of the experiences gained so far in using innovation measures to inform policy decisions. This paper argues that this could be done by fostering international comparisons and exchanges of information concerning the use of innovation survey data for policy purposes and policy linkage mechanisms. This is developed more in section 4, which includes some concrete suggestions. Before this, the following section tries to add more substance to this discussion by reviewing some of the work to date on analysing innovation survey data to address policy questions.

3. USING INNOVATION SURVEY DATA FOR POLICY DEVELOPMENT

3.1 Introduction

In reality “innovation policy” covers a broad range of different policy fields including research, industrial regulation, education, employment, taxation, environmental regulation, health standards, quality control, and IPR law. It therefore embraces not only those funding instruments used to support R&D and innovation in firms, but also the fiscal, institutional and regulatory environment, as well as all measures and mechanisms within the control of government that can encourage the interaction between those actors involved in producing, distributing and applying various kinds of knowledge.

Innovation surveys cannot be expected to measure the effects of policy in all of these areas. Moreover, they have wider objectives than just policy assessment, including the mapping of innovative activities and the improved understanding of the innovation process. Nevertheless, significant efforts have been made to take into account various policy questions in the design and analysis of innovation surveys.

This section explores some examples of studies carried out to date which relate innovation survey data³ to policy questions (see Table 1 for an overview). This is not intended to be an

³ The main focus here is on the family of innovation surveys based on the Oslo Manual. However, many important “non-Oslo” surveys of innovative activity have been carried out, and some interesting examples of these are also highlighted. Clearly this debate also extends to the use of many other complementary indicators and data sources (R&D surveys, patent statistics...).

exhaustive review, but rather an attempt to sketch out some first issues from a sample of papers in this area.

3.2 Evaluation of public support for R&D and innovation

One of the major preoccupations of policy makers in recent years is the evaluation of the effects of government funding for R&D and innovation. Innovation surveys have generally responded to this by asking enterprises whether they receive particular forms of (direct or indirect) support from government schemes. In some countries it has also been possible to identify, from administrative records, the firms that are known to have received such support and to link this information with survey data.

One of the advantages of including such a question in an innovation survey is that one can obtain equivalent data for non-innovators, while at the same time exploiting a statistically rigorous survey and sampling frame. But there are limits on the depth of questioning on public policy that can take place through an innovation survey with broader aims.

This view is partly supported by the findings of Pianta and Sirilli (1997). The authors analysed the results of direct questions on public support included in successive Italian innovation surveys carried out in the 1990s, and assessed the degree of importance assigned by firms to various types of government intervention. They recommended that questions on this subject be included in new surveys, but concluded that deeper analyses are required to obtain a definitive answer regarding the impact of innovation policy on the performance of firms.

One of the methods that increasingly employed to enhance the analytical power of innovation survey data is to link them with data from other enterprise surveys. This extends the range of indicators available for exploring firm-level impacts.

One such study by Klomp and van Leeuwen (2000) matched CIS II data with statistics from production surveys in order to investigate the links between innovation and firm performance. Among the linkages they examined was the stimulating effect of public funding on the innovative activities of firms. They found evidence of a “crowding in” effect, though which public funds for R&D and innovation encouraged firms to spend more money on innovation, all other factors being equal.

Grosfeld and Roeland (2000) linked administrative data to statistics on productivity and innovation output (CIS II). They raised the important question of how to measure the effects of public support when policy itself lacks clear and quantifiable targets. Moreover, some government programmes have rather general aims (e.g. to stimulate or raise awareness of new technological opportunities, rather than to boost firms’ economic performance).

These three studies all used data from the Community Innovation Survey. While no direct equivalent of the CIS exists in the USA, there have been a number of surveys of enterprises that explicitly ask about innovative activities and the effects of government programmes. Kordes et al (1999) carried out a survey of small businesses in high-tech sectors, and analysed the effects of two policy instruments : tax credits for research and experimentation and the small business innovation research programme (SBIR). The 1999 Georgia Manufacturing Survey aimed to identify trends and needs in the manufacturing base, and to measure change in the performance of those firms assisted by the manufacturing extension service of the Economic Development Institute (see Shapira 2000).

Table 1 : Some examples of the use of innovation survey data

Evaluation of effects of public policy measures on innovation

Effects of public support	Pianta and Sirilli (1997) Klomp and van Leeuwen (2000) Grosfeld and Roeland (2000) Cordes et al (1999) Shapira (2000)
Impact of environmental policy	Hemelskamp (1999) Jaffe and Palmer (1996)
Role of patents	Arundel et al (2000) Arundel and Kabla (1998a, 1998b) Brouwer and Kleinknecht (1999) Licht and Zoz (1998) François and Lehoucq (1998) Arundel and Steinmueller (1998) - MERIT (1995) CBS (2000)
Collaboration with public research organizations	Arundel et al (2000) Polt et al. (1999) CBS (2000)

Understanding the innovation process

Link between innovation and firm performance	Heshmati and Lööf (2001) Klomp and van Leeuwen (2000) Shapira (2000) Näs and Leppälähti (1997),
Innovation in the service sector	Ebling et al (2000)
Regional innovation	Richiardi (2000) Alanen et al (2000)
The role of embodied and disembodied technological change	Evangelista (1999)
In- vs out-sourcing of technology	Veugelers and Cassiman (1999)

With such studies we approach the interface between official statistical surveys of innovative behaviour and a second, strongly related, class of surveys more specifically designed for the assessment of policy instruments. These are evaluation surveys which focus upon measuring

the outcomes, impact and additionality of public support programmes. A recent review of work in this field can be found in the paper by Giorghiou and Roessner (2000). Such studies offer a more targeted and detailed method for exploring the effects of particular policy instruments compared with policy impact questions in innovation surveys, which are generally more limited in their scope in view of the need to ask respondents about other aspects of their innovative activities.

This raises the important question of whether innovation surveys are a useful tool for the assessment of the effects of public support measures and policies on the innovative behaviour and economic performance of firms, or whether dedicated evaluation surveys are a more appropriate method for determining these effects. As mentioned above, the attraction of innovation surveys is that they provide a statistically rigorous frame, as well as broad range of firm-level indicators covering a representative sample of the total population of enterprises. Evaluation surveys are not generally integrated in the official statistical system, and are more likely to be carried out by funding agencies, or by independent evaluation professionals. Such surveys can be designed with the same statistical rigour as innovation surveys, but sampling tends to be more targeted. These surveys have the advantage of allowing more detailed and focussed questions on policy instruments. Clearly innovation surveys and evaluation surveys are complementary tools which can be used together for the assessment of policy instruments, and it would be interesting to compare international practices in this area.

A further intriguing issue is the use of appropriate comparison or “control” groups of non-client firms (e.g. those who do not receive funding from a particular programme) when assessing the effects of public support. Various approaches can be found in the evaluation literature (Brown (1995), Jaffe(2000)), and there may be some room for cross-fertilization of ideas between evaluation exercises and statistical surveys of innovation.

3.3 The role of the patent system

Another area of policy where governments can directly intervene to stimulate innovation is the patent system. There are two key issues here that innovation surveys can potentially address. The first concerns the importance and effectiveness of the patent system for firms as a means of protecting appropriability, as well as understanding other motives firms may have for patenting. The second relates to the success of patent systems in disseminating information that can lead to innovation.

The importance of patenting for innovation is investigated in a number of studies. For example, the use innovation survey data to investigate the propensity of firms to patent according to their type (sector, company size, nationality ...) can be found in Arundel and Kabla (1998a), Licht and Zoz (1998) and François and Lehoucq (1998). Arundel and Kabla (1998b) use the PACE/SESSI survey to explore the motives for patenting, while Arundel et al (1995) and Brouwer and Kleinknecht (1999) analyse the relationship between patenting in a company and its innovative output.

The question of the dissemination of patent information has been tackled in several studies using questions relating to the use of patent databases as a source of information for innovation (see for example Arundel et al (2000), Arundel and Steinmueller (1998) and CBS (2000)).

It would be interesting to know the reactions of those involved in developing policy in the patent field to these sorts of results. Do they shed light on important issues for patent offices,

and what types of data and analysis do they need for future policy challenges? For example, has the establishment of on-line patent databases on the internet – which has developed since CIS II – helped to improve the dissemination and use of patent information? Other questions might also help to evaluate public policy in this area : for instance how prohibitive is the cost of patenting renewal and defence, especially for small firms, and to what extent does the use of patents by firms either block or promote the diffusion of knowledge?

3.4 Environment policy

The impact of environmental policy on innovation is a subject that has received increasing attention in recent years. The policy questions here (see Kemp (1998)) include whether environment regulations crowd out more productive investments or lead to new competencies and innovation-related organizational change ; whether regulation limits certain avenues of exploration and technology use, and creates competitive disadvantages vis-à-vis foreign competitors. There is also a need to analyse their interactions with other forms of regulation (consumer protection, health and safety, antitrust, employment...).

Hemelskamp (1999) is one of a fairly small number of empirical studies that examine the relationship between environmental policy and innovation. His study, based on data from the Mannheim Innovation Panel, analyses the determinants of environmental innovation and the specific impact of environmental policy. However, the direct linkage with policy instruments was only possible via an additional survey of German chambers of commerce. A more general discussion of the impact of environmental regulation on innovation can be found in Hemmelskamp et al. (2000).

Using panel data from a sample of companies, Jaffe and Palmer (1996) examine the statistical relationship between compliance expenditures, R&D expenditures, and firm performance.

Kemp et al (2000) study the concepts, sources, indicators and methods that can be used to explore this relationship. They conclude that innovation surveys provide good data on the economic significance of product renewal, but do not study the specific technological character and objectives of innovations. They observe :

“A major problem in using the above indicators for analysing environmental innovation lies in the sectoral or technological classifications which are used. For R&D and innovation survey statistics, the underlying data tends to be classified according to some standard industrial classification (either NACE or ISIC) at a fairly high level of aggregation. This makes it very difficult to isolate environment-related activities at a detailed level of disaggregation. Patents, on the other hand, are classified by technological field, and while this enables the identification of environmental components, it makes it difficult to relate patents to specific fields of economic activity.”

Innovation survey questions to date have focused on two main issues : regulation as a barrier to innovation, and the importance of the reduction of inputs among the innovation objectives of firms (see table 2). Given the need to limit the size of innovation survey questionnaires, this again leads us to the question of how to develop complementary data sources to explore key policy issues.

Table 2. Environmental innovation indicators included in the family of innovation surveys based on the Oslo Manual

Survey	Question	Measurement scale
CIS - 1 (1993)	Importance to the firm of developing and introducing innovations to lower production costs by: 1. reducing materials consumption 2. reducing energy consumption	five-point scale ranging from insignificant to crucial
“	Importance to the firm of developing and introducing innovations to reduce environmental damage	“
“	Importance of 'legislation, norms, regulations, standards and taxation as a barrier to innovative success	“
Canada (1993)	Government standards or regulations as a factor of particular significance as an impediment to innovation	Yes or no
“	Importance of factors in the firms general development strategy: 1. Using existing materials more efficiently 2. Reducing energy costs	five point scale from not important to crucial
“	Effects of the firm's most economically important innovation: 1. Reduced energy requirements 2. Reduced capital requirements 3. Reduced material requirements	Yes or no
PACE (1993)	Importance of environmental regulations as an obstacle to the ability of the firm to profit from innovation	five-point scale ranging from not important to extremely important
CIS - 2 (1997)	Importance to the firm's innovative objectives of: 1. Reducing materials consumption 2. Reducing energy consumption	Not relevant category plus importance scale of 1 to 3

Source : Kemp, Smith and Becher (2000)

3.5 Cooperation with public research organizations

How to make best use of the resources channelled into the public research infrastructure is has been a policy conundrum for many years now. It is widely perceived that the competitiveness of firms depends in part on their exploitation of the results of basic and applied research carried out by universities and public research centres. These latter organizations are responsible for producing new basic and applied knowledge and new instruments, not to mention highly trained scientists. In order to develop effective policies, we need to understand the mechanisms that link industry with public research organizations, and how firms benefit from this interaction.

A recent analysis of innovation cooperation between private firms and public research organizations can be found in Arundel et al (2000). Their findings echo those of other researchers : the rate of cooperation with public research organizations increases with firm size, and also as one moves from low- to high-tech firms. The authors also explore the influence of universities and public research centres as a source of innovation in terms of a firms propensity to introduce new-to-market product innovations. Other recent uses of these data can be found in Polt et al. (1999) and CBS (2000).

Another perspective on this issue can be found in the series of international studies, based on a survey methodology developed by the DISKO project in Denmark. These so-called DISKO studies focused mainly on innovation collaboration between firms, but also examined the role of partnerships with public research institutes (see for example Basri (2000)), Ørstavik and Nås (1998), Schibany (1998)), Vinding and Kristensen (1999), and Sanz-Menéndez and García (1998)).

Here too it would be useful to explore how complementary data sets can be used together and developed in a coherent way for policy. For example, several private databases exist on research and technology alliances (including those between firms and universities), while the utility of the public research base has also been explored through indicators of citations in patent documents to scientific papers by public research organizations.

3.6 Understanding the innovation process

The above review reveals that two key questions underpin the use of innovation data for policy purposes: what policies are needed, and how can we measure the results of these policies?

While many of the studies mentioned so far explore the more explicit policy linkage of the second question, there is probably a greater volume of research devoted to gaining a more general understanding of the innovation process. This latter body of work seeks to describe and analyse the various components of the innovation process in the firm, as well as their interactions, so as to better target areas which could benefit from public intervention.

For example, among the first objectives of the Community Innovation Survey was the identification of the barriers to innovation in order to assess where and how governments could intervene to stimulate innovative activity. Much effort has also been devoted to understanding the links between innovation and the economic performance of firms. Such studies help both to

provide an analytical foundation for developing political initiatives, and to justify the cost of these policies. Table 1 gives a list of examples of studies of this type⁴.

3.7 Use of innovation surveys : some first conclusions

From this rather short sampling of the literature one might draw the following tentative conclusions.

- In their relatively short lifetime, there is already evidence of a wide and diverse use of innovation surveys as a tool to assess the effects of a number of different policy measures. However, it would appear that such surveys are more often employed in a broader analytical framework in order to gain an improved understanding of the innovation process, and its various components and interactions. Such an understanding is, of course, also necessary for effective policy development.
- It is very difficult to assess in what ways innovation survey data, and the analyses of these data, have been useful as an input to the formulation of policy. However, most countries must and do address this issue in some way, either directly or indirectly, and it would be interesting to exchange experiences on this matter.
- It is also not clear what mechanisms (institutional structures, steering committees, project involvement of policy staff, ...) have been used to link policy needs with the development of innovation surveys and the analyses that are made using innovation survey data.
- Innovation surveys are one of a series of complementary data sources that can be used to throw light on policy questions (others include evaluation surveys, patent data, bibliometric data, ...). It would be useful to gather experiences of what innovation surveys are good at measuring in relation to policy, and what is better measured through other instruments. Moreover, how can these different sources be developed and exploited in a complementary way?

4. EXAMINING APPROACHES AND EXPERIENCES IN POLICY LINKAGE

4.1 Learning about policy linkage

The channelling of useful data and analyses relating to the innovation process into policy development is far from simple. Various factors (institutional, historical, legislative, conceptual, methodological...) combine to make this a highly complex and constantly challenging process. Different countries handle this linkage in different ways, from their institutional structures to the nature and content of their innovation surveys.

The central thesis of this paper is that it could be beneficial to foster international comparisons and exchanges of information concerning the use of innovation survey data for policy purposes and policy linkage mechanisms. The identification of good practices in this area might help to

⁴ In practice, the distinction between studies that measure policy effects (sections 3.2 to 3.5) and those that aim to gain an understanding of the innovation process more generally is a rather simplistic one, and is employed here merely to facilitate the presentation.

stimulate the use of innovation data by policy makers and to suggest useful paths for developing surveys and economic analyses of innovation.

This is by no means a new idea. As indicated in section 2, there are already statistical forums that discuss such matters in a broader context (for example the CEIES). Moreover, there is frequent exchange of information about innovation measurement, analysis and policies in various international conferences or official meetings, notably those organized under the auspices of the OECD and the European Commission, not to mention the circulation of information through published papers, reports and research networks (now enhanced through the internet).

At the same time, the measurement of innovation, and in particular the use of dedicated innovation surveys, is no longer in its infancy. Over the last ten years, the quantity and quality of data collected internationally have risen very rapidly, and the volume and sophistication of analyses based on these data have increased proportionately. There is now a rich diversity of approaches and experiences. During the same period, and, one hopes, in response to the improved understanding of innovation gained from these efforts, research and innovation policies have evolved considerably. It may therefore be an opportune moment to take stock of what has been learnt with regard to policy linkage, through an international exchange of information and the identification of good practices.

4.2 Some concrete issues to explore

The following list, by no means exhaustive gives some concrete examples of issues that could be explored in this way:

The interface with policy users

A number of important issues surround the mechanisms that are used to link policy makers with those who produce and analyse innovation statistics:

- Who are the “policy users” of innovation survey data and analyses and how are they identified? Which institutions, which profile of user, and at which level in the institution?
- To what extent and how have different concerned ministries (research, industry, education, employment, environment) been associated with the design and use of innovation analyses?
- What methods have been successful in involving policy makers in the formulation of innovation surveys, and in the analysis of the results?
- What institutional structures have helped to encourage an effective dialogue between policy users and statistical producers?
- Is research directly commissioned by policy departments, and do they also make use of independently produced studies? Are directly commissioned studies necessarily more effective ?
- To what extent have other stakeholders been involved in the development of innovation measures and analysis. In particular, how have enterprises been consulted on the relevance of the survey questions and results?

Usefulness of data and analyses for policy

Another key set of questions concerns assessing the contribution of innovation surveys and analyses to the process of policy development :

- What techniques are used for evaluating the relevance and usefulness of innovation survey data for policy makers? What are the results of these evaluations, and how are these results fed back into the process of re-designing surveys?
- There has now been a common experience with the CIS for several years now involving the collection and analysis of innovation data using a harmonized approach: what are the experiences across countries in terms of the relevance and success of these data for policy formulation ?
- Are there examples of innovation measurement helping to influence policy changes (i.e. success stories)?
- Are there policy fields in which the use of results from innovation data is stronger/weaker (e.g. research, industrial regulation, education, employment, taxation, environmental regulation, health standards, quality control, IPR law), and why?
- How have innovation surveys helped to contribute to a better understanding of the general process of innovation, and how has this in turn influenced the development of policies ?
- What forms of results and dissemination methods have been appreciated by policy makers (statistical overviews, tailored analyses of specific policy issues, econometric analyses, presentation and debate, on-line data, ...)?

The development of complementary sources

Innovation surveys on their own cannot reply to all policy questions, and there is a need to use them in conjunction with other sources. A number of issues could be explored in this context :

- How can innovation surveys be used in a complementary way with other sources of enterprise micro-data to address specific policy questions ?
- What are the respective roles of innovation surveys and specifically designed evaluation surveys for measuring the effects of policy instruments ? How can these two types of survey complement each other ?
- Have any countries experimented with, or do they plan to use, smaller specialized sub-surveys which focus in more detail on specific policy issues, or which contain different questions depending on the sector/size of the firm?
- How can innovation survey data be used in conjunction with related indicators to answer policy questions (for example, combining innovation survey data on patenting with patent statistics, or data on cooperation with indicators from other sources on inter-firm technology alliances or university-industry collaborations)?

- What other sources of information have been successfully combined with innovation survey data in order to shed more light on policy issues?

4.3 Some measurement issues for European Union policy

Against the background of the above discussion, it may be interesting to mention finally the following future directions for innovation data that could be of use in the specific area of European research and innovation policy :

- The development of comparable innovation survey data for non-EU countries would help to extend the range of countries against which European innovation performance can be benchmarked.
- It is planned to include a question on participation in the EU Framework Programme for RTD in the next Community Innovation Survey, and it is hoped that this can lead to some analytical insights of use for EU research policy.
- The linking and analysis of micro-data from different surveys (e.g. innovation, R&D, business surveys...) is increasingly common in many countries and provides a powerful analytical approach. It would be interesting for EU policy if more such work could be carried out using comparable linked data from several countries at the same time.

5. CONCLUSIONS

The whole process through which innovation research is linked into policy formulation, and policy needs are fed back into the research and data-gathering system is highly complex. Like the innovation process itself, it is non-linear, involves intricate interactions and feedbacks, and varies significantly from one country to another. In order to reinforce the linkage with policy, it may be helpful to understand more about this process – the interactions between the various systems that are used for designing and collecting innovation statistics, for carrying out research and analyses using these data, and for using the results as an input to policy formulation – and to compare experiences between countries.

Statisticians and researchers are keenly aware of the cost of the statistical and analytical infrastructure for innovation measurement, and expend considerable effort trying to ensure that their outputs are of use for policy makers. The diversity of approaches employed by the different actors in this still young field is a real asset. In exchanging information about the way these issues are handled in different countries, it may be possible to identify what is successful and what is not successful.

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