Foreword

Supporting innovation and production development is fundamental to compete in global economies. Innovation is gaining momentum in Latin America, and many countries in the region are involved in designing and implementing better policies to promote it for a more inclusive and sustainable growth. Over the last decade, many countries in Latin America have strengthened their institutional capacities for innovation policies. However public investment is still very limited and the commitment of the private sector to invest in innovation is still low.

Panama is one of the fastest growing economies in Latin America, but there is a general consensus that incentives are needed to transform that growth into an inclusive and sustainable development path. Since the 2000s, the country has started to design and implement policies to promote innovation and it has set up a mechanism to monitor implementation. Panama, like most countries in the region, seeks to increase the impact of its innovation policy and it has therefore engaged in a peer-review exercise, led by the Development Centre, to assess the effectiveness of its innovation policy and its institutional setting.

This study is part of the OECD Development Centre's work on production development, global value chains (GVCs) and innovation. It reviews the experience of Panama in supporting science, technology and innovation, benefiting from the participation of peers from the Dominican Republic and Uruguay. It analyses the recent economic and innovation trends in the country, the strategy and policy mix of the National Strategic Plan for Science, Technology and Innovation (PENCYT) 2010-14, and the experience of Panama in the evaluation of innovation policy. The study concludes by identifying ways to improve the design and implementation of the national innovation policy. Despite the challenges that the country faces in improving its innovation performance and policies, its experience offers interesting lessons to other small developing economies which are experimenting with ways to improve their participation in global knowledge economies.

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The report was drafted by Annalisa Primi, as lead author, and Marta Talevi and Alsino Skowronnek, Junior Policy Analysts at the OECD Development Centre, with the collaboration of Ximena Usher, Head of the Evaluation and Monitoring Unit at the National Agency for Research and Innovation of Uruguay (ANII) and Leonie Zapata Silvestre of the Ministry for Higher Education, Science and Technology of the Dominican Republic who participated as peer reviewers in the project. We thank José Ramón Perea and Federico Recalde-Ovelar for their comments on the draft and Lorenzo Formenti for his support in finalising the publication. The report benefited from the editing of Stephen Jessel. Book production was co-ordinated by Delphine Grandrieux and Vanda Legrandgérard. The lead-author acknowledges the comments and the debates on the challenges of implementing innovation policies in Latin America of Carlos Álvarez Voullieme, former Deputy Director and Head of the Thematic Division of the OECD Development Centre at the time of the drafting of the report.

The report is the outcome of a Targeted Policy Support Project beweteen the OECD Development Centre and the National Secretariat for Science, Technology and Innovation (SENACYT) of Panama. We acknowledge Dr. Ruben Berrocal, former National Secretary for Science, and the commitment and contributions of Jorge Motta, current National Secretary of Science, Technology and Innovation of Panama and of Diana Candanedo, Co-ordinator of the Strategic Plan Unit at SENACYT who actively supported the project and

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The report benefited from consultations with a number of stakeholders and institutions in Panama, including (in alphabetical order), ACP (Panama Canal Authority), APANAC (Panamanian Association for the Advancement of Science), APEDE (Panamanian Association of Business Executives), Chamber of Commerce and Industry of Panama, Ciudad del Saber International Technopark, CNC (National Competitiveness Center of Panama), CONACYT (National Commission for Science, Technology and Innovation), CONEP (National Council of Private Enterprise), COSPAE (Private Sector Council for Educational

Assistance), ICGES (Instituto Conmemorativo Gorgas de Estudios de la Salud), INDICASAT (Institute of Advanced Scientific Investigations and High Technology Services), UDELAS (Universidad Especializada de las Américas Panama), ULAT (Universidad Latina de Panama), UMIP (Universidad Marítima Internacional de Panama), UNACHI (Universidad Autónoma de Chiriquí), USMA (Universidad Católica Santa María La Antigua), UTP (Universidad Tecnológica de Panama). The report benefited from direct interviews with enterprises operating in Panama, including Hewlett-Packard, GlaxoSmithKline and the Georgia Tech Logistics Innovation and Research Centre.

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Editorial

In the context of what at the Development Centre we have termed "shifting wealth" developing economies are increasingly engaged in the redefinition of their development strategies. The recognition that development is more than growth, and that it requires a change in socio-economic structures in order to redistribute rents and increase equality of opportunities for all citizens, is accompanied by a renewed attention towards production development and innovation in many developing economies. In this respect, increasing attention is paid to the role of innovation as a potential source of more inclusive and sustainable development.

In Latin America and the Caribbean, the debate about innovation for development has regained ground since the beginning of the 2000s. Most countries have designed and implemented innovation plans and policies to increase their domestic scientific and technological capabilities and to enhance their capacity to introduce innovation into domestic, regional and global markets. Despite the improvements of the last decades in the institutions for innovation policy, such as the creation of councils for innovation with private and public participation, the innovation agenda in the region tends to suffer from low budgets, barriers in implementation, a low degree of co-operation between science and business and a lack of a culture of impact assessment and evaluation.

Economies in the region are increasingly confronted with the imperative of diversifying and broadening their sources of growth. As science, technology and innovation (STI) policies are called upon to play a more prominent role to drive production transformation and productivity growth, it becomes crucial to assess and enhance their effectiveness. Better understanding of STI policy design and implementation and of their impact should also be seen as part of government attempt to respond to citizens' call for more accountable policies.

Against this background, the Development Centre has engaged with key actors in the region in the framework of the OECD Latin American and Caribbean Innovation Initiative and analysed the experiences of countries with policies to promote structural transformation. This included the 2015 *Latin American Economic Outlook* on skills for innovation, the analysis of Costa Rica's approach to attracting knowledge intensive FDI and the comparative analyses of policies to promote the creation of start-ups in six Latin American countries.)

The present study, looking at the experience of innovation policy in Panama is the latest addition to this strand of work. Panama is one of the fastest growing countries in Latin America. It is a small, open economy and highly specialised in services. However, despite the high growth of the last decades, poverty and inequality remain major development bottlenecks, especially when territorial differences between provinces are taken into account. Since the mid-2000s, Panama has started to promote science and innovation as part of its development strategy. This initial policy approach focused on improving the quality and quantity of human resources for science and technology and on democratising access to information technologies. Nonetheless, and like many countries of the region, Panama still faces significant challenges in promoting innovation. Against this background, guaranteeing employment for scientific staff, promoting innovation in the private sector and enhancing co-ordination between different governmental bodies involved in the promotion of innovation will be key in the years to come.

The new global economic landscape opens opportunities for development, but to grasp the full benefits of these new opportunities enhanced policy frameworks, increased co-ordination among government actions and private sector commitment are required. This study reviews the institutions and the policy mix of Panama's innovation policy; it assesses the achievements and challenges of innovation policy in the country and it proposes recommendations to improve the design and implementation of the national innovation policy to increase its effectiveness. While Panama is engaged in the definition of its new innovation plan, this publication is a contribution that takes stock of the country's experience in innovation policy and identifies policy recommendations to move forward.

Mario Pezzini
Director, OECD Development Centre

Country profile: Panama

Territorial and institutional framework

Panama is a unitary country with elected regional authorities, composed of the nine provinces of Bocas del Toro, Chiriquí, Coclé, Colón, Darién, Herrera, Los Santos, Panamá, Veraguas, and of five indigenous regions (*comarcas)*: Emberá, Kuna Yala, Madungandi, Ngäbe-Buglé, and Wargandi. The provinces and *comarcas* are further sub-divided into 75 districts and councils, as well as 640 village areas *(corregimientos)*. The capital, located in the province of Panamá, is Panama City.

Note: This map is for illustrative purposes and is without prejudice to the status of, or sovereignty over, any territory covered by it.
Source: Ministry of the Economy and Finance of Panama.

Table 0.1. **Main economic indicators of Panama, 1970-2010**

	1970	1980	1990	2000	2010
Demographic and social indicators					
Population (million)	1.5	1.9	2.4	2.9	3.5
Proportion of population in the capital city (%)	-	-	-	44.8	46.5
Economically active population (million)	-	0.7	0.9	1.3	1.7
Unemployment rate (%)	-	9.9	20.0	15.2	7.7
Poverty headcount ratio at USD 1.25 a day (PPP) (% of population)	-	8.0 (1979)	20.9 (1991)	15.4 (2001)	6.6
Macroeconomic indicators					
GDP (current USD, billion)	1.0	3.8	5.3	11.6	26.8
GDP (constant 2000 USD, billion)	4.1	6.2	7.1	11.6	21.5
GDP growth (annual %)	6.4	1.1	8.1	2.7	7.6
GDP per capita (current USD)	637.1	1951.0	2199.2	3931.0	7614.0
GDP per capita (constant 2000 USD)	2734.8	3170.3	2935.5	3931.0	6109.6
Gross savings (% of GDP)	-	27.6	24.2	23.1	28.5
Industrial and employment structure					
Gross value added by economic activity (% of GDP)					
Agriculture (a)	-	8.9	9.8	7.2	4.5
Industry (b)	-	19.5	15.1	18.9	16.5
Services (c)	-	71.5	75.1	73.9	78.9
Employment by economic activity (% of total employment)					
Agriculture (a)	-	28.1 (1982)	26.6 (1991)	17.0	17.9 (2009)
Industry (b)	-	17.9 (1982)	14.6 (1991)	17.4	19.1 (2009)

Table 0.1. **Main economic indicators of Panama, 1970-2010** (*contd.*)

Services (c)	-	51.2 (1982)	58.7 (1991)	65.7	63.0 (2009)
Trade structure					
Exports of goods and services (constant 2000 USD, billions)	-	6.6	6.9	8.4	15.9
Exports of goods and services (% of GDP)	-	98.2	86.8	72.6	77.0
Imports of goods and services (constant 2000 USD, billions)	-	5.4	5.9	8.1	14.3
Imports of goods and services (% of GDP)	-	88.8	78.6	69.8	69.5
Science, technology and innovation indicators					
Gross Domestic Expenditure on R&D (GERD) (million current USD)	-	-	20.2	44.6	51.9
GERD (% of GDP)	-	-	0.38	0.40	0.19
GERD financed by business entreprise (% of total GERD)	-	-	0.46 (1991)	0.6	2.3
Total number of researchers (FTE)	-	-	89 (1991)	286	410
Number of researchers (per 1 000 labour force, FTE)	-	-	0.09 (1991)	0.24	0.28

Note: (a) Agriculture corresponds to ISIC (Rev. 3) divisions 1-5 and includes forestry, hunting, and fishing; (b) industry corresponds to ISIC (Rev. 3) divisions 10-45 and includes manufacturing (ISIC divisions 15-37). It comprises value added in mining, manufacturing, construction and utilities; (c) services correspond to ISIC (Rev. 3) divisions 50-99 and they include value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services. FTE refers to full-time equivalents.

Source: Authors' elaboration based on CEPAL/ECLAC, CepalStat database, http://estadisticas.cepal.org/cepalstat/WEB_CEPALSTAT/Portada.asp?idioma=i; INE database, www.ine.es/consul/inicio.do RICYT, www.ricyt.org/ UNESCO, World Bank, *World Development Indicators 2012*, http://data.worldbank.org/sites/default/files/wdi-2012-ebook.pdf.

Acronyms and abbreviations

AIG	Autoridad Nacionál para la Innovación Gubernamental (National Authority for Governmental Innovation), Panama
ANII	Agencia Nacional de Investigación e Innovación (National Innovation and Research Agency). Uruguay
BRL	Brazilian Reais
CICYT	Consejo Interministerial de Ciencia y Tecnología (Inter-ministerial Council for Science, Technology and Innovation), Panama
CIDT	Consejo para la Innovación y Desarollo Tecnológico (Council for Innovation and Technological Development), Dominican Republic
CNC	Centro Nacional de Competitividad (Centre for National Competitiveness), Panama
CONACYT	Comisión Nacional de Ciencia y Tecnología (National Commission for Science, Technology and Innovation) Panama
CONADES	Consejo Nacional de Desarollo Sostenable (National Council for Sustainable Development), Panama
CONEP	Consejo Nacional de la Empresa Privada (National Council of Private Enterprise), Panama
CONICYT	Consejo Nacional de Innovación, Ciencia y Tecnología (Council for Innovation, Science and Technology) Uruguay
CORFO	Corporación de Fomento de la Producción (Chilean Production Development Corporation), Chile
ECLAC	Economic Commission for Latin America and the Caribbean of the United Nations
EU	European Union
FDI	Foreign Direct Investment
FIC	Fondo de Innovación para la Competitividad, (Innovation for Competitiveness Fund), Chile
FONACITI	Fondo Nacional para el Desarrollo de la Ciencia, la Tecnología y la Innovación (National Fund for Science, Technology and Innovation) Panama
FTA	Free Trade Agreement
FTZ	Free Trade Zone
GCI	Global Competitiveness Index

GERD	Gross Domestic Expenditure on Research and Development
GDP	Gross Domestic Product
ICT	Information and Communication Technologies
IDIAP	Instituto de Investigación Agropecuario de Panama (Agricultural Research Institute of Panama), Panama
IFARHU	Instituto para la Formación y Aprovechiamento de Recursos Humanos (Institute for Training and Development of Human Resources), Panama
IMF	International Monetary Fund
INDICASAT	Instituto de Investigaciones Científicas de Alta Tecnología (Institute of Advanced Scientific Investigations and High Technology Services), Panama
MEDUCA	Ministério de Educación (Ministry of Education), Panama
MEF	Ministerio de Economía y Finanzas (Ministry of the Economy and Finance), Panama
MESCyT	Ministerio de Educación Superior, Ciencia y Tecnología (Ministry for Higher Education, Science and Technology), Dominican Republic
MICI	Ministerio de Comercio e Industria (Ministry of Industry and Commerce), Panama
MICIT	Ministerio de Ciencia y Tecnología (Ministry of Science and Technology), Costa Rica
OECD	Organisation for Economic Co-operation and Development
PECYT	Plan Estratégico de Ciencia, Tecnología e Innovación (Strategic Plan for Science, Technology and Innovation), Dominican Republic
PENCYT	Plan Estragético Nacional de Ciencia, Tecnología e Innovación (National Strategic Plan for Science, Technology and Innovation), Panama
PENCTI	Plan Estratégico Nacional de Ciencia, Tecnología e Innovación (National Strategic Plan for Science, Technology and Innovation), Uruguay
PISA	Programme for International Student Assessment
PPP	Purchasing Power Parity
R&D	Research and Development
SCI	Science Citation Index
SENACYT	Secretaría Nacional de Ciencia, Tecnología e Innovación (National Secretariat for Science, Technology and Innovation), Panama
SME	Small and medium-sized Enterprises
SNI	Sistema Nacional de Investigación (National Research System), Panama
SNIDT	Sistema Nacional de Innovación y Desarrollo Tecnológico (National System for Innovation and Technological Development), Dominican Republic
STI	Science, Technology and Innovation
STRI	Smithsonian Tropical Research Institute
USD	United States Dollar

Executive summary

Panama is one of the fastest growing economies in Latin America, but there is a consensus that policies are needed to transform its growth into an inclusive and sustainable development path and that more should be done to spur innovation and productivity growth. Since the 2000s, the country has started to design and implement policies to promote innovation and has set up a mechanism to monitor implementation. This study analyses the recent economic and innovation trends and the innovation policy in the country, focusing, in particular, on the implementation of the National Strategic Plan for Science, Technology and Innovation (PENCYT) 2010-14, with a view to identifying lessons to improve the innovation policy. The study has benefited from the participation of peers from the Dominican Republic and Uruguay to gain insights from their experiences in innovation policy design, implementation and evaluation. The experience of Panama offers lessons to other small developing economies which are experimenting with ways to improve their participation in global knowledge economies.

Panama is a small, open economy, highly specialised in services. However, despite the strong growth of the last decades, poverty and inequality remain major development bottlenecks, especially if territorial differences between provinces are taken into account. Since the mid-2000s, Panama has started to promote science and innovation as part of its development strategy. Like many countries of the region, Panama still invests little in innovation. The country's investment in research and development (R&D), for example, is one of the lowest in Latin America: in 2010, the country's gross expenditure on R&D (GERD) stood at only 0.2% of gross domestic product (GDP), significantly below the regional average (0.75% of GDP). The initial policy approach resulted in an increase in the quality and quantity of human resources for science and technology and the democratisation of access to information and communication technologies, but the country now faces the challenges of guaranteeing employment for scientific staff and of promoting innovation in the private sector.

The country's experience in designing and implementing innovation policy is recent. While it is still too early to assess the overall impact of its efforts, a review of current government measures to foster innovation reveals that it is

accumulating expertise on how to design and implement innovation policies. Major challenges are consolidation of actions around a reduced number of core priorities; simplification of procedures for policy implementation and resource allocation; and increasing co-ordination with other government bodies, such as the agency in charge of the promotion of the development of SMEs, and with the private sector.

While Panama is engaged in the definition of its new innovation plan, this study is a timely contribution that takes stock of the country's experience in innovation policy and identifies ways to move forward. From the analyses presented in this report, it is possible to make the following recommendations to strengthen the effectiveness of innovation policy in Panama.

Shift attention from planning to implementation

Government plans do not guarantee effective implementation. They are a relevant starting point, but they are effective only when matched with execution capacities and the availability of budgets to implement the relevant actions.

- **The PENCYT could be shortened**, and focused on setting the strategic orientation of the policy over a five-year period, with targets and associated planned budget.
- Within the National Secretariat for Science, Technology and Innovation (SENACYT), **planning and evaluation functions could be separated**.
- **The barriers to effective implementation should be removed by simplifying procedures**. The government could consider the creation of an institutional arrangement that makes it possible to have an implementing body/agency, such as, for example, the creation of a dedicated operative unit in SENACYT. In addition, it would be important to modify the existing procedures and facilitate disbursement mechanisms to reduce operating costs and time delays in implementation by allowing SENACYT to operate in a more flexible way.
- **Look for new pluri-annual financing mechanisms.** The effectiveness of the pluri-annual plan for innovation is hindered by the mechanism of yearly budget allocation and by the fact that each disbursement from SENACYT is subject to approval by the national audit office, making the process of allocation of resources slow and bureaucratic. The creation of innovation funds in priority areas, jointly managed by the public and private sectors, with simplified operational rules, could help raise the budget for innovation and overcome the current implementation barriers

Mainstream innovation policy in the national development strategy

The innovation agenda cuts across several institutions and bodies. Despite the efforts made, innovation policy in Panama has suffered from a low level of co-ordination with other government policies and with a low capacity for dialogue with the business community. In order to advance, it is important to:

- Continue to **raise awareness** at the decision-making level of the importance of innovation as a fundamental element of the national economic strategy, with the aim of mobilising a greater amount of resources in the future.
- **Keep investing in the popularisation of science and technology** to increase citizens' awareness of the importance and potential contribution of science and innovation to the development of the country and its access to global markets.
- **Increase co-ordination** across government bodies and levels of government. This can be done by reactivating the SENACYT Governing Board and the Interministerial Council for Science and Technology (CICYT) as spaces for strategy-setting to align actions managed by different government bodies.
- **Increase public-private dialogue** and partnership for innovation. The Centre for National Competitiveness (CNC) offers the private-public linkage dimension that SENACYT lacks and it could be a powerful ally in promoting science, technology and innovation policy in Panama, by making the domestic private sector more aware of the innovation agenda.

Strengthen monitoring and evaluation capacities for innovation policy

Monitoring and evaluation systems are essential to allow policy learning and to increase the effectiveness of actions. In Panama, it would be important to:

- **Strengthen monitoring capacities** within SENACYT, by increasing the number and variety of backgrounds of the people in charge.
- Plan in advance **evaluations of specific programmes** and tools with a view to improving future policy design, clarifying data requirements and costs.
- **Increase domestic evaluation capacities** and, given the limited size of the country, set up a network of external evaluators to rely on as a complement to internal evaluation capacities.
- **Define clear mechanisms for feedback** from monitoring and evaluation into current and future policies.

Assessment and recommendations

Panama is a small and fast-growing economy specialised in services. The country is well integrated into global trade, but production of goods and services with high knowledge content remains an exception.

Panama's GDP grew on average by 6.57% a year between 1990 and 2012, twice the average growth of Latin America during the same period. The country has recovered relatively well from the financial and economic crisis of 2008, helped by the expansion of the Panama Canal and other investments in infrastructure development. In parallel, since 1990 real per capita incomes in Panama have more than doubled. Despite the progress, however, poverty and inequality persist in the country, mostly in rural areas, and unemployment is still high, especially among the young (15.6% in 2011).

The service sector accounts for the largest share of Panama's economy – around 80% of gross domestic product (GDP) in 2011 – and employs 60% of the workforce. These shares are higher than in other small economies such as Singapore and Costa Rica, where the shares of services in GDP are 73% and 68% respectively, and higher than the average in OECD countries, where the service sector accounts for an average of 70% of GDP. Most economic activities in the country are related to the operations of the Panama Canal and the Colon Free Trade Zone. In 2012 the canal's revenues amounted to 7% of GDP. Manufacturing accounts for a small share of GDP (around 6% in 2011). Within manufacturing, low-tech sectors account for about 75% of total value added, a share which is higher than in other Latin American countries, including Colombia, Costa Rica and Uruguay. Agriculture produces between 3% and 4% of GDP, and employs 18% of the total workforce, being an important source of income, especially in rural areas.

Panama is well integrated into global trade. In 2011, total exports accounted for 81% of GDP, while total imports amounted to 84%. The average in Latin America and the Caribbean was 39% of GDP for total exports and 35% for total imports. Services dominate the export portfolio and contribute 75% of total exports. The country also exports a number of agricultural products, mostly in unprocessed form, including bananas, sugar, fish and pineapples. Sophisticated manufactured exports, including chemicals, electronic equipment and pharmaceuticals are mostly re-exports of multinational companies situated in the Colón Free Trade Zone. Panama has recently started to give priority to attracting multinational companies (MNCs). As a result, a number have recently opened regional headquarters in the country or offshored knowledge-intensive business activities such as research and development (R&D), design or training facilities, which have created new jobs. However, by comparison with other countries of similar size in the region, such as Costa Rica, knowledge-intensive foreign direct investment (FDI) is still limited.

Despite recent efforts in the promotion of innovation, Panama still lags behind most other countries in the region in terms of scientific and technological capabilities, R&D investment and private sector innovation. The country has, however, improved its performances in scientific production and diffusion of information and communications technology (ICT).

Panama is investing in improving its human resources for innovation, but major bottlenecks in terms of quality and critical mass remain. The quality of secondary education is low on the basis of an international comparison. The 2009 OECD Programme for International Student Assessment (PISA) on the performance of secondary students (aged 15 and above) ranked Panama 62nd out of a total of 65 countries. The country scored below the OECD average in each assessed category. University students show a strong preference for the social sciences and humanities and few are enrolled in applied sciences curricula As far as doctoral training is concerned, Panama's number of PhD students is low, totalling 14 in the period 2000-09, against 2 252 PhDs in Chile, 571 in Costa Rica, and 219 in Uruguay.

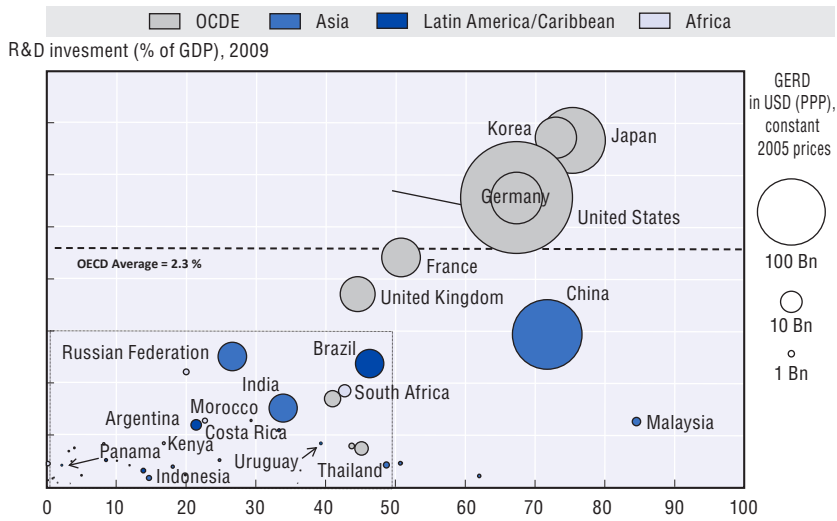
Recently, as a result of efforts to promote research in the country, Panama's scientific production has increased. In 2007, Panama instituted the National Research System (SNI) to recognise and regulate the profession of "researcher" in the country. The SNI helps in identifying the set of potential beneficiaries of National Secretariat for Science, Technology and Innovation

(SENACYT) research grants and in creating the conditions to perform research for professionals, such as professors, attached to bodies where their contract also requires them to perform other activities (such as teaching). In 2010, the country hosted a total of 410 researchers, that is 0.28 researchers per 1 000 labour force, and 553 R&D staff. This number is low when compared with international and regional peers. The average ratio of researchers per 1 000 members of the labour force in Latin America was 1.09 in 2010. Costa Rica, which has roughly the same population as Panama, in 2009 hosted 1 535 researchers and Uruguay 1 745. In addition, foreign researchers represent a significant proportion in Panama. Nevertheless, Panama has recently increased its research output. The number of scientific publications in the Science Citation Index (SCI) increased from only 162 in 2000 to 424 in 2011. This ratio of 84.6 articles per 100 researchers was the highest in Latin America in 2011.

Panama has improved access to and use of ICT. Nowadays around 43% of Panamanians use the Internet on a regular basis, a share which is on a par with the figures registered in the other countries of the region. While, in 2010, the number of broadband subscriptions was only 3.4 per 100 inhabitants, today Panama has one of the highest and fastest-growing mobile broadband penetration rates in Latin America. It also scores relatively well in terms of e-government indicators. However, in 2011, only 29% of all Panamanian households owned a computer and of these only 21% were connected to the Internet. In the same year, the rate was 62% in Uruguay and 45% in Costa Rica.

Business R&D expenditure and private sector innovative activities are still underdeveloped in Panama. In 2010, the public sector accounted for about 47% of total R&D expenditure and the private sector financed only about 2% of total R&D. This is a low proportion compared with similar-sized Latin American countries where private companies spend significantly more on R&D. In Costa Rica, for instance, the private sector contributes 29% of all R&D expenditures, and in Uruguay the figure is as high as 39%. In OECD economies, where private companies are the main source of R&D financing, the private sector's share is usually between 40% and 70% (Figure 0.1).

Figure 0.1. **Research and development investment and private sector commitment in selected countries, 2009**



Note: 2009 or latest available year. No reliable data available for Dominican Republic. Estimates for R&D expenditure (as % of GDP) are 0.25% (see UNCTAD, 2012).

Sources: Authors' calculations based on OECD MSTI Database for OECD countries, www.oecd.org/sti/msti.htm; RICYT for Latin America and the Caribbean, www.ricyt.org/; UNESCO for other countries.

Panama has a National Secretariat for Science, Technology and Innovation (SENACYT), in charge of policy design, implementation and monitoring. The main policy guidelines are set by a five-year plan (PENCYT), but resources are allocated on an annual basis, through a long and highly bureaucratic process.

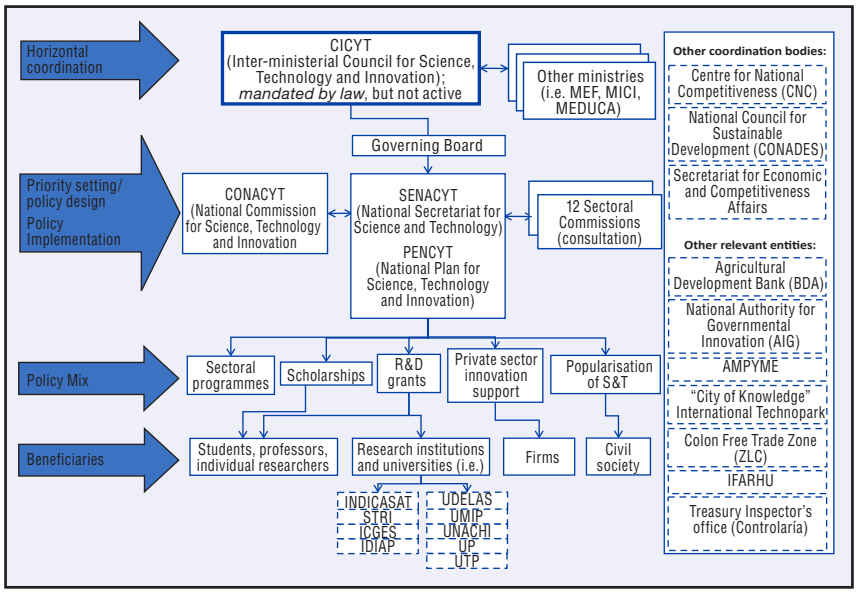
Panama's experience in science, technology and innovation policy is quite recent and dates back to the end of the 1990s when the National Secretariat Science, Technology and Innovation (SENACYT), was instituted by law as an autonomous agency in charge of the elaboration and implementation of science and innovation policy in the country. SENACYT is responsible for defining the strategy (as set by the five-year National Strategic Plan for Science, Technology and Innovation, PENCYT) and for implementing that policy. While countries in general tend to assign this function to separate entities, Panama lacks an implementation agency/body for innovation policy (Figure 0.2). In Uruguay for

example, the National Strategic Plan for Science, Technology and Innovation is designed by the Interministerial Innovation Cabinet, and implemented by the National Research and Innovation Agency (ANII) which has been given a special status to allow flexibility and agility in operations.

SENACYT was instituted to support domestic scientific development and it is a highly respected institution among the national scientific community. Since the 2000s, in line with a general trend in the region, SENACYT has been engaging in efforts to promote innovation in the private sector, by setting up specific policy tools. In this area, however, results have been poorer than expected, because the resources allocated are not sufficient to excite attention from the private sector and the disbursement procedures are very long. Furthermore, the promotion instruments are designed in such a way that resources are allocated through public tenders to firms which have to complete specific government documents and in the local context the awareness and capacity of firms, especially small and medium-sized enterprises (SMEs), in respect of how to deal with government procedures are low.

The PENCYT 2010-14 was elaborated following a participatory approach and is not perceived as a "government document", but rather as a set of reference guidelines for science-related activities enjoying legitimacy in the eyes of the scientific community. Sectoral and horizontal commissions composed of members of research centres, academia, relevant governmental institutions and the private sector were established to identify the needs and priorities of the different knowledge and scientific areas. But the plan is extremely detailed, with a multiplicity of objectives and lines of actions and little capacity to consolidate investment around a limited number of priorities. The level of detail of operational conditions included in the plan hinders the possibility of fine-tuning according to evolving conditions.

Figure 0.2. **Institutional framework for innovation policy, Panama, 2013**



Note: AMPYME=Authority for Micro, Small and Medium Enterprises; ICGES=Gorgas Commemorative Institute of Health Studies; IDIAP=Agricultural Research Institute of Panama; IFARHU=Institute for Training and Development of Human Resources; INDICASAT=Institute of Advanced Scientific Investigations and High Technology Services; S&T=Science and Technology; MEDUCA=Ministry for Education; MEF=Ministry of the Economy and Finance; MICI=Ministry of Commerce and Industry; STRI= Smithsonian Tropical Research Institute; UDELAS=Panama Specialised University of the Americas; UMIP=Panama International Maritime University; UNACHI=Autonomous University of Chiriquí; UP=University of Panama; UTP=Technological University of Panama.

Source: Authors' elaboration based on PENCYT 2010-2014 and information provided by SENACYT, 2013.

The innovation policy mix in Panama is conducted on a "project-based" approach. In spite of the existence of a variety of tools, most of them are implemented on an ad hoc basis, reducing the capacity of the policy mix to help achieve the strategic objectives of the plan.

Panama's innovation policy mix has four main dimensions:

i) Popularisation of science and technology. This pillar gathers together initiatives that address the need to raise awareness about the relevance of science, technology and innovation for Panamanian society. In this area the country is performing well and it has managed to achieve good results. For example, the network of Internet points (*Infoplazas*) disseminated all over the country has helped not only to favour Internet access even in remote areas, but also to create a government presence and to support community building in poor rural areas.

ii) Education grants. SENACYT offers grants to undergraduate, graduate and PhD students, teachers and professors. Out of the 641 grants in place in 2013, almost half (46%) targeted undergraduates, 37% professional programmes, and only 16% doctoral or post-doctoral careers. A very small fraction (1%) of the grants is devoted to vocational training. Of the 641 grants, only 20% were used for educational programmes within the country, while most of them went to Panamanian students who had chosen to pursue their studies in the United States (38%), Europe (24%), or other countries in Latin America and the Caribbean (16%). SENACYT grants include conditions for repatriation, but deeper co-ordination with industrial and production development policies is needed to ease the absorption of these highly skilled people into the domestic economy.

iii) Promotion of scientific R&D. SENACYT manages competitive R&D grants which target individual researchers or groups and special sectoral programmes in priority areas. These funds are allocated on the basis of ad hoc project proposals. In parallel, SENACYT also finances the development of research infrastructure. In 2002, the Institute of Scientific Research and High Technology Services (INDICASAT) was established to carry out frontier research in chemistry and biology.

iv) Incentives to promote innovation in the private sector. SENACYT offers incentives and grants to promote innovation in firms. New Entrepreneurs started in 2009 and offers grants covering up to 100% of total project costs to graduate students who want to set up a company within the two years following their graduation. SENACYT also manages a fund to promote innovation in existing firms (FIE, *Fomento a la Innovación Empresarial*). However, this line of financing has been discontinued, leaving an empty space for promoting modernisation and entrepreneurial networks in the country. These incentives are oriented towards demand (meaning that potential beneficiaries need to respond to tender calls by completing official government documents. These schemes function better in highly dynamic and innovative contexts where companies know how to access government resources and/or in the presence of awareness campaigns.

Even though the innovation plan in Panama covers a five-year period, the budget for implementation is assigned on an annual basis, diminishing the capacity to implement pluri-annual actions. The SENACYT budget for scientific and technological activities increased from USD 80.6 million for the period 2005-09 to USD 122 million for 2010-13. In spite of the increase in the amount allocated, the volatility of the annual budget has increased since 2011, calling into question the implementation of pluri-annual actions (such as grants). SENACYT also suffers from long delays in resource allocation. A major bottleneck derives from the legal requirement to obtain an authorisation from the national audit office for each financial disbursement.

A major challenge ahead for Panama is to co-ordinate the innovation policy with other government policies, such as education, attraction of FDI and support to the development of SMEs, among others. A variety of institutional spaces for policy co-ordination in fact exist, but they have seldom been utilised.

The innovation agenda in Panama, as in other countries, cuts across several ministries and agencies. A major challenge for SENACYT is the co-ordination with other government bodies with STI-related responsibilities. Panama is endowed with a multiplicity of institutions and spaces in charge of policy co-ordination. It has had, since 1997, a cross-sectoral body with advisory functions to contribute to the definition of the national innovation strategy (the National Commission of Science, Technology and Innovation, CONACYT) and an Interministerial Council for Science and Technology (CICYT) instituted in 2005, composed of six ministries with responsibilities in competitiveness and scientific subjects. The governing board of SENACYT, composed of seven members drawn from the ministry of the presidency, the ministry of education, the National Banking Association, the National Council of Private Enterprise (CONEP), the Panama Rectors' Council and two representatives from public and non-governmental research centres, is an additional space for policy co-ordination. However, even though these mechanisms have been established by law, they have barely been used, especially in the last few years.

New institutions have been created, which are opening new opportunities for co-ordination, as for example, the Centre for National Competitiveness (CNC). Created in 2005 as a private-public partnership, it brings together the private sector, representatives of the labour force and the government. The CNC has a significant convening power. It has managed to convert itself into an effective space for public-private dialogue where ministries in charge of the economy, finance, infrastructure, education and trade meet to talk about

achievements and future challenges in an open dialogue with the private sector and civil society. It could be a powerful ally in SENACYT's effort to strengthen the linkages with the business community.

Panama monitors the implementation of innovation policy, but needs to strengthen its evaluation capacities.

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. Innovation policies are still often perceived as "luxury" policies, whose impact on development and poverty alleviation is too indirect to be considered relevant. It is therefore important to strengthen evaluation capacities to increase the effectiveness of policy action and to support the generation of consensus on the impact that science and innovation could have on the well-being of citizens.

Panama has introduced an innovation survey to monitor innovation trends in the domestic economy, but few resources are invested in monitoring and evaluation in comparison with countries of similar size. SENACYT has developed a matrix to monitor progress in the achievement of targets. The matrix reveals that for the period 2010-14 Panama has: *i)* shifted the focus from supporting tertiary to secondary education and *ii)* faced difficulties in meeting the targets of the support for STI in the private sector. Mid-term and ex-post evaluation of the PENCYT have been introduced, since 2004, as a legally required step in policy planning. However, Panama needs to strengthen its institutional capacities for evaluation. While monitoring can be assigned to the unit in charge of implementation because of ease in accessing and processing information, evaluation functions tend to be assigned to different units to ensure independency between assessment and implementation. For example, the ANII in Uruguay has a unit in charge of evaluation, employing eight people with diverse backgrounds, out of a total of 53 employees. SENACYT assigns evaluation to the planning unit, which operates with 2 employees out of 245.

To establish innovation policy at the heart of the national development agenda and make innovation a reality, Panama needs to strengthen its institutional capacities. In particular, it would be beneficial to shift the focus from planning to implementation. The country can achieve this based on its own experience and by drawing lessons from other countries.

Shift the attention from planning to implementation

Government plans do not guarantee effective implementation. They are a relevant starting point, but they are effective only when matched with capacities for execution and the availability of budgets to implement the relevant actions. The fact that Panama has a pluri-annual innovation plan represents a step forward for the country, as it contributes to raising awareness about the relevance of innovation, and it provides a framework for the implementation of specific actions. However, the existence of the plan and the willingness to put it into practice have revealed the presence of bottlenecks that jeopardise the implementation capacity.

- **The PENCYT could be shortened**, and focused on setting the strategic orientation of the policy over the five year period, with targets and associated planned budget. Fewer priorities could be identified and it would be beneficial to shift from seeing the plan as a micro-management guide to a logic in which the plan sets strategic orientation and facilitates the implementation of actions in co-ordination with other bodies.

- Within **SENACYT**, proposals could be made about how to **separate planning and evaluation functions** without necessarily increasing the number of employees in the organisation; a number which is already high in comparison with peer countries.

- **SENACYT** could **draw on its good experience in the participatory approach** to planning and enlarge it to the private sector in order to increase the effectiveness of the activities of promotion of innovation in firms.

- **Remove barriers to effective implementation by simplifying procedures**. Panama lacks an implementation agency for innovation policy. The country could consider the creation of an institutional arrangement that allows it to have an implementing body/agency to facilitate action. In addition, it would be important to modify the existing procedures and facilitate disbursement mechanisms to reduce operating costs and time delays in implementation by allowing SENACYT to operate in a more flexible way. In Uruguay, for example, the ANII has simplified the procedure of authorisation of resource allocation by substituting *ex-ante* controls with *ex-post* monitoring. An annual plan, which includes a budget, is prepared each year by the ANII, and approved by the governing board. Any expenditure not envisaged in the annual plan needs instead to be

specifically authorised by the executive secretary (or the governing board, if the amount is greater than a given threshold). Moreover, deadlines of up to ten days have been established for the execution of the payments. This increase in the capacity to implement policies and in the ability to allocate resources has been achieved by assigning to the ANII a special status of "non-state public entity".

- **Look for new, pluri-annual financing mechanisms.** The budget for innovation policy in Panama is low when compared with those of other countries. The effectiveness of the pluri-annual plan for innovation is hindered by the mechanism of yearly budget allocation and by the fact that each disbursement from SENACYT is subject to approval by the national audit office, making the process of allocation of resources slow and bureaucratic. The creation of innovation funds in priority areas, jointly managed by the public and the private sectors, with simplified operational rules could help in raising the budget for innovation and in overcoming the current implementation barriers.

Put innovation policy at the heart of the national development strategy

Panama is a small economy and faces barriers in respect of the scale and scope of public interventions. The challenges, however, are not only linked to the critical mass of resources that the country could eventually channel to promote innovation, but to the lack of consensus about the relevance of innovation for development. If an adequate consensus were built around the role of science and technology in the country, Panama could have an adequate cash flow to increase the amount of resources mobilised for investment in innovation, which is today one of the lowest in the region. The innovation agenda cuts across several institutions and bodies. Despite the efforts made, innovation policy in Panama has suffered from a low level of co-ordination with other government policies and from a low capacity for dialogue with the business community. In order to advance, it is important to:

- Continue to **raise awareness** at the decision-making level of the importance of innovation as a fundamental element of the national economic strategy, with the aim of mobilising a larger amount of resources in the future.

- Keep **investing in the** popularisation of science and technology to increase citizens' awareness on the importance and potential contribution of science and innovation to the development of the country and its insertion in global markets.

- **Increase co-ordination** across government bodies and levels of government. This can be done by reactivating the SENACYT governing board and the CYCIT as spaces for strategy-setting to align actions managed by different government bodies.

- **Increase public-private dialogue** and partnership for innovation. The CNC offers the private-public linkage dimension that SENACYT is missing and it could be a powerful ally in promoting science, technology and innovation policy in Panama by making the domestic private sector more aware of the innovation agenda.

Strengthen monitoring and evaluation capacities for innovation policy

Monitoring and evaluation systems are essential to allow learning in the making and execution of policy and to increase the effectiveness of actions. While monitoring systems are often carried out by the implementing agency, evaluations need to be carried out by external bodies and the time, scope and objective of the evaluation need to be clarified up front. In Panama, it would be important to:

- **Strengthen monitoring capacities** within SENACYT, by increasing the number and variety of backgrounds of the people in charge.

- Plan in advance **evaluations of specific programmes** and tools with a view to improving future policy design, clarifying data requirements and costs.

- **Increase domestic evaluation capacities** and, given the limited size of the country, set up a network of external evaluators to rely upon as a complement to internal evaluation capacities.

- **Define clear mechanisms for feedback** from monitoring and evaluation into current and future policies.

Chapter 1

Innovation trends in Panama

This chapter presents an overview of innovation trends in Panama. The country has experienced high economic growth during the last decades and has increased its specialisation in services. Since 2004 it has implemented targeted efforts to increase skills for innovation by promoting graduate and postgraduate training in foreign universities and has started to promote domestic research and development (R&D) and innovation. While Panama has started to accumulate some domestic innovation capabilities, it still lags behind most other countries in Latin America in terms of R&D expenditure, human resource development and private sector innovation efforts.

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Introduction

Panama has a fast-growing economy: the country has experienced sustained growth since the 1990s. In 2012 the gross domestic product (GDP) growth rate reached 10.7%, well above the Latin America and Caribbean average of 3% (data from European Commission for Latin America and the Caribbean statistics [CEPALSTAT]). The canal is a major source of rent for the country and has helped make Panama a relevant international trade platform. Since the 1990s the country's living standards have improved and the country is making advances in reducing poverty. But inequality remains a major bottleneck for the country's development, especially when differences in income and standards of living across the territory are taken into account.

Like other countries in Latin America and the Caribbean, Panama is engaged in defining a sustainable development model capable of translating high growth into higher standards of living for all its citizens. The risks of a "dual" economy advancing on two tracks – one highly modernised and linked to the canal and to the off-shoring activities of international banks and multinational enterprises, and the other operating at much lower levels of technology and productivity – are high, and are attracting the attention of the government. To address the issue, infrastructure building and the modernisation of the state have been being prioritised.

Panama began to promote innovation and to invest in science, technology and research in 2004. Promoting innovation in a small, service-oriented economy like that of Panama is not easy. The country has managed to increase domestic research capabilities, to improve access to the Internet and broad-band, and to introduce incentives to invest in innovation. Yet it is far from achieving the

critical mass needed to improve its innovation capacities and rank high in traditional innovation indicators.

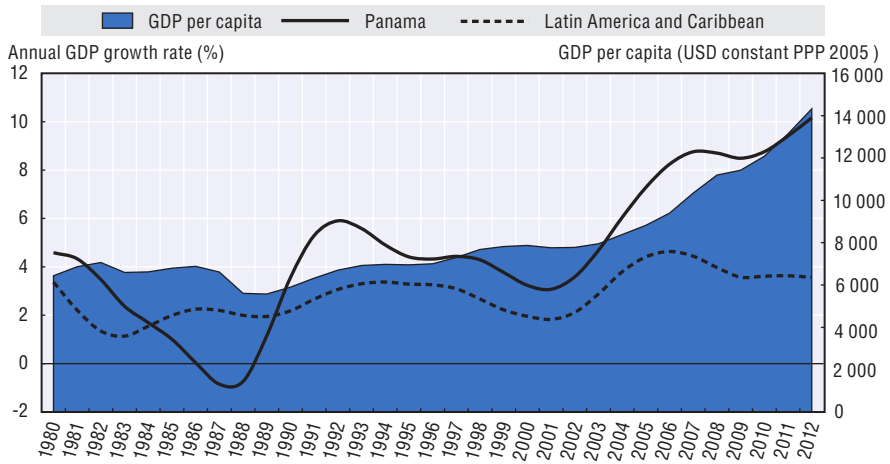
This chapter presents an overview of innovation trends in Panama. After a brief summary of the country's growth and poverty reduction pattern, it discusses its production and trade specialisation. It then reviews Panama's performance in several innovation-related indicators, including R&D, human resources, foreign direct investment (FDI), patents and trademarks, and compares it with the experience of benchmark countries, including the Dominican Republic and Uruguay.

A small open economy with steady growth and rising income per capita

Panama's economy has been on a steady growth path for the past 20 years; growth has accelerated in particular since the 2000s. The country on average grew by 6.57% a year between 1990 and 2012, and thus doubled average Latin American growth rates within that period (Figure 1.1). Its economy has recovered relatively well from the financial and economic crisis of 2008, bolstered by the continuing Panama Canal expansion and other sizeable public infrastructure projects (IMF, 2012). Since 2007, and with the exception of 2010, Panama has been the fastest growing economy in Latin America and the Caribbean (World Bank, 2013). In parallel with high and sustained growth, Panama has experienced an increase in income per capita. Since 1990, real per capita incomes in Panama have more than doubled. In 2012, the country had the sixth highest per capita income in Latin America, almost 30% higher than the regional average (in 2005 PPP terms, World Bank Indicators, 2013).

Despite Panama's high growth and achievements in poverty reduction, poverty and inequality remain two major development challenges. Even though poverty rates fell by about 12% between 2002 and 2011, about one-quarter of all Panamanians still live below the national poverty line and about 12% in extreme poverty (ECLAC, 2013). Remote and rural areas which are predominantly populated by the country's indigenous population are particularly affected by poverty. In these areas, rates are as high as 44% (Figure 1.2A). In addition, despite the slight reduction in Panama's Gini index since the beginning of the 2000s – in line with a general trend of falling income inequalities in the region (ECLAC, 2010) – Panama remains one of the more unequal countries in Latin America, with a Gini index of 0.53 in 2011 (Figure 1.2B).

Figure 1.1. **GDP growth and income per capita, Panama, 1980-2012**
Smoothed rates; Hodrick-Prescott filter

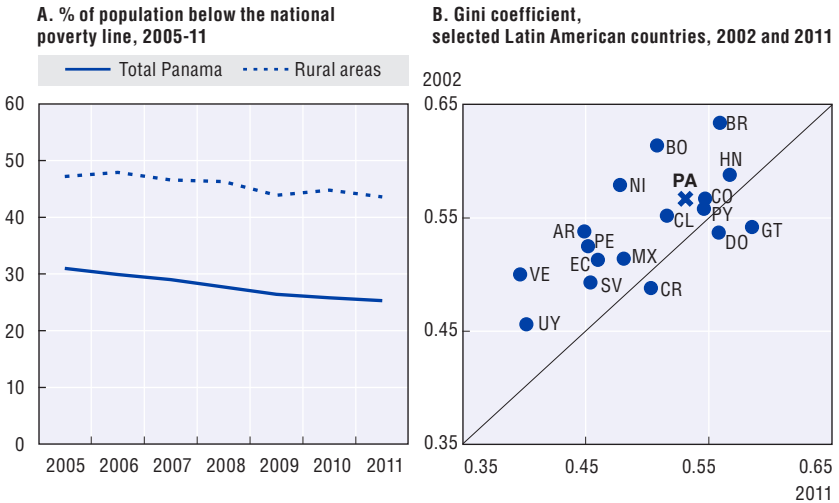


Note: Latin America and the Caribbean include Antigua and Barbuda, Argentina, Aruba, the Bahamas, Barbados, Belize, Bolivia, Brazil, the Cayman Islands, Chile, Colombia, Costa Rica, Cuba, Curaçao, Dominica, the Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Sint Maarten, St. Kitts and Nevis, St. Lucia, St. Martin, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, the Turks and Caicos Islands, Uruguay, Venezuela and the Virgin Islands. GDP per capita in PPP, constant 2005 international USD. The Hodrick-Prescott (HP) filter is commonly used to smoothen trends of macroeconomic time series such as GDP to identify their long-term trends. The smoothing parameter used, according to Ravn and Uhlig's (2002) rule, is 6.25.

Source: Authors' calculations based on World Bank (2012a), *World Development Indicators 2012,* http://data.worldbank.org/sites/default/files/wdi-2012-ebook.pdf.

Unemployment has also been falling over recent years. In 2011 it stood at 5.4%, the lowest rate in Latin America and lower than in countries such as Colombia (11.5%), Costa Rica (7.7%) or Uruguay (6.3%). However, youth unemployment is still high. In 2011 it stood at 15.6%, making young Panamanians almost three times more likely to be without a job than adults (ECLAC/ILO, 2012).

Figure 1.2. **Poverty and inequality in Panama, 2002-11**



Note: Panel b): 2002 data correspond to closest year for: Chile (2003), Ecuador (2004), El Salvador (2004), Nicaragua (2001), Paraguay (2001), Peru (2001), Uruguay (2007); 2011 data correspond to closest year for: Argentina (2010), Bolivia (2009), El Salvador (2010), Guatemala (2006), Honduras (2010), Mexico (2010), Nicaragua (2009).

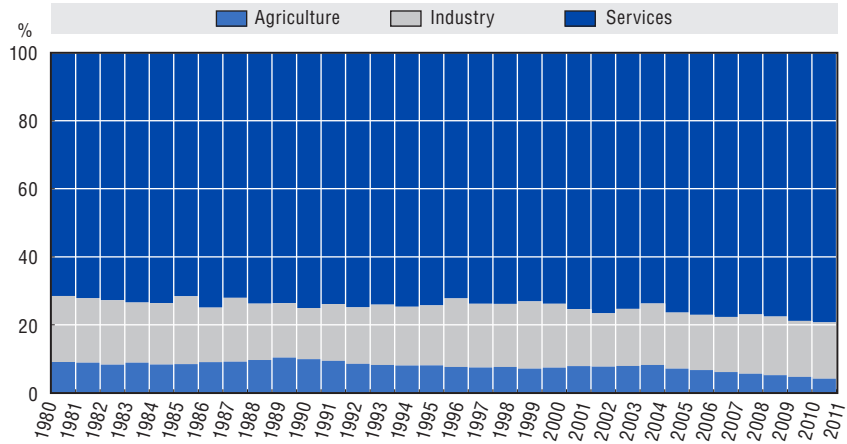
Sources: Authors' calculations based on: Panel a): ECLAC (2012); Panel b): ECLAC (2012); World Bank, 2012a, *World Development Indicators 2012*, http://data.worldbank.org/sites/default/files/wdi-2012-ebook.pdf

Panama as a platform for services, trade and investment

Panama is highly specialised in services. The country's geographic position and the Panama Canal make it a strategic location for transport and logistics along the major trade routes between the Atlantic and Pacific Oceans. In 2012, the canal's revenues totalled USD 2.8 billion or almost 7% of GDP (Panama Canal Authority, 2013). Most economic activities in the country are related to the operations of the Panama Canal or the Colon Free Trade Zone. The service sector accounts for the largest share of Panama's economy – around 80% of GDP in 2011, and it employs 60% of the workforce (Figure 1.3). These shares are higher than in other small economies such as Singapore and Costa Rica, where the proportion of services in GDP is 73% and 68% respectively, and higher than the average in OECD countries, where the service sector typically accounts for about 70% of GDP. In addition to tourism and financial and business services, the predominant service activities are related to the transport, storage and communication sector which alone accounts for more than 20% of Panama's GDP. [1]

Figure 1.3. **Structural composition of the economy, Panama, 1980-2011**

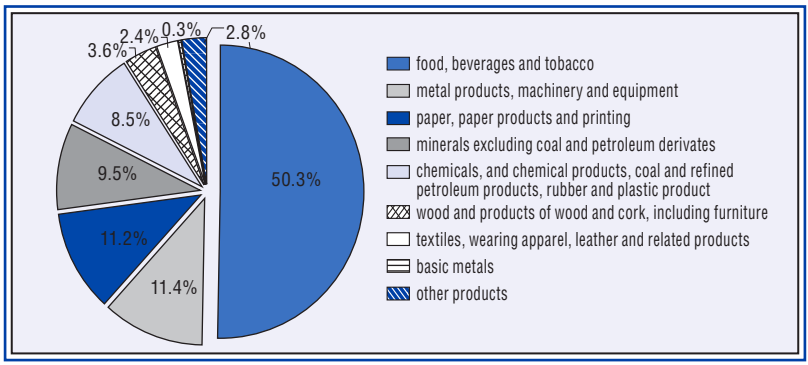
Value added (% of GDP)



Source: Authors' calculations based on World Bank (2012a), *World Development Indicators 2012*, http://data.worldbank.org/sites/default/files/wdi-2012-ebook.pdf.

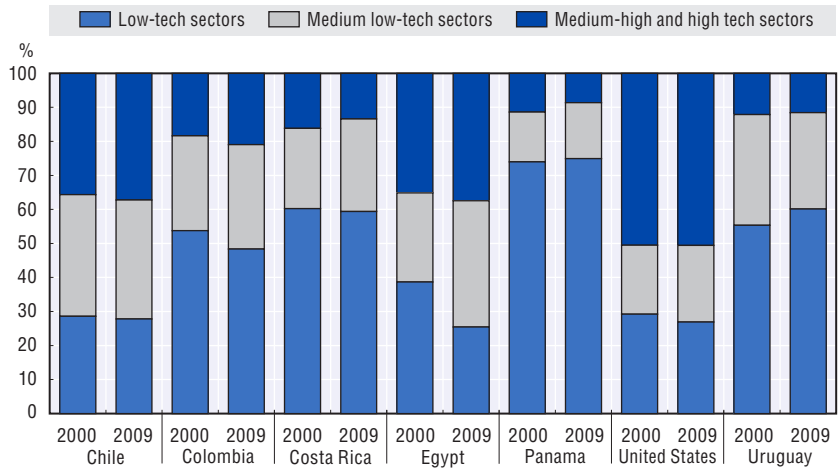
Industry accounts for a small share of Panama's GDP (17% in 2011), and only 6% is contributed by manufacturing.[2] The level of technological sophistication of the country's domestic manufacturing industry is rather low. Food and beverages account for more than half of total manufacturing value added. Overall, low-tech sectors account for about 75% of total manufacturing value added (Figure 1.4). This share is higher than in other Latin American countries including Chile, Colombia, Costa Rica and Uruguay (Figure 1.5). The production of goods and services with high-knowledge content remains an exception in Panama. High-tech sectors only account for 2% of total manufacturing value added (with operations in pharmaceuticals, chemical and medical equipment). This low share is on a par with neighbouring countries such as Costa Rica, but far below the OECD average of 13%, or countries such as Singapore – often cited as a successful example of a service-based economy, and yet among the world's top five countries in terms of manufacturing value added per capita. In Singapore, in fact, almost half of the manufacturing value added is concentrated in high-technology intensive sectors (Figure 1.6). In Panama, agriculture accounts for between 3% and 4% of GDP, and it employs 18% of the total workforce, being an important source of income especially in rural areas.

Figure 1.4. **Disaggregation of the manufacturing sector, Panama, 2007**
% of total manufacturing production



Note: Data on assembly (*maquila)* industry are not included.
Source: Authors' calculations based on Cordero (2010).

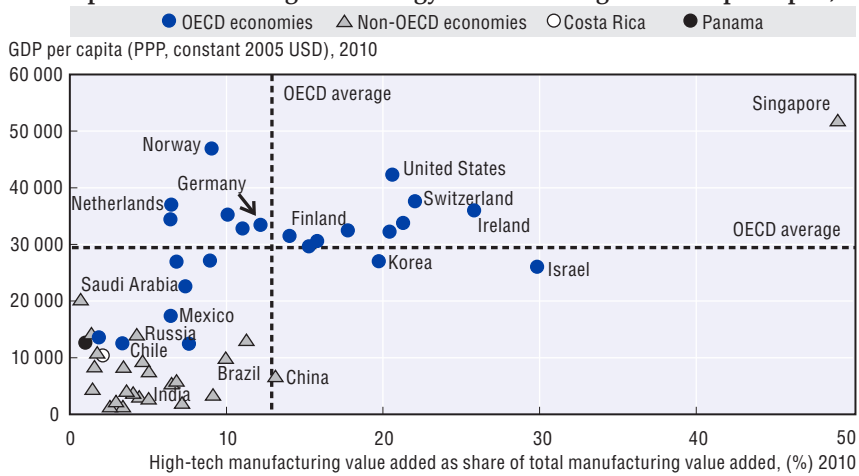
Figure 1.5. **Manufacturing by technological intensity, selected countries, 2000-09**
Manufacturing value added by technological intensity (%)



Note: Sectors are classified and grouped according to technological intensity by ISIC, Rev. 3 divisions. Low tech sectors: ISIC divisions: 15-22, 36, 37; medium-low tech sectors: 23,25-28; medium-high and high tech sectors: 24, 29-35.

Source: Authors' calculations based on UNIDO (2013a) INDSTAT2 Database, www.unido.org/en/resources/statistics/statistical-databases/indstat2-2014-edition.html and UNIDO (2013b) Statistical Country Briefs www.unido.org/en/resources/statistics/statistical-country-briefs.html.

Figure 1.6. **Specialisation in high technology manufacturing and GDP per capita, 2010**



Note: OECD: no data for Austria, Estonia, Greece, Hungary, Iceland, Luxembourg, Portugal, Slovakia, and Slovenia. High-tech value added data for Panama = 2001 (last year). Value added is amount contributed by country, firm or other entity to value of good or service and excludes purchases of domestic and imported materials and inputs. High-technology manufacturing industries classified by the OECD and including aerospace, communications and semiconductors, computers and office machinery, pharmaceuticals, and scientific instruments and measuring equipment.

Source: Authors' calculations based on IHS Global Insight, special tabulations (2011) of *World Industry Service* database, www.ihsglobalinsight.com/gcpath/WISIndicators.pdf, National Science Foundation (2012), *Science and Engineering Indicators 2012*, www.nsf.gov/statistics/seind12/ and UNIDO (2014) INDSTAT 4 database, www.unido.org/en/resources/statistics/statistical-databases/indstat4-2014-edition.html.

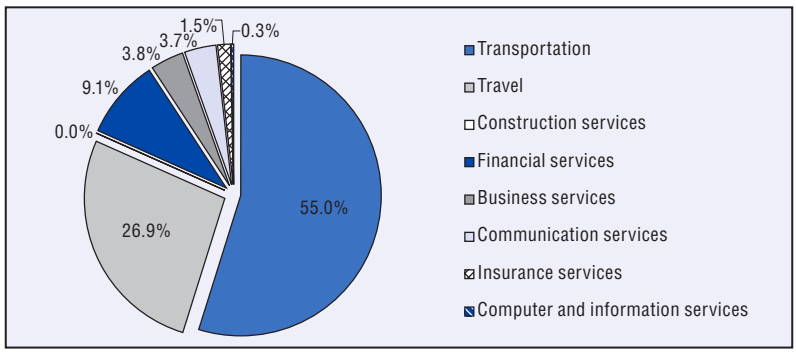
Panama is highly integrated into global trade. In 2011 total exports accounted for 81% of GDP, while total imports accounted for 84%, compared to the average in Latin America and the Caribbean of 39% of GDP for total exports and 35% for total imports (World Bank, 2013). The country has been able to position itself as a global platform for trade and commerce. In 2011 it exported goods and services with a total volume of USD 21.8 billion. Services dominate the export portfolio, accounting for about 75% of total exports, according to the Centre for National Competitiveness (CNC, 2011). The country also exports a number of agricultural products, mostly in unprocessed form, including bananas, sugar, fish and pineapples. These account for about 6% of total exports. The lion's share of more sophisticated manufactured exports, including chemicals, electronic equipment and pharmaceuticals can be attributed to re-exports of multinational companies situated in the Colón Free Trade Zone (FTZ). Panama's high openness to trade is largely due to the Colón Free Trade Zone (FTZ) – one of the largest FTZs in the world – which accounted for 92% of

the total exports and 65% of the total imports of the country in 2010. Contrary to the experience of most of Central America, from 1990 Panama's export share has consistently overtaken the import share, resulting in trade surpluses (World Bank, 2012b). Trade and investment volumes are likely to increase in the future as the country has recently signed a Free Trade Agreement (FTA) with the United States, which came into effect at the end of 2012. An association agreement for a similar trade deal with European Union countries was signed in July 2012.[3]

Trade in services is the backbone of Panama's economy**.** Taken together, total service trade (imports and exports) accounts for about one-third of Panama's GDP (United Nations Conference on Trade and Development statistics [UNCTADSTAT] 2013) and service exports accounting for about 32.9% of total exports in 2010 (UNCTADSTAT, 2013). Exports of transportation services account for more than half of total service exports, in contrast to other Central American countries, where most exports in services are related to tourism (ECLAC, 2012). While the actual knowledge content of any service activity is debatable, transportation and tourism tend to be on average, characterised by low-knowledge content. In Panama, knowledge-intensive services such as finance, business and information technology (IT) services, account for 18% of total service exports (Figure 1.7).

Figure 1.7. **Exports of traditional and knowledge-intensive services, Panama, 2010**

Percentage of total commercial service exports



Note: Following the National Science Foundation, commercial knowledge-intensive service exports include business services, royalties and licensing fees, financial and insurance services as well as computer, information and communication services (http://www.nsf.gov/statistics/seind12/c6/c6s3.htm). Data on business services is of 2010. No data for royalties and licensing fees available.

Source: Authors' calculation based on ITC (2013), Trademap Database, www.trademap.org/Index.aspx.

Panama's role as an international trade platform is helping make it an attractive destination for FDI. In 2011 FDI inflows accounted for USD 2.8 billion or 9% of GDP, making FDI a particularly relevant source of revenue for the national economy. Panama's 9% FDI-to-GDP ratio in 2011 is higher than those of Chile (7.4%), Costa Rica (5.2%) and Uruguay (4.6%) (UNCTAD, 2013). According to estimates by fDi Markets, almost 90% of all jobs created by FDI projects between 2003 and 2012 were located in Panama City and Colón. The top five investing countries in terms of job creation in 2010-12 were the United States, Spain, Germany, Colombia and Japan. Most FDI projects in Panama are concentrated in sectors such as finance, software and information technology (IT), tourism and business services, and in commerce and construction. The financial sector alone hosted 34 new projects between 2003-12 (Financial Times, 2013, fDi Markets database). Most jobs are created in business activities such as customer and technical service support as well as maintenance. These sectors often imply FDI with low technological content, and barely become a source of innovation (Financial Times, 2013, fDi Markets database).

Panama has recently started to give priority to attracting multinational companies (MNCs). As a result, a number MNCs have recently opened regional headquarters in Panama or offshored knowledge-intensive business activities such as R&D, design, or training facilities, which have created new jobs. For instance, in 2009 the US computer company Hewlett-Packard joined forces with Panama's National Vocational Training Institute for Human Development and the University of Technology of Panama to build a new technology training centre with a capacity of 150 students per class. In 2010 Microsoft opened an innovation centre specialised in technology related to the tourism sector in Panama. In 2012, the UK-based pharmaceutical company GlaxoSmithKline opened a R&D lab for vaccines research (Financial Times, 2013, fDi Markets database, 2013). However, by comparison with other countries of similar size in the region such as Costa Rica, these types of "innovative FDI" are still limited (Figure 1.8). Panama has recently put in place new legislation and institutions to attract MNCs, including fiscal, labour, and immigration incentives. The new Law 45 of 2012 extends the existing incentive packages and offers exemption from corporate tax, income tax and value added tax in services to MNC headquarters located in Panama. In addition, it simplifies visa requirements for executives and technical staff working in these companies (see Table 2.5 on laws and regulations in Chapter 2).

Figure 1.8. **FDI into Panama and Costa Rica, by sector and selected business activity, 2003-12**

Note: The figure includes only data from greenfield and expansion-related investments; merger and acquisition transactions are not captured. Education and training means that the company invested in a facility providing training services or education courses (includes internal training services for company and outsourced staff). Research and development means the discovery, design, or development of a product through an investment in a technical design centre. Design and testing means a project which is involved in designing, developing or testing a product. To be included as R&D a FDI project must involve pure research.

Source: Authors' calculations based on Financial Times, 2012, fDiMarkets, *Crossborder Investment Monitor*, a service from the Financial Times Ltd., www.fdimarkets.com/.

Recent trends in science, technology and innovation in Panama

Panama has recently performed well in a number of international competitiveness rankings (Table 1.1). In the 2012/13 and 2013/2014 Global Competitiveness Index (GCI), published by the World Economic Forum, the country ranked 40th for two consecutive years out of a total of 144 countries, making it the most competitive economy in Central America. The Global Innovation Index compiled by the business school INSEAD and the World Intellectual Property Organisation (WIPO) ranks Panama 87th out of 141 countries and the World Bank's Knowledge Economy Index places the country 65th out of 144. While all these rankings offer a convenient way of assessing Panama's overall competitive and innovative performance vis-à-vis other countries, it is important to note that they are based on composite indicators which seek to measure broader phenomena by relying on a limited range of individual indicators.

Experience from OECD countries shows that composite indicators need to be carefully interpreted, especially if there is a wish to translate them into policy messages (Box 1.1). These indicators apply different methodologies and rely on different types of data sources (i.e. the GCI draws heavily on executive opinion surveys and interviews in addition to "hard data"). This has consequences for interpretation (Lall, 2001; Box 1.1). For example, while Panama ranks well on overall competitiveness in the GCI 2012/13, it performs poorly in a number of different sub-indices of the same index, especially those related to innovation, such as the overall quality of the educational system (112th out of 144), and the quality of maths and science education in the country (125th out of 144). It also performs less impressively in terms of the GCI's own "Capacity for Innovation" sub-index (94th out of 144) (Aguirre-Bastos, 2012). It is thus useful to complement the analysis by drawing on additional structural indicators to complement the picture of innovation dynamics in Panama.

Table 1.1. **Selected composite indicators for measuring innovation and competitiveness in Panama, 2009-13**

Index	Year	Rank Panama	Rank top LAC country	Organisation	Main characteristics
Global Competitiveness Index (incl. Capacity for Innovation Index)	2012/13	40/144 (94/144)	Chile: 33/144 (Brazil: 34/144)	World Economic Forum	• Measures the overall competitiveness of an economy • Focus on basic requirements, efficiency enhancers and sophistication factors for competitiveness • Includes separate "Capacity for Innovation Index"
Global Innovation Index	2012	87/141	Chile: 39/141	INSEAD/ World Intellectual Property Organisation	• Measures the innovation efficiency of an economy • Focus on both innovation inputs and outputs
International Innovation Index	2009	63/110	Mexico: 17/110	Boston Consulting Group/ National Association of Manufacturers (USA)	• Measures innovation inputs and outputs • Focus on manufacturing sector • Most data generated through interviews and surveys • Only one edition published so far (2009)
Networked Readiness Index	2013	46/144	Chile: 34/144	World Economic Forum	• Measures the ICT readiness of an economy for growth and well-being • Focus on ICT only
Knowledge Economy Index	2012	65/145	Chile: 40/145	World Bank	• Measures innovation in four pillars (Economic Incentive and Institutional Regime, Innovation and Technological Adoption, Education and Training, ICT)
Doing Business Index	2013	61/185	Chile: 37/185	World Bank/ IFC	• Measures the ease of doing business in an economy • Focus on regulatory environment

Note: LAC= Latin America and the Caribbean.

Source: Authors'calculations.

Box 1.1. **Composite indicators of country performance: Some insights from the OECD**

Composite indicators (CIs) are increasingly used to compare country performance. The number of existing CIs is growing year after year. These indicators provide simple comparisons of countries based on their performance in different fields, such as the environment, economy, society or technological development.

They are powerful communication tools and often capture much policy attention. However, composite indicators need to be carefully interpreted when there is a wish for them to be used as indicators to guide policy action.

The *OECD Handbook on Constructing Composite Indicators*, concerned mainly with those indicators which compare and rank country performances in areas such as industrial competitiveness, sustainable development, globalisation and innovation, reveals the main pros and cons of using composite indicators for policy making. The main results are summarised in Table 1.2 below.

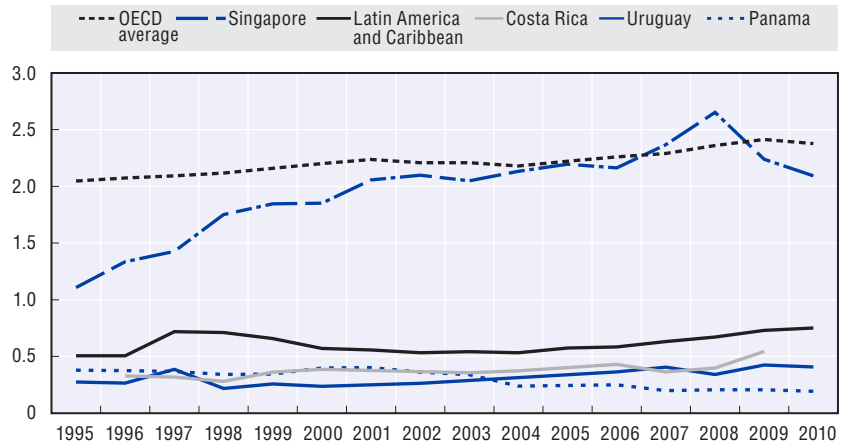
Table 1.2. **Pros and cons of composite indicators**

Pros:	Cons:
• Can summarise complex, multi-dimensional realities with a view to supporting decision makers. • Are easier to interpret than a battery of many separate indicators. • Can assess progress of countries over time. • Reduce the visible size of a set of indicators without dropping the underlying information base. • Thus make it possible to include more information within the existing size limit. • Place issues of country performance and progress at the centre of the policy arena. • Facilitate communication with general public (i.e. citizens, media, etc.) and promote accountability. • Help to construct/ underpin narratives for lay and literate audiences. • Enable users to compare complex dimensions effectively.	• May send misleading policy messages if poorly constructed or misinterpreted. • May invite simplistic policy conclusions. • May be misused, e.g. to support a desired policy, if the construction process is not transparent and/or lacks sound statistical or conceptual principles. • The selection of indicators and weights could be the subject of political dispute. • May disguise serious failings in some dimensions and increase the difficulty of identifying proper remedial action, if the construction process is not transparent. • May lead to inappropriate policies if dimensions of performance that are difficult to measure are ignored.

Source: OECD (2008).

Given the structural characteristics of its economy, it is not surprising that Panama records a poor performance in innovation. In 2010, the country's gross expenditure on R&D (GERD), a common indicator used to proxy a country's aggregate innovation efforts, was USD 52 million. This is about 130 times less than the amount spent by the US software company Microsoft on R&D in the same year (European Commission, 2011). GERD as a percentage of GDP was 0.2%. This ratio is significantly below the OECD average of 2.4% of GDP as well as that of similar sized countries such as Singapore, which in 2011 spent 2.1% of GDP on R&D activities (Figure 1.9). It is also among the lowest ratios in Latin America, behind regional peers such as Costa Rica (0.5% of GDP in 2009) and Uruguay (0.4% of GDP in 2010). While the average R&D expenditure of Latin America as a whole increased from 0.6% of GDP in 2000 to 0.8% of GDP in 2010, GERD in Panama actually declined by more than 50% over the same period. This trend is particularly worrisome in the light of a changing global competitive landscape in which emerging and developing countries are increasing their commitments to innovation (OECD, 2013).

Figure 1.9. **Gross expenditure on R&D (GERD), 1995-2010**
percentage of GDP

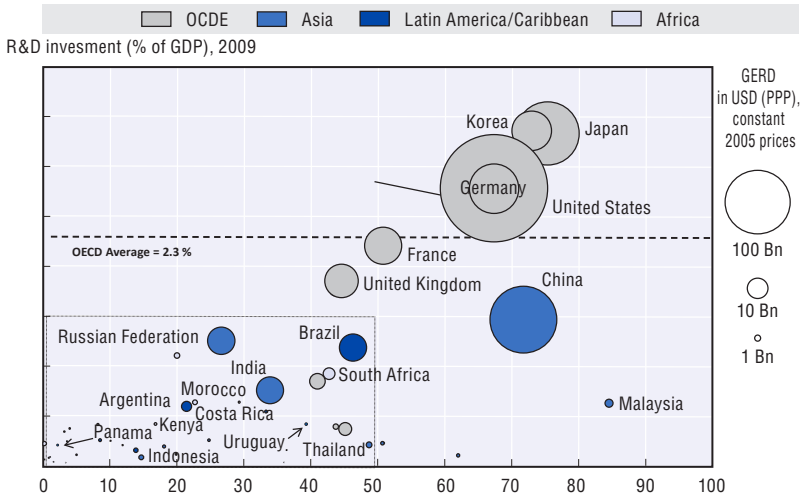


Note: No data for Uruguay=2001; 2003-05; Costa Rica=1995, 2001, 2002, 2005, 2010.
Source: Authors' calculations based on OECD MSTI database, RICYT, UNESCO, 2013.

Business R&D expenditure and private sector innovative activities are still underdeveloped in Panama. In 2010 the public sector accounted for about 47% of total R&D expenditure and foreign sources, including the Smithsonian Tropical

Research Institute, accounted for almost 50%. The private sector financed only about 2% of total R&D. This is a low proportion compared with similar-sized Latin American countries where private companies spend significantly more on R&D. In Costa Rica, for instance, the private sector contributes 29% of all R&D expenditures, and in Uruguay the figure is as high as 39%. In OECD economies, where private companies are the main source of R&D financing, the private sector's share is usually between 40% and 70% (Figure 1.10).

Figure 1.10. **Research and development investment and private sector commitment in selected countries, 2009**



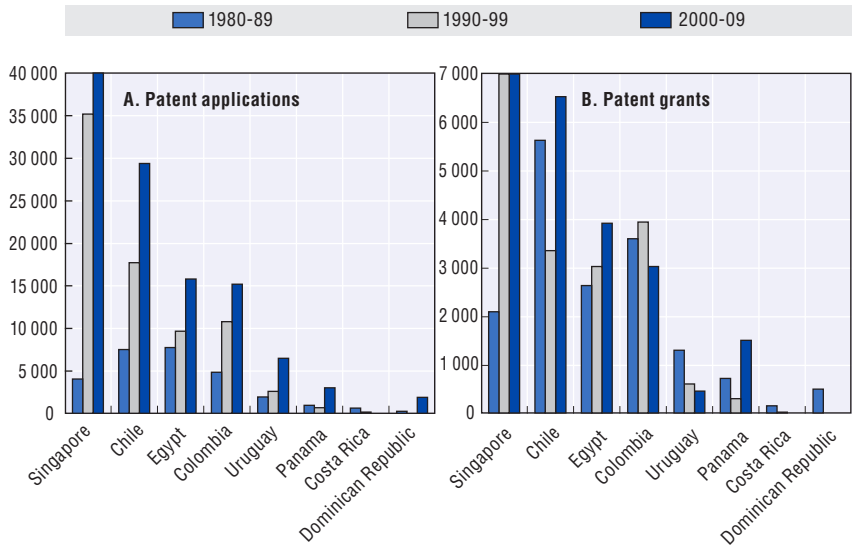
Note: 2009 or latest available year. No reliable data available for Dominican Republic. Estimates for R&D expenditure (as % of GDP) are 0.25% (see UNCTAD, 2012).

Sources: Authors' calculations based on OECD MSTI Database for OECD countries, www.oecd.org/sti/msti.htm; RICYT for Latin America and the Caribbean: RICYT; UNESCO for other countries.

Patents are commonly used as an indicator to compare the intensity of innovation efforts across countries. Panama shows modest levels of patenting, but since the 1980s the number of patent applications via the PCT (Patent Co-operation Treaty) has grown. Between 2000 and 2009, about 3 000 patents were filed through the Panamanian office for direct and PCT national phase entries. This number is three times higher than the applications of the same type filed in the decade 1980-89, and more than four times higher than those filed in 1990-99. Patent grants followed a similar positive trend (WIPO IP Statistics, 2013). These numbers are still far from those of other countries in the Latin American region and even further from countries which have identified innovation as one of the

main drivers for their development strategies, such as Singapore. Nevertheless, they are in line with the patenting activity of neighbouring economies of similar size, such as Uruguay and Costa Rica (Figure 1.11).

Figure 1.11. **Number of patent applications and grants, selected countries, 1980-2010**

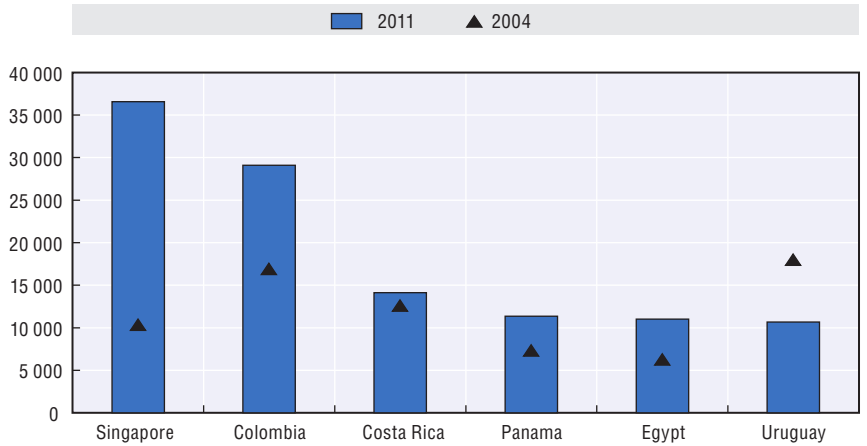


Note: Total patent (direct and PCT national phase entries) count by filing office .

Source: Authors' calculations based on WIPO IP Statistics Data Centre, 2013.

Trademark applications have also been increasing. Trademarks are used to claim the specific properties of a product or service in the market in order to distinguish it from others. They often signal novelty or a specific brand value and are widely used as indicators to compare companies' attitudes towards commercial innovation and intangibles. Panama has recently seen an increase in trademark applications. In 2011, the number of total trademark applications as shown in Figure 1.12 was about 11 000, up from only 7 000 in 2004, which is roughly the same number as in countries such as Egypt or Uruguay, but only about one-third of the total applications by Singapore and slightly less than Costa Rica (Figure 1.12).

Figure 1.12. **Number of trademark applications, selected countries, 2011**



Note: The figure shows the total count of trademark classes in each country's trademark applications. Included are direct applications and applications via the Madrid system. 2004 data refers to latest year for: Costa Rica=2010, Uruguay=2008.

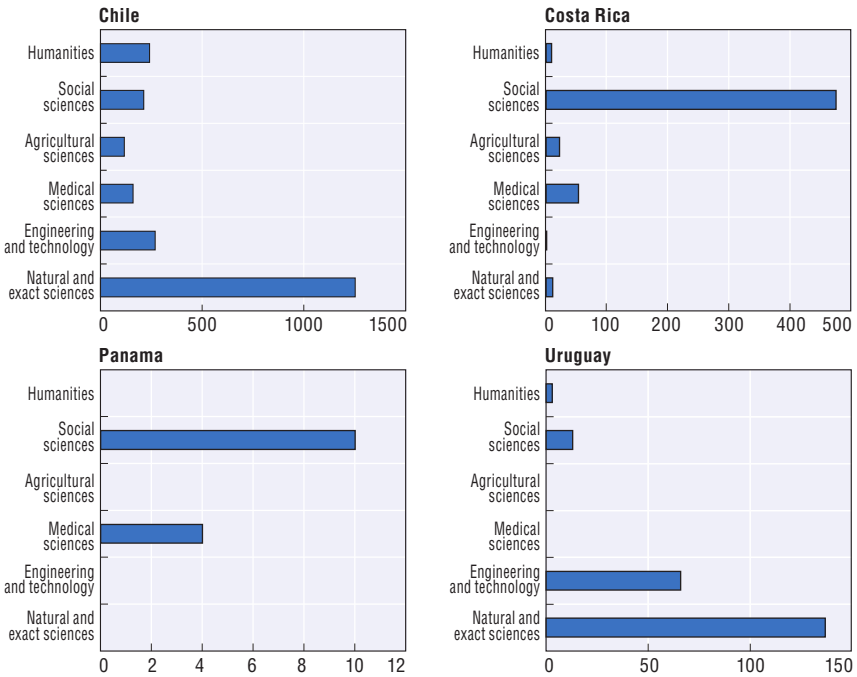
Source: WIPO statistics database, November 2012.

Panama is investing in improving its human resources for innovation, but major bottlenecks in terms of quality and critical mass remain. In 2010 Panama's tertiary gross enrolment ratio was 46%; that means that fewer than half of all Panamanian students who had completed secondary school were actually enrolled in a university programme. This is in line with overall low tertiary enrolment rates in Latin America. As for doctoral training, Panama's number of PhD students is still extremely low, totalling 14 in the period 2000-09, against 2 252 PhDs in Chile, 571 in Costa Rica, and 219 in Uruguay (RYCIT Science and Technology Indicators, 2013) (Figure 1.13). Panamanian university students show a strong preference for the social sciences and humanities. About two-thirds of all students in postgraduate programmes are enrolled in these subjects, compared to only 17% in engineering and 9% in natural sciences. Between 2000 and 2009 Panamanian universities awarded 14 PhDs, either in medical or social sciences, but none in natural sciences or engineering. This pattern is similar to that of Costa Rica in terms of specialisation, but shows significant differences with respect to other countries in the Latin America and the Caribbean region, such as Chile and Uruguay, which are awarding the vast majority of their PhD grants in natural and exact sciences, as well as engineering and technology, thereby fostering capability formation in Science and Technology (RYCIT Science and Technology Indicators, 2013). The quality of secondary education is also

rather low on an international comparative basis. The 2009 OECD Programme for International Student Assessment (PISA) study on the performance of secondary students (aged 15 and above) ranked Panama 62nd out of a total of 65 countries. The country scored below the OECD average in all three categories of reading, mathematics and science. A particularly worrying fact is that about 93% of all secondary students in Panama reached only the lowest proficiency levels in mathematics and about 88% in science. This is one of the worst outcomes in Latin America (Table 1.3)

Figure 1.13. **Specialisation profiles of PhDs by subject area, selected countries, 2000-09**

number of PhDs assigned



Source: Author's calculations based on RICYT, 2013.

Table 1.3. **Latin America and OECD: Students with the lowest score in the PISA tests**

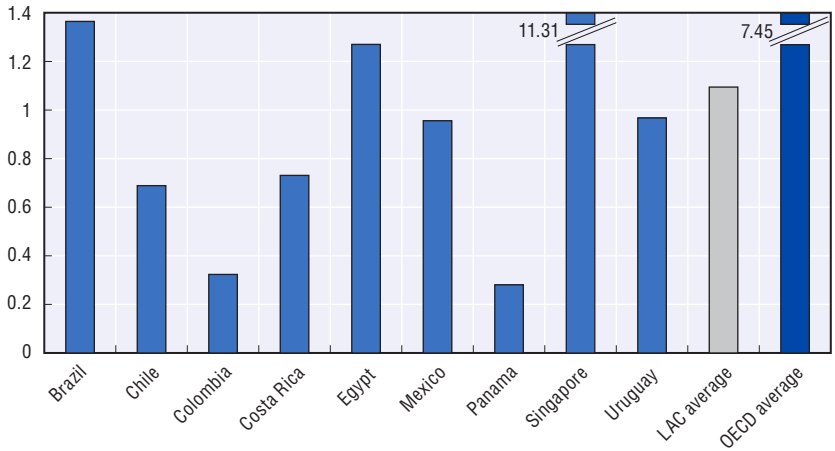
in percentages

Country	Reading	Mathematics	Science
Argentina	51.6	84.3	79.1
Brazil	49.6	88.1	83
Chile	30.6	78.3	67.4
Colombia	47.1	90.8	84.3
Mexico	40.1	79.2	80.9
Panama	65.3	92.6	88.3
Peru	64.8	90.4	90.0
Uruguay	41.9	72.7	71.9
Latin American average	48.9	84.5	80.6
OECD average	18.8	44.0	42.3

Source: OECD/ECLAC (2013), *Latin American Economic Outlook 2013: SME Policies for Structural Change*, OECD Publishing, Paris, doi: http://dx.doi.org/10.1787/leo-2013-en.

Panama's scientific production is increasing. In 2010 the country hosted a total of 410 researchers, that is 0.28 researchers per 1 000 labour force and 553 R&D staff (Figure 1.14; figures are full-time equivalents). This number is quite low when compared with international and regional peers. The average ratio of researchers per 1 000 labour force in Latin America was 1.09 in 2010. Costa Rica, which has roughly the same population as Panama, in 2009 hosted 1 535 researchers and Uruguay 1 745. In addition, foreign researchers represent a significant proportion in Panama. The Smithsonian Tropical Research Institute alone employs about 35 scientists and hosts about 900 visiting scientists and students each year, who often stay for only a short time in the country (Smithonian Institution, 2011). Nevertheless, Panama has recently increased its research output. The number of scientific publications in the Science Citation Index (SCff increased from only 162 in 2000 to 424 in 2011. This ratio of 84.6 articles per 100 researchers was the highest in Latin America in 2011.

Figure 1.14. **Researchers per thousand labour force, selected countries, 2010**



Note: LAC = Latin America and the Caribbean; latest year for Costa Rica, Egypt and Singapore=2009.
Source: Authors' calculations based on RICYT and UNESCO databases, 2013.

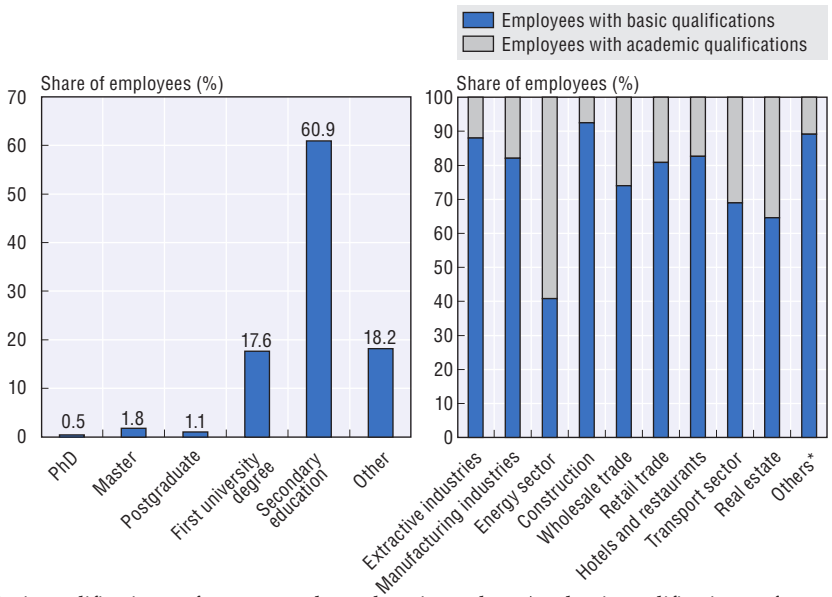
Panama is at the forefront in the use of new information and communications technology (ICT) in Latin America. This is largely due to a rapid increase in the use of mobile broadband technology and smartphones. In 2011 only 29% of all Panamanian households owned a computer and of these only 21% were connected to the Internet (ITU, 2012). By contrast, in the same year, about 86% of all Singaporean households owned a computer while in Uruguay the rate was 62% and in Costa Rica 45%. Nowadays, around 43% of Panamanians use the Internet on a regular basis, a share which is on a par with the figures registered in the other countries of the region. While in 2010 the number of broadband subscriptions was only 3.4 per 100 inhabitants, in 2011 this figure had increased to 14.5. Today Panama has one of the highest and fastest growing mobile broadband penetration rates in Latin America. It also scores relatively well in terms of e-government indicators (United Nations, 2012). In spite of these successes, much has still to be done in the field of ICT, especially in software protection and property rights. In fact, Panama has 72% of pirated software in use, one of the highest percentage in Latin America.

Panama is investing in improving its capacity to measure innovation trends. Together with Costa Rica, Panama is one of the few countries in Central America to carry out an innovation survey (Padilla Perez, 2013). In 2010 the country carried out its first innovation survey, monitoring private sector firms' innovative activities over the period 2006-08. The survey follows the Oslo and Bogotá Manuals. According to the survey about 44% of all Panamanian firms implemented an innovation from 2006-08 (Suarez, 2010). This ratio is high when compared to other Latin American countries such as Chile (31%),

Colombia (33%) or Uruguay (28%). These differences may, however, be partly attributed to the differences in sampling methods between the surveys. Most innovations were related to the import of capital equipment (73%) and only to a lesser extent to expenditures on technology transfer (10%). About three quarters of all innovations implemented within Panamanian firms concerned process, organisational and commercialisation improvements and only about 25% were related to new products. Only about 13% of all firms indicated they had implemented the "new to the world" type of innovation. However, there is limited evidence that government support programmes by SENACYT (Secretaría Nacional de Ciencia, Tecnologia e Innovación) have had a positive impact on the R&D expenditures of private firms (Crespi et al., 2011).

An additional finding of the survey is the low degree of co-operative behaviour among domestic firms with other agents of the national innovation system (Suarez, 2010). Estimates from the survey reveal that only 21% of private sector employees have an undergraduate university degree and only 3% have completed postgraduate studies and/or a PhD (Figure 1.15). According to the survey academic qualifications are highest in the energy, wholesale, transport and real estate sectors with about 40% to 60% of the total workforce having obtained at least an undergraduate degree (Aguirre-Bastos et al., 2011).

Figure 1.15. **Employment structure in private firms in Panama, by level of qualification and sector, 2008**



Note: Basic qualifications refers to secondary education or less. Academic qualifications refers to at least a first university degree or postgraduate degree (i.e. Master, PhD).
Source: Authors' calculations based on Suarez (2010).

Conclusions

Panama has achieved robust GDP growth well above the regional average since the 1990s. More recently, the large infrastructure projects associated with the expansion of the canal and domestic infrastructure building have provided an additional impetus to growth. With a view to support more inclusive and sustainable growth the country has started to promote research and innovation.

Panama has achieved important results in favouring access to ICTs and in promoting its productive uses. It has also introduced an innovation survey to monitor innovation trends in the domestic economy. However, despite the intentions, the country still invests little amounts of resources in research and innovation, lacks a critical mass of high skilled people and faces high barriers to promoting innovation in existing firms, as well as the creation of new innovative enterprises.

Notes

1. ISIC, Rev. 3, code I, divisions 60-64. Based on data from the UN National Accounts Main Aggregates Database, 2013.
2. Industrial value added comprises value added in manufacturing plus value added in mining, construction and utilities (electricity, water and gas).
3. Panama is currently a signatory to 12 regional trade agreements, including with Canada, Chile, Chinese Taipei, Costa Rica, El Salvador, the European Union, Guatemala, Honduras, Nicaragua, Peru, Singapore, the United States (WTO Regional Trade Agreements database, as of June, 2013)

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Chapter 2

Designing and implementing innovation policy in Panama

Panama's experience in designing and implementing innovation policy is recent. The country has made progress in learning how to elaborate pluri-annual plans and monitor the implementation of innovation policy. Nevertheless, major challenges remain: especially in guaranteeing pluri-annual budgeting for innovation; in improving the co-ordination of the promotion of science, technology and innovation with the national development strategy; and in scaling up initiatives in key priority areas. This chapter focuses on: *i)* the institutional setting and governance for innovation policy; *ii)* the national innovation strategy and policy mix as outlined in Panama's National Strategic Plan for Science, Technology and Innovation (PENCYT) 2010-2014; and *iii)* the main implementation challenges.

Introduction

Panama's experience in designing and implementing innovation policy is recent. Because this is a new commitment, the country is still in a learning phase. A critical analysis of the policies adopted so far, together with a look at the solutions implemented by other countries facing similar challenges, is therefore a helpful exercise in providing hints for the future of innovation policy in Panama.

During the last decade, the high economic growth of the country, mostly led by the expansion project of the Panama Canal and other large infrastructure projects, as well as by the growing revenues from the canal's management, is increasing the scope for government investments. So far the country has put the focus on bridging the infrastructure gaps, by investing in creation of a metro-transport system in the capital and improving the physical, as well as digital,infrastructure for science and technology. Innovation policy has not been at the core of the country's priorities, but several agencies, such as the National Secretariat of Higher Education, Science, Technology and Innovation (SENACYT, *Secretaría Nacional de Educación Superior, Ciencia, Tecnología e Innovación*) and the National Competitiveness Council (Centro Nacional de Competitividad, CNC) are drawing attention to the importance of science, technology and innovation for sustaining Panama's growth in the future, promoting the diversification of its sources of growth, and contributing to a shift towards a more inclusive growth pattern.

This chapter presents a brief overview of the institutional setting for the design and implementation of innovation policy in Panama. It assesses the current innovation strategy, including priorities and budget, and it reviews the existing policy mix for innovation, comparing it with those of peer countries, including the Dominican Republic and Uruguay. The chapter concludes by identifying some areas of improvement as an introduction to Chapter 3 which focuses on the evaluation of the implementation of innovation policy in Panama.

Institutions and governance for science, technology and innovation policy in Panama

Panama's experience in supporting science, technology and innovation (STI) is quite recent, dating back to the end of the 1990s. In particular, Law 13 of

15 April 1997, later modified by Law *50 of 21 December* 2005, is considered the keystone of Panama's support for STI. It establishes the institutional framework and policy tools to promote science, technology and innovation in Panama. The law instituted the National Secretariat of Higher Education, Science, Technology and Innovation (SENACYT) as an autonomous agency with legal autonomy and its own assets. Its president answers directly to the President of the Republic. Together with the creation of SENACYT, the Law 13/1997 also established the National Commission of Science, Technology and Innovation (CONACYT, *Comisión Nacional de Ciencia, Tecnología e Innovación*), a cross-sectoral body with advisory functions, set up to contribute to the preparation of strategic plans for the development of STI. In parallel, Law 13/1997 created the National Fund for Science, Technology and Innovation (FONACITI, *Fondo Nacional para el Desarrollo de la Ciencia, la Tecnología y la Innovación*). However, even though the fund exists in practice, the SENACYT needs to administer its budget through the national budget system, thus making more difficult disbursement procedures. The same law also established the Interministerial Council for Science and Technology (CICYT, *Consejo Interministerial de Ciencia y Tecnología*), which is composed of six ministries with responsibilities in competitiveness and scientific subjects, and has co-ordination functions.

SENACYT is the main institution responsible for innovation policy in Panama. Like other countries in the Latin American and the Caribbean region, Panama does not have an ad hoc ministry for innovation. SENACYT was created to provide specific support to domestic scientific development. The institution is therefore highly respected among the national scientific community. However, despite recent efforts to engage in the promotion of innovation capacities in the private sector, increasing its capacity to enter into dialogue and interaction with firms and setting up programmes to promote applied research programmes matching scientific research with business actors remain major challenges ahead. Today, SENACYT is responsible for the elaboration, implementation, evaluation, and revision of the five-year National Strategic Plan for Science, Technology and Innovation (PENCYT, *Plan Estratégico Nacional de Ciencia, Tecnología e Innovación*). SENACYT employs 245 people and has an overall budget of USD 42 487 900 for 2013. Table 2.1 shows a comparison of SENACYT with the peer institutions in the Dominican Republic and Uruguay.

Table 2.1 **Comparison of the human and budgetary resources of SENACYT (Panama), the Vice Ministry for Science and Technology (Dominican Republic) and ANII (Uruguay)**

Country	Panama	Dominican Republic	Uruguay
Agency	**SENACYT**	**Vice Ministry for S&T**	**ANII**
Number of employees (2012)	245	16	53
Annual budget (USD million)			
2012	33.1, of which 94% exec.	4.5 of which 100% exec.	33.9 of which 84% exec.
2011	30.9 of which 92% exec.	2.4 of which 100% exec.	31.6 of which 91% exec.
2010	34.4 of which 90% exec.	2.9 of which 100% exec.	27.3 of which 79% exec.

Note: ANII is the National Innovation and Research Agency of Uruguay.

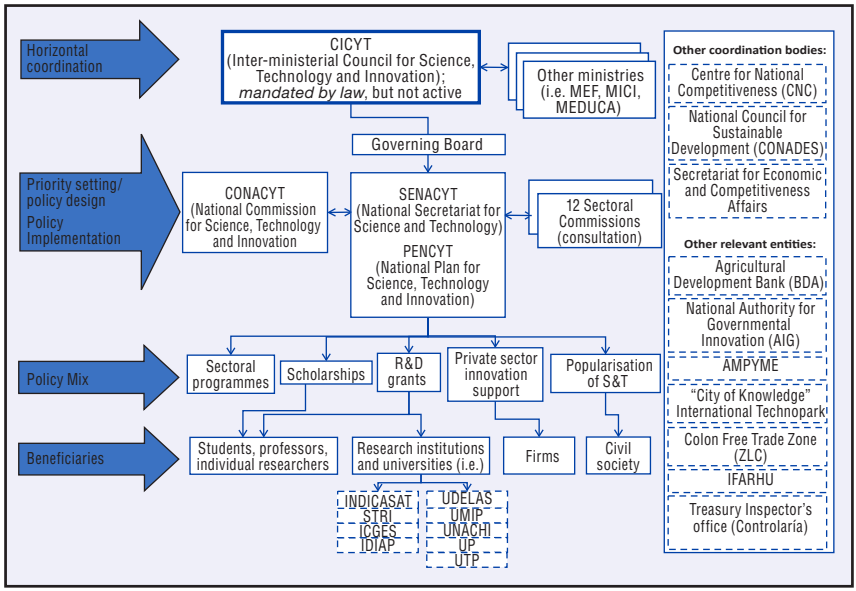
Source: Authors' calculations based on national official sources (SENACYT for Panama, ANII for Uruguay and Vice Ministry for S&T of the Dominican Republic), 2013.

In Panama, SENACYT is responsible for both defining strategy and implementing policy (Figure 2.1). In general, countries tend to assign these functions to two separate entities. The separation of functions allows for a smoother operation and favours tailoring the management structure of each institution to the specific functions it has to perform. The institutions in charge of policy implementation are usually independent – although affiliated – agencies, in order to make the implementation function more responsive and adaptable.

The separation of strategy setting from implementation is not only a characteristic of big economies, as in Argentina where the Ministry for Science, Technology and Productive Innovation is in charge of strategy setting, and the National Innovation Agency is responsible for policy implementation. It is also the case for economies that are smaller in terms of country size and population such as Costa Rica and Uruguay (Figures 2.2 and 2.3). In Uruguay, a recent reform following the Law 18.084 in 2006 established that the National Council for Innovation, Science and Technology (CONICYT, *Consejo Nacional de Innovación, Ciencia y Tecnología*) is formally responsible for planning, as well as for elaborating proposals on specific policies and instruments. The National Innovation and Research Agency (ANII, *Agencia Nacional de Investigación e Innovación*), created in 2005, is entrusted with implementation functions (Figure 2.2). In Costa Rica, strategy setting and policy implementation are managed by different institutions, working under the co-ordination of the Presidential Council for Competitiveness and Innovation (CPCI, *Consejo Presidencial de Competividad e Innovación*). Since Costa Rica has a dedicated Ministry for Science and Technology (MICIT, *Ministerio de Ciencia y Tecnología*),

this Ministry is responsible for innovation priority setting, policy design and strategy setting, while the National Council for Scientific and Technological Research (CONICIT) is in charge of implementation (Figure 2.3).

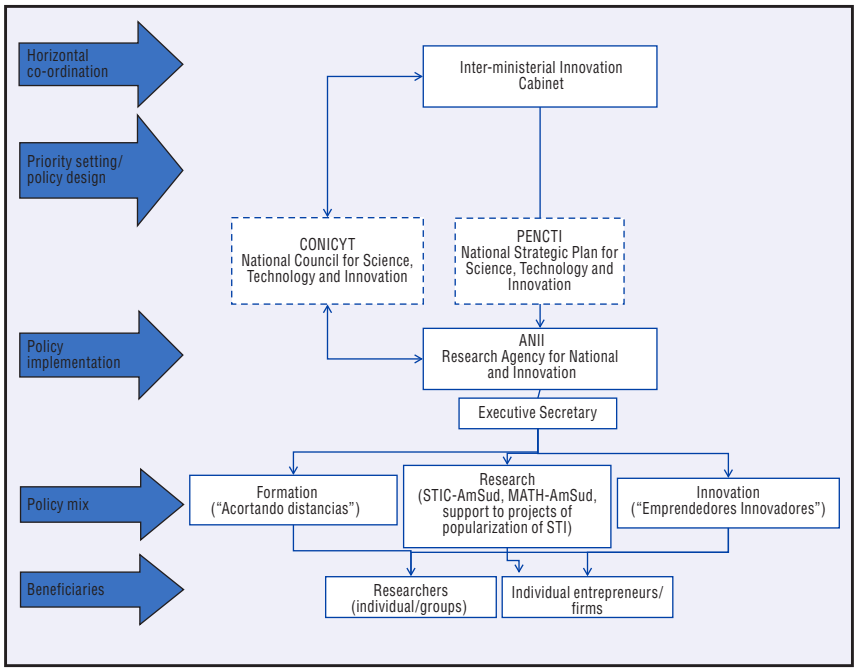
Figure 2.1. **Institutional framework for innovation policy, Panama, 2013**



Note: AMPYME=Authority for Micro, Small and Medium Enterprises; ICGES=Gorgas Commemorative Institute of Health Studies; IDIAP=Agricultural Research Institute of Panama; IFARHU=Institute for Training and Development of Human Resources; INDICASAT=Institute of Advanced Scientific Investigations and High Technology Services; S&T=Science and Technology; MEDUCA=Ministry for Education; MEF=Ministry of the Economy and Finance; MICI=Ministry of Commerce andI ndustry; STRI= Smithsonian Tropical Research Institute; UDELAS=Panama Specialised University of the Americas; UMIP=Panama International Maritime University; UNACHI=Autonomous University of Chiriqui; UP=University of Panama; UTP=Technological University of Panama.

Source: Authors' elaboration based on PENCYT 2010-2014 and information provided by SENACYT, 2013.

Figure 2.2. **Institutional framework for innovation policy, Uruguay, 2013**



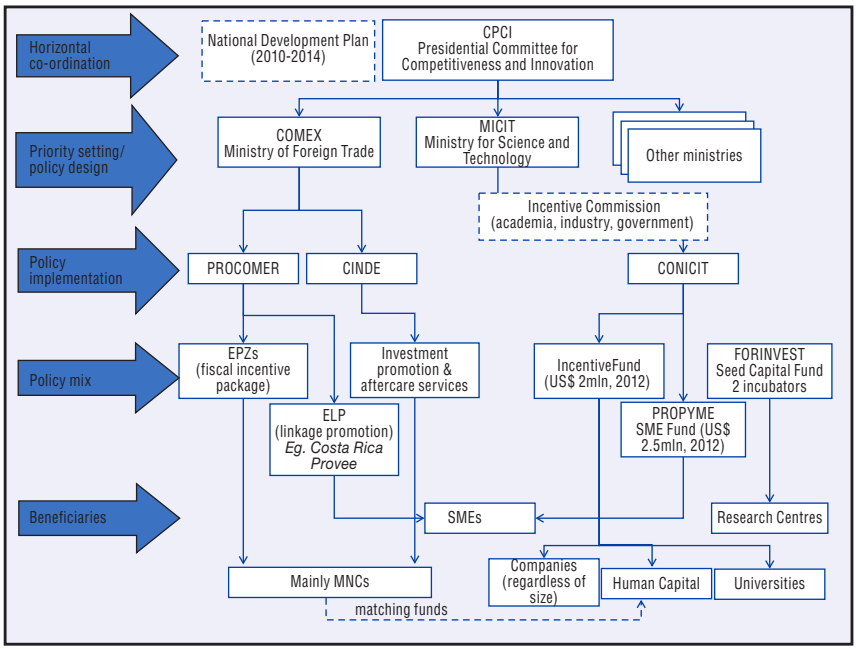
Source: Authors' elaboration based on information provided by ANII, 2013.

The innovation agenda in Panama, as well as in other countries, cuts across several ministries and agencies, from those responsible for the introduction of innovation in government management practices – such as the recently instituted Panamanian Authority for Government Innovation – to the ministries responsible for education, industrial development, trade and finance. A major challenge for the institutions in charge of innovation policy is therefore co-ordination with other government bodies with STI-related responsibilities.

Panama is endowed with a multiplicity of institutions and spaces in charge of policy co-ordination. However, even though these co-ordination mechanisms are established by law, in many cases they have been barely used, especially in the last few years. One of those is the Interministerial Council for Science, Technology and Innovation (CICYT, *Consejo Interministerial de Ciencia, Tecnología e Innovación*). Set up in 2005, it is made up of the ministers with relevant responsibilities with respect to STI, as designated by the president. CICYT is responsible for the approval of overall national expenditure in STI, and contributed to the co-ordination of public budgets for innovation in the

years in which it was called upon to operate. The SENACYT governing board is an additional space for policy co-ordination. It is composed of seven members drawn from the Ministry of the Presidency, the Ministry of Education, the National Banking Association (*Asociación Bancaria de Panamá*), the National Council of Private Enterprise (CONEP, *Consejo Nacional de la Empresa Privada*), the Panama Rectors' Council (*Consejo de Rectores de Panamá*), and two representatives from public and non-governmental research centres (art. 19-B Law 13/1997).

Figure 2.3. **Institutional framework for innovation policy, Costa Rica, 2013**



Source: OECD (2012a).

While the CICYT and the SENACYT governing boards have not been active spaces in recent years, Panama has created new institutions which are making advances in becoming platforms for policy co-ordination in the area of competitiveness. The Secretariat for Economic Affairs and Competitiveness (*Secretaría de Asuntos Económicos y Competitividad*), is designed to support the President of the Republic and the Ministry of the Presidency in the implementation of the national economic agenda. Its main responsibility is to co-ordinate the different programmes launched by the national government to improve competitiveness. The National Council for Sustainable Development

(CONADES, *Consejo Nacional de Desarollo Sostenable*) was created in 1996 with the National Decree N° 163, as a tool for the Minister of the Presidency to ensure the systematisation and integration of social and environmental concerns into Panama's economic activities. The activities of the council operate at three levels; local, national and international, following a decentralised structure. This feature could be exploited to engage local and indigenous communities, as well as international actors, in the debate about Panama's development strategy.

The Centre for National Competitiveness (CNC) was created with the support of the National Enterprise Association (APEDE, *Asociación Panameña de Ejecutivos de Empresa*) in 2005, a private-public partnership aiming at bringing together the private sector, representatives of the labour force and the government. Since its creation, the CNC has managed to convert itself into an effective space for public-private dialogue where ministries in charge of the economy, finance, infrastructure, education and trade meet to talk about achievements and future challenges in an open dialogue with the private sector and civil society. The objective of the CNC is to promote alliances to improve the competitiveness of the country, concentrating above all on the quality and quantity of industrial production, and on the creation of a business environment which attracts both domestic and foreign investment, while improving the well-being of the citizens of the country.

The CNC has a significant convening power and could help to overcome the co-ordination gap that is currently weakening the national innovation policy. In fact, the co-ordination issue in innovation policy concerns not only the inter-ministerial dimension, but also the capacity to create synergies with the actors of the national innovation system, including the private sector, universities and research centres. SENACYT, as has been stated, has a good reputation in the scientific community, but it is much weaker when it comes to its capacity to enter into dialogue with, and deliver services and incentives to, the private sector. The CNC offers the private-public linkage dimension that SENACYT is missing and it could be a powerful ally in promoting science, technology and innovation policy in Panama by sensitising the domestic private sector to the innovation agenda. To mainstream the role of the CNC as a space for co-ordination in strategy setting, it needs to align and create synergies with CICYT or SENACYT governing board which already exist in law.

Promoting co-ordination across ministries for S&T and with the private sector is a common challenge for OECD and non-OECD countries (Box 2.1). In Latin America several countries have invested in the last decade in improving the spaces for policy co-ordination. Colombia, for example, created in 2011 the Private Council for Promotion of Competitiveness, to provide a forum for dialogue

between the private and the public sectors. Seventeen companies (both national and foreign) founded the initiative, whose members are required to commit their chief executive officers (CEOs) to participate actively in its activities. The council has a specific agenda and is "action-oriented", co-ordinating initiatives among the private sector, government and academia. The Colombian Private Council on Competitiveness has a staff of six associate researchers and publishes a bi-annual National Competitiveness Report analysing and providing policy recommendations on different topics, such as education, social security, the labour market, science, technology and innovation, infrastructure, information and telecommunications technology, the financial and tax system, competition, justice and corruption, and sustainability (OECD, 2012a).

Box 2.1. **Promoting inter-ministerial co-ordination in innovation policies: The cases of Costa Rica, Dominican Republic and Uruguay**

Promoting innovation requires aligning actions across different fields, including education, infrastructure and trade. As innovation assumes a higher priority in countries' development agendas governments are confronted with the need to foster co-ordination across several ministries and government agencies. The following paragraphs outlinet examples of recent experiences in three Latin American countries that have put in place reforms to promote co-ordination for innovation policy.

For the last decade Costa Rica has been shifting its policy model towards the attraction of more knowledge-intensive foreign direct investment (FDI) and to stronger promotion of domestic innovation. The Presidential Council for Competitiveness and Innovation (CPCI, *Consejo Presidencial de Competividad e Innovación*) was established in 2010. It is run by an executive secretary reporting directly to the President of the Republic, who serves as the council's chair. Its members, who include several ministers, meet every month and participation is mandatory at the ministerial level. The council has identified five priority areas in need of better policy co-ordination: *i)* infrastructure; *ii)* permit simplification; *iii)* creation of new financial instruments, especially for start-ups and small and medium-sized enterprises (SMEs); *iv)* FDI and foreign trade; *v)* human resources development. Efforts are being made to upgrade the council, which so far has played an important role in knowledge sharing, to a platform for policy dialogue, enlarging the spaces for co-operation among the different innovation agents in the country. The OECD assessment (OECD, 2012a) suggests that the council needs to have more enforcement powers to elaborate shared guidelines and priorities if it is to foster policy co-ordination among different sectoral ministries. In particular, it should be endowed with the highest political support and empowered as the policy space for creating consensus on objectives and aligning policy actions. In addition, it should be made responsible for ensuring the implementation and follow-up of decisions stemming from its discussions and deliberations, as well as for identifying a proper mechanism to channel the voices of the private sector. Otherwise there is a risk that its role will be confined to mere information sharing.

Box 2.1. **Promoting inter-ministerial co-ordination in innovation policies: The cases of Costa Rica, Dominican Republic and Uruguay** (*contd.*)

The Dominican Republic's Ministry for Higher Education, Science and Technology (MESCYT, *Ministerio de Educación Superior, Ciencia y Tecnología*) co-ordinates actions with various entities that define policy, such as the National Competitiveness Council. The MESCYT also presides the Council for Innovation and Technological Development (CIDT, *Consejo para la Innovación y Desarollo Tecnológico*) created by decree to govern the National System for Innovation and Technological Development (SNIDT, *Sistema Nacional de Innovación y Desarrollo Tecnológico)*. The main objective of the SNIDT is to co-ordinate the functioning of the institutions (academic, public, private and foreign) promoting innovation and applied technological development. The council is composed of 15 members including: the Centre for Export and Investment, the National Competitiveness Council, the Dominican Institute of Telecomunications, the Innovation in Industry and Biotechnology Institute, the National Intellectual Property Office, the Dominican Agriculture and Livestock Research Institute, as well as four business associations, and university representatives. In 2007 the CIDT co-ordinated the National Strategy for Science, Technology and Innovation 2008-2018 (PECYT, *Plan Estratégico de Ciencia, Tecnología e Innovación*) of which the main goal is to establish the foundation for a transition to an economy based on knowledge and innovation.. This strategic plan is defined as a planning tool for policy and institutional co-ordination of the national science, technology and innovation system in the interest of developing competitive advantages for productive sectors, as well as promoting sustainable development and the improvement of quality of life of the society. The PECYT is in its fifth year of implementation and has been used as basis for planning for national science and technology institutions, as well as being consulted for national dialogues between industry and government. This strategic plan was also used as input for the National Development Strategy (Law 1-12) co-ordinated by the Ministry of Economy, Planning and Development.

In Uruguay, the task of horizontal co-ordination in STI has been assigned to the Inter-Ministerial Innovation Cabinet created in 2005. The Cabinet consists of the Ministries of Economy and Finances, of Industry, Energy and Mining, of Livestock, Agriculture and Fisheries, and the Director of the Office of Planning and Budgeting, and is chaired by the Ministry of Education and Culture. Acknowledging the horizontal nature of STI, its fundamental role in the development of the country and the fragmentation of responsibilities for innovation-related policies among different institutions, the Cabinet has been positioned at the highest level of the executive of the country. Its main objective is to co-ordinate and articulate governmental actions in support for STI – identified as a fundamental pillar for the development of the country – in fields such as education, research, industrial production and taxation.

Source: OECD (2012a), UNCTAD (2012) and authors'elaboration based on official information from ANII (Uruguay), 2013

Panama's national innovation strategy: The pluriannual plan 2010-14 (PENCYT)

Multiannual plan and participatory approach in strategy setting

SENACYT is responsible for defining the National Plan for Science and Technology (PENCYT) which sets the main priorities and lines of action for national innovation policy. SENACYT designed and implemented the third PENCYT for the period 2005-09 and, on the basis of the objectives that were envisaged but not fulfilled within that period, it has defined the priorities and lines of action for the PENCYT 2010-14.[1] Panama – SENACYT in particular – is still in a learning phase of how to design, implement and evaluate innovation policies, and so the continuity in terms of objectives and programmes between the previous pluri-annual plan and the current one appears a strategic choice.

The PENCYT has been defined taking into account the innovation challenges of the Panamanian economy and the government's development priorities. SENACYT has put in place efforts to align the PENCYT with the priorities of the government's strategic plan 2010-2014, set out by the Ministry of the Economy and Finance (MEF, Ministerio de Economía y Finanzas). The national development plan prioritises the achievements of: *i)* sustainable economic growth and *ii)* the reduction of poverty and income inequality. To achieve the first, the government has prioritised investment in infrastructure, regulatory reforms, institutional strengthening and modernisation of the state in three key sectors: logistics, tourism and agriculture. The social sustainability goal, by contrast, rests on investment in human capital formation and social inclusion, with a prioritisation of educational and social protection programmes in rural areas (MEF, 2010). The co-ordination between the national plan and the plan for innovation rests at the level of strategy setting and implementation of specific projects, as for example the strengthening of university capacities in the field of logistics, which is one of the priorities of the national strategic plan. However, in practice the two plans operate in parallel, target different sectors, and generate low synergies among implemented actions.

SENACYT elaborated the plan following a participatory process. Sectoral and horizontal commissions composed of members of research centres, academia, relevant governmental institutions and the private sector were established to convey the needs and the priorities of the different knowledge and scientific areas. The plan is structured at four levels: *i)* development goals; *ii)* strategic objectives, identifying the purposes to which the tools defined in

the plan should be directed; *iii)* priority lines of action, targeting areas of key interest for the country; and *iv)* specific programmes for each of the lines of action (Table 2.2). The plan is structured in a two-volume document.The first part identifies six lines of action including promoting innovation in the private sector; enhancing knowledge generation and diffusion; strengthening institutional capabilities of public STI institutions; improving human resources and scientific infrastructure; undertaking high-impact project in logistics, tourism, and agriculture (i.e. the priority sectors defined in government strategic plan); and enhancing public awareness of the relevance of science and technology for development (i.e. popularisation of science). The second volume focuses on the 12 areas that were prioritised in the previous PENCYT (seven sectoral; bio and health sciences; agriculture, forestry, and fisheries; basic sciences; social sciences; education; industry and energy; logistics and transport) and five horizontal (ICT development; STI and the environment; gender equality in STI; STI and ethics; strategic alliances for STI). When compared with the national plans and policies for innovation in other countries of the region, the PENCYT looks extremely detailed, with a multiplicity of objectives and lines of action and with little capacity to consolidate around strategic initiatives. The level of detail of operational conditions included in the plan hinders the flexibility of implementation and the capacity of fine-tuning according to evolving situations.

One of the strengths of the PENCYT 2010-2014 is its legitimacy among the scientific community. The fact that the plan has been developed following a participatory approach has helped translate it from a "government document" to a set of reference guidelines for the scientific community. The plan is the result of SENACYT's effort to work side by side with the key actors of the Panamanian scientific and innovation communities. The sectoral commissions are expected to retain consultation functions in the implementation phase although in practice they have been under-consulted over the last two years.

Table 2.2. **Key features of Panama's innovation policy: The National Strategic Plan for Science, Technology and Innovation (PENCYT), 2010-2014**

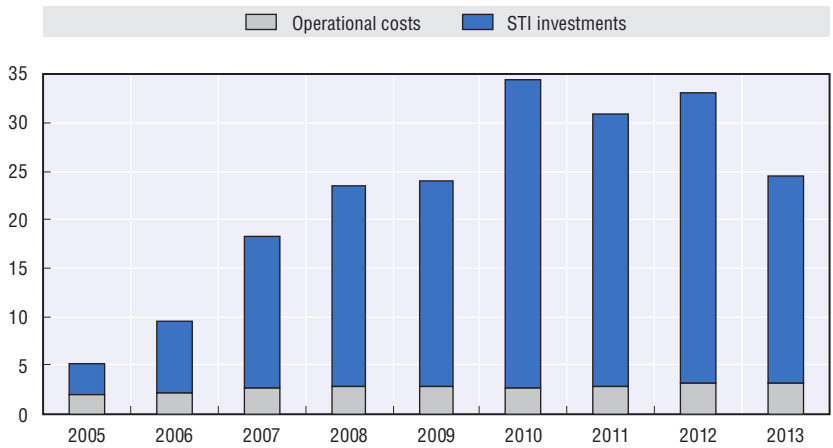
Programming period	**2010-14**	
Budget (SENACYT)	USD 98.38 million (committed from 2010-12); 90.48 million(executed from 2010-12) USD 42.48 million (committed in 2013)	
Innovation policy framework	National innovation systems framework	
Development goals	• Sustain GDP growth • Diversify the economy, and increase the knowledge and specialised human capital content in production • Develop skills and human resources for competitiveness	
Strategic objectives	• Invest in human capital for knowledge-based development • Foster social and economic innovation • Support applied research in STI for social and economic development	
Lines of actions	• Undertake high-impact projects in logistics, tourism, agriculture (i.e. priority sectors defined in government strategic plan); • Improve human resources and scientific infrastructure development; • Enhance knowledge generation and diffusion; • Strengthen private sector innovation; • Enhance STI education and public awareness; • Increase capacities of public STI institutions	
Main programmes (Iniciativas)	• Financing of "centres of excellence" in logistics, tourism and agriculture, i.e. national research institute for logistics and transport and applied research centre for agricultural research; • Direct funding of new research and development (R&D) projects, research networks and public-private platforms for technology transfer (with a focus on strengthening regional R&D capacities); • Financing of scientific infrastructure, access to electronic scientific resources and publication assistance for researchers (i.e. in biosciences); • Direct financial support to young researchers; • Introduction of specialised postgraduate study programmes and technical education schemes in logistics, tourism and agriculture; • Scholarships and subsidies for postgraduate and doctoral studies abroad; • Insertion programme for scholarship holders into academia, business and public institutions; • Attraction of foreign and repatriation of Panamanian researchers; • Financing of stationary and mobile internet units (Infoplazas) to promote ICT access and use; • Financing of start-ups and assistance in internationalisation efforts of businesses; • Financing of programmes and evaluations to strengthen science and maths education • Creation of innovation challenges and prizes	
Sectoral focus	Yes	
Priority areas	*Sectoral:* Seven priority sectors 1. Bio and health sciences; 2. Agriculture, forestry, fisheries; 3. Basic sciences; 4. Social sciences; 5. Education; 6. Industry and energy; 7. Logistics and transport	*Horizontal* Five transversal programmes a. ICT development; b. STI and the environment; c. Gender equality in STI; d. STI and Ethics; e. Strategic alliances for STI

Source: Authors' elaboration based on National Strategic Plan for Science, Technology and Innovation (PENCYT), 2010-2014.

Budget

Panama has increased its investment in innovation. In respect of the PENCYT 2005-2009, the budget at the disposal of SENACYT for scientific and technological activities has increased, although with some fluctuations. While the previous strategic plan for STI was allocated an overall USD 80.6 million for the period 2005-09, the current PENCYT has already exceeded this amount, receiving more than USD 122 million in 2010-13. In spite of the increase in the amount allocated, the volatility of the annual budget has increased since 2011 (Figure 2.4).

Figure 2.4. **Evolution of SENACYT budget for STI activities, 2005-13**
USD million

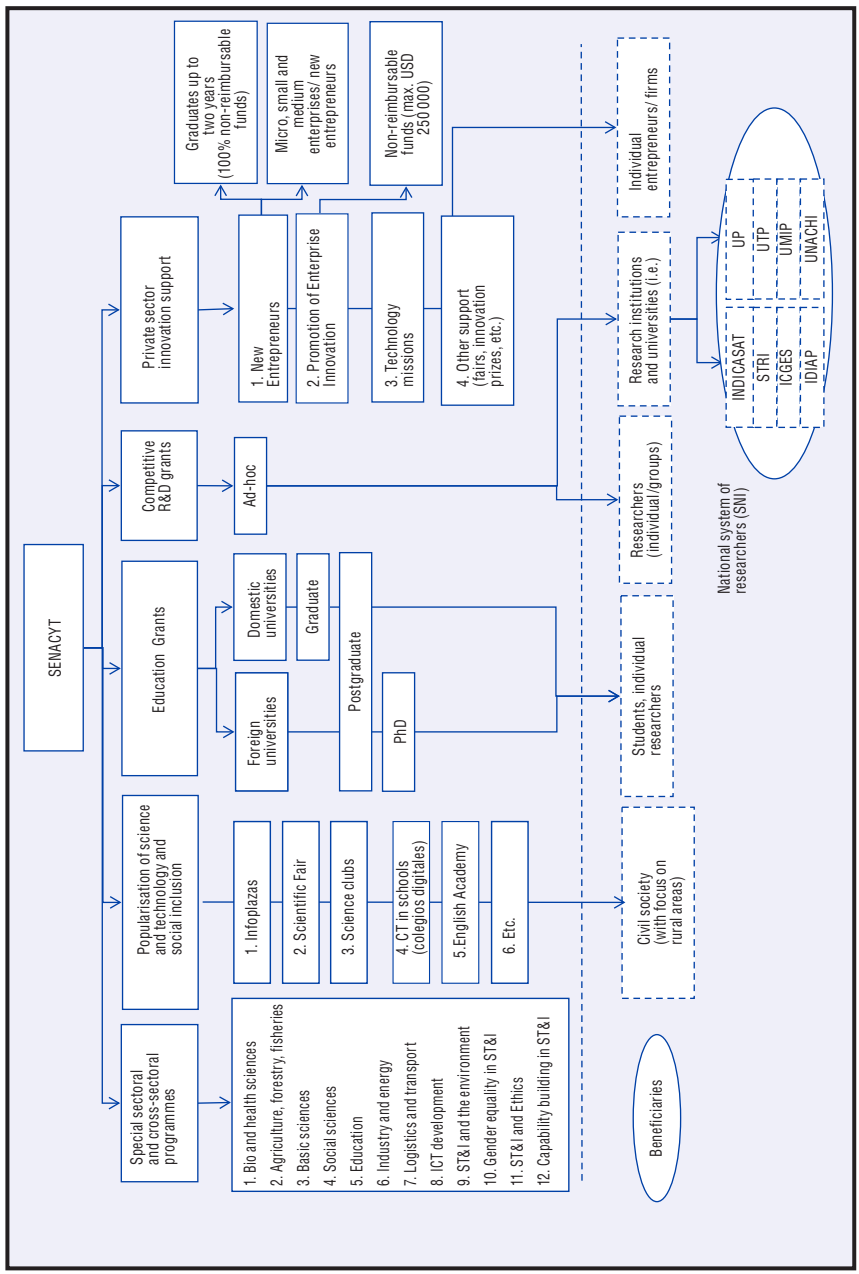


Source: Authors' calculations based on PENCYT 2010-2014 and information provided by SENACYT, 2013.

A"project-based" policy mix

Panama has a wide range of policy tools at its disposal to achieve the PENCYT's priorities. SENACYT administers incentives, grants and services in four main areas (Figure 2.5).

Figure 2.5. **Panama's innovation policy mix, 2013**



Source: Authors'elaboration based on official information from SENACYT.

- Popularisation of science and technology.

  The pillar of popularisation gathers together initiatives that respond to the need to raise awareness about the relevance of science, technology and innovation for Panamanian society. There is a general perception of "innovation" as an issue that is far removed from the possibilities and the realities of the lives of most citizens; while, on the contrary, science and technology could be powerful assets to help the country shift towards better living conditions for all (the examples of the impact of the advances in health research and in e-government on citizens are evident, but they are not unique; promoting innovation also supports the strengthening of domestic firms, and there is a need to increase public awareness about these issues). In this area Panama is performing well, and it has managed to achieve good results. For example, the network of Internet points (Infoplazas) disseminated all over the country has helped not only to favour Internet access even in remote areas, but also to create a presence of the government and to support community building in poor rural areas (Box 2.2). Panama has also developed relevant capacities in scientific journalism and in science and technology awareness campaigns. Other initiatives in this area include science clubs, digital colleges, the National Science and Technology Fair, and innovation prizes. SENACYT has also favoured access to scientific journals for local universities.[2]

Box 2.2. **Infoplazas**

SENACYT Infoplazas are part of a digital literacy programme, aiming to increasing the accessibility of ICT in poor and rural areas and those with indigenous peoples, and therefore contributing to the reduction of the digital gap. Infoplazas are structured as community centres, and provide public access to the Internet and to e-learning platforms, as well as training in information and communication technologies.At the end of 2013, Panama had 296 Infoplazas around the country, each of them supplying, in addition to the regular services (Internet access, document printing, text editing, document digitalisation, training courses, access to digital encyclopedias), different arrays of additional services, tailored to the needs and demands of the local community. Infoplazas have so far been successful not only in facilitating access to the digital network, but also in contributing to the development of local communities and their integration into the national system. SENACYT Infoplazas constitute an important tool for the central government to reduce the distance to the poorest and less accessible areas, addressing the growing social exclusion and territorial inequality problems.

Source: Authors' elaboration based on official information from SENACYT, 2013.

- Education grants

  SENACYT offers grants to train professionals for science, technology and innovation. When calls for grants are opened, beneficiaries are selected on the basis of the quality of the training proposal; there is no prioritisation in terms of areas of capabilities that need to be developed. Grants are offered for undergraduate, graduate and PhD students, as well as for strengthening the competences of trainers, teachers and professors. Over three years (2010-12), SENACYT delivered 233 grants for undergraduate, 275 graduate (including 89 within the country) and 45 PhD students. These students enrolled mostly in agriculture, engineering and technology at the undergraduate level, natural sciences at the doctoral and post-doctoral level, and social sciences and humanities at the professional level (SENACYT, 2013).

  In recent years a rebalancing of the funds has appeared to favour pre-graduate students and lower levels of education. Out of the 641 grants in place in 2013, almost half (46%) targeted undergraduates, 37% professional programmes, and only 16% doctoral or post-doctoral careers. A very small fraction (1%) of the grants is devoted to vocational training (SENACYT, 2013). Of the 641 grants, only 20% were used for education programmes within the country, while most of them went to Panamanian students who chose to pursue their studies in the US (38%), Europe (24%), or other countries in Latin American and the Caribbean (16%) (SENACYT, 2013). In Uruguay, grants for human resources training within the country are fixed, amounting to USD 700 per month for two-year masters' programmes, and USD 880 per month for three-year PhD programmes. For grants to study outside the country, the ANII has instead established an overall upper limit of USD 40 000 for masters and USD 60 000 for PhDs (Table 2.3). In the Dominican Republic from 2010 to 2012, 12 605 scholarships were granted (45% to study abroad, 89% of which were to pursue postgraduate studies). Most grants go to students enrolled in health, business, pedagogy and engineering studies in the United States, Europe, South America and Asia. The maximum yearly amount for grants is USD 1 200 to study in the Dominican Republic and USD 15 000 to study abroad.

Table 2.3. **Education grants in Panama, Dominican Republic and Uruguay, 2013**

		Panama		Dominican Republic		Uruguay	
		Maximum amount of approved grant (last five years)	Number of grants approved in 2010-12	Maximum amount of approved grant (last five years)	Number of grants approved in 2010-12	Maximum amount of approved grant (last five years)	Number of grants approved in 2010-12
Under-graduate	Within the country	N/A	N/A	USD 34 500	5 121	USD 81 000	411
	Programmes abroad	USD 180 000	233	USD 80 000	383	N/A	N/A
Post-graduate	Within the country	USD 180 000	89	USD 8 500	248	USD 348 000	372
	Programmes abroad	USD 135 000	186	USD 59 200	5 141	USD 40 000	23
Ph.D	Within the country	N/A	N/A	N/A	N/A	USD 658 800	152
	Programmes abroad	USD 285 000	45	USD 154 188	210	USD 60 000	27

Source: Authors' elaboration based on national official sources (SENACYT for Panama, ANII for Uruguay and Ministry for Education, Science and Technology for Dominican Republic).

Panama has prioritised the strengthening of human resources for science and technology, But this poses the challenge of providing productive professional opportunities for these better trained people. SENACYT grants include conditions for repatriation, but deeper co-ordination with industrial and production development policies would be needed to ease the absorption of these highly skilled people into the domestic economy.

- Promotion of scientific R&D

  SENACYT manages competitive R&D grants which target individual researchers or groups and special sectoral programmes in priority areas. These funds are allocated on the basis of ad hoc project proposals. In parallel, SENACYT also finances the development of research infrastructure. For example, in 2002 it instituted the Institute of Scientific Research and High Technology Services (INDICASAT, *Instituto de Investigaciones Científicas de Alta Tecnología*) to carry out frontier research in chemistry and biology (Box 2.3), and recently it signed an agreement with a major academic publishing company to facilitate access to scientific knowledge.

Box 2.3. **INDICASAT**

In 2002, SENACYT established the Institute of Scientific Research and High Technology Services (INDICASAT), as a platform for promoting scientific and technological development in Panama. The Institute is devoted to training researchers and technicians in the fields of R&D which have applications in the sectors identified as priorities for the country. Among its objectives, the institute supports the competitiveness of production, facilitating the interaction of academia and research centres with private sector in innovation. Today INDICASAT has one of the most comprehensive infrastructures for R&D in chemistry and biology in Central America, and can count on specialised expertise in key areas of biomedical research, as well as biotechnology, natural product chemistry, immunology, neuroscience, pharmacology, toxicology, parasitology, clinical trials and other related areas. The institute is organised around four centres – biodiversity and drug discovery, neuroscience, cell biology and molecular diseases, and the centre for clinical trials and translational medicine – which provide high-tech services to the community. Now that it has become an established research hub in the country, the aim of INDICASAT is to assert its position as a centre of exellence not only nationally but also in the global landscape, and to facilitate technology transfers from and towards other countries, especially in the Latin America and the Caribbean region. In order to do fulfill this vision, INDICASAT is focusing on the selection of highly qualified human resources, on the interdisciplinarity and internationalisation of its biomedical research programme, on the diffusion of a scientific culture and on the provision of supporting services and knowledge-sharing in Panama's priority sectors.

Source: Information from INDICASAT, 2013.

- Incentives to promote innovation in the private sector

  SENACYT offers incentives and grants to promote innovation in firms. New Entrepreneurs (NE, *Nuevos Emprendedores*) is a programme started in 2009 that offers grants covering up to 100% of total project costs to graduate students whot want to set up a company within two years after their graduation. Eligible beneficiaries need to be trying for the first time to set up a business and need to be affiliated to an incubator that operates in the City of Knowledge (CDS, Ciudad del Saber). The programme also offers support to new entrepreneurs in setting up a micro enterprises. In Uruguay, a similar programme for new entrepreneurs funds up to 80% of the total cost of a project, within the limit of USD 25 000 per project. Promoting the creation of start-ups is an emerging phenomenon in Latin America, and Panama is in line with this trend, although its policy mix is less elaborate (See Box 2.4).

  SENACYT also manages a fund to promote innovation in existing firms (FIE, *Fomento a la Innovación Empresarial*), offering grants up to USD 250 000 for research projects in companies. SENACYT had a line to finance

technology missions abroad to favour access to technology by a group of firms and universities. This line has been recently discontinued, leaving an empty space for promoting modernisation and entrepreneurial networks in the country.

Box 2.4. **Promoting start-ups in Latin America: What are the goverments of the region doing?**

Start-ups are an emerging phenomenon in Latin America's innovation strategies. Latin American countries are highly heterogeneous and are implementing different support mechanisms. Argentina has been successfully introducing performance-based management criteria in its business incubators and in its intermediate agencies facilitating access to public programmes. Brazil and Chile have accumulated knowledge in supporting start-ups since the 1990s. Over the past two years both countries have introduced new incentives to promote start-ups, combining financing with business and training services. Mexico has improved its legal framework to facilitate start-up creation and expansion. Colombia and Peru are currently designing "new generation" support tools that combine seed capital with business training services for new entrepreneurs. In spite of country specificities, two common trends are emerging in the region: *i)* the increasing role of sub-national and local governments (such as the Ciudad de Buenos Aires in Argentina and the states of Porto Alegre, Amazonia and Sao Paulo in Brazil); and *ii)* the emerging role of large companies that are increasingly involved in financing and coaching start-upss as part of their new open innovation strategies. The case of Wayra in Peru is an example of a private sector initiative that is helping to bring dynamism to support start-ups.

The OECD study identifies some recommendations to improve designing and implementing policy to support start-ups in the region:

- **Increasing co-ordination in strategy planning**. Start-up support programmes can only reach their full potential when they are set within broader productive transformation strategies that contribute to generating a favourable environment for these companies to develop.
- **Ensuring the availability of a balanced policy mix targeted at the different development stages.** Public policies play an important role in promoting start-ups by facilitating access to finance, development of entrepreneurial skills and by setting up a business-friendly regulatory framework. Nevertheless, some countries tend to focus on one particular tool, overlooking other important elements which are critical for these firms to develop. The experiences of OECD countries – especially Australia, Finland and Israel – show the importance of offering adequate financing at all stages of firm development, such as seed funding in the creation stage and venture capital and business angels investments in the expansion stage. Seed capital typically requires permanent public support. Venture-capital and business angels, however, mainly need support in the initial stages of their development. As the sector develops, direct public-sector support can be withdrawn while control is handed over to private investment, as was the case in Australia and Israel.

Box 2.4. **Promoting start-ups in Latin America: What are the goverments of the region doing?** (*contd.*)

Table 2.4. **Targeted policy tools to promote start-ups in Latin America: a comparison between countries, 2012**

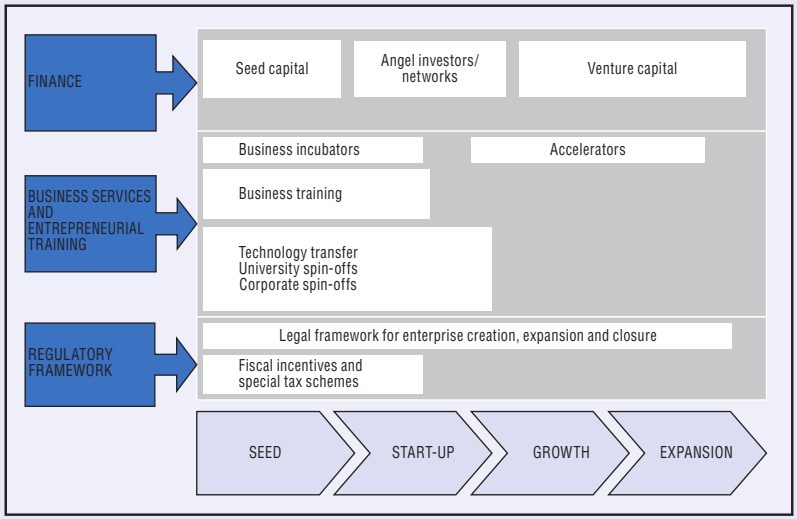
Category	Tool	Argentina	Brazil	Chile	Colombia	Mexico	Peru
Financing	Seed capital	●	●	●	▨	○	▨
	Angel investors	○	●	●	▨	○	○
	Venture capital	○	●	●	▨	●	○
Business services and entrepreneurial training	Incubators	●	●	●	●	●	▨
	Accelerators	●	●	●	○	●	○
	Corporate spin-offs	○	○	○	○	○	○
	Tecnology transfer and university spin-offs	●	●	●	○	●	○
	Business training	●	●	●	●	●	●
Regulatory framework	Ease of creating or clsoing down businesses	○	○	●	●	●	●
	Taxation and special legislation	○	●	●	○	●	○

Note: This table is not meant to present an international classification. It is based on qualitative information gathered in the country case studies in chapters 4 to 9 of an OECD 2013 report (see below). The goal is to summarise visually the variety of instruments created to support innovative entrepreneurship and how developed they are in the countries in the region.

Source: OECD (2013c).

Box 2.4. **Promoting start-ups in Latin America: What are the goverments of the region doing?** (*contd.*)

Figure 2.6. **Taxonomy of targeted policy tools to promote start-ups**



Source : OECD (2013c).

- **Designing and implementing more sophisticated support tools that are more in line with emerging global trends**. In spite of the region's recent progress in promoting start-ups, Latin American countries still face major barriers that need to be overcome by: i) simplifying the regulatory framework to facilitate the creation and expansion of innovative start-ups; ii) identifying opportunities to promote business angel networks; iii) iInvesting in promoting an entrepreneurial culture, particularly among young people; iv) introducing performance-based management criteria in incubators and agencies that facilitate access to public development programmes; and v) designing integrated support programmes that simultaneously offer financing, business services and entrepreneurial skills learning.
- **Taking advantage of emerging private sector open innovation trends, corporate venture capital and knowledge-sharing** to foster the quantity and quality of innovative entrepreneurial projects in the region.
- **Evaluating programmes and adjusting incentive schemes based on performance.** This also requires investing in creating new, better metrics for measuring the dynamics of creation and expansion of start-ups in Latin America in order to improve the capacity to design better policies based on results.

Source : OECD (2013c).

The innovation policy mix in Panama is mainly "project-based". In spite of the existence of a variety of tools, most of them are implemented on an ad hoc basis, reducing the capacity of the policy mix to help achieve the strategic objectives of the plan. SENACYT is still experimenting with the policy tools to put in place and ways to balance them. A further step would involve moving into a consolidation phase of rationalising and increasing the effectiveness of the support for innovation.

Innovation is a cross-ministerial issue and a key challenge for SENACYT is to increase the co-ordination with the actions managed by other ministries and institutions, including the Ministry of Economy and Finance (MEF), the Ministry of Commerce and Industry, and the Authority for the Promotion of Small and Medium-sized Enterprises (AMPYME, *Autoridad de la Micro, Pequeña y Mediana Empresa*). Another key challenge is to promote innovation in specific areas/sectors. Many countries in the region have introduced sectoral technology funds to address this issue (Box 2.5). In 2008, Panama introduced a fund of this type, requiring companies working in the telecommunication sector to devote a part of their revenue to R&D, but the tool has been unutilised

Box 2.5. **Promoting innovation through sectoral technology funds: The case of Brazil and Uruguay**

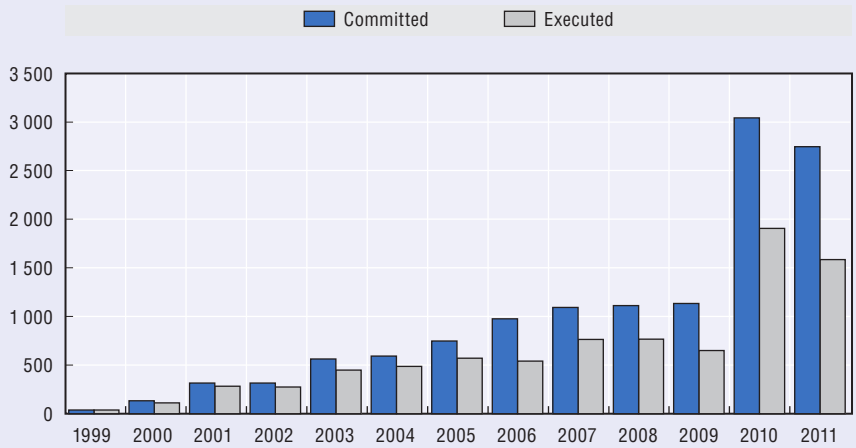
Brazil

In 1999, Brazil introduced a system of sectoral technology funds to finance scientific and technological development. It is based on the creation of several sectoral funds (12 at the start, now 14) and two horizontal funds for innovation. Each fund is financed by channelling specific rents from each sector to the federal fund; in addition, a percentage is channelled to the horizontal funds to finance improvements in R&D infrastructure and co-operative R&D projects between universities and firms. Each fund is managed by a committee composed of members from the ministry of science, technology and innovation, other sectoral ministries, regulatory agencies, the scientific community and the business sector. Brazil has funds for all major sectors, including oil and gas, biotechnology, energy, information and communication technologies, and health. This system represented an innovation in the existing mechanisms to finance scientific and technological development. Even though it entails complex management schemes that require co-ordination between government, the private sector and academia, it overcomes the limits of incentive schemes designed to follow only a supply-side or a demand-side approach. The resources invested through the sectoral technology funds have increased over the years.

Box 2.5. **Promoting innovation through sectoral technology funds: The case of Brazil and Uruguay** (*contd.*)

Figure 2.7. **Budget for sectoral technology funds in Brazil, 1999-2011**

million Brazilian reals (BRL)



Source: OECD (2011), CEPAL/SEGIB (2010) and based on information from the Brazilian Ministry of Science, Technology and Innovation (www.mct.gov.br).

Uruguay

Sectoral funds in Uruguay were created following co-operation agreements between the ANII and institutions relevant to the sector of reference of the fund. The funds have been designed as tools for removing bottlenecks and supporting research, technological development and innovation in those areas identified as priorities in the National Strategic Plan for Science, Technology and Innovation (PENCTI, *Plan Estratégico Nacional de Ciencia, Tecnología e Innovación*), i.e. energy, fisheries and aquaculture, agriculture and livestock, health and digital television. Projects submitted for approval and financing can be either projects of research and development targeting public or private non-profit research institutions in the country (Category I), or projects of corporate innovation and technological development, targeting public or private local companies (Category II). Once submitted, the projects are evaluated by a Programme Evaluation and Monitoring Committee, constituted of at least five members chosen by the ANII governing board and approved by the CONICYT, as well as representatives of each one of the institutions engaged in the specific fund. These institutions, together with the ANII, define the agenda and themes of each call, and provide the resources for the realisation of the approved projects.

Box 2.5. **Promoting innovation through sectoral technology funds: The case of Brazil and Uruguay** (*contd.*)

The first sectoral fund to be established in 2010 was the sectoral fund for energy, involving the National Administration of Power Plants and Electrical Transmissions (UTE, *Administración Nacional de Usinas y Trasmisiónes Electricas*) and the National Administration of Fuels, Alcohols and Portland Cement (ANCAP, *Administración Nacional de Combustibles, Alcoholes y Portland*). Together with the three institutions, the Ministry of Industry, Energy and Mines (MIEM, *Ministerio de Industria, Energía y Minería*) also contributes to the definition of the agenda. The fund supports projects aimed at improving the efficient use of energy, social inclusion in energy consumption, the use of smart grids, and the territorial management of energy supply. Other sectoral funds in use are the innovagro fund, the health fund, the digital TV fund, and the fund for fisheries and aquaculture.

Source: Based on information from ANII and CEFIR and IDRC (2010) (Uruguay) and MCTI(Brazil).

Implementation: Legal and operational details/bottlenecks

Government plans do not guarantee effective implementation. They are a relevant starting point, but they are effective only when matched with execution capacities and budgets to implement the relevant actions. The fact that Panama has a pluri-annual innovation plan represents a step forward for the country, as it contributes to raising awareness about the relevance of innovation, and it provides a framework for the implementation of specific actions. However, the existence of the plan and the willingness to put it into practice have revealed the presence of bottlenecks that jeopardise its implementation.

One of the first areas in which the country moved forward in setting the conditions for policy implementation was the creation of the National Research System (SNI, *Sistema Nacional de Investigación*). The SNI was instituted in 2007 and it became operative in 2008, with the objective of formally recognising the profession of "researcher" in Panama. The system responds to the double function of allowing the identification of the potential set of beneficiaries of the research incentives offered by SENACYT and of effectively granting the possibility to carry out research to the individuals attached to bodies (such as universities) where their contract requires them to perform other activities, such as teaching. The SNI has been defined by the Law 56/2007, which establishes: *i)* the existence of different levels of researchers according to their level of seniority and excellence in research impact; and *ii)* the monetary and non-monetary incentives (including reduction in teaching hours) associated with each category. The peculiarity of the SNI is that it formally recognises groups of

researchers and research centres, besides individual researchers. This is aimed at supporting work in clearly identified groups and at favouring a co-operative approach to research. In November 2013, the SNI counted 102 members. The main fields of research represented in the SNI are biodiversity and ecology, bio-medical sciences, and health. A major challenge for Panama is the capacity to reach a critical mass at least in certain priority areas; for example, Uruguay, which has the same population as Panama has more than 1 600 researchers enrolled in the system.

Since the elaboration of the 2005-09 pluri-annual plan for science, technology and innovation, Panama has taken steps to move forward in creating the conditions to implement its innovation policy, but major bottlenecks remain that reduce the capacity to achieve the planned results.

First, Panama lacks an active and targeted agency for the implementation of innovation policy. The SENACYT is responsible for planning, implementation and evaluation at the same time; on an organisational level, this is challenging the capacity to monitor the implementation of programmes and to follow up with the beneficiaries. For example, the National Agency for Research and Innovation in Uruguay has a dedicated unit of 8 people out of a total of 53 in charge of evaluation with multidisciplinary backgrounds, ranging from economy, statistics, political science and sociology.

Second, even though the innovation plan covers a five-year period, the budget for its implementation is assigned on an annual basis, thus creating uncertainty in respect of the possibility of implementing pluri-annual actions. This is a common challenge for most Latin American countries where often budgets are assigned on an annual basis. Science, technology and innovation policies aim at implementing actions that go beyond a one-year horizon; therefore it is important to identify a mechanism to guarantee a reduction in the level of annual discretion in budget allocation. Chile, for example introduced in 2005 Law number 20.026, which channels part of the royalties from mining production into the Innovation for Competitiveness Fund (FIC, *Fondo de Innovación para la Competitividad*). The FIC was established in 2006 as one of the instruments to finance the implementation of the innovation policy with a long-term horizon (IDB-OECD, 2010). A similar initiative has also been launched in Colombia, with the general royalty system. Implemented in 2012, it guarantees that at least 10% of the royalties are allocated every year to the science, innovation and technology fund managed by Colciencias, the Department of Science, Technology and Innovation (OECD, 2013b).

Third, administrative burdens hinder policy implementation at different levels. A major bottleneck which is responsible for long delays in resource allocation derives from the legal requirement that SENACYT has to respect in assigning resources to beneficiaries. Because of its legal status, SENACYT is required to get an authorisation from the national audit office for each financial disbursement, even after the allocation of resources has been approved and cleared. This administrative requirement, which applies, for example, to each grant assigned for human resource training, contributes to an increase in both the operational management costs and to the time delay in policy implementation. In Uruguay for example, the ANII has simplified the procedure of authorisation of resource allocation by substituting *ex ante* controls with *ex post* monitoring. An annual operative plan, which includes a budget, is prepared each year by the ANII, and approved by the governing board. Any expenditure not envisaged in the annual operative plan needs instead to be specifically authorised by the executive secretary (or the governing board, if the amount is greater than a given threshold). Moreover, deadlines of up to ten days have been established for the execution of the payments. This increase in the capacity to implement policies and in the ability to allocate resources has been achieved by assigning to the ANII a special status of "non-state public entity" (*Persona Pública no Estatal*) (Law 17 930/2005, art. 256). In the Dominican Republic, the Ministry of Higher Education (MESCyT, *Ministerio de Educación Superior, Ciencia y Tecnología*) is also required to get authorisation from the national audit office for each financial disbursement, but the method developed guarantees that payments are disbursed within seven days of the request for payment. The process starts with the audit office registering each signed contract for every individual research project or study grant, using specially designed software for this purpose. The ministry then requests a payment through the Financial Management Integrated System (SIGEF, *Sistema Integrado de Gestión Financiera*). Upon the receipt of the request for payment from the ministry, the audit office processes the payment using the internal audit system, the total number of steps to conclude the audit amounting to five. To expedite this process, the national audit office has staff located in each government dependency which functions under the Law 10-07. The number of personnel for these offices depends on the number of financial transactions in any given institution.

Fourth, there are a high number of laws that set incentives to promote innovation in Panama, but many are under-used and little co-ordination is available between them (Table 2.5).

Table 2.5. **Main laws and regulations influencing innovation policy in Panama, 2013**

Law/decree	Main government body of reference	Content	Examples of specific provisions
Political Constitution of Panama 2004	All	Establishes the role of the Panamanian state in formulating S&T policy	• Art. 83: The country commits itself to design policies to promote the development of science and technology.
Law 25/1992, modified by Law 32/2011	Ministry of Commerce and Industry	Establishes special regime for Panamanian Export Processing Zones (now Free Zones)	• Art. 27-30: Fiscal regime: firms in Export Processing Zones are exempt from income tax, import tax on required assets, export tax on produced assets, value added tax, patents tax, real estate tax, capital and dividends tax • Art. 41-55: Labour and Migratory regime: foreigners with an invested sum of at least USD 250 000.00 have the right to a permanent resident visa. Technical staff will receive a temporary resident's visa for the term of the contract duration. Foreigners making transactions in export processing zones receive a merchant resident visa valid for a year
Law 13/1997, modified by Law 50/2005 and Law 55/2007	National Secretary of STI (SENACYT), Inter-ministerial council for STI (CICYT), National Commission on S&T (CONACYT), National Fund for S&T (FONACITI)	Establishes the institutional framework and policy instruments for science, technology and innovation in Panama	• Art. 5: Stipulates that PENCYT must include both specific sectoral and general policy instruments • Art. 6: Ensures that PENCYT policy actions are prepared and carried out according to annually assigned government budget • Art. 8: Establishes SENACYT as an autonomous body with legal personality and own assets. The national audit office performs supervision and control functions • Art. 10: Establishes SENACYT's functions (22 functions in total), incl. (1) the preparation, co-ordination, implementation, evaluation and revision of PENCYT, (12) proposes to the executive the creation of any other institutional or legal instrument deemed necessary to support S&T development • Art. 16-18: Establishes inter-ministerial council for STI (CICYT) as co-ordination mechanism between SENACYT and other ministries consists of relevant ministers as suggested by president. • Art. 20: Establishes the National Commission on STI (CONACYT) as cross-sectoral advisory body for SENACYT • Art. 24: Establishes National Fund for S&T (FONACITI) as mechanism to finance and support research, technological development and innovation

Table 2.5. **Main laws and regulations influencing innovation policy in Panama, 2013**(*contd.*)

Law/decree	Main government body of reference	Content	Examples of specific provisions
Law 6/1998	Ministry of Commerce and Industry (Proinvex)	Establishes the "Ciudad del Saber" International Technopark	• Incentives for firms engaging in scientific, technological, human development or cultural activities. Duration: 25-year (renewal possible) • Fiscal incentives: exemption from all taxes, levies, fees or import duties on machines, equipment, furniture, vehicles, appliances or materials; exemption from value added and remittances tax • Immigration benefits: Special visas for affiliated staff and families • Labour benefits: Authorisation to hire international staff as required
Law 54/2001 modified by Law 32/2011	Ministry of Commerce and Industry	Extends the benefits of Panamanian Export Processing Zones (now Free Zones) to call centre operations	• Art. 2: Stipulates that natural or corporate persons that own a concession issued by the *Autoridad Nacional de los Servicios Públicos* for the provision of the call centres Services for commercial export purposes (Call Centres) may have recourse to the benefits granted by Law 25 of 30 November 1992, of the Free Zones.
Law 41/2007, modified by Law 45/2012	Ministry of Commerce and Industry (Proinvex)	Establishes benefits and incentives for multinational companies (MNCs)	• Art. 6-8 (Law 45/2012): Fiscal incentives: *i)* exemption from income and value added tax for services provided to its the business group outside the country; *ii)* exemption from income tax for executives, when their salaries come from foreign sources; *iii)* for the services provided within Panama, payment of half of the income tax on the amount to be taxed • Art. 9-14(Law 45/2012): labour incentives: MNCs may hire foreign executives of high and mid-levels that they consider necessary to carry out their activities; permanent visas for executives and temporary
Law 56/2007	Creates the National Research System (SIN) and establishes a series of incentives for R&D		• Formally recognises individual and group of researchers, and research centres. • Establishes economic incentives for members of the National Research System (SNI) that can be used by the researchers for personal and research and development expenses. • Beneficiaries can lose their status if they fail to comply with the requisites.

Table 2.5. **Main laws and regulations influencing innovation policy in Panama, 2013** (*contd.*)

Law/decree	Main government body of reference	Content	Examples of specific provisions
Law 59/2008 modified by Law 62/2012	National authority for governmental innovation (AIG)	Establishes funds for universal access to telecommunications	• Ch. 3, Art. 4: Establishes operator-specific funds which serve to finance projects approved by the Advisory Board. • Ch. 3, Art 4/1: Establishes financing of the funds: all ICT operating company (as outlined in Art.3/15) are obliged to establish an universal services and access fund; operating companies are obliged to contribute 1% of their taxable income to the fund, including the taxable income for incoming international calls to Panama. • Ch. 3, Art 9: Establishes the 10% of the universal services and access fund is for financing research and development activities. This 10% has to be transferred to FONACITI.
Law 76/2009	Ministry of Commerce and Industry	Establishes the measures for the promotion and development of the Panamanian industry (CFI)	• Ch. 3: Governs the modalities of obtaining an Industrial Promotion Certificate (*Certificado de Fomento Industrial,* CFI), which reimburses payments for permitted activities: *i)* research and development; *ii)* management and quality assurance systems/ environmental management; *iii)* investments and reinvestments of utilities; *iv)* training of human resources; *v)* increment in the employment associated to the production (Art. 16-34)

Source: Authors' elaboration based on information from SENACYT and the Ministry of Commerce and Industry.

Conclusions

Panama, like most Latin American countries, does not have a Ministry of Science, Technology and Innovation. It has a national secretariat (SENACYT), which mostly promotes scientific research and technological development. Since the mid-2000s SENACYT has started to develop programmes to promote innovation. Panama first prioritised access to ICT, especially in rural and indigenous areas and training of human resources for research and innovation. The country has set up a National Research System (SNI), which is, however, still limited in critical mass and has invested in training human resources abroad. The productive integration of skilled people and the support ot entrepreneurship

is still quite limited. Panama is in the process of learning how to set up and implement an innovation policy. The introduction of an innovation survey and the formal requirements of evaluating the implementation of the policy are assets that can help the country in making the most of its investments in science, technology and innovation. However, much needs to be done to increase the impact of public policy in this area. Chapter 3 presents a short assessment of the implementation of the innovation policy in Panama, and identifies a key set of policy recommendations for moving forward.

Notes

1. The PENCYT 2010-14 was approved with the Resolution No.2 of 27 September, 2010, and by the executive with the Resolution No.215 of 10 December, 2010.

2 A similar project has been undertaken by Uruguay, through the creation of the Timbó (*Trama Interinstitucional y Multidisciplinaria de Bibliografía* Online) portal, providing access to international STI journals and books, many of these for free, and to the national innovation system patent banks. The aim of the project is to bring down barriers and facilitate access to information.

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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.

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 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 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 by *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 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, 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 is 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 eight 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 it 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 stages 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 behaviours and conducts 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 is 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 better target policies. 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 experience 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 experience 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 aims to expand its evaluation system so that it will 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**

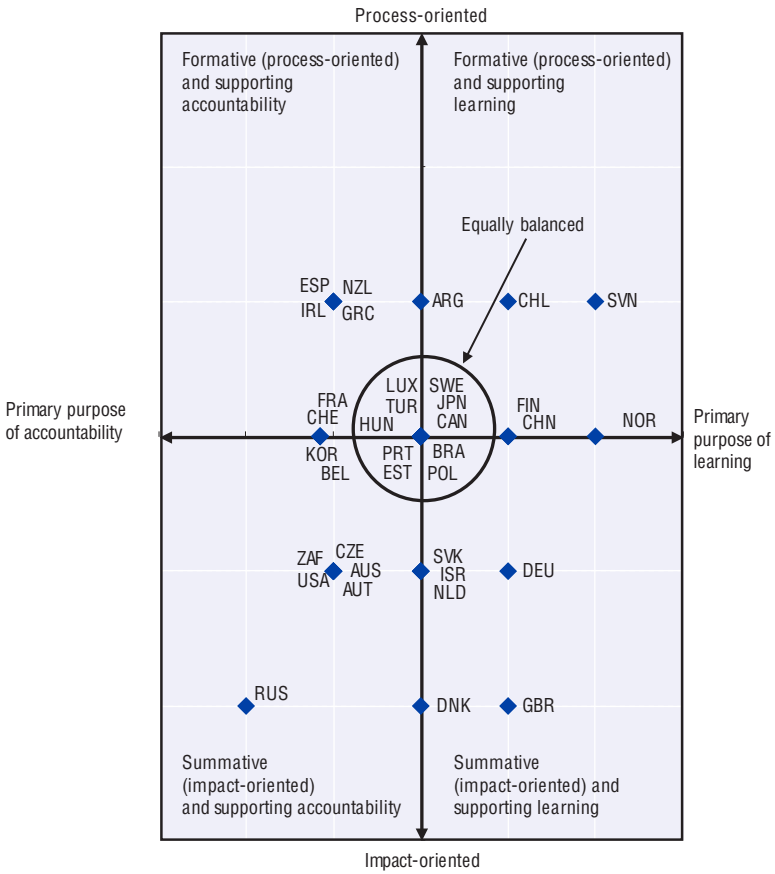
Consolidating framework conditions for evaluation	Promoting a culture of evaluation	Belgium (Wallonia and Capital), Brazil, Poland, Portugal, Russian Federation, Turkey
	Enforcing evaluation by law	Belgium (Wallonia and Capital), Canada, Hungary(higher education institutions)
	Establishing performance 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, RussianFederation, 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 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 o 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 US, 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 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: OECD (2012c) and Presentation of Statistics Norway at the OECD Expert Group Meeting on the Evaluation of Industrial Policy, January 2013, Paris.

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 a kind 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 little. 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 S&T 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 "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 in 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* evaluation of the implementation of the National Innovation Plan have been introduced, since 2004 as 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 world top pharmaceutical multinational. The down side 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 US, 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 a policy mix 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 the 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 stakeholder 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 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 which most of the countries are engaged in a process of experimentation of improving public and private commitment to innovation.

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