Chapter 3

Evaluating the implementation of innovation policy in Panama

This chapter presents an overview of the importance of setting up systems to monitor and evaluate innovation policy. It presents the experiences of different countries that are evaluating innovation policies, focusing on the institutional capabilities that are required and the challenges involved in setting up effective monitoring systems. It concludes by assessing the experience of Panama in implementing and evaluating innovation policy, pointing to key issues for further improvement.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Introduction

There is a growing awareness in both developed and developing countries that investing in innovation is a key determinant for long-term growth and development. As innovation policies increase in relevance in governments' strategies, the demand for the establishment of accountability systems grows, to trace how public resources are spent and to assess to what extent these public investments are effective and capable of delivering the expected results. There is a general recognition that policy interventions should be monitored and evaluated. But less consensus exists on how and when to carry out these assessments; by whom these exercises should be conducted; and on the nature of the necessary incentives to incorporate feedbacks from evaluations into further policy design (OECD, 2012a).

Panama's experience in designing, implementing and evaluating innovation policy is recent, even compared with other countries in Latin America. Over the last decade the country has accumulated institutional expertise on how to design, implement and monitor innovation policies. Currently the country is capitalising on this experience and is making progress in improving the institutional capacity to design and implement better policies. With the aim of supporting this learning process, this chapter presents: *i)* an overview of recent global trends in innovation policy evaluation, focusing on the experience of OECD and Latin American countries, and *ii)* a brief assessment of the implementation and evaluation capacities of innovation policy in Panama.

Countries are expressing an increasing demand for evaluation of innovation policies

In developing, as well as in developed, economies, there is a growing demand for evaluation of the degree to which innovation policies are appropriate, efficient and effective. This growing attention to monitoring and evaluation is the result of several concurring factors. In OECD countries, in addition to a general agreement on the importance of investing public money in a transparent and effective way, the 2008 financial and economic crisis and the budgetary constraints under which most countries are operating have increased the need to prioritise public investments and to increase the value for money of public actions. In developing economies, one of the main reasons behind the growing demand for evaluating innovation polices derives from the need to legitimise these interventions within broader national development strategies. Innovation policies are still often perceived as "luxury" policies, the impact of which on development and poverty alleviation is too indirect to be considered relevant.

In the process of government budget allocation, innovation policies compete with other interventions which are directly targeting social imbalances and are therefore difficult to preserve in contexts of budgetary constraints. In Latin America, for example, beyond the nowadays common rhetoric that innovation matters for development, innovation policies are often assigned limited budgets, and rank low in governments' main priorities (Primi, 2014). In this context, policy evaluations can provide valuable information on the development impact of public investments and can therefore help to legitimise policy interventions in the innovation field (Papaconstantinou and Polt, 1997; OECD, 2010, 2012a).

In addition, developing economies are designing and implementing innovation policies in contexts that place increasing value on the democratic processes of public policy decision making, and this contributes to increasing the demand for evaluation of any public action. Citizens are demanding more transparent, accountable and participatory public-spending systems. Moreover, the diffusion of new technologies in public administration is increasing the possibilities of setting up new forms of interactive systems to monitor and assess the process of implementation of public policies and delivery of public services (Primi, 2014). Developing economies are facing a growing demand from their emerging middle classes not only to be informed about public policy choices and actions, but also to be involved in the decision-making processes and to receive information on continuing activities in real time. These new opportunities for generating and sharing information about public policies are increasing the complexity of the decision-making and evaluation processes, but are also enriching them by involving a broader range of stakeholders and thereby allowing for experimentations of new forms of designing and evaluating policies.

Part of the growing demand for evaluation of innovation policies also derives from the willingness of governments to go beyond policy design and actually to implement policies. The capacity to design and implement policies evolves over time and advances through trial and error. Monitoring and evaluation systems are important tools in policy design because they provide feedback and information about how policies are implemented in practice. They can reveal unintended consequences of policy actions and bottlenecks in implementation which are precious pieces of information in fine-tuning policy design over time. Policy evaluations are much more than mechanisms for legitimisation and appropriation of policies; they are "learning tools" for improving policy design and policy management when the appropriate incentives for feedback are set up. Indeed, part of the growing demand for setting up evaluations of innovation policies comes from governments' willingness to be engaged in policy implementation over a medium and long period; in these cases evaluation efforts contribute to the generation of essential information for future decision-making processes.

There is a common recognition that evaluating innovation policies is a challenging task

While there is a widespread consensus about the importance of setting up mechanisms to evaluate any policy action, including innovation policy, countries and experts recognise that this task is complex and subject to multiple restrictions. There are no blueprints or pre-elaborated universal guidelines for evaluating innovation policies (OECD, 2010; 2012a). The challenges associated with evaluation help explain why most countries have in place incentives and programmes to promote innovation, but few carry out systematic assessment of their policy interventions (OECD, 2010; 2012a). However, recently many countries are taking steps to improve their capacities to evaluate innovation policies (Box 3.1).

Box 3.1. **Country examples of recent trends in Science, Technology and Industry policies' evaluation practices**

According to the *OECD Science, Technology and Industry Outlook 2012*, most countries in the OECD and beyond are improving the framework conditions for evaluation of science, technology and innovation policies. For example:

Denmark has emphasised the evaluation and impact assessment of policy instruments and in 2011 developed a manual to set the minimum requirements for data collection and evaluation methods for innovation policy.

Egypt has launched the "Decade for Science and Technology 2007-16" aiming at strengthening domestic scientific and technological capabilities by increasing international co-operation with more advanced economies. The country elaborated the "Developing Scientific Research Plan 2007-16" which introduces reforms in the governance of innovation policy and which aims to build a complete chain from promotion of research to commercialisation, and creation of a culture of innovation across the whole of society. The country has strengthened the institutional capacities for innovation policy since 2007, by*: i)* creating the Ministry of Higher Education and Scientific Research in charge of research policy design*; ii)* creating the Higher Council for Science and Technology, as a consultative body strategy and priority setting; *iii)* restructuring of the Academy of Scientific Research and Technology into an advisory body in charge of evaluation; and *iv)* transferring the responsibilities of funding from the academy to a new body, the Science and Technology Development Fund.

Israel has increased the capabilities for evaluation of innovation policy by creating a policy and evaluation unit in the office of the Chief Scientist. The unit is in charge of programme evaluation and acts as an advisor in strategy setting.

Source: OECD (2012a) http://dx.doi.org/10.1787/sti_outlook-2012-en.

A major challenge in evaluating innovation policies is related to a lack of information and the difficulty in establishing counterfactual evidence (OECD, 2012a; Warwick, 2013; EVALSED, 2013). In fact, if appropriate monitoring systems are set up and targeted surveys are carried out, it is possible to identify the impact

of certain government interventions on the behaviour of different innovation agents, but it is not possible to assess the overall impact of the government action because it is hard to estimate what would have happened to the same agents in the absence of the intervention. Furthermore, the time lag between interventions and expected outcomes increases the complexity of evaluation techniques because it is difficult to establish the right timing for assessment exercises.

Another major challenge is linked to the "attribution problem". Innovations are the result of the concurrence of different actions implemented by different agents and government bodies at different levels of government. As such, innovation policies include actions that are planned, financed and managed at different levels of governments (national, regional, local), and the outcomes are the result of synergies (or lack of them) between these different actions (OECD, 2011; 2012a). Given the fact that innovation is the result of systemic interactions between different agents and institutions, it is difficult to isolate the responsibilities and identify in a linear way the determinants of outcomes (Miles and Cunningham, 2006). In practice, the impact of innovation policies is linked not only to the effective design and management of innovation policies *stricto sensu* but also to other policies, as well as to market dynamics. For example, in Latin America, the lack of synchronisation between innovation and industrial policies since the 1990s has hampered the capacity of innovation policy interventions to achieve the expected transformative changes (Cimoli, Ferraz and Primi, 2005).

While there is consensus on the fact that "evaluations" are important, in practice countries link to the term "evaluation" different activities, which range from monitoring to impact assessment. Evaluation activities differ in scope (i.e. it is possible to evaluate a measure or an instrument, a programme which includes different policy tools, or the overall innovation strategy) and also in the main objective of the evaluation (i.e. where the request for evaluation comes from; in certain cases evaluations are requested by donors or main financers of innovation programmes in order to assess the relevance and effectiveness of actions, in others they are part of the policy cycle process and are a requested step in policy planning, in yet other cases they are carried out *ad hoc* to assess the impact and effectiveness of new or old measures in order to redefine the policy package). The different scope and objective of the evaluation exercises influence the data, and the methodological and institutional requirements for carrying them out properly. While most of the recent debate has focused on impact assessment of policy interventions, the setting up of monitoring systems is a preliminary and a main step towards more comprehensive types of evaluation. Table 3.1 summarises the main institutional, timing and data requirements of different types of evaluation exercises, focusing on monitoring, impact assessment and appropriateness of government intervention. These three types of exercises are of increasing complexity and reinforce each other.

Table 3.1. **Monitoring and evaluation exercises: Institutional, timing and data requirements**

Characteristics	Monitoring	Impact assessments	Appropriateness
Brief description	Tracking policy implementation	Evaluating efficiency and effectiveness of policy programmes/tools/actions	Assessment of relevance of objectives/rationale for policy action
Main functions	1. Accountability of expenditure of public resources (how much and to whom) 2. Generation of information base for impact assessment	3. Clarification of unintended consequences of policy action 4. Identification of implementation bottlenecks 5. Generation of information for future policy design	6. Assessment of relevance of state intervention in the domain 7. Assessment of appropriateness of priorities/objectives of state intervention
Institutional responsibilities	Internal (e.g. unit within the implementing institution/agency)	Internal (e.g. unit within the implementing institution/ agency and/or other government agency/body responsible for impact assessment) It can also be external (e.g. financing agent of programme/policies) but it needs internal institutional capacities	External (e.g. independent panel/group of experts) backed up with internal evaluation capacities
Time framework	Infra-annual report and ongoing data collection	*Ex post.* *Una tantum* (one-off) activity. The timing depends on the scope and object of the evaluation and on the time horizon of the policy programme/action/mix to be assessed	*Ex ante* and/or *ex post* Carried out rarely.
Data sources and methodological issues	Data are generated through policy implementation (basic data on beneficiaries and benefits received) Simple accounting & reporting methodologies	Databases generated through monitoring systems; qualitative and quantitative data based on *ad hoc* beneficiaries' surveys; peer reviews Complementary firm level and researchers' level surveys Mixed methodologies: qualitative, comparative assessments; econometric studies; case studies	Qualitative and quantitative data. Macrodata of reference; sophisticated methodologies; interdisciplinary evaluation teams

Table 3.1. **Monitoring and evaluation exercises: Institutional, timing and data requirements** (*contd.*)

Budget	Low, but necessary to foresee this up front to have the necessary human and financial resources for operating the monitoring system	Medium; it depends on the methodology and type of evaluation performed, as well as on the scope of the evaluation	High.
Examples	Panama's evaluation matrix set up to keep track of the implementation of the national innovation policy plan	Chile's assessment of support to venture capital funds (see OECD, 2013a for details)	Korea's assessment of national strategy for technology parks (see OECD, 2012b for details)

Source: Authors' elaboration.

The distribution of institutional responsibilities differs from country to country. In most cases, a dedicated unit/function in charge of monitoring and evaluation exists within the main agency in charge of policy implementation. While monitoring is often assigned to the unit in charge of implementation because of ease in accessing and processing information, evaluation functions are often assigned to dedicated units to ensure assessment and implementation are independent of each other. For example, the National Agency for Research and Innovation (ANII) in Uruguay has a dedicated unit in charge of evaluation; this unit employs 8 people out of a total of 53 employees of the ANII. It employs people with diverse backgrounds, including economists, statisticians, political scientists and sociologists. Even though internal capacities for evaluations are needed, it is also important, especially for small economies, to get contributions from evaluators from abroad. This is true for *ex ante* evaluations and selections of projects, but also for impact assessments and evaluations of appropriateness. In small economies, regional and international co-operation in evaluation is determinant in ensuring that effective evaluation exercises are carried out.

A key dimension in defining the evaluation processes is time. While monitoring needs to be done on a continuous basis and an assessment of results is often useful at the mid-term, different types of evaluations are appropriate at different points of time. Timing is important when conducting evaluations. Governments are often under pressure to demonstrate the effectiveness and the impacts of new measures. However, innovation policy tools often deliver results over the mid term and premature evaluations can deliver misleading results in respect of the success or failure of the new measures. Monitoring and

assessment exercises that are done well can provide the necessary feedback for correcting problems in implementation while programmes are under way, and can be effective in improving policy design. Impact assessment, for instance, should be planned over the medium term, and should also consider that appropriate timing varies with the scope (i.e. the kind of measure that is subject to the evaluation) and the characteristics of the measure itself (e.g. assessments of programmes to train human resources for evaluations should take into account the capacity to insert productively the new skilled people and this should be taken into account in selecting when to carry out the evaluation, and this timing might be different for the evaluation of programmes to finance the creation of new innovative enterprises). Often monitoring and early-stage evaluations offer feedback on management of policy tools and programmes, while mid-term and *ex post* evaluations contribute to assessment of the impact of the implemented public support on changing behaviour and conduct in the private sector, and in academia, and the relevance of the established goals to the changing economic environment.

Impact assessments are costly, and are often carried out on specific programmes or measures and not on the overall policy mix. The experience of countries shows that evaluation exercises should be planned in advance to ensure relevance for future policy design. The Korean experience in the evaluation of regional industrial promotion programmes provides insights on how monitoring and evaluation conducted can be useful for readjusting the initial set of goals and improving programme implementation and its effectiveness. Another example includes monitoring and evaluation practices of start-up support policy in Chile (see Box 3.2).

Monitoring and evaluations are both "sources" and "users" of qualitative and quantitative information. Monitoring systems are the basis for any type of evaluation because over time they build valuable information on policy implementation and on beneficiaries. In some countries, data on implementation are collected by observatory-types of institutions which also favour the matching of the newly generated information with information available in other parts of government, the private sector and academia, constituting important inputs for overall economic policy analyses. Some examples of these institutions are the Business Innovation Observatory of the European Commission, and, at a local level, the innovation benchmarking services offered by the National Confederation for Small and Medium-sized Enterprises in Italy (CNA) which generates and shares information generated by collecting firm-level data at the regional level. Other examples are the Observatory for Science and Technology of Colombia, created in 1999 as a public-private partnership initiative, which is responsible for producing qualitative and quantitative indicators to monitor

trends and support the process of strategic decision making and the National Centre for Science and Technology Evaluation (NCSTE) of China, created in 1997, to monitor and assess the impact of government policies (OECD, 2013b).

Impact assessments and more comprehensive evaluations require the use of different types of data, often matching those generated by the monitoring system with other data sources. In Latin America over the last decade many countries, including Panama, have set up innovation surveys which have been used as complementary information sources for policy assessments (Cimoli, Primi and Rovira, 2011; Primi and Rovira, 2011). Innovation surveys have been used to assess the performance of different innovation policy tools, as for example, research and development (R&D) tax credits, technology parks and R&D funds (see, among others, Cappelen, Raknerud and Rybalka, 2012; Czarnitzki and Lopes-Bento, 2013; Czarnitzki, Hanel and Rosa, 2011; Yang, Huang and Hou, 2012). Firm-level surveys are useful when they help to reveal the heterogeneity in the behaviour of firms, which makes it possible to target policies better. Their advantage is to "show differences in behaviours in order to help policy makers better to understand the variety of conditions in which policies operate (Cimoli, Primi and Rovira, 2011).

Box 3.2. **Evaluating innovation policies: The experiences of Chile and Korea**

Evaluation and adjustment of start-ups support policy in Chile

Since 2007 Chile has made a number of adjustments to initiatives to support start-ups. The recommendations made following the evaluations of the instruments put in place by CORFO (Chilean Production Development Corporation) have helped streamline and simplify the financing system. The two lines of first-tier and second-tier seed capital were replaced with the single, flexible, two-stage Flexible Seed Grant (SSAF) system. As a result, an initial investment is made when the project is approved, and then a second larger investment is made once the project has been shown to be feasible, so that resources are prioritised towards projects with the greatest potential impact.

The system of incubators has also been modified on the basis of the results of an evaluation carried out in 2006, six years after the system was introduced. A major weakness of the incubators was that there were no performance-based criteria for the allocation of resources. As in other countries, the incentive encouraged incubators to increase the number of projects they took care of, rather than to prioritise the selection of projects with high potential impact. Between 2009 and 2010, adjustments were made to redirect incentives by introducing performance-based selection criteria. To make the incubators more effective, a second-tier system was introduced in which CORFO's InnovaChile programme allocates resources to potential entrepreneurs through registered incubators, ranked on the basis of their performances. The incubators are therefore given a greater role, managing InnovaChile's resources, but at the same time they are expected to achieve results in terms of quality and performance. In addition, incubators must also provide support and advisory services and allocate additional resources to start-ups or facilitate third-party investment, including from angel investors.

Box 3.2. **Evaluating innovation policies: The experiences of Chile and Korea** (*contd.*)

CORFO's programmes for the venture-capital industry were evaluated in 2011. These assessments led to the creation of the Early Stages Fund and the Development and Growth Fund, thus distinguishing between operating mechanisms according to the phase of development. Measures are also being taken to simplify the methods for evaluating the proposals, with greater priority being given to projects with a global outreach. CORFO aimed to expand its evaluation system so that it would systematically cover all programmes by 2013. To facilitate evaluation, recent beneficiaries of public incentives were required to provide information for up to three years after they received their last public investment (OECD, 2013a).

Using monitoring and evaluation as policy learning tools in Korea

Korea is known for its capacity to set targets and achieve them. This capacity comes in tandem with an intelligent use of monitoring and evaluation. The government monitors the implementation of policies and programmes and draws on feedback from evaluations. For example, after the first phase of the implementation of regional industrial promotion programmes the country carried out an assessment which revealed that the lack of a regionally based institution jeopardised the positive impact of the regional promotion programmes. In the second phase, on the basis of this assessment, regional innovation agencies were introduced to fill the institutional gap at the regional level. Policies advance through trial and error, but for this progress to be made, monitoring and evaluation are essential and need to be managed not by following the logic of control, but as learning tools to improve policy performance. This requires monitoring and evaluation to be included in the policy planning cycle, assigning resources and responsibilities to this function, and allowing space for intermediary readjustment of plans in the course of action without reducing the guarantee of long-term support to the initiative (OECD, 2012b).

Source: OECD (2013a) and OECD (2012b).

Countries are increasingly looking at evaluation as a learning tool

Over the years countries have consolidated evaluation methods and have accumulated experience in carrying out different forms of evaluation. The experiences differ from country to country, but a common element of the last decade is the development of approaches that consider evaluation as a "learning tool" for policy making. The *OECD Science, Technology and Industry Outlook* (OECD, 2012a) showed the results of a survey targeted at identifying the main purposes of evaluation and the main shifts in the evaluation trends in a set of OECD and non-OECD countries. Results showed that countries are:

i) consolidating the framework conditions for evaluation by, for example, enforcing evaluation by law as in Belgium;

ii) increasing co-ordination and institutional capabilities for evaluation by, for example, setting up new units in charge of evaluation as in Poland and South Africa;

iii) strengthening capabilities for evaluation, by defining methodologies and guidelines for evaluations as in Argentina, Colombia and Spain. (See Table 3.2).

Table 3.2. **Major shifts in STI policy evaluation over the past five years**

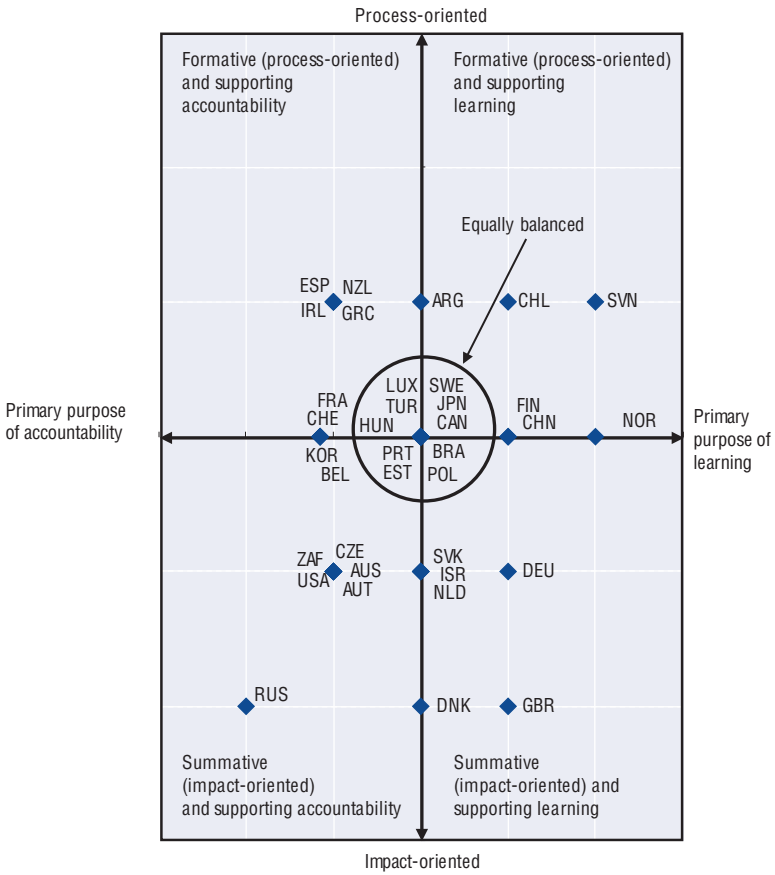
Consolidating framework conditions for evaluation	Promoting a culture of evaluation	Belgium (Wallonia and Capital), Brazil, Poland, Portugal, Russian Federation, Turkey
	Enforcing evaluation by law	Belgium (Wallonia and Capital), Canada, Hungary (higher education institutions)
	Establishing performance agreements and/or contracts with central government	Finland (higher education institutions), France, Luxembourg
	Increasing budget allocated to evaluation policy	People's Republic of China
Agencification and co-ordination	Establishing new evaluation units	Poland, South Africa
	Streamlining evaluation exercises (e.g. through a single agency)	Argentina, France, Korea, Finland, Israel, Italy, Portugal, Slovenia, Turkey, Netherlands
	Increasing co-ordination of evaluation units	Poland
Evaluation capacity building	Implementing a whole-of-government approach/framework for policy evaluation and impact assessment (IA)	Australia, Canada, Finland, Ireland, Japan, Russian Federation, South Africa, United Kingdom
	Defining standards, guidelines and methodological framework for evaluation	Argentina, Austria, China, Colombia, Estonia, Japan, Netherlands, Spain, Switzerland, United Kingdom
	Developing and consolidating science, technology and innovation (STI) and key performance indicators (KPIs)	Australia, Belgium (Capital), Colombia, Denmark, Finland, Norway, Slovenia, Spain, Switzerland, Turkey
	Building STI policy data infrastructure, e.g. science or science and innovation policy initiatives	United States, Japan, Korea
	Building evaluation and IA expert community	United States

Source: OECD (2012a), http://dx.doi.org/10.1787/sti_outlook-2012-en.

Most countries carry out evaluations with the objective of assessing the impact of public policy measures on the expected outcomes/issues to be addressed (summative evaluation) and with the objective of monitoring the management process of measures to identify how to increase the management's effectiveness (formative evaluation). Some countries, such as Germany, Finland and Norway, tend to have evaluation systems that focus on inducing learning

processes, while other countries, such as France, Ireland and the United States, have as their main purpose the accountability of the implemented public actions (OECD, 2012a). The responses to the OECD *Science, Technology and Industry Outlook 2012* policy questionnaire show the differences in purposes of evaluations (accountability versus learning) and in focus (impact or process-oriented evaluations) (Figure 3.1).

Figure 3.1. **Primary purposes and orientation of STI policy evaluation, 2012**



Note: Country rating to the question: what are the purposes and orientations of STI policy evaluation in your country? A summative evaluation measures the impact a policy programme may have upon the problems to which it was addressed. A formative evaluation monitors the way in which a programme is being administered or managed as to improve the implementation process.

Source: OECD (2012a) http://dx.doi.org/10.1787/sti_outlook-2012-en.

The increasing attention towards evaluations as learning tools is also shown by the growing engagement of countries in peer review efforts of their overall innovation strategy, as documented by the series of innovation policy reviews carried out by international organisations such as the OECD, United Nations Conference on Trade and Development (UNCTAD), Economic Commission for Latin America and the Caribbean (ECLAC) and UNESCO. These studies often involve peers in the assessment of the design and implementation of policies and constitute learning opportunities for the countries because they help to build institutional memory about successes and failures in policy design as well as in reforms of policy mix and budgets.

From the perspective of practitioners and hands-on policy makers, the main role of evaluation is to support the implementation, quality, responsiveness and effectiveness of programmes through analysis of the implementation and management of these activities. Despite these differences there is a growing understanding that evaluation can be used as a learning tool for improving implementation and design of both current and future programmes and for development of STI strategy (OECD, 2012a; EVALSED, 2013). For example, the experience of Norway in evaluating a R&D tax credit scheme shows how lessons learned from the particular evaluation of a single instrument can have the potential for broader application (Box 3.3).

Box 3.3. **Evaluating innovation policy in Norway**

Lessons from the Norwegian R&D tax credit scheme

Governments in OECD countries have recently shown an increased interest in the role of evaluation of innovation policy. Evidence shows that governments in a diverse range of member countries including Ireland, Israel, the Netherlands and Norway have started to engage in evaluating both entire innovation programmes and individual policy instruments in an endeavour to maximise policy impact and contain public expenditure. This is in line with a general demand for increased efficiency and accountability of public policies in a context of squeezed public budgets.

Norway has been at the forefront of this trend by carrying out a comprehensive evaluation of its R&D tax credit scheme over the period 2002-06. The scheme, which was introduced in 2002, was part of an overall government strategy to increase private sector R&D expenditure over the medium term. It provided that a certain percentage of a firm's R&D costs were deductible against tax, regardless of the industrial sector and according to specific eligibility criteria. The evaluation, carried out by the Ministry of Finance and the Ministry of Trade and Industry, found that the scheme worked out mainly as intended by stimulating R&D in Norwegian firms, with a particular positive effect on the innovative activity of small firms without any previous R&D experience. The evaluation also concluded that the scheme was carried out in a cost-effective way, incurring low direct administrative costs. Moreover, the high uptake among firms suggested overall satisfactory results in terms of its user-friendliness.

Box 3.3. **Evaluating innovation policy in Norway** (*contd.*)

The Norwegian evaluation experience reveals some insights for other countries, not only with regard to the specific policy measure of tax credits but on how evaluation can be used as an integrated tool to increase the effectiveness of innovation policy design and implementation. A number of findings from the Norwegian evaluation exercise include:

1. Evaluations require adequate resources to ensure high-quality evaluations.
2. Evaluations should be built into the design of the policy from the outset.
3. Evaluations should ideally be based on different types of instruments and methods, depending on the evaluation objective as well as available resources, including surveys, econometric analysis and cost-benefit analysis.
4. The timing of an evaluation is crucial. Evaluations are often called upon to produce results as early as possible to inform policy choices. On the other hand, if carried out too early, a "no policy effect" may be observed, because agents have not yet adapted their behaviour.
5. Good data are essential for evaluations. Data requirements should be identified by governments and operating agencies *a priori* and data should be timely and easy to obtain without creating an excess administrative burden.

Source: Presentation of Statistics Norway at the OECD Expert Group Meeting on the Evaluation of Industrial Policy, Paris, January 2013..

Panama monitors policy implementation, but needs to strengthen evaluation capacities

Panama's experience in innovation policy is recent. Over the last decade the country has accumulated capacities in designing and implementing a multi-annual plan for innovation policy. From interviews with government, academia and private sector stakeholders, as well as from the appraisal of the effective allocation of budget, it is observed that a major pending task for Panama is transforming innovation policies from "government" policies to "state" policies. This is not a unique feature of Panama, since most countries face the challenge of ensuring continuous support for innovation, avoiding strong changes in direction and intensity of support as a consequence of changes in government. But for Panama to advance in implementing an effective innovation policy there is a strong need to increase its relevance in the overall national development strategy. So far, beyond the rhetoric, which is common in the region, that innovation matters for development, in practice the policy still occupies a very low level in the hierarchy of government's policies.

Panama also faces specific challenges to improve the effectiveness of its innovation policy and to increase the contribution that science, technology and

innovation can make to the well-being of its citizens. Panama is a small economy. Therefore when it comes to innovation it faces serous barriers in relation to the scale and scope of interventions. The challenges are not linked to the resources that the country could channel to innovation; in fact, if consensus were built around the role of science and technology in the development of the country, Panama has a sufficient cash flow to increase its investment in innovation, which is today one of the lowest in the region, in absolute and in relative terms.

The territorial disparities within the country and the issue of the indigenous community make regional development a major item on the country's development agenda. Panama has a high concentration of wealth and opportunities in Panama City, while the rest of the regions, even the richest ones in terms of agricultural produce, such as the province of Chiriquí, still lag in terms of living standards and economic opportunities. Addressing the issue of regional development clearly goes beyond the task of innovation policy, but is an issue that the national innovation policy should take into account. A major advancement in this respect is the experience of "*infoplazas*" (the rural information communications and technology [ICT] access point) which the National Secretariat for S&T has built all over the territory, prioritising rural and marginalised areas. In certain cases, these centres for access to ICT, operated as kinds of "community centres", have made it possible to bring the presence of central government into the territory in areas where local government capacities are extremely weak.

Panama faces a major challenge in relation to the critical mass (of human resource, companies, territory) needed to make support to science, technology and innovation potentially effective. The amount of human resources that the country can train and specialise in scientific fields is limited. The production and technology areas in which the country could make a difference and develop clusters of excellence are also reduced by the critical mass of the territory and the people that could be potentially devoted to it. This situation requires a strong capacity to select and prioritise areas of intervention. Prioritisation is a very difficult issue to manage, especially in countries where resources that could potentially be channelled are substantial and in which state management capacities are small. However, the issue of the scope and scale of critical mass is still a potential barrier for Panama, not an actual one. The country has, in fact, a margin to scale up its critical mass by increasing the number of human resources devoted to science and technology and the number of domestic innovative firms. For example, in Uruguay, which has the same population as Panama, the number of researchers in the National Research System is more than 1 600 while in Panama it amounts to 102 (see Chapter 2 of this study).

A major challenge is linked to the implementation of innovation policies. Small economies need to build specific institutional arrangements to be able effectively to monitor and evaluate the implementation of innovation policies. Relying on external peers and evaluators is a common practice, but this needs to be regulated and often the creation of a roster of international evaluators that get to know the country and its specificities proves useful. This is even more important when the policy shifts from a horizontal approach towards a more targeted approach that contributes to broader national development goals. At the same time, the country needs to increase its domestic evaluation capacities to better manage external evaluators and to accumulate knowledge within the country to avoid being submitted to a "stop-and-go" type of policy advice from external bodies.

The growing economic prospects of Panama, mostly linked to the expansion of the Panama Canal, and the rising relevance of trade and trade logistics in the competitiveness of the world economy, challenge the consensus for investing in such a risky business as innovation. History has shown that science and technology, matched with the capacities to use them productively, have been common *leitmotivs* of different successful development stories (Finland, Korea and Singapore, to name just a few). The difference with the case of Panama is that some of these successful experiences were originated in a context where there was a lack of "easy access to money inflows" for the country, whereas some other countries and/or given territories have been able to activate learning mechanisms from foreign direct investment (FDI) inflows in support of the generation of domestic industrial and technological capabilities.

The quality of the innovation strategy process can be assessed in various ways; a first approach, as stated in Primi (2014), consists of assessing the capabilities of the country in four domains:

1) **Choice** (i.e. the capacity of the policy to select objectives, sectors, activities and beneficiaries).
2) **Coherence** (i.e. the capacity to deal with the cross-ministerial nature of innovation [sectoral] and with the diversified territorial impact of innovation [territorial]).
3) **Consistency** (i.e. the capacity to implement policies "of the state" and not "of governments", and to take into account dynamic changes in policy planning, as well as the capacity to guarantee continuity in financial support, and appropriate funding according to the policy objectives).
4) **Control** (i.e. the capacity of the institutional setting to ensure accountability and to allow stakeholders' participation in the policy process).

Based on a peer review process and interviews with relevant stakeholders, Table 3.3 presents a summary of these aspects in the case of Panama:

- Panama has accumulated strong capacities in adopting a participatory approach in the process of innovation strategy setting. Since the beginning the policy has been designed following a participatory approach of the scientific and business communities and this is an asset that should be further exploited.
- Panama's innovation policy lacks prioritisation. The national innovation plan is too detailed and its implementation is limited by bureaucratic requirements and by the mismatch between a multi-annual plan and an annual budget. There is a need to consolidate around a limited number of priorities. This requires increasing capabilities for planning and shifting from a logic of seeing the plan as guiding micro-management to a logic in which the plan sets strategic orientation to facilitate co-ordination with other bodies (public and private).
- Innovation policy has suffered from a low level of co-ordination with other government policies, despite the efforts targeted at generating co-ordination. Co-ordination among policies is hard to achieve in most countries, but it is a key way of increasing the effectiveness of policy actions. Monitoring implementation and evaluation exercises can help identify bottlenecks and missed opportunities in generating synergies across different governmental actions and can therefore contribute to the improvement of future policy design. The risk for small economies is to underestimate this dimension, because of the relatively small size of the country and the power of informal channels of communication and influence. However, it is important to raise the relevance of co-ordination spaces to generate synergies among different actions. Support to science, technology and innovation needs to be planned and implemented in line with the overall government agenda for production transformation and competitiveness to increase its effectiveness and to maximise impact. In Panama multiple spaces for policy co-ordination exist (see Chapter 2), but in practice they are not effective. The National Council for Competitiveness seems to be a promising space for inter-ministerial co-ordination and for co-operation with the private sector.
- There are few resources invested in evaluation, even in comparison with countries of similar size. In Panama mid-term and *ex post* evaluations of the implementation of the National Innovation Plan have been introduced since 2004 as a legally required step in policy planning. The responsible institution in charge of this evaluation is SENACYT and the functions

are assigned to a unit, which is responsible for strategy setting and for evaluation (see Chapter 2). The unit has developed a matrix to monitor progress in the achievement of targets, but to advance the country needs to strengthen planning and evaluation capacities by separating the functions. Most countries have a unit in charge of evaluation which is separated from that of strategy setting, as well as an agency/unit in charge of implementation of innovation policy. Planning and evaluation functions are merged, and following international practice it would be advisable to split them to increase effectiveness.

The policy mix of Panama (as shown in Chapter 2) would benefit from a restructuring in line with improved governance for strategy setting, evaluation and implementation. The experience of targeted support to the training of highly skilled researchers in given science fields has proved to be effective on the one hand and challenging on the other. Actions in the innovation policy field respond to the principle that "good science anywhere is good for science everywhere" (as stated by Professor M. Ferguson, Director of Science Foundation Ireland, on the occasion of the "EU debate on "Global Science, Global Collaboration" in June 2013). In fact, the creation of a top research laboratory in Panama (with top researchers, trained abroad and repatriated) and good infrastructure, made the institute become eligible for a contract to conduct part of the research for a top world pharmaceutical multinational. The downside is that these initiatives need continuous support for a while before they become fully sustainable, and in certain cases there is a need for continuous government support for research in certain fields, as happens in Argentina, Brazil, France and the United States, or other countries where bio-pharmaceutical research is considered a priority. Clarifying the prioritisations could also help in better articulating the policy mix by shifting from one which is mostly oriented to the supply side to a more systemic approach which also promotes the demand side and the creation of productive employment opportunities for the new, trained generations. In the absence of this, there are high risks in terms of social dissatisfaction, economic losses and outward migration of the talented.

Table 3.3. **Assessment of Panama's innovation strategy process through the four Cs approach**

Choice	Coherence		Consistency		Control	
	Cross-sectoral	Territorial	Time	Financial	Policy	Social
Capacity of the policy to select objectives, sectors, activities and beneficiaries	Capacity to deal with the cross-ministerial nature of innovation	Capacity to deal with the diversified territorial impact of innovation	Capacity to implement policies "of the state" and not "of governments", and to take into account dynamic changes	Capacity to guarantee continuity in financial support, and appropriate funding according to the policy objectives	Capacity of the institutional setting to ensure accountability and monitoring	Capacity of the institutional setting to allow stakeholders' participation in the policy process
Lack of prioritisation and focus The policy mix is structured around projects, not around main priorities High emphasis on science, scant support for incorporating science and technology into business	Co-ordination is provided for by law but not put into action (e.g. CICYT) Co-ordination with the various stakeholders should be improved (e.g. CNC)	Most programmes concentrated in Panama City. Need for more inclusive development of peripheral areas and indigenous communities. (e.g. territorial funds or quotas)	Detailed plan, liable to be rigid and difficult to fine-tune according to changing conditions. Temporal mismatch: four-year plan vs. annual budget	Reduced amount of available resources. Need for prioritisation Bottlenecks in the distribution of resources Few resources invested in the evaluation phase	Continuity has been favoured in the passage from the PENCYT 2006-2010 to 2010-2014 Design and implementation are both carried out by SENACYT. Advisable to split the functions	Participatory approach Closer to the scientific community than to the private sector

Source: Based on Primi (2014) and authors' elaboration based on the peer-review process and interviews with government's private sector and academia stakeholders.

The follow-up matrix set up by SENACYT to monitor implementation also shows that for the period 2010-14 Panama has: *i)* shifted the focus from support to tertiary and higher education to secondary education and *ii)* faced difficulties in meeting the targets of the support for STI in the private sector. This can be explained, mostly, by the fact that the policy mix is oriented towards demand (meaning that potential beneficiaries need to apply to policy calls by filling governments' templates). These schemes function better in highly dynamic and innovative contexts where companies know how to access state resources. In other countries strong awareness campaigns and co-operation with agents based in the territories are needed to facilitate the development of high quality proposals and to increase demand for access to these funds. The simple financial offer is not enough to stimulate innovation in the private sector. The actions devoted to the popularisation of science, to raising awareness of the importance of science, technology and innovation in the country have been remarkable, and they still need to play a relevant part in the innovation policy mix of Panama.

Conclusions

As countries recognise the importance of science, technology and innovation for development, and start to mobilise public resources to support the creation of domestic capabilities in these areas, different sets of challenges emerge. There are no recipes or blueprints on "how to do it", nor on "how to do it well". However, some common principles emerge from the experience of countries. What is observed in Latin America, and on a global scale, is that policies evolve through trial and error and that countries and institutions accumulate capacities over time on how to design, manage and assess policy actions. When setting up an innovation policy in less developed economies, countries tend to face multiple challenges at the same time, three of which are of primary importance:

1) **Identifying the appropriate governance structure for managing innovation policy in the country in question:** The institutional frameworks for innovation policy vary across countries and over time, but they all need to find an effective way of performing the following functions: planning, design, implementation management, and monitoring and assessment.

2) **Finding the resources for implementing actions and committing them on a multi-annual basis**: The budget for innovation policy is built up and disbursed in different ways in different countries; often there are different

sources of finance and different mechanisms to channel resources to the different sets of beneficiaries (research centres, companies and/or private-public consortiums), but a common challenge is to ensure an engagement of resources over multiple years and to set up an agile mechanism for disbursements. The lack of timely delivery of resources can be as much of a barrier as the lack of resources to project implementation.

3) **Designing an effective policy mix which generates synergies with other government actions to channel the resources addressing the key innovation enablers for each country at each moment in time**: There is no ideal policy mix, but the experience of countries shows that while needs of innovating agents are complex and evolve over time quickly, policy tools perform better when they are simple, offer stable conditions, mix supply-side with demand-side incentives, and are communicated effectively to potential beneficiaries.

Given that there are no universal guidelines, a degree of experimentation is normal in this process. However, uncontrolled experimentation can be costly in terms of image, when not of resources; therefore monitoring systems are of the utmost importance to reveal unexpected consequences and/or asymmetries between the planned actions and expected outcomes and effective implementation. Monitoring systems are at the basis of evaluation capacities and resources and institutional capabilities need to be devoted to that process to enable future evaluations.

Panama's experience in designing and implementing an innovation policy framework is recent, and it is a timely moment to assess the governance for policy design, implementation and evaluation, to identify new mechanisms to ensure effective channelling of resources and to improve and simplify the policy mix in order to achieve more results. In the definition of a renewed government strategy focused on attracting more FDI to the country, the innovation policy can be an important lever for achieving the objectives of a more inclusive and sustainable growth in Panama. In addition to capitalising on the learning experience from the past and from an improved assessment of the opportunities and challenges offered to the country by the global economic context, Panama could benefit from strengthening its engagement in regional policy dialogues and co-operation processes to create synergies with the countries of Latin America and the Caribbean and to generate opportunities for policy learning in a region where most of the countries are engaged in a process of experimentation of improving public and private commitment to innovation.

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