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Chapter 4

The Innovation Policy Mix

In recent years, the concept of an innovation policy mix has become an increasingly popular way of thinking about the balance and coherence of the strategic tasks for policy and of the range of policy instruments deployed. This chapter further elaborates the concept and explores its utility for innovation policy assessment and design. The analytical framework outlined will be an important component of the new innovation policy handbook currently being prepared as a follow-up to the OECD Innovation Strategy.

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

Introduction

The understanding of what governments can do to stimulate innovation and to influence the pace and direction of technological change is evolving. The recent example of successful emerging economies – but also of many of the most advanced innovative nations – has shown that governments continue to play an important role in fostering science, technology and innovation (STI). At the same time, various factors lead governments to reconsider how to achieve the best results with available resources. Fiscal consolidation will create constraints although efforts will be made to safeguard areas of expenditure that are considered to play a key role for countries' future innovation performance and competitiveness.

A better understanding of the impact of policy measures adopted in specific national (or regional) contexts contributes to a more realistic assessment of what can be expected from government interventions. During the past few decades, an increasing number of countries have made an impressive effort to assess and evaluate specific programmes and instruments aimed at fostering STI. Yet, despite these advances, the challenge of finding an appropriate policy mix, one which combines policies ranging from framework policies to dedicated STI policies and is well adapted to the prevailing environment and national objectives, remains. Moreover, this is not a task to be solved once and for all, since the scope and content of government policies evolve, driven by changes in external factors (such as globalisation and technical advances) as well as in the level of economic and institutional development. These in turn influence both the set of attainable goals and the ability to achieve them, including the level of sophistication of government itself.

Ideally, the task of STI policy makers is to develop an optimal mix of policies and instruments for stimulating innovation performance that takes into account possible positive and negative interactions among instruments and ensures balanced support for the range of challenges faced by a nation's innovation system. In practice, given the uncertainties and limitations faced, the policy mix should be sufficiently good in terms of the overall net benefits. Furthermore, it should be adapted to national circumstances, *e.g.* industry structure in terms of activities and firm size, the role of universities and government research laboratories, etc.

In assessing policy mixes, the key issues revolve around whether the mix is appropriate, efficient and effective. For example, does the policy mix address the country's main innovation challenges or are there obvious gaps? Is the balance of the main policy domains consistent with the relative magnitude of the innovation challenges? At the level of instruments, are there too many or too few, and is the scale appropriate? Are individual instruments well-designed and effective (*i.e.* is the right type of instrument used to address the particular problem to be solved and does it build on good practice)? Are there synergies between and among individual instruments?

Questions surrounding the policy mix are not confined to assessing existing policy arrangements. They also extend to the design of new ones. From this perspective, some of

the questions above can be rearticulated, such as: How to implement a policy mix that meets the innovation challenges of the country? How to adapt international good practice to local conditions and settings? How to resolve the tradeoffs associated with the pursuit of multiple goals? How to sequence policy goals and instruments to best effect?

Answers to these questions are not straightforward, and the solutions proposed are often difficult to implement. Furthermore, the expansion of the range of objectives of innovation policy and of the bundles of instruments deployed has made for an increasingly complex policy landscape. In part, this has reflected changes in the understanding of the determinants of innovation; these go beyond the production of knowledge through research and development (R&D) to a host of factors known to influence the innovation activities of firms. With the widespread adoption of the systems of innovation perspective over the last few decades, policy makers and analysts have taken a broader view of the actors and factors responsible for a country's, region's or sector's innovation performance. This widening of the "frame" of innovation policy has led to new rationales for policy intervention and has opened up a larger toolbox of policy instruments. This in turn has led to issues related to the selection of policy instruments and to concerns over the balance and coherence of the policy mix in support of innovation, in light of the interaction between different instruments in specific national contexts.

At the same time, many OECD countries have been affected by a growing regionalism, with more control over policy and resources devolved to sub-national authorities. Their interest in promoting local socioeconomic development has led to the emergence of innovation and increasingly of sub-national science agendas. Matters are further complicated by the growth of international governmental organisations and international regulations which increasingly shape governance regimes. This is especially true in Europe, where the European Commission plays a prominent role in supporting research and innovation agendas, mostly at the European, but also at the sub-national level. Co-ordination of levels – what has been termed multi-level governance – tends to be underdeveloped, despite their often obvious interdependence. This may constrain the effectiveness of policies at different levels and constitute a significant source of inertia.

A further driver of change is the types of policy instruments deployed. In recent years, many governments have put relatively less emphasis on direct funding and more on indirect support measures. Each of these instruments has its own operating procedures, skill requirements and delivery mechanism, which means that public managers must master a host of policy techniques. In particular, many of the newer indirect measures tend to rely heavily on a wide assortment of third parties for their design and delivery. The result has been the emergence of often elaborate governance complexes of governmental and non-governmental actors, working together in public-private partnerships. This means that public policy makers must "weigh a far more elaborate set of considerations in deciding not just whether, but also *how*, to act, and then how to achieve some accountability for the results" (Salamon, 2002).

This chapter builds upon empirical work carried out as part of the OECD's country reviews of innovation policy, as well as conceptual work undertaken in preparation for the OECD's planned handbook for innovation policy. It sets out to explore the meanings and scope of the policy mix concept with a view to making it more useful for policy assessment and design, as well as more effective as a basis for international policy learning. The chapter first introduces a framework that permits the mapping of interactions between policies and between policies

and their wider environment. This is an essential starting point for assessing and designing policy mixes. Using this framework, the sections that follow explore the combination and balance of policies through four dimensions: policy areas, policy rationales, policy strategic tasks and policy instruments. The chapter then considers the problems of policy co-ordination in distributed governance arrangements, together with some examples of current practices for enhancing policy coherence. A final section looks at the prospects for improved international learning about the design and implementation of policy mixes.

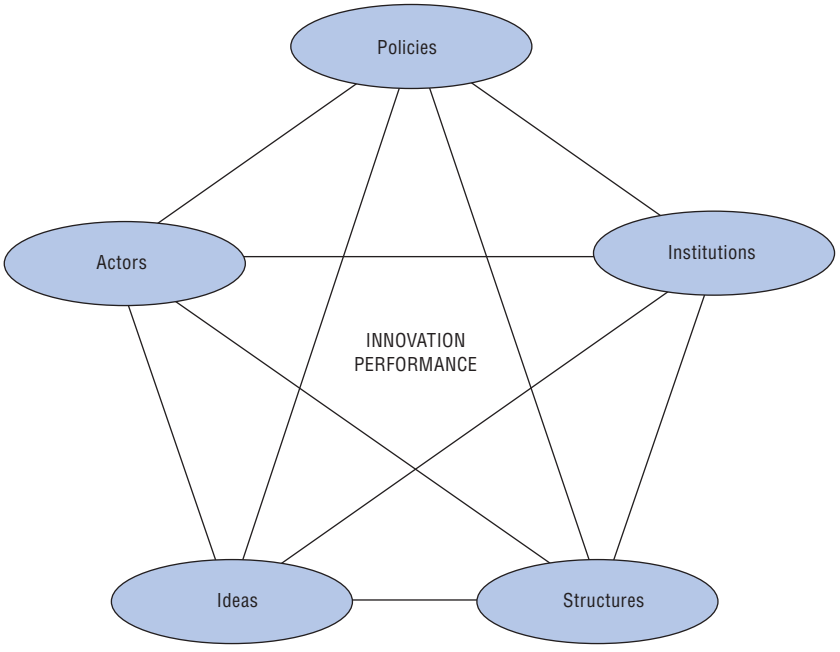
What is the policy mix and how is it useful?

The term policy mix has become increasingly popular in recent years and has been widely adopted by international organisations, such as the OECD and the European Commission, when advising governments on their innovation policies. The term would nonetheless benefit from further clarification, in terms of its meaning (Flanagan *et al.*, 2010) and its implications for policy making. This section therefore presents a variety of meanings for the term and links them in a framework that should prove useful in policy assessment and design.

The introductory section has already explained the growing interest in the innovation policy mix: essentially, it reflects an appreciation of interdependency and an understanding that the performance or behaviour of innovation systems requires the adoption of more holistic perspectives. Also, policy interventions aimed at improving performance or changing behaviour should be based upon an understanding of how they will interact with existing arrangements – for example, whether they will be complementary, neutral or conflicting.

In the first instance, a more holistic perspective can be achieved by adopting a systems of innovation perspective in which the influence and dynamics of a combination of actors and factors are considered as shaping innovation performance. As Figure 4.1 shows, these

Figure 4.1. **Interdependent actors and factors shaping innovation performance**



include various structures, institutions, ideas and existing policies that contribute to innovation performance. These are briefly defined in Box 4.1. Their interactions and interdependencies account for many properties of the innovation system, which is more complex than the sum of its actors and factors. As such, they constitute the wider political

Box 4.1. **Brief definitions of the actors and factors (excluding policy) which shape innovation performance**

Actors include a wide range of types of organisation, including firms (large and small, multinational and domestic), universities, public research labs, government ministries and agencies, various intermediary bodies, such as industry associations, private consultants, etc. The ways in which actors perform domain area activities are determined by their motivations and interests and by their resources: finance, skills and various dynamic capabilities.* These attributes not only determine the roles that actors assume, but also the sorts of interactive relationships they enter into with other actors, *e.g.* through networks, markets and hierarchies. Obviously, any single actor may perform various roles, either within a single domain area or across two or more domains.

Structures constitute the material (and other resource) factors that shape the opportunities and constraints for innovation. For example, countries' innovation systems and their performance are, at least in the short and medium term, shaped by their current state of economic development, resource endowments and specialisation patterns in production and international trade, as well as other structural factors. Firm demography – the structure of the population of business enterprises as well as their interrelations in the economy – also has a strong impact on firms' capabilities and constraints or opportunities for learning.

Institutions refer to the rules of the game and codes of conduct that reduce uncertainty in the innovation system. Institutions are emergent, in that they are generated by the activities of actors and their interactions with one another. At the same time, they also structure these activities and interactions. A distinction is often drawn between hard and soft institutions (North, 1991). Hard institutions are the formal institutional mechanisms that may stimulate or hinder innovation. They include formal written laws and regulations, such as those around technical standards, labour laws, the general legal system relating to contracts, intellectual property rights (IPR), etc. By contrast, soft institutions are the implicit rules of the game that can enable or hinder innovation. They include social norms, the willingness to share resources with others, the entrepreneurial spirit in organisations and countries more generally, tendencies to trust, risk averseness, etc.

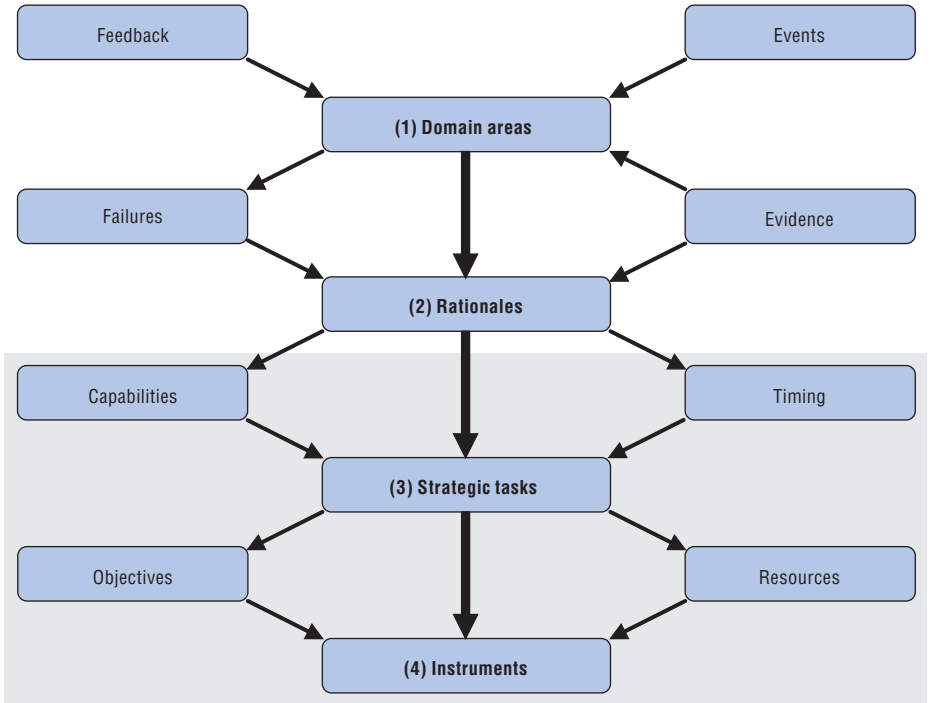
Ideas constitute the socio-cognitive frameworks within which actors carry out their activities. They include, for example, world views, normative beliefs and values, and the logics of appropriateness held by actors and embodied in institutions. As with institutions, ideas are emergent in that they structure the behaviours of actors and are at the same time generated by them. They are often expressed in the form of analogies, metaphors, myths, expectations, future visions, concepts and heuristics, guidelines, etc., and are instrumental in shaping actors' identities, institutional arrangements and policy frames. While the last two decades have seen ideas growing in importance as explanations of socioeconomic phenomena – particularly in political science, institutional economics and organisational sociology – they are still relatively neglected by innovation studies analysts. This should change, since these factors play a not insignificant role in shaping innovation performance.

* Dynamic capabilities are those that enable actors to achieve *i)* internal and external co-ordination; *ii)* learning; and *iii)* transformation. They are unique to each organisation and are technical and organisational in nature (Teece *et al.*, 1997).

and socioeconomic circumstances in which policies are framed and implemented, enabling and constraining the feasibility of particular policy interventions.

In this context, the term policy mix is generally taken to refer to the balance and interactions among policies. As the meaning of the term policy is rather diffuse, it needs to be more precisely defined before the nature and dynamics of these balances and interactions can be appreciated. In this regard, policy can be viewed as comprising four different dimensions, namely: *i)* the *domain areas* addressed; *ii)* the *rationales* offered in support of policy intervention; *iii)* the *strategic tasks* pursued; and *iv)* the *instruments* deployed (see Figure 4.2 and Box 4.2 for definitions). In theory at least, these dimensions exist in "nested" relationships, *i.e.* the domain areas addressed shape the rationales for policy intervention, which in turn influence the strategic tasks pursued by policy makers, which then orient the choice of appropriate instruments. This is indicated in the uni-directionality of the arrows in Figure 4.2, which flow from domain areas through to instruments. Such a perspective is commonly used to assess the appropriateness of choices within dimensions, given preceding choices and conditions. Thus, one meaning of policy mix refers to the *alignment of different dimensions of policy*, particularly between supporting rationales, strategic tasks and instruments deployed.

Figure 4.2. **From domain areas to instruments: the dimensions of policy**



Note: The shaded area indicates policy dimensions which offer a greater choice of alternative options and which therefore tend to vary more among countries.

The logical flow shown in Figure 4.2 suggests that, as a matter of principle, it should be possible to match particular instruments to types of strategic tasks, rationales and/or domain areas. However, the contingency of policy interactions with the specific actors and factors of each innovation system has made this very difficult. Furthermore, rationales,

Box 4.2. **Brief definitions of the elements of policy design**

For the purpose of operationalising the concept of policy mix, it is useful to distinguish between the following four policy dimensions:

Domain areas refers to the variety of policy sub-systems associated with innovation performance. These can be broadly divided into two groups: policies in support of the framework conditions for innovation and policies dedicated to science, technology and innovation (STI). External events and the internal feedback dynamics of innovation systems drive developments in domain areas and subsequently shape policy agendas. Furthermore, evidence about the performance of the innovation and/or wider socioeconomic system, for example in the form of internationally comparable indicators, can implicate different policy sub-systems in innovation policy agendas.

Rationales provide the justification for policy intervention and relate to the underlying causes understood to be responsible for under-performance in particular domain areas. Rodrik (2007) provides a model for identifying binding constraints that act as obstacles to better performance. Typically they are expressed in terms of various types of market and governance failures.

Strategic tasks refer to the broad direction of policy intent and are, in theory at least, derived from the rationales for policy intervention. They should take into account issues of timing – for example, some tasks should be addressed before others or perhaps in parallel. They should also take account of capabilities, *i.e.* the knowledge and skills of both policy managers and the groups they seek to target through intervention. For example, where rationales seek to increase demand for R&D-intensive goods and services, the strategic task might focus on public procurement, regulatory change, supply-chain management, etc. Evidently, any given rationale for intervention may point to several strategic tasks, while any single strategic task may reflect more than one rationale.

Instruments are identifiable techniques for structuring collective action to meet strategic tasks. In this sense, they are widely considered the means for achieving the goals of strategic tasks. The choice of instruments is somewhat dependent on the preceding dimensions of policy outlined here. Nevertheless, there is still considerable leeway in the choice of instruments, at least in theory. For example, for the strategic task of promoting the establishment of new R&D-performing firms, instruments may include loans for start-up firms, grants for the establishment of commercialisation units in public-sector research institutes, regulations that allow academics to benefit financially from commercialisation activities, information campaigns to promote spin-offs from public and academic institutes, etc. In fact, it is not uncommon for a mix of such instruments to be deployed in pursuit of strategic tasks.

strategic tasks and instruments often take on a life of their own and a certain autonomy, thereby disrupting any representation that seeks to impose a rational logic flowing from an assessment of domain area issues to the ultimate selection of appropriate instruments. This is because coalitions of interests collect around strategic tasks and instruments; they gradually become institutionalised and therefore relatively impervious to influences from other, higher-level dimensions. In fact, they may even shape the articulation of dimensions at preceding levels, *i.e.* existing instruments may shape the strategic tasks pursued, the strategic tasks already pursued may shape the rationales for intervention, and the latter may implicate particular domain areas in policy agendas. Seen in this way, the arrows in Figure 4.2 would point in the opposite direction. The argument being made here is that

there is in fact a *co-determination* of mutually influencing policy dimensions. Appreciating this possibility and understanding the dynamics involved are important for assessing and designing policy mixes.

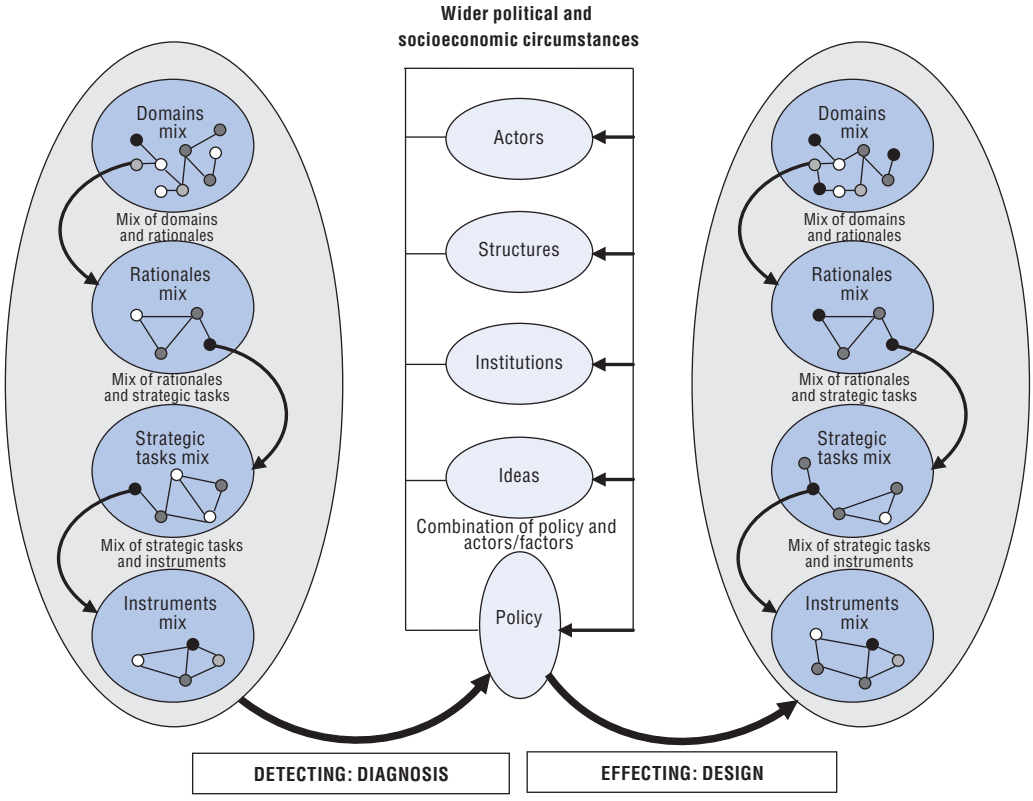
Besides alignment between the four dimensions of policy, the concept of policy mix is perhaps most commonly understood to refer to interactions (coherence) and balance within each dimension. Thus, a second meaning of policy mix concerns balance and coherence: *i)* among different domain areas with a stake in innovation; *ii)* among different rationales; *iii)* among different strategic tasks; and *iv)* among different policy instruments. Interactions within each dimension might be complementary, neutral or conflicting and are likely to demonstrate emergent properties in terms of their effects and impacts, which has made their study difficult.[1]

To summarise, the term policy mix can have two different meanings. A first emphasises the nested relations *between* four dimensions of policy, namely the policy domain areas covered, the rationales for policy intervention, the strategic tasks pursued, and the policy instruments deployed. It provides a useful perspective for exploring the alignment and appropriateness of choices within dimensions, given the choices already made or the prevailing conditions in other dimensions. A second meaning focuses upon interactions *within* each of the policy dimensions. It is useful for considering issues of balance and coherence, for example, between different types of policy instruments. These two meanings of policy mix should not be viewed as alternatives. In fact, for the purposes of policy assessment and design they are complementary and interdependent. To illustrate this point, consider discussions of appropriate mixes of policy instruments, where issues of gaps and balances in instrument portfolios are often raised (*e.g.* Guy *et al.*, 2009). It is obvious that discussions of gaps and balances are meaningless in the absence of some yardstick of what an appropriate policy instrument mix should look like. This yardstick is provided largely by the other dimensions of policy (*i.e.* by the strategic tasks pursued, the rationales offered for intervention, and the domain areas covered), as well as by assessments of wider circumstances. Accordingly, the expectations of appropriateness and performance associated with the first meaning of policy mix constitute a baseline for assessments of gaps and balances in the second meaning.

Figure 4.3 shows these two complementary meanings of policy mix and their relation to the wider political and socioeconomic situation. It also distinguishes between the use of the policy mix concept for assessing (detecting) existing innovation policy arrangements and its use for designing (effecting) new ones. Their use in the context of innovation policy instrument mixes can be described as follows:

- *Detecting*: The policy mix concept can be deployed as an analytical device for understanding the dynamics and performance of existing innovation policies. In this use, the starting point is an appreciation of innovation performance (or certain aspects of it), exploration of the various factors that shape this performance – in the form of general root cause analysis – and consideration of the contributions made by the existing mix of policies to this performance. The aim is to diagnose policy gaps or failures (including policy mix problems) that appear to account for weaknesses in innovation performance.
- *Effecting*: The policy mix concept can also be deployed as a framework for designing and taking policy action. Armed with a diagnostic assessment and/or a normative sense of appropriate action, the policy mix concept can, in theory, provide a roadmap that

Figure 4.3. **The various meanings of policy mix and their relation to wider political and socioeconomic conditions**



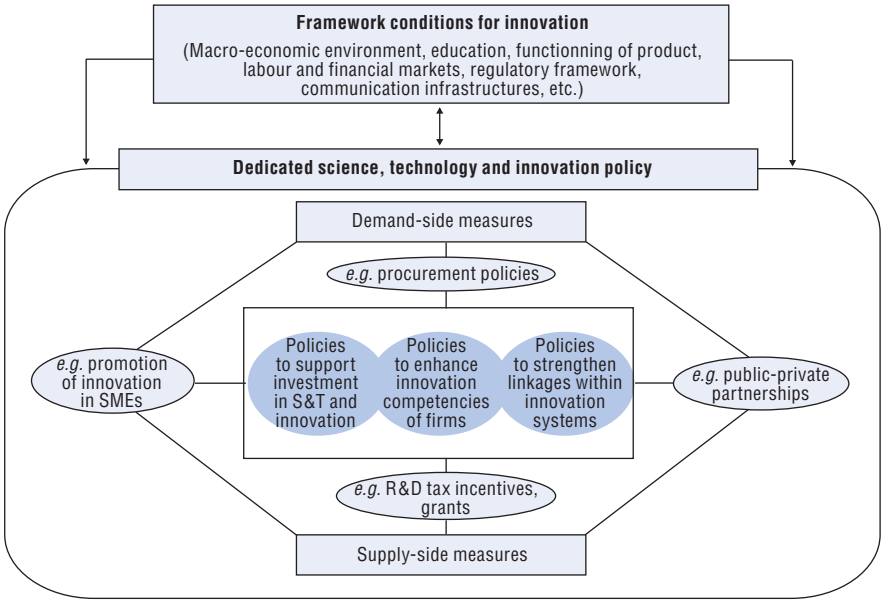
sequences the deployment of a broad array of interdependent policy measures and instruments that address failures in the system. This broad framing of policy mix design is associated with attempts to shift whole systems or sub-systems to more desirable states of performance. However, more modest aims can also be pursued: for example, the policy mix concept is more likely to be used as part of an *ex ante* assessment of single or small numbers of new instruments when their interactions with existing policies are an important selection and design criterion.

Overall, the benefit of introducing the concept of policy mix is to help to open up to greater scrutiny the choice of policy domain issues taken up, of rationales for intervention, of strategic tasks pursued and of instruments deployed. It draws attention to the appropriateness and coherence of these elements in the context of assessments of the changing nature of innovation systems and the failures that characterise them. In the sections that follow, attention is paid to the second, more common meaning of policy mix, *i.e.* mixes of types of domain areas, mixes of types of rationales, mixes of types of strategic tasks and mixes of types of instruments.

The policy domains mix

At a fundamental level, a distinction can be drawn between policies that shape and affect the broad economic framework conditions that are relevant for innovative performance – in the following referred to as framework conditions for innovation – as distinct from dedicated science, technology and innovation policies (Figure 4.4). While the

Figure 4.4. **Scope of innovation policy**



latter aim directly at fostering innovative performance (or some dimensions thereof) by addressing a specific kind of market or systemic failure, the former are, in general, designed to meet primary objectives other than fostering innovation. Supportive framework conditions enable and facilitate innovation throughout the economy. Some of the key framework conditions for innovation relate to major aspects of broader economic governance.[2] Good framework conditions – and related policies – can be viewed as necessary, but not always sufficient, conditions for good innovative (and economic) performance.

In recent years, and with a broadening base of policy experience, it is increasingly acknowledged that policies relating to framework conditions for innovation need to be explicitly considered as part of the overall STI policy mix.[3] The inclusion of policies aimed at shaping framework conditions for innovation in the discussion and development of the overall policy mix is supported by the results of recent empirical research indicating that both sets of policies – framework policies and dedicated STI policies – have an impact on innovation performance, both in isolation and in their interaction. This OECD work has contributed to identifying the policies, institutions and framework factors that can provide effective means of supporting innovation (*e.g.* Jaumotte and Pain, 2005a, 2005b, 2005c and 2005d). The OECD country reviews of innovation policy offer rich information on the evolution of the policy mix in an increasing number of countries[4] which differ in terms of their level of economic development, size, institutional characteristics, policy orientations, etc.

The complementarities and tradeoffs between policies are not always fully understood, but there is evidence that they are very important for assessing a country's STI policy and its impact on innovative and economic performance. For example, framework conditions and policies that are conducive to fixed capital formation are likely to have some influence on the level of business R&D expenditure. Acknowledging these interdependencies from a macro perspective, Aghion *et al.* (2009, p. 689) propose focusing

on the more "tightly coupled" elements and "to give priority to identifying those that are strong complements of the activities or institutional structures that the policy intervention seeks to affect". This "calls for complementary policy interventions in order to promote positive feedback responses in the tightly coupled parts … or at least to mitigate the force of negative feedbacks" that may reduce or effectively cancel the intended effects of policy interventions.

To be more specific, boosting R&D and innovation through policy intervention is unlikely to be successful when too little attention is paid to the specific context shaped by policies relating, for example, to general macroeconomic policy, education, product markets (notably competition policy), labour markets, financial development, infrastructure, the regulatory framework and intellectual property rights (Box 4.3). For example, the real effect of boosting R&D activity through public programmes may – at least in the short term – be limited by an inelastic supply of specialised human resources (Golsbee, 1998).

Box 4.3. **Examples of framework policies**

Although they are not primarily focused on innovation, policies which shape the following areas, among others, have a major influence on innovation performance:

Policies which promote a favourable *macroeconomic environment* – notably strong and stable rates of output growth – encourage business enterprises to take the long-term perspective that is conducive to investment in R&D and more radical forms of product, process and organisational innovation. These types of investments also tend to be encouraged by low and stable rates of inflation and a reduction in the level and volatility of real interest rates (Jaumotte and Pain, 2005a). A lack of stability in the institutional system and in regulations tends to undermine business confidence and prompts actors to focus on short-term, rather than on long-term, strategic goals.

A well-performing *education* system which turns out sufficient numbers of people equipped with the range of skills necessary to support and drive innovation throughout the economy. These include highly skilled personnel in science, engineering, mathematics and management, but also medium-level skills.

Competitive *product markets* give firms powerful incentives to innovate in order to survive and prosper (Baumol, 2002). Product market competition is a driver of innovation, at least up to a certain intensity of competition.* Empirical evidence points to a robust relationship between product market competition and productivity growth that is, in the long term, closely related to innovation (Ahn, 2001, 2002). Vigorous competition has a long-lasting impact on firms' behaviour. Low barriers to entry are essential for the emergence of new innovative firms. Regulatory reform and openness of the economy help maintain well-functioning, competitive product markets.

Sufficiently flexible *labour markets*, and related institutions, support the reallocation of resources towards new economic activities and smoothly adjust the composition of the labour force as new products and processes are introduced.

A high level of financial development allows *financial markets* to manage the inherent risk and provide sufficient funding for innovative projects and new firms entering the market. The interaction between competition in product, labour and financial markets has an important influence on innovation and growth.

Box 4.3. **Examples of framework policies** *(cont.)*

A high-performing *infrastructure* includes a communication infrastructure that allows firms to acquire and exchange information easily and at low cost. The network industries themselves are important actors in innovation but given their character, they also tend to have a strong impact on the innovation capabilities of the large "downstream" parts of the economy.

Developments in the telecommunications sector make clear that the *regulatory framework* is of crucial importance for the speed of diffusion as well as for the generation of new technologies.

Protection of *intellectual property rights*, through patents or other instruments (trademarks, copyrights, etc.) stimulates R&D by enabling successful innovators to reap rewards and prevents free riding. The publication requirements for patents contribute to the dissemination of scientific and technological knowledge and help prevent costly duplication of research efforts. These benefits have to be weighed against the social costs arising from delayed diffusion and reduced use of the invention over the lifetime of the patent, administrative costs, etc.

* Aghion *et al.* (2005) established an inverse U-shaped relationship between competition and innovation. The model predicts, among others, that liberalisation (measured by an increase in the threat of entry), "encourages innovation in industries that are close to the frontier and discourages innovation in industries that are far from it. Productivity, output, and profits should thus be raised by more in industries that are initially more advanced" (Aghion and Howitt, 2009, p. 279).

Yet, their importance notwithstanding, supportive framework conditions are in many instances insufficient to induce an optimal level of innovation if market and systemic failures remain. Even when they are generally supportive, specific policy measures are needed to address specific market or systemic failures that hamper R&D and innovation. A well-known case is the failure of perfectly competitive markets owing to the intrinsic public-good characteristics of information (often referred to as non-rivalry and limited excludability) and thus suboptimal investment in R&D. This type of market failure was analysed in early studies on the economics of R&D, most prominently by Arrow (1962) and Nelson (1959). These offered support for policy interventions to lift R&D to a socially optimal level. In addition, beyond the public-good characteristics of R&D, imperfections in financial markets, a shortage of skilled researchers and engineers, or a lack of information about opportunities arising from scientific and technological advances in other parts of the economy or other countries can mean that gainful innovation projects will not be undertaken in the absence of policy intervention.

Sometimes, dedicated STI policies are aimed at compensating for shortcomings in the framework conditions for innovation. However, there are limits to this approach, as such dedicated policies cannot make up for seriously flawed framework conditions such as the absence or the serious malfunctioning of markets or other fundamental economic institutions. For example, it seems unlikely that a marked lack of competition can be compensated for. Overall, the quality of framework conditions has an impact on the effectiveness of dedicated innovation policies.

The policy rationales mix

The idea that *market failure* leads to underinvestment in research has been the principal rationale for public funding of R&D for the last half-century (Stoneman, 1987).

The pioneering work on market failure related to the production of knowledge (R&D) was rigorously elaborated in the framework of neo-classical welfare economics by Arrow (1962) and Nelson (1959), and has been further extended since.[5] Arrow highlighted three fundamental causes for failure of competitive markets in the context of the production of new knowledge (R&D): externalities, indivisibilities and uncertainty, notably:

- Knowledge has properties of a *public good*. This implies that performers of R&D can only imperfectly appropriate the results of their effort and that the use of a piece of knowledge does not preclude its simultaneous use by others. A lack of appropriability is reflected in positive externalities (evidenced by a wealth of empirical studies), with social returns exceeding the private returns to R&D. Under these circumstances, underinvestment in the production of new knowledge occurs. Traditional responses to market failure due to non-appropriability of the results of R&D include strengthening IPRs (notably the patent system), R&D subsidies to private producers of knowledge, and the internationalisation of externalities through horizontal R&D co-operation (Geroski, 1995).[6]
- High fixed costs and learning by doing through R&D activity give rise to static and dynamic or inter-temporal *economies of scale* (Grossman, 1990; Grossman and Helpman, 1991).
- Investment in R&D is inherently risky, and *information asymmetries* abound in markets for knowledge and technology where they exist (Stiglitz, 1994).

Owing to advances in the understanding of innovation processes and systems, the rationale of STI policies has been revisited since the 1990s (OECD, 1998). The innovation systems approach – which highlights interactions between institutional actors (such as business firms, universities, research organisations) in the production, diffusion and use of knowledge – gave rise to the notion of *systemic failure*. Systemic failures block the functioning of the innovation system, hinder the flow of knowledge and technology and, as a result, reduce the overall efficiency of the system-wide R&D and innovation effort. Such systemic failures can arise from mismatches between different components of an innovation system, such as incompatible incentives for market and non-market institutions, *e.g.* enterprises and the public research sector (and, of course, the people operating within them). Other failures may result from institutional rigidities, asymmetric information and communication gaps, and lack of networking or mobility of personnel (OECD, 1999). It can be argued that systems approaches have a greater potential for identifying where public support should go (Smith, 2000). It is important to note, however, that market and systemic failures can occur simultaneously, and policies to address them are not *per se* mutually exclusive. Indeed, market failure remains the basic rationale for innovation policy in many instances. At the same time the need for innovation policy to address systemic failure has become widely accepted.

The rise of the innovation systems framework for analysing innovation has been complemented by the emergence of a more comprehensive understanding of innovation processes. These developments – the adoption of an innovation systems perspective and a broader view of what innovation encompasses – have revealed a greater variety of failures relating to the generation, distribution and use of knowledge. In addition to failures relating to deficiencies in the broader framework conditions for innovation discussed earlier, Arnold (2004), for example, has identified other types of failure: *capability failures* (innovation capabilities may be lacking, owing, for example, to managerial deficits, lack of

technological understanding, the ability to learn, or the absorptive capacity necessary to make use of externally generated technology); and *network failures* (problems exist in the interaction among actors in the innovation system which relate to phenomena such as weak linkages among actors, missing complementary assets in clusters, etc.).

Not all potential failures in innovation systems make government intervention a requirement or even desirable. There is no guarantee that government policy can address each market or systemic failure in a way that effectively improves the outcome, *e.g.* in welfare terms. Even when governments may potentially improve welfare, it does not always have the means to do so in practice (Dixit, 1996). Governments' space of action may be limited, and information constraints limit their ability to intervene effectively. Indeed, policy or *government failures* often occur because the government is subject to similar and sometimes even more stringent information constraints than private actors. Indeed, if government interventions are not carefully designed, they may be counterproductive.[7] For these reasons, the soundness of the foundations and the achievements of government intervention need to be scrutinised *ex ante* and *ex post*. Transparency, built-in feedback (*e.g.* through competitive mechanisms or, in their absence, evaluation, etc.) and associated learning processes may help keep policy on track and avoid locking in wasteful activities.

Yet, there are many areas in which governments do, in practice, make a difference through their support for STI. These include the funding of basic and strategic research; the development of absorptive capacity of firms; support for innovative small and medium-sized enterprises (SMEs); the fostering of networks and other system linkages; the provision of strategic intelligence as a public good to inform actors throughout the innovation system, etc. Awareness of the possibility of government failure helps to limit the risk of costly and ineffective intervention. The more recent innovation policy rationales (*e.g.* based on systemic failure) do not invalidate the objectives and choices of instruments associated with earlier rationales, notably market failure. Instead, the overall effect of broadening concepts and rationales tends to be another layer of strategic tasks (and policy instruments) which complement those that exist, thereby increasing policy complexity and the need for co-ordination and coherence.

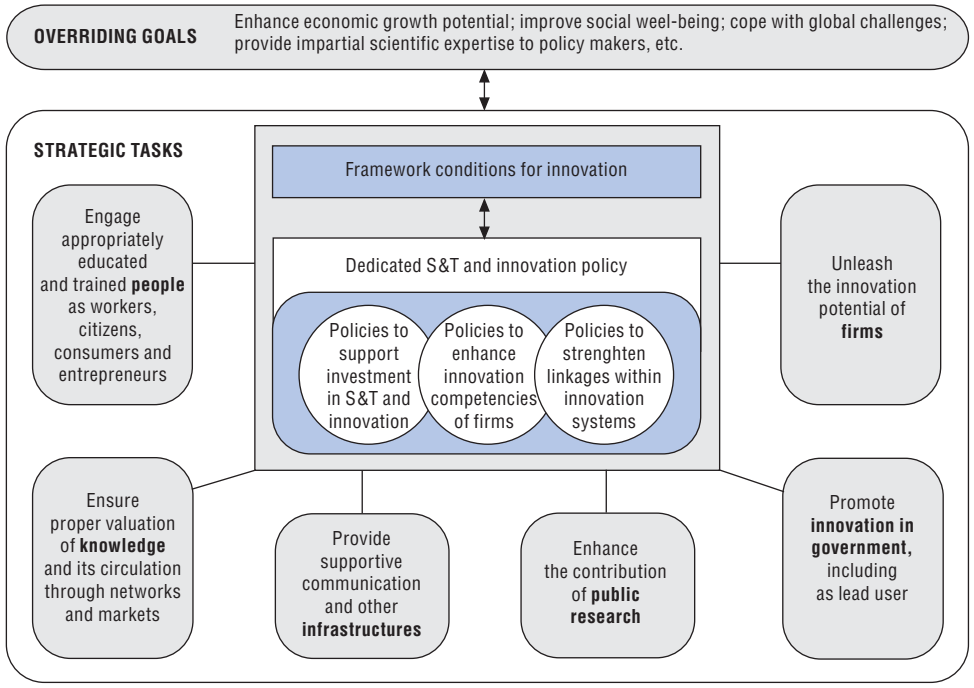
The policy strategic tasks mix

Major issues identified and to be tackled in a given innovation system are reflected in the broad strategic tasks derived from a diagnosis of the state of the system, a vision of its future and a rationale for government intervention to improve the current situation. Figure 4.5 gives a stylised picture of such strategic tasks. Typically, each strategic task requires the application of a range of instruments – or types of instruments – as each is usually multi-dimensional and has multiple objectives. Policy instruments are combined to pursue a set of (immediate) objectives and operate through different mechanisms.

Two strategic tasks that appear in one way or another in practically all contemporary innovations systems are singled out as examples:

- *Unleashing the innovation potential of business firms* is one important strategic task. Many countries have addressed this task, especially lagging countries which seek to boost their innovation performance. Yet, advanced and highly innovative countries, too, need to maintain and continuously expand the innovativeness of their firms. What is meant by innovation may differ, however, depending on the specific state and performance of the national innovation system. The concept – and the operational definition of

Figure 4.5. **Overriding goals and strategic tasks of innovation policy**

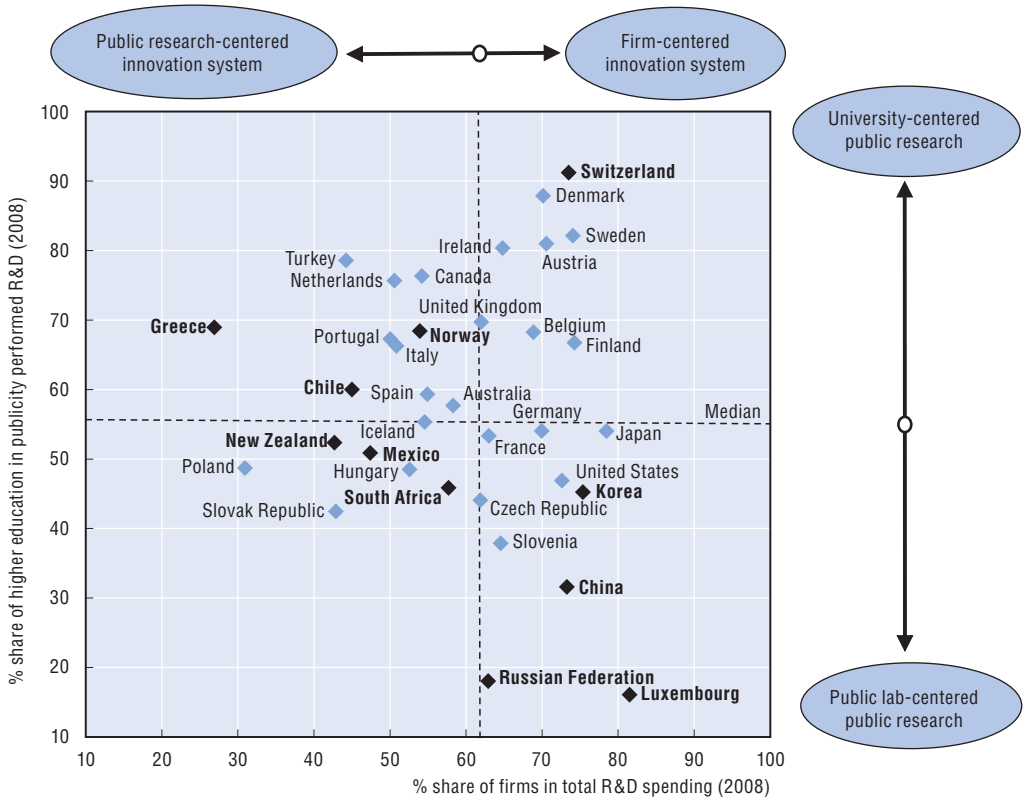


innovation in the *Oslo Manual* (OECD, 2005a) – is sufficiently flexible to accommodate these differences. It covers not only cutting-edge innovation which is "new to the world" but, at a minimum, the bulk of mostly incremental product innovations and often productivity-enhancing process innovations which are "new to the firm".

- *Enhancing the contribution of public research organisations* to the country's innovation performance is another strategic task of key importance. It is important because many countries encounter difficulties at the interface between the public research and the business enterprise sectors. Some kind of systemic failure is often the reason for weak links between the public research and the business enterprise sectors. In some cases this requires new investment in research infrastructure or human capital so that public research organisations (PROs) are better able to fulfil their tasks. Sometimes it is necessary to set clear rules of the game and to modify the incentives of public research actors, for example through appropriate funding mechanisms, remuneration, career paths, etc. Moreover, as the boundary between public and private domains is shifting, the role of PROs is changing. For example, markets have emerged for services previously provided by public research, and this has necessitated an adaptation of PROs' missions. In many countries the linkages between public research and the business sector are hampered not just by shortcomings in PROs but also by a lack of business demand. This is the case in many less advanced countries, but also in economies that lack a thick layer of innovative domestic companies (*e.g.* Greece and Hungary). In this case, there is a clear link between enhancing the contribution of PROs and the strategic task of unleashing the innovation potential of firms, and this makes policies to enhance firms' innovative capabilities important. This may be accompanied by policy measures which affect more directly the demand of businesses for certain services supplied by PROs (through vouchers, tax incentives for R&D outsourced to PROs, etc.)

The role of PROs differs widely across countries (OECD, 2005b). In some they make up for a lack of scale in terms of firm size (*e.g.* New Zealand and Norway). In others, most prominently in the former communist countries, most research, including industrial research, traditionally took place in PROs. Many advanced countries now look back at an extended period of restructuring of their public research system; in other countries this process is just starting. Countries also differ regarding the extent to which their innovation systems are public-research centred or firm-centred, measured by the share of business in total R&D expenditure (Figure 4.6). Today's top-performing countries in innovation do not have a predominantly public research system, even though a heavily firm-based system may not be sufficient. The extent to which countries' public research system is public lab-centred or university-centred plays a role. Some catching-up economies have relied on the former but it is fair to say that there is a general movement towards more university-centred public research. It appears clear that actions taken to unleash the innovation potential of business firms and enhance the contribution of public research are influenced by the country's position in this respect. Some countries have made an explicit choice to move from one type of system to the other. China, which is clearly shifting towards a firm-based system, is a prominent example.

Figure 4.6. **Archetypes of innovation systems**



◆ *In bold are countries that have been already subject of an OECD Review of Innovation Policy.*

Note: Data for Chile are 2004 estimates based on CONICYT data.

Source: OECD, *Main Science and Technology Indicators (MSTI) Database*, December 2009.

StatLink http://dx.doi.org/10.1787/888932335362

The policy instruments mix

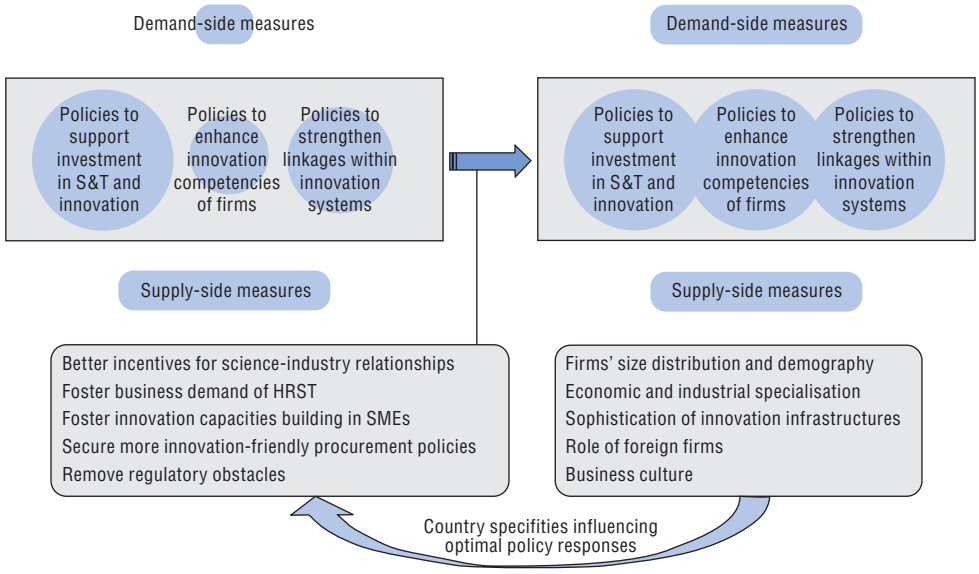
Differences in strategic tasks will generally be reflected in different instrument mixes. But even if strategic tasks and objectives are (broadly) the same, the instrument mixes adopted can be expected to differ, as these are adapted to the wider political and socioeconomic circumstances in which they are applied. As outlined earlier, this environment includes structural features but also different institutions and preferences, *e.g.* a strong preference for a simple, transparent tax system may rule out tax incentives for R&D. The presence of corruption may constrain the choice of instruments. A low level of financial development may also influence the choice of instruments. For example, direct subsidies for R&D appear to be mostly used in some (dynamic) emerging and a segment of advanced countries. The exceptions at the top end tend to be countries with strong defence-related R&D activity. A similar point could probably be made for tax incentives for R&D. As discussed, the potential (*ex ante*) and actual (*ex post*) impacts of dedicated policies for innovation are likely to vary depending on existing framework conditions and their interaction with framework policies. In addition, there are interdependencies within the set of dedicated innovation policies.

Policies and associated instruments can be characterised in several ways, such as their target groups, their desired outcomes, or the funding mechanism employed. Many of the most popular characterisations are binary in nature. A key challenge is to strike an appropriate balance, taking into account the current state and a vision for the future of the innovation system concerned. These instruments include:

- *Direct and indirect support measures for R&D and innovation.* In the past, direct public support for business R&D and innovation activities was more popular than indirect fiscal incentives such as tax credits or concessions. Today, more than 20 OECD countries offer tax relief for business R&D, up from 12 in 1995, and most have tended to make it more generous over the years. The appeal of R&D tax credits derives from their non-discriminatory, neutral nature in terms of research and technology fields or industrial sectors. Ideally, the two types of measures should be complementary in order to make the best use of their respective advantages. There may also be a case for recognising interdependencies. Guellec and van Pottelsberghe (2000) examined direct public support on the one hand and fiscal incentives for R&D on the other as an example of interaction between different types of R&D subsidies.
- *Institutional and competitive funding instruments.* Up until the 1990s in most countries, public funding for public-sector research institutions – including government laboratories and universities – tended to be predominantly non-competitive, institutional funding (block grants). However, in a bid to raise research quality and, in some instances, to limit research spending to a few centres of excellence, governments increasingly turned to competitive modes of funding. For the most part, this has had the desired effect by providing government laboratories and universities incentives to improve their research effectiveness and efficiency. Nonetheless, in some instances the use of competitive funding modes may have gone too far and jeopardised the maintenance of core capabilities by exposing research institutions to too much instability and leading to unintended side effects (such as the retention of units likely to have been spun off under different incentive regimes).
- *Supply-side and demand-side measures.* Innovation policy has traditionally been more supply-side oriented, with policies to enhance innovation competences in firms receiving

less attention than policies to support investment in S&T and innovation. Today, the role of demand as a major driver of innovation has become better recognised and there is growing policy interest in stimulating and articulating public demand for innovative solutions and products, in part to improve the delivery of public policy and services. This has been an emphasis of government stimulus packages in the recent economic crisis. Public procurement is therefore emerging as a potentially powerful instrument to drive research and innovation by providing lead markets for new products and technologies, which may then be adopted in private-sector markets. Such demand-side policies can lead to innovative solutions for tackling today's societal and global challenges (OECD, 2010a). Strengthening the demand side is important not only for many less advanced economies, but more generally for economies with relatively low innovation activity in parts of the business sector, *e.g.* among SMEs. When devoting more attention to demand-side measures, the specific conditions of the country concerned should be carefully taken into account in specifying and designing such instruments (Figure 4.7).

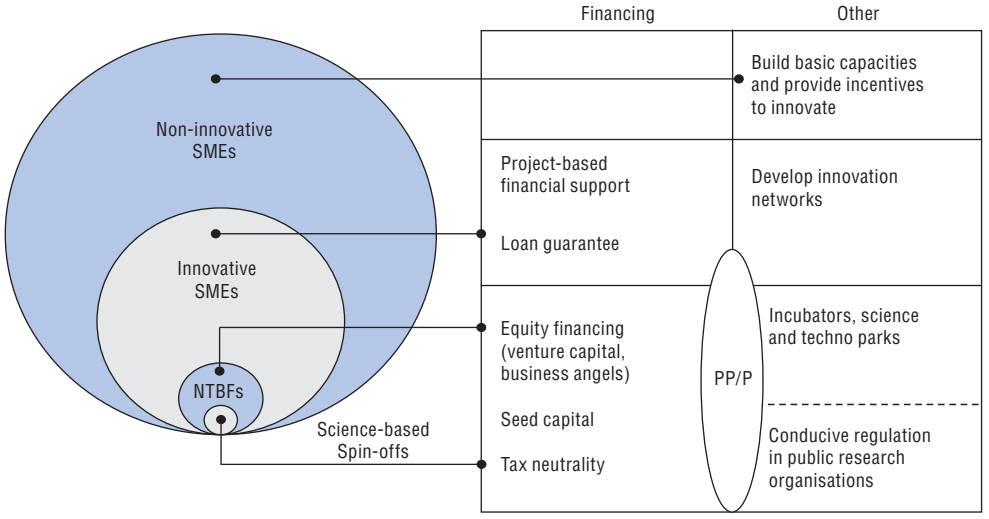
Figure 4.7. **Balance of supply and demand orientation of innovation policy**



As mentioned, a country's specific characteristics will influence the optimal policy response for setting its strategic tasks and instruments. In the current context, these characteristics include the size distribution and demography of firms, the specialisation of the economy, the role of foreign firms, the quality of innovation infrastructures, the business culture, etc. For instance, most countries have an important sector of SMEs. It is well known that this category of enterprises faces specific problems, and it receives special policy attention in many countries. At the same time, the population of SMEs varies greatly, not least in terms of their innovation performance. While some countries have an SME sector that supplies mostly unsophisticated products for local markets, others – such as Switzerland – have developed a strong segment of innovative SMEs and an expanding core of new technology-based firms, some of them created through spin-offs, *e.g.* from public research institutions. Clearly, the needs of SMEs vary considerably, and, to be effective, policy needs to take due account of these differences (Figure 4.8). While non-innovative

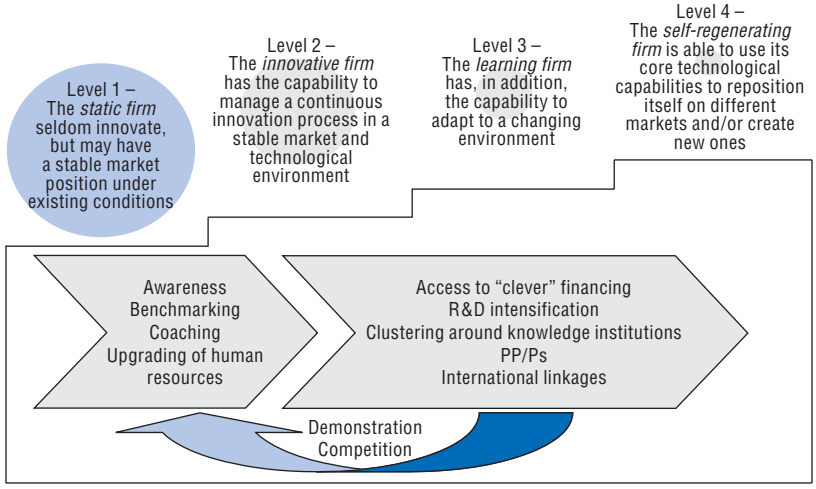
Figure 4.8. **SME policies**

Different policy priorities for different types of SMEs



NTBFs = New Technology-based firms
PP/P = Public-Private Partnership for innovation

Building SMEs' innovation competencies: a step-wise approach



firms often need to develop basic capabilities as well as incentives and framework conditions that help them to engage in innovation activity, support for highly innovative and science-based firms takes very different forms. The supportive role of government changes with the level of economic development and the level of firms' own capacities.

New policy instruments are typically introduced into settings which contain an array of other instruments, often with the same or overlapping targets. Moreover, the effectiveness of a policy instrument almost always depends upon its interaction with other instruments, sometimes enacted at different times and for somewhat different purposes. Bressers and O'Toole (2005) distinguish five forms of interaction associated with policy mixes, as shown in Table 4.1. The selection and design of policy instruments should take account of such interactions, as these may conflict with as well as reinforce each other. Yet, few studies have documented the interactive effects of instruments, which remain, for the

Table 4.1. **Five forms of influence or confluence in policy instrument blends or mixes**

Increased intensity of policy intervention	Multiple instruments targeting *a specific actor or group* of actors
Integration of multiple instruments into one interactive process between government and target groups	Multiple instruments targeting different actors/actor groups involved *in the same process*
Instruments and actions at different levels of governance	Interactions between instruments and actions taken at *different levels of multi-level governance*
Competition and co-operation between different but interdependent policy fields	Interactions and tensions *across policy areas/domains*
Mutual strengthening or weakening of the effects of interventions at different points of action in the broader system	Interactions mediated through processes in a broader system

Source: Flanagan, K., E. Uyarra and M. Laranja (2010),The Policy Mix' for Innovation: Re-thinking Innovation Policy in a Multi-level, Multi-actor Context, *Manchester Institute of Innovation Research Working Paper Series*, University of Manchester, based on Bressers, H. and L. O'Toole (2005) Instrument Selection and Implementation in a Networked Context, in P. Eliadis, M. Hills, M. Howlett (eds.), *Designing Government: From Instruments to Governance*, McGill-Queens University Press, Montreal.

most part, poorly understood. However, policy instrument mixes are likely to create synergies, insofar as they represent more than the sum of the individual instruments.

A balance also needs to be struck concerning the number of policy instruments adopted. The tradeoff here is the need for a set of instruments that is sufficiently differentiated to meet the needs of complex innovation systems. At the same time, it is important to avoid inefficiencies arising from operating too many schemes at too small a scale.[8] This is a real concern, since instruments can develop a certain autonomy and in effect become ends in themselves (Vedung, 1998; Ringeling, 2005), making them less amenable to change or cancellation, even when that would make sense. The incremental accretion of policy instruments, if widespread and long-lasting, can result in complex and dense policy mixes. Although these mixes may sometimes have a unifying overall logic, the build-up of instruments over time normally reflects differing conceptions of the causes of specific problems as well as variations in how problems are framed.[9] Achieving policy coherence under these circumstances can be very difficult, but using the policy mix concept in policy assessment and design work should help draw attention to such inconsistencies and redundancies.

Coherence in the policy mix

A variety of interrelated developments – analysed in some detail in OECD (2010a) – have led most OECD countries to deploy a more comprehensive and differentiated set of policies and associated programmes and instruments. This has drawn greater attention to the need for policy coherence or consistency, that is, the extent policies act to support rather than detract from one another. Coherence can be viewed as a policy mix goal, with co-ordination the means to achieve it and good communication the basis for effective co-ordination, which is a central concern of the policy mix concept (Guy *et al.*, 2009).

As the preceding discussion has highlighted, the policy mix concept – and, by extension, policy coherence – points to the co-ordination of a multitude of policy actions in the core set of innovation policies, such as S&T and education. It also requires an evaluation of their possible interaction with policies pursuing other primary objectives, *e.g.* tax policy, competition law, etc., *i.e.* those policies that shape the framework conditions for innovation. For example, attracting foreign students or university staff requires close co-ordination of education and immigration policies. Fostering innovation and a cleaner

environment to help guide economies towards greater sustainability requires closer integration of many policies, *e.g.* in transport, energy, environment, etc. Such policies may, in some instances, be inherently complementary (see the earlier discussion of Aghion *et al.*, 2009), but in others they may be incompatible. This can reduce their overall effectiveness or at least involve some tradeoff.

Achieving policy coherence is therefore crucial for success in several areas of innovation policy. At the same time, however, the scope for achieving coherence has been made more difficult by a number of developments (OECD, 2005c; Peters, 1998):

- As governments have become involved in more aspects of the economy, the likelihood that any one programme will affect others has increased.
- The adoption of the tenets of new public management has seen a proliferation in agencification, which has created a more fragmented landscape of policy actors which are expected to act more or less autonomously.
- Regionalism and internationalisation of policy has led to the emergence of multi-level governance.
- Fiscal crises in states have led governments to search for and reduce apparent redundancies and inconsistencies across programmes in a push for greater efficiency.
- Issues are becoming increasingly cross-cutting and do not fit neatly into traditional departmentalised structures.

A comprehensive innovation policy therefore requires co-ordination of a wide range of actors and government ministries, such as science and technology, education, competition, trade, communication, migration, employment, environment, health and foreign affairs. It must nonetheless be acknowledged that the behaviour of policy-making organisations is guided by their own logic of appropriateness.[10] Insofar as these organisational logics are unaligned, co-ordination and coherence will be difficult. Furthermore, co-ordination will be inhibited because each organisation serves its own networks (clientele), and demands often vary from one network to another. As part of their network-building activities, organisations invest in creating elaborate sets of mutual agreements and understandings; they are unlikely to want to upset those arrangements through active (positive) co-ordination efforts. The best outcome that might be expected under these circumstances is for negative co-ordination between organisations, whereby each respects the others' commitments but does nothing to integrate its actions (Peters, 1998). This raises difficulties when problems are large-scale and cross-cutting, as in the case of innovation policy. The risk is that a number of different organisations will attempt to parcel out components among themselves, thereby reducing the overall effectiveness of policy interventions. The end result may be policy instrument choices that grow haphazardly out of bureaucratic turf battles rather than out of clear-headed analysis of the policy problems involved (Peters and Hoornbeek, 2005).

Accordingly, a number of arrangements have emerged for increasing the overall coherence of policies, programmes and instruments across a range of departments and agencies. These include the articulation of strong guiding national visions or strategies (*e.g.* through the use of national foresight exercises, as in many OECD countries); the merger of policy-making organisations, for example, into super-ministries (*e.g.* the Korean government recently merged several ministries, including science and education, with the aim of improving policy coherence); and the adoption of joint programming practices (*e.g.* around cross-cutting challenges, such as healthy ageing, environmental sustainability,

etc.). In addition, in recent years, a substantial number of countries have set up high-level policy councils, in a number of cases emulating the experience of the Finnish Science and Technology Council with the Prime Minister at the helm, which has been perceived as international best practice. Such councils can play an important role in agenda setting, prioritisation and as a platform for overall policy co-ordination (Box 4.4).

It has become evident, however, that simply establishing such a council is insufficient in itself to achieve greater policy coherence and is certainly not a panacea. Indeed, the role

Box 4.4. **STI policy councils**

Several countries have established science, technology and innovation policy councils as key elements in their co-ordination efforts:

- The Finnish Science and Technology Policy Council, headed by the Prime Minister, has been a reference for many similar institutions around the world.
- Canada's Science, Technology and Innovation Council brings the public and private sectors together to advise the government on priority setting. It produces a biennial State of the Nation report to track the impact of policies.
- Korea has made persistent efforts to better co-ordinate its STI policies. It established a National Science and Technology Council, which has been progressively strengthened to play a pivotal role in policy co-ordination. Among other functions, it is responsible for improving coherence between rival ministries' programmes.
- In Germany, the Expert Commission for Research and Innovation (EFI) presents to the federal government annual proposals for national research and innovation policy making based on a comprehensive analysis of the strengths and weaknesses of the German innovation system.
- The advisory Swiss Science and Technology Council focuses on science and higher education. Unlike comparable councils in other countries its membership comes largely from academia.
- The Supreme Council for Science and Technology in Turkey steers the innovation system forward while diffusing developments on STI policies and establishing *ad hoc* committees to provide policy recommendations.
- Hungary's Science and Technology Policy Council (chaired by the Prime Minister) has a varied history. In recent years it has stopped convening and thus has not played a decisive role in important strategic policy decisions.
- Mexico, too, had a council that has not yet been fully functional; a new inter-ministerial co-ordination mechanism was established recently.
- Chile has established an advisory National Innovation Council for Competitiveness which has succeeded in developing a national strategy and deploying a cluster initiative. The Council has triggered changes in the governance system, including the creation of an Inter-ministerial Committee for Innovation, the advisory Council's counterpart in the executive branch.
- The People's Republic of China's State Council Steering Group for Science, Technology and Education headed by the Prime Minister is a top-level co-ordinating mechanism on strategic matters.

Source: OECD (2010a), *The OECD Innovation Strategy. Getting a Head Start on Tomorrow*, OECD, Paris.

and performance of existing councils has sometimes been limited, often owing to some deep-rooted problems. Their tasks may have been ill-defined in the context of the country's innovation system or measured against what such a council can be expected to deliver. Policy makers may not have been prepared to take on their assigned role. This highlights the need for precision about the concrete role of councils and the need to gear them towards the strategic tasks to be fulfilled in the innovation system as well as to social and political realities. There are some general lessons to be drawn from international experience. For example, it appears counterproductive for a council tasked with providing strategic advice to become closely involved in the budget allocation process. The council's composition, too, needs to be considered in view of the specific strategic tasks to be fulfilled by the national innovation system. This includes ensuring an adequate degree of openness, including to the outside world (*e.g.* through the nomination of members from beyond national boundaries or otherwise exposed to international practices) and, of course, to new ideas and newly emerging innovation actors in the innovation system. This implies that councils should not be overly biased towards vested interests (both in the business community and academia).

As the example of STI policy councils shows, there is plenty of scope for international learning about appropriate mechanisms for achieving enhanced policy coherence and their design. However, it is also important to acknowledge the limitations of what can be realistically achieved in terms of policy coherence. In this regard, work carried out by the OECD in the 1990s on the management of policy making (OECD, 1996) identified five key lessons relevant to efforts to enhance policy coherence:

- *There is a gap between the need for coherence and the capacity to achieve it*. This gap largely results from the complexity of governing contemporary societies, which are characterised by an increasing globalisation and regionalism, by the expanding availability of information, by growth in the number of actors involved in policy processes, and by the framing of problems as cross-cutting.
- *Governing in a democratic political system necessarily involves a degree of incoherence*. Coherence is but one quality of good governance; the OECD's Innovation Strategy (OECD, 2010a) identifies several others, including stability, adaptability and legitimacy, which may be in tension. Democratic societies require governments to be responsive to competing interests which rarely converge towards coherent sets of policies. The challenge for governments is to manage these contradictions rather than to avoid them.
- *No single governance system can guarantee improved policy coherence*, i.e. *there is no best practice*. This parallels messages in other parts of the chapter that emphasise the importance of local contingencies. Different systems can achieve similar degrees of coherence with different governance mechanisms. Indeed, the levels of performance of apparently similar mechanisms, *e.g.* S&T councils, in different countries can be very different on account of wider political and socioeconomic factors. Coherence should therefore be considered more a guiding principle than a fixed set of widely applicable arrangements.
- *There nevertheless exist good practices and tools of coherence*. These are organisational in nature and concern the process rather than the substance of policy making. They reflect the need for a strong strategic capacity at the centre of government; the need

for organisational flexibility; and the need for effective information-gathering and processing systems.

- *The paramount tool of coherence is informed decision making.* Policy makers need to know what their realistic options are, what inconsistencies might result from their decisions, how the costs of those inconsistencies can be mitigated, and how the tradeoffs they have had to make can be explained. In an environment characterised by complexity, change and the availability of vast quantities of information, a high premium is put on developing information systems and analytical capacities that allow decision makers to govern as coherently as possible.

This last point is taken up in the final section of the chapter, which sets out proposals for developing information systems and analytical capacities in support of innovation policy design.

International policy learning and the policy mix

The previous sections have highlighted the significance of local contingencies in appropriate policy design. This might lead to the conclusion that the scope for interventions based on international learning is somewhat limited. While it is appropriate to abandon the belief that policies (and especially policy instruments) are in essence technical in nature and largely independent of their context, knowledge of their uses elsewhere can nonetheless be enlightening if considered in the context of wider political and socioeconomic circumstances, including existing policy mixes. The difficulty, of course, lies in gaining a measure of these wider circumstances in shaping the performance of a given policy instrument in another national setting. It also lies in gaining an appreciation of how the policy instrument might work in one's own setting given its political and socioeconomic circumstances and existing policy mix. Such difficulties are widely documented in the international literature on policy transfer and policy learning (*e.g.* Rose, 1993; Dolowitz and Marsh, 2000; James and Lodge, 2003), and they are recognised as accounting for a great deal of the policy failure associated with inappropriate or incomplete transfer. International organisations, such as the OECD, can help to minimise the risks of such failures by supplying detailed case studies and principles of policy design and implementation, and by providing forums for the exchange of lessons between different countries.

The fundamental analytical question is how to cope with multi-attribute problems and the varying forms these problems and their solutions may take in different political and socioeconomic circumstances (Peters and Hoornbeek, 2005). One approach would be to rely largely upon technical analysis to model the factors involved, but this has limitations. First, quantitative indicators that aid in such assessments are lacking in many instances. While further indicator development could be helpful, it has to be acknowledged that certain important phenomena are not suited to expression in terms of quantitative indicators; this limits the scope for quantitative data-driven analysis. Second, the knowledge necessary to make such assessments tends to be distributed and thus to require a more deliberative approach to policy design. This does not deny a role to technical analysis but instead situates it in multi-actor forums involving a more transparent deliberation process. Such forums are also crucial in providing opportunities for policy learning among policy designers, implementers and target groups. Third, innovation systems are complex and adaptive, as the outcomes of policy interventions

are uncertain and characterised by unintended consequences. This again points to a more open approach to policy design, one which involves a great deal of experimentation and monitoring and the participation of many actors.

In the end, of course, processes of open deliberation in designing policies may involve no more than simply recognising the multiplicity of the criteria and the tradeoffs that are involved and relying upon the good judgement of participants in multi-actor forums (Peters, 2005). This still leaves open the challenge of ordering and structuring such criteria and tradeoffs to permit their systematic consideration in policy design efforts. The challenge, in fact, is to develop an analytical framework that can accommodate this multiplicity of criteria while remaining accessible and useful to multi-actor policy-making forums. There is scope for international learning in building such an analytical framework, irrespective of differences in the wider political and socioeconomic circumstances (including existing policy mixes) that shape countries' innovation performance. In this regard, and in the wake of its recently launched Innovation Strategy, the OECD has committed to provide more operational advice and guidance on formulating innovation policy through a policy handbook which includes such an analytical framework (Box 4.5).

Box 4.5. **The innovation policy handbook**

The policy handbook's main purpose is to provide insight and guidance to inform practical policy decisions relating to a broadly conceived notion of innovation. It will have at its core an analytical framework along the lines set out above, together with case materials and briefing notes, to aid policy makers and analysts to learn more about the current performance of their innovation systems and to discern pathways to more desirable states. The expected benefits of creating an innovation policy handbook are as follows:

- Assemble in one place current knowledge of innovation dynamics and policy measures and use this to provide policy-relevant guidance and data support.
- In doing so, take due account of factors that are important for innovation policy making and encourage a better appreciation of their connectedness.
- Encourage recognition of the need to tailor policy interventions to specific contexts and to take account of past and existing policy actions.
- Shift policy-making paradigms towards more active and open collective learning processes which acknowledge the limits of current knowledge and make available spaces for policy experimentation.
- Highlight the need to nurture the capabilities necessary for continual reflexive governance of innovation systems.

The policy handbook's architecture is modular to allow for the incorporation of new content on a continuous basis. Member countries and other users will be encouraged to contribute case materials and other analyses to support the information base underpinning the guidance contained in the policy handbook. In this way, its growth will be organic, drawing upon the experiences and conceptual thinking of the wider innovation policy community. Furthermore, it will link to the extensive data already gathered by various EU-funded projects, *e.g.* ERA-Watch, PRO-INNO Europe and Regional Innovation Monitor. The policy handbook's analytical framework will be sufficiently broad to accommodate analysis and synthesis of all relevant areas of policy for innovation and will be applicable in a wide variety of settings, including OECD and non-OECD countries and at national, regional and sectoral levels.

Conclusion

This chapter has set out to elaborate on the policy mix concept, with the aim of making it more operational and useful to policy makers and analysts. It has assigned two complementary and interdependent meanings to the concept. One emphasises the nested relations between four dimensions of policy, namely the policy domain areas considered relevant to innovation performance, the rationales for policy intervention, the strategic tasks set for policy action, and the policy instruments deployed. It has broadly characterised each of these dimensions and provided examples that demonstrate both the commonality and variety of policies found across OECD countries. A second meaning of the policy mix concept focuses upon interactions within each of the policy dimensions, such as issues of coherence and balance between different types of policy instruments. In this regard, the chapter has argued that the scope for achieving policy coherence is limited by the very nature of modern systems of governance. Nevertheless, coherence can be improved through the establishment of multi-actor forums that are strongly supported by information systems and advanced analytical capacities. A more operational conceptualisation of policy mix can bolster such analytical capacities, providing a useful entry point for assessing the dynamics of innovation policy and for designing new policy arrangements.

This is the starting point for the OECD's work on developing a policy handbook in support of innovation policy making. The handbook will utilise an analytical framework based upon a concept of policy mix that can accommodate the contingencies of local political and socioeconomic circumstances. To recall, these include the capabilities of innovation system actors (including policy actors), the rules of the game, the incentives and ideas that shape actors' behaviour and their patterns of interaction, and the resources at their disposal. They also include existing policy and governance arrangements that influence innovation performance. Each of these factors is, to some extent, path-dependent and a legacy of historical events and arrangements that are unique to individual countries, regions and sectors. This is an important point to bear in mind in international policy learning, where the dangers of inappropriate policy transfer often loom large. At the same time, however, the opportunities offered by international policy learning are too great to be neglected. The handbook therefore sets out to utilise the policy mix concept to provide an open and dynamic platform for more informed international policy learning and to introduce a more strategic basis for policy formulation and implementation.

Notes

1. In fact, it would not be unfair to claim that much of the empirical work around innovation policy mixes has so far been concerned, for the most part, with discussing only balances (and by extension, policy gaps). Much less attention has been paid to researching interactions, particularly between instruments, no doubt on account of the conceptual and practical challenges involved.
2. Economic governance – *i.e.* the governance of economic activity more generally – can be defined as encompassing the "structure and functioning of the legal and social institutions that support economic activity and economic transactions by protecting property rights, enforcing contracts, and taking collective action to provide physical and organizational infrastructure" (Dixit, 2009, p. 5). The latter guarantees an adequate provision of public goods.
3. At the same time it appears useful to maintain the distinction. One argument in favour of this is that innovation policy makers have only limited control over these policies and special

co-ordination mechanisms have to be put in place in order to achieve the necessary degree of coherence and co-ordination.

4. To date the following reviews of innovation policy have been carried out: Chile (OECD, 2007a), China (OECD, 2008a), Greece (OECD, 2010b), Hungary (OECD, 2008b), Korea (OECD, 2009a), Luxembourg (OECD, 2007b), Mexico (OECD, 2009b), New Zealand (OECD, 2007c), Norway (OECD, 2008c), South Africa (OECD, 2007d) and Switzerland (OECD, 2006). A number of reviews are currently under way.

5. See, for example, the surveys by Geroski (1995), Metcalfe (1995) and Scotchmer (2004).

6. There are potential tradeoffs involved since co-operation in R&D may lead to anticompetitive behaviour in downstream product markets.

7. For example, measures to raise the necessary finance for public expenditure and fiscal incentives such as tax credits or concessions for R&D may incur economic costs and involve substantial deadweight losses. The existence of support programmes for particular types of innovative activity may at times also lead to a diversion of resources from productive uses, *e.g.* from direct innovation activity towards lobbying.

8. To some extent, organisational arrangements, *e.g.* bundling the operation of these instruments in specialised arm's-length agencies that can serve different principals may help mitigate this problem. Yet, there is no substitute for scrutinising instruments as much as feasible for their net social benefit.

9. Howlett and Rayner (2007) distinguish between two types of instrument accretion, namely layering and drift. Layering is a situation in which new objectives and instruments are added without abandoning previous ones. This often leads to incoherence among the objectives and inconsistency with respect to the instruments. Drift is a situation in which new objectives are added but the instruments remain the same. In this setting, the policy instrument mix is inconsistent with the new objectives and is most likely ineffective in achieving them.

10. This is the situation in which policy makers are said primarily to use criteria of similarity and congruence rather than rely upon rational anticipation of value (referred to as a logic of consequence) in selecting and designing policy strategic tasks and instruments (March and Olsen, 1989).

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