Chapter 1

Analysing the national intellectual property systems of developing and emerging countries

This chapter defines a framework to provide guidance on conducting country analyses for national intellectual property (IP) systems in middle-income countries with the aim of defining policy recommendations to promote innovation. It concludes that national IP systems can support innovation in these countries by creating exclusive rights for different groups of users. IP systems have to have legal and administrative conditions to guarantee those rights. Moreover, economic development contexts are characterised by multiple market failures where leading innovative firms and universities co-exist with a substantial informal sector and a large number of firms with low innovation capacities. If different users are to benefit from the national IP system, complementary support policies are needed as well as a focus on types of IP beyond patents. Successful reforms of national IP systems will also depend on a high level of co-ordination to implement an effective IP for innovation agenda.

1.1. Aim of the framework

Purpose

The purpose of the framework presented in this chapter is to facilitate analyses of national intellectual property (IP) systems for countries, at different stages of development, with a view to identifying policy priorities that support innovation. The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) and various free trade agreements (FTAs) have led to the strengthening of IP systems in most countries. The starting point for the framework, then, is how existing IP systems can best be mobilised for innovation.

In order to achieve this objective the framework has set four objectives:

1. **Map the full set of actors, conditions, policies and interrelationships that matter for IP systems and their contributions to innovation.**

   Intellectual property is a potentially very powerful tool for innovation policy for countries at different stages of development. However, the complexities of the topic, including its legal components, frequently result in superficial treatment of IP in country-based analyses of innovation policy. Existing studies of IP systems often emphasise strongly procedural and legal aspects without fully embracing the innovation context. It is, however, the interrelationships of the IP system with complementary innovation policies that will shape conditions for success, particularly in a development context. For instance, discount rates for IP applications from universities alone will not guarantee that those inventions will result in innovations. More needs to happen, in particular, private businesses with the capacity to exploit such knowledge play a critical role, and innovation policy can help to foster their capacities so as to foster the commercialisation of IP generated by universities. Assessing the contributions of national IP systems to innovation, therefore, requires a focus on the full set of actors of IP and innovation systems and the conditions they face that affect their innovation performance.

2. **Incorporate the development dimension into discussions of IP.**

   Policy impact depends on making development challenges a key focus of analysis. Intellectual property has been studied extensively, but often without consideration of how different development contexts explicitly shape conditions for innovation. Such abstraction hinders the design of adequate policy recommendations on IP for innovation. This is because several contextual features, such as university-industry networks and limited markets for access to finance for innovators, are often particularly pronounced in development contexts, and shape how IP systems support innovation. For instance, as discussed above, intellectual property is only one of several critical components needed in support of the commercialisation of inventions generated by public research. Therefore, other factors – such as limited capacities of the private sector to commercialise those inventions – if left unaddressed, lead to limited or, in extreme cases, no impacts of IP systems.

   It should be noted that the framework is by no means a "one-size-fits-all" theory for developing and emerging countries. Instead, it emphasises some critical components of emerging innovation systems that, if existent in the country of analysis, require specific adjustments of IP policies for them to support innovation.

3. **Focus on national IP and complementary policies.**

   The purpose of the framework is to help identify options for national IP policies and complementary policies to support impacts for innovation. This is not to disregard the international dimensions of IP policy, which the framework does make reference to. There are, however, multiple fields of action for national policies which can make a substantial difference to the success or failure of an IP system to support innovation. As such, the framework makes these policies its explicit focus.

4. **Describe policy principles emphasising priorities, trade-offs and compatibilities of policies.**

   The framework also defines a set of policy principles for IP policies and complementary measures. The purpose is not to draw policy conclusions for all emerging and developing countries. Rather, it provides principles to be applied to specific country contexts so as to allow for country-specific policy conclusions. In addition, it discusses which priorities should be set when it comes to implementing policy recommendations. Since a flat catalogue of policy recommendations can challenge their implementation, it also discusses trade-offs and the compatibility of IP policies with the wider set of innovation policies.

Thematic coverage

The framework takes innovation as its focal point in analysing IP systems. It, therefore, focuses essentially on how IP systems affect domestic industry. That is, the focus is on users of the IP system in the production sector, not on end consumers. The purpose is to review the policy arsenal at the disposal of developing countries with regard to IP. The framework aims to be comprehensive in its coverage of themes since incomplete coverage does not allow for an adequate evaluation. However, given its focus on supporting domestic industry, the framework addresses issues of access only to the extent that they directly relate to innovation. The framework focuses only on the impacts of technology transfer on these users. In consequence, other important IP issues such as access to drugs and green technology are not within the scope of the framework.

Moreover, the framework emphasises topics that are not commonly the focus of IP policy. The objective of this framework is to better reconcile IP policies from the perspective of innovation; therefore, it has adopted a strong emphasis on complementary factors. This emphasis reflects the observed disconnect between IP and innovation policies that undermines potential impacts IP systems could have, but consequently fall short of. While it also covers questions of enforcement and operations, these are treated with less detail given their detailed discussion elsewhere, and the widespread understanding of required policy changes to address those challenges.

The topics discussed by the framework cover a wide area. They have been extensively discussed and have benefited from varied policy experiences across many countries. In order to provide a concise treatment of the main themes, the document does not provide detailed accounts of those discussions and experiences. The relevant IP policy experiences of Colombia and Indonesia are discussed in detail in subsequent sections. Additional details on specific themes are provided as part of the OECD-World Bank Innovation Policy Platform's Intellectual Property Rights module.

Country coverage

The aim for this framework is that it may be applied to different country contexts. It provides a better basis for analysing development contexts than more generic frameworks. There is obviously no clear line of separation between developed, emerging

and developing countries and, indeed, substantial differences exist between these countries. At the same time, many of the conclusions will be valid in developed country contexts to the extent that they share some of the challenges (e.g. weaknesses of industry-university networks), although most will not apply to the same extent. These conditions are discussed below. It is the purpose of specific country studies to identify the most relevant shortcomings and draw relevant policy implications. Obviously some contexts are very different: while these cannot be described by income only, as an approximation it is probably adequate to say that the types of contexts that form the object of this study describe the range of middle-income countries, but less so that of low-income countries.

1.2. National IP systems and innovation in a development context

Overview of the national IP systems

This section provides an overview of national IP systems and the impacts of the development context. National IP systems can be defined as the set of institutions, rules and bodies involved in the design, implementation and enforcement of IP in a national economy. Figure 1.1 illustrates the IP system in a conceptual map. The nodes indicate the various issues (concepts, mechanisms or actors) to be addressed, while the boxes indicate issues that belong to the same theme. The structure provides the basis for the Intellectual Property Rights module of the OECD-World Bank Innovation Policy Platform.

Box 1.1. The relevance of different types of IP for innovation

Patents are often discussed in the context of innovation. However, as shown in Annex Table A.1, other types of IP are equally closely related to innovation activities, including non-traditional innovations in sectors other then manufacturing. Trademarks, for instance, can be useful for non-technological innovations in the service sector by providing brand names to clearly distinguish such products for consumers. The filing of new trademarks partially reflects the introduction of new products and can help improve conditions for appropriating returns on innovation, whenever other means are not effective, or extend or expand protection provided by other types of IP (Mendonca et al., 2004, Millot, 2009). Utility models, trademarks and design are more relevant than patents for residents in various middle-income countries. One imperfect indication of this is the fact that the national-to-foreign application ratio is lowest for patents compared to other types of IP for various developing and emerging countries (Table 1.1).[1]

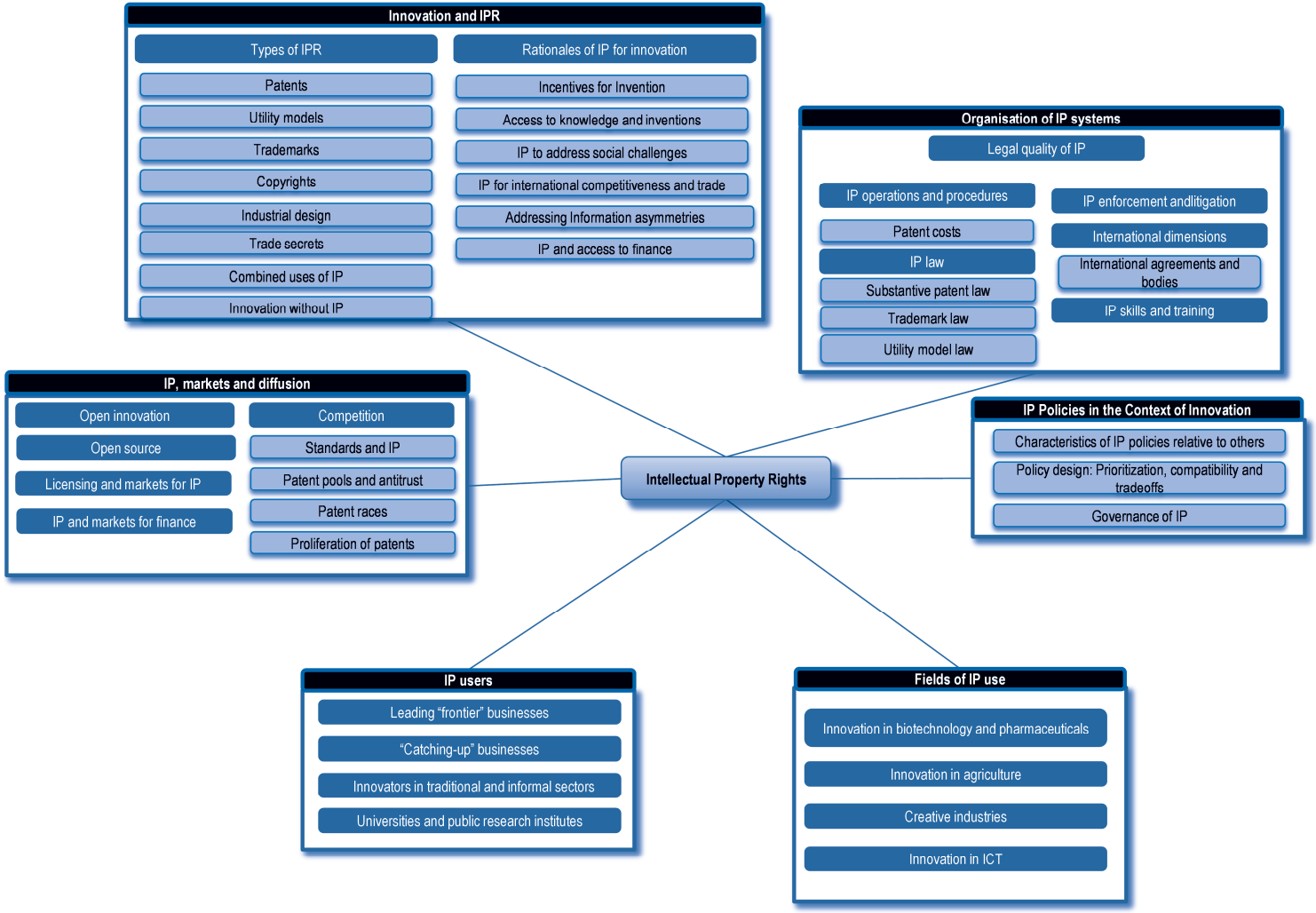
Table 1.1. IP applications by IP office, broken down by resident and non-resident (%), 2011 or latest available year

	Patent		Utility model		Trademark		Design	
Office	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident	Resident	Non-Resident
Indonesia (2009 for design data)	9%	91%	81%	19%	95%	5%	79%	21%
Malaysia	17%	83%	56%	44%	45%	55%	40%	60%
Philippines	6%	94%	94%	6%	57%	43%	48%	52%
Thailand	24%	76%	92%	8%	60%	40%	77%	23%
Brazil (2010 for all)	12%	88%	97%	3%	82%	18%	70%	30%
Chile	12%	88%	76%	24%	68%	32%	11%	89%
Colombia	9%	91%	92%	8%	58%	42%	38%	62%
Ecuador (2010 for all)	1%	99%	41%	59%	54%	46%	32%	68%
Mexico	8%	92%	89%	11%	71%	29%	46%	54%
China	79%	21%	99%	1%	92%	8%	97%	3%
France	87%	13%	42%	58%	92%	8%	95%	5%
Germany	79%	21%	80%	20%	88%	12%	89%	11%
Japan	84%	16%	79%	21%	78%	22%	87%	13%
United States	49%	51%			84%	16%	57%	43%

Source: WIPO Statistics Database.

1. Note that the ratio is also affected by differential payoffs to IP and is, therefore, an imperfect indicator.

Figure 1.1. Conceptual mapping for analysing IP for innovation



It is critical to start with an assessment of innovation and IP where the key dimensions are the different types of IP (Box 1.1) and the ways in which they relate to innovation, as well as the rationales for using IP to promote innovation (Annex A).

The following elements describe the relevant dimensions of the IP system for analysis:

- Various aspects concern the *organisation of IP systems*. Key issues here are: the legal provisions set for IP ownership (as established by substantive patent law for patents); the operations and procedures of the IP system; the conditions for enforcement of IP rights; international agreements regarding IP that countries have agreed on; and IP skills and training on both the public administration and user side. These are critical for the "legal quality" of the IP system, which determines whether IP ownership rights are indeed guaranteed.
- *IP, markets and diffusion* describe a range of framework conditions that critically shape IP impacts. This includes: the state of competition; conditions for licensing and markets for IP; whether IP can be used to obtain credit on markets for finance; and the roles played by open innovation and open source.
- A key element is also how IP systems and innovation support innovation activities and access to knowledge for different types of *IP users in the production sector*, including (in emerging and developing countries): traditional and informal actors; "catching-up" firms; leading "frontier" firms; and universities and public research institutions.
- The ways in which IP can serve innovation differ across users, and also vary substantially across *fields or sectors of activities* (including ICT, agriculture and creative industries, as well as biotechnology and pharmaceuticals).
- There is a wider question of how IP policies relate to innovation policies. Critical issues include: how national IP systems are governed; the characteristics of IP policies compared to others; policy design questions (i.e. prioritisation, compatibilities and trade-offs); and relevant governance dimensions for IP policies.

The design of IP policies depends on the use of relevant qualitative and quantitative measures of the IP system and its characteristics (see Annex 1.A1).

The development context and its impacts on national IP systems

The development context is associated with a set of substantial contextual weaknesses. These constitute key factors explaining low innovation performance, but they also condition the ability of IP policies to achieve innovation objectives. Table 1.2 summarises these well-known factors and their impacts and implications for IP policy. This is not to say that these factors inevitably all occur to the same extent in all countries, or that they are in any way specific to developing countries. In addition, several of these factors are often correlated, which further intensifies negative impacts. The main implication is that IP policies have to explicitly incorporate those weaknesses. Complementary policy approaches have to be developed if they are to have impacts on innovation.

Table 1.2. Innovation system challenges, their impacts on IP systems and policy implications

Innovation system challenges	Impacts on IP systems	Policy implications
• **The productive sector is characterised by inequality** with few leading sectors ("islands of excellence" co-exist with low-productivity firms and a large informal sector). ○ **Lack of competition** is a challenge. ○ **Polarising policy pressures** can be substantial. ○ **Growth/economic performance is often skewed towards a few sectors** with agricultural and services, and in some cases, natural resource-based industries, playing a particularly important role.	• Actors place very different demands and needs on the IP system (e.g. some seek international IP, while others have more to benefit from access to the information contained in IP applications). • Potential policy pressures might influence IP policies in a way that does not serve all actors. • Incumbents with strong monopoly powers might not substantially increase innovation efforts with IP, and rather use IP ownership to fight potential incumbents. • Specific types of IP will be most important for leading sectors.	• IP policies have to consider a variety of actors and ensure their involvement and participation in policy consultations. • Accountability and transparency of IP policy systems can help to reduce the dominance of powerful players over policy decisions. • Competition policy has to ensure that all firms, including leaders, have incentives to innovate and do not make use of IP to fight incumbents. • IP policies should explicitly focus on those types of IP that serve leading sectors best.
• **Private sector capabilities are weak with major capacities in research institutions**. ○ Opportunities for national **university-firm network** co-operation are weak. ○ **Private sector capacity** to absorb S&T from universities, research institutes and abroad is limited, given lack of access to skills and resources.	• Increased university IP will have only a limited impact on the commercialisation of inventions generated by universities and PRIs, as the business sector does not have the capacity to exploit them. • Patents will remain out of reach for many businesses, as they lack the inventive capacity and the resources for needed investments. • The potential benefits to be had from IP differ substantially (e.g. lack of access to finance constrains opportunities for businesses to commercialise inventions, even if they possess the corresponding IP titles).	• Universities and PRIs with research capacities can provide substantial contributions to successful IP strategies. As such, they should be a target group for these policies. • IP policies for universities and PRIs need to be complemented by a strategy to establish active links with businesses and develop their capacities for successful commercialisation. • Lack of access leads to limited returns from IP. It is necessary for complementary policies to compensate for such lack of access to resources (e.g. by supporting access to finance for innovation).
• **There are institutional weaknesses and missing institutional settings.** ○ National markets to provide finance for innovation development are weakly developed, as are markets for trading technology. ○ Complementary IP institutions, such as TTOs, may be inexistent or less well equipped. ○ Competition authorities might be less well prepared to regulate markets. ○ IP office capacities might suffer from limited human capital, resources and productivity. ○ Governance co-ordination challenges are potentially substantial, not only for IP policy, but also for innovation policy. ○ There are potential challenges regarding trust in institutions and corruption.	• Ensuring the "legal quality" of IP systems is challenging. • Enforcement is often weak, reducing the value of IP ownership rights. • Complementary policies in addition to core IP system policies are weaker with more limited funding and constraints on governance. • IP systems will have only weak impacts on financing for innovation unless institutional barriers are overcome to enable such market developments.	• Institutional reforms at various levels remain critical for the legal and administrative framework of IP to operate. Trust is critical and would, if absent, lead to the failure of administrative and legal conditions. • Public policy efforts on finance are necessary for IP systems to positively impact innovation financing. • Seeking economies of scale in the provision of services, for example, by co-operating internationally to automate and improve the efficiency of IP application procedures or setting up regional TTOs to address weaknesses is critical.

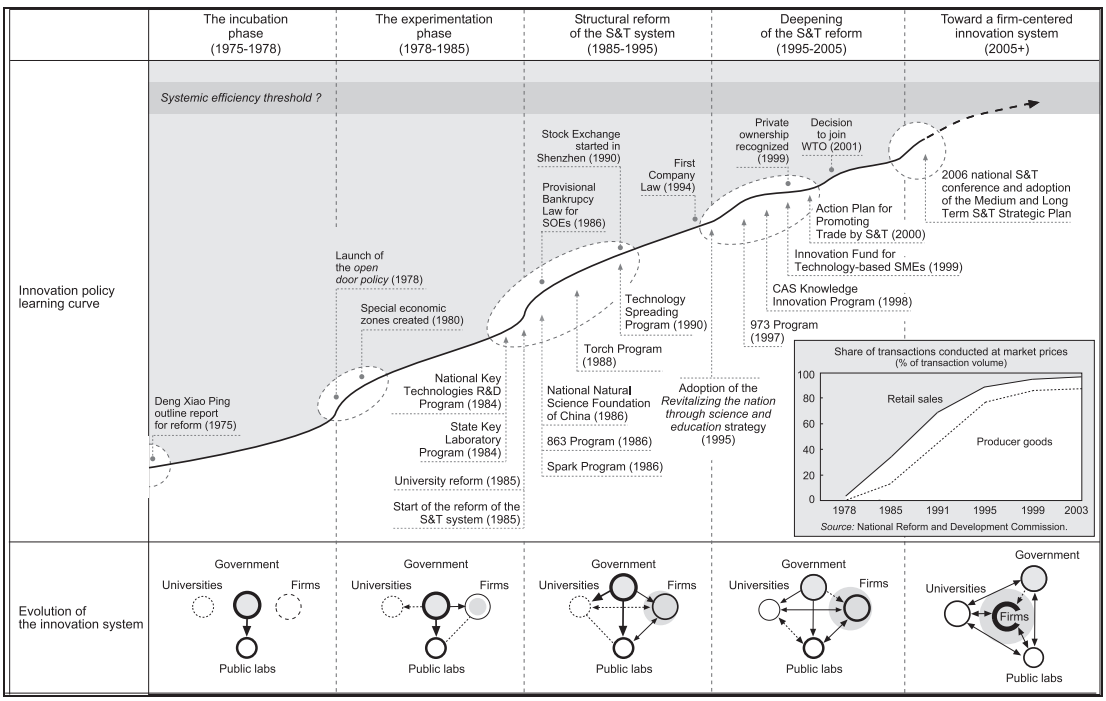
Table 1.2. Innovation system challenges, their impacts on IP systems and policy implications (*continued*)

Innovation system challenges	Impacts on IP systems	Policy implications
• **Knowledge is scarce.** ○ **The skills base for innovation is weak**. Skills are more concentrated, and research capacities, IP knowledge, managerial capacities and absorptive capacities from abroad are low. ○ **Foreign knowledge is critical,** but limited absorptive capacities challenge opportunities for local industry to benefit ○ **Levels of S&T activities are low.**	• Patents are not a realistic target for many actors because they lack the needed research capacities. • Tapping into knowledge provided by IP will be extremely relevant, but limited absorptive capacities can lower potential spillovers.	• Building up knowledge and research capacities must be a constant objective so as to increase the number of potential users of IP. It should include, in particular, patents and opportunities for tapping into foreign knowledge. • With limited skilled resources to support the innovation system the IP system should avoid absorbing a large share of engineers as examiners.
• **Market failures are prevalent.** ○ **Markets for finance** are weakly developed including for innovators. ○ **Infrastructure challenges** are substantial and constrain business activities, particularly for smaller businesses. Transportation costs limit market size.	• While IP can provide powerful incentives, the reality is that incentives will only arise for inventors who have successfully commercialised their products. This translates into IP systems that will, in the absence of addressing those challenges, only provide innovation to those less affected by market failures.	• IP policies alone are not sufficient to facilitate innovation, particularly for actors confronted with market failures. Policy complementarities should play a critical role in addressing and providing them with opportunities. • Regional IP offices can play an important role in providing access to users in remote locations.

Without discussing all dimensions, a few points are worth emphasising. First, inequalities and "islands of excellence" characterise these economies. A majority of the world's poor now live in middle-income countries where the inequalities in income and opportunities are strikingly skewed. The realities in many emerging and developing countries are such that a small fraction of the population has access to wider resources and opportunities, while other large groups lack access to the most basic resources. This has implications for innovation performance in that it implies substantial heterogeneities and often large informal sectors. Many emerging and developing economies have economic structures characterised by "islands of excellence" – very innovative, world-leading businesses, sectors, research institutions or universities – which co-exist with a group of weak performing firms or institutions and a substantial informal economy (OECD, 2013a). Due to the diversity of contexts for innovation faced by different groups within countries, conditions for innovators cannot be looked at from an aggregate perspective alone.

Second, the private sector often plays a marginal role in innovation with public research institutes and universities taking on a more central role: A frequently observed feature of developing country innovation systems is the small role of the private sector, which often has only weak innovation capabilities. In these cases only few companies have the human capital, scale and adequate market conditions to be effective innovators. This is particularly the case when it comes to investments in R&D. In low and middle-income countries, for which data are available, public research is critical for the majority of basic R&D, that is, close to 90% in Mexico and 75% in South Africa (WIPO, 2011). The private sector plays a more prominent albeit still not central role, as is the case in middle-income economies, which have evolved more towards more private firm-centred systems of innovation found in the most advanced economies. Figure 1.2 illustrates how China's development of a firm-based model went hand-in-hand with an innovation policy learning curve. The development process involved moving towards a more firm-centric model.

Figure 1.2. China's innovation policy: Institutional reform and learning curve



Source: OECD (2008), *OECD Reviews of Innovation Policy: China 2008*, OECD Publishing, doi: 10.1787/9789264039827-en.

Principles for country policy assessments: IP systems and innovation in a development context

Box 1.2 provides conclusions for country policy assessments based on the discussion in this chapter.

Box 1.2. IP and its relation with innovation

IP is a means to support innovation, but not an end in itself.

There are different types of IP. They differ in terms of the nature of the intangible asset they protect, their sectors of activity and the different actors they involve. All have a close connection to innovation.

The number of granted IP rights is an indication of successful inventive capacities, but not of successful innovation performance. An additional step has to be undertaken – the commercialisation of IP.

Comprehensive analyses of national IP systems for innovation must focus on:

- the organisation of IP systems, i.e. the set of critical legal and administrative conditions
- IP, markets and diffusion, i.e. critical market conditions for impacts of IP such as the state of competition and licensing opportunities
- IP users in different sectors of economy i.e. conditions of potential and actual IP use for different actors and activities
- IP policy questions.

IP policy has to be contextualised for an IP system to support innovation

The following challenges to development processes affect the potential impacts of IP and need to be considered as part of assessments of IP systems:

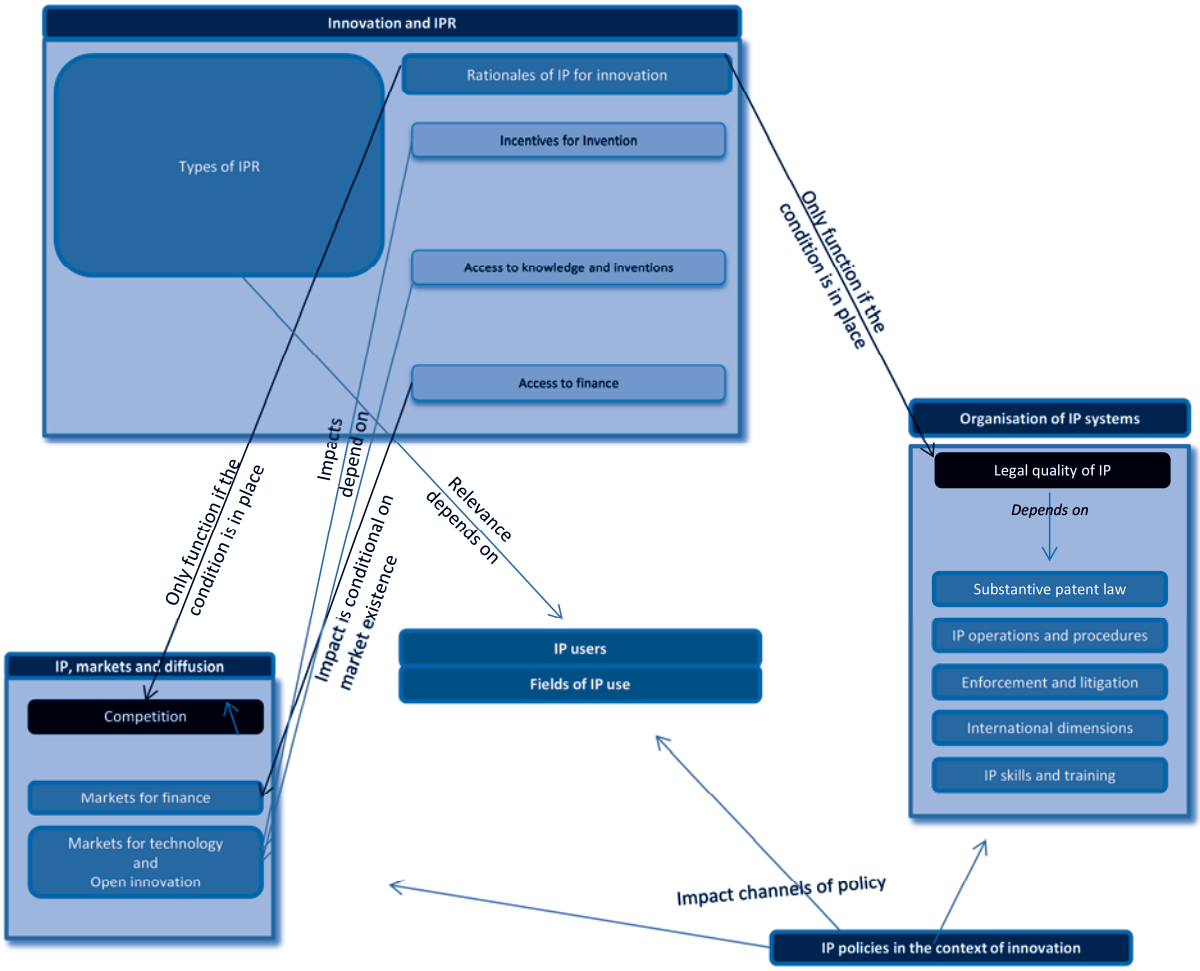
- large inequalities in the productive sector
- weak private sector capabilities with major capacities in research institutions
- institutional weaknesses and missing institutional settings
- scarce knowledge assets
- widespread market failures.

These challenges require complementary policies, particularly in order to commercialise IP and ensure the effective use of IP for innovation.

1.3. The legal and administrative conditions of IP systems

IP systems can support innovation performance in multiple ways; these mechanisms are described in Annex A. However, those mechanisms will only have impacts if the legal and administrative conditions are such that inventors effectively receive ownership of their IP. This in turn depends on factors ensuring "legal quality" (see Figure 1.3). However, it also depends on the state of competition and the extent to which IP can be traded on markets or provide access to finance.

Figure 1.3. Binding constraints on IP impacts for innovation



Organisation of the IP system

Legal quality

The legal and administrative conditions of the IP system have to provide "legal quality" if IP is to encourage innovation. In the case of patents, utility models, registered industrial design and plant variety, the following conditions characterise "legal quality":

- The *certainty* of legal provisions and the IP examination process needs to be guaranteed. In the case of patents, legal certainty is about clear legal provisions regarding subject matter, duration, scope and breadth, inventive step and disclosure requirements. It also requires objective, high-quality and timely IP examination procedures and enforcement. That is, the IP examination process has to be applied within a reasonable time period, using standardised criteria, and must decide on IP titles efficiently and in such a way that a low proportion of IP titles are rejected in court.
- *Stability* over time is crucial to avoid frequent changes that raise perceived uncertainties and put in question *ex post* rewards for *ex ante* investments, thereby weakening the incentives provided by the system.
- *Clarity* is vital to ensure that the IP system has effective disclosure of inventions.

- *Reasonable inventive step* (i.e. the distance of the invention to be patented from the state of the art in the given field, and novelty in the case of utility models) needs to be adopted to draw a balance between encouraging substantial inventions and excluding many relevant incremental innovations from the system.

In the case of trademarks and geographical indications, certainty of the IP examination process and stability are the key components of "legal quality". For unregistered industrial design rights, copyright and trade secrets, certainty over legal provisions and stability are the critical elements.

Finally, "legal quality" has to be attained at a reasonable trade-off against the requisite costs needed to achieve such an IP system.

Substantive patent law and laws regarding other types of IP

IP are legal rights. For these rights to operate effectively, a corresponding comprehensive and clear legal framework should be implemented. The critical dimensions for the working of the patent system are the following:

- *Subject matter* can impact how patents support or hinder inventions. Boundaries of the patent system apply, for example, to the question of genetic resources and business methods. Uncertainties regarding what is patentable can increase enforcement costs and therefore can reduce the incentives to patent.
- *Duration* of protection matters to the extent that it limits monopoly rights by making the invention available to the general public after a lapse of time. The legal provision operates in combination with patent renewal fees. The current provision is for 20 years. There are, however, provisions for patent term extensions in the United States and elsewhere, and supplementary protection certificates in the European Union.
- *Scope and breadth* are claims that define the scope of protection and thus its boundaries and conditions for infringement. The central issue regarding scope is that it defines the degree of potential monopoly power it provides to the patent owner.
- *Inventive step* is critical for providing incentives for inventions. The lower the threshold, the less patents will incorporate substantial inventions, and the higher will be the rate of destruction of previously held patents. Lower rates increase the number of patent applications, which has a downside in the uncertainty created by backlogs, and raise challenges related to patent thickets. While the threshold needs to be set above the state of the art if it is to offer incentives for innovation, determining the exact level at which to set the inventive step is difficult. If set too high, which would avoid the costs described, the step would exclude numerous de facto inventions from the patent systems. This could decrease incentives for inventions and reduce their potential for commercialisation. Taken together, it could result in negative effects on the system.
- *Disclosure* requirements ensure that information about inventions are shared to the benefit of society.

Regarding substantive patent law and IP law, the national IP policy of each WTO member country must comply with the TRIPS agreement. Signed in 1994, the TRIPS agreement applies to all developing WTO member countries since 2005, excluding only the least developed economies (Box 1.3).

Box 1.3. Overview of the TRIPS agreement regarding patents, trademarks, geographical indications and copyright

The TRIPS Agreement is to date the most comprehensive multilateral agreement on intellectual property. Signed in 1994, it applies to all developing WTO member countries since 2005, excluding only the least developed economies. It is a minimum standards agreement; members can provide more extensive protection of intellectual property if they so wish. The areas of intellectual property that it covers include: (i) patents; (ii) copyright; (iii) trademarks including service marks; (iv) geographical indications; and (v) industrial designs. The TRIPS agreement also allows for limited exceptions to IP rights, such as fair use, compulsory licensing and government use without authorisation of the rights holder, but requires that certain obligations are fulfilled. The specifications for different forms of IP are as follows:

Patents

The agreement requires that members make patents available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application. It also requires patents to be made available and patent rights to be enjoyable without discrimination as to the place of invention and regardless of whether products are imported or locally produced.

Members may exclude from patentability: (i) inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect public order or morality, including to protect human, animal or plant life or health, or to avoid serious prejudice to the environment; (ii) diagnostic, therapeutic and surgical methods for the treatment of humans or animals; and (iii) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes.

The term of protection available does not end before the expiration of a period of 20 years counted from the filing date.

Copyright

The agreement requires compliance with the basic standards of the Berne Convention for the Protection of Literary and Artistic Works. It confirms that copyright protection shall extend to expressions, computer programs and databases, provided that the arrangement of contents constitutes intellectual creation. It does not extend to ideas, procedures, methods of operation or mathematical concepts as such.

The general term of protection, which must be granted automatically, constitutes the life of the author plus 50 years from their death. If not based on the life of a natural person, the term of protection is no less than 50 years from the end of the year of production.

Trademarks

The basic rule for trademarks is that any sign, or any combination of signs, capable of distinguishing the goods and services of one undertaking from those of other undertakings, must be eligible for registration as a trademark, provided that it is visually perceptible. The TRIPS agreement requires service marks to be protected in the same way as marks distinguishing goods.

Members may make registration of trademarks dependent on use, but at least three years must have passed after the filing date before failure to realise intent to use is allowed as grounds for refusing an application. Initial registration and each renewal of registration of a trademark lasts for a term of no less than seven years. Registration of a trademark is renewable indefinitely.

Industrial designs

Members have to provide for the protection of independently created industrial designs that are new or original if they do not significantly differ from known designs or combinations of known design features.

The duration of protection available amounts to at least 10 years. The wording "amount to" allows the term to be divided, for example, into two periods of five years.

Source: WTO, *Overview: The TRIPS Agreement*, accessed at www.wto.org/english/tratop_e/trips_e/intel2_e.htm.

IP operations and procedures

Registered IP only works if national IP systems provide for objective, high-quality and timely IP examination procedures and enforcement. The pricing strategies involved also have to be carefully considered since they can impact on IP examination procedures and their duration by affecting access to the IP system and the nature of applications deposited at IP offices.

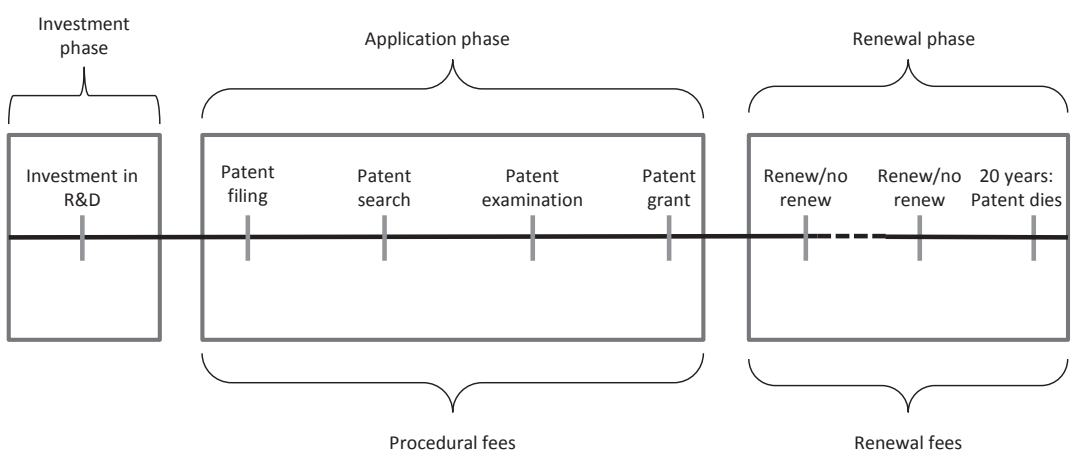
Patents, utility models, plant variety protection and registered design rights

The four steps in the patent application process (Figure 1.4) are as follows:[1]

- The entity seeking patent protection files a patent application at a patent office. The application must disclose in sufficient detail the invention for which protection is sought for the average skilled person to be able to understand and make use of it.
- The patent office appoints an examiner who takes charge of the application and conducts a novelty search. The patent document is made public with a search report 18 months after filing date.
- At the examination stage, a decision is taken regarding "non-obviousness" and "inventive step", where granting of a patent means no reason for refusal as all criteria for patentability are met. Applicants normally need to request examination within a given timeframe after receiving the search report.
- Once granted, a patent can be maintained for a maximum duration of usually 20 years from the filing date, subject to the payment of renewal fees. It can be challenged by competitors in courts and possibly amended or revoked.

Similar processes arise for utility model applications, but with substantial differences regarding notably the examination stage, as well as the duration of the application process and the granted IP rights. The registration of industrial design rights and plant variety protection follow a similar routine, but again with differing processes for registration and duration of protection.

Figure 1.4. The patent life-cycle



Source: EPO (2010), Study for the EPO on the Economic Dimensions of the Fee Structure in the European Patent System Final Report, European Patent Office, London.

Trademarks

The steps in the trademark process are as follows (Millot, 2009):

- An application for registration of a trademark can be filed with trademark offices. The application must contain a clear reproduction of the distinctive sign filed for registration, including any colours, forms or three-dimensional features. It must also contain a list of goods or services to which the sign would apply.
- The offices then examine the application to ascertain that the sign is not identical or similar to trademarks already granted to another trademark owner and also whether the application complies with trademark regulations.
- The trademark is then published "for opposition" so that third parties may oppose its registration within a period of a few months.
- In the absence of oppositions, the mark in question will be registered.

It is also possible to register a trademark with the WIPO system of international registration of marks, which is governed by the Madrid Agreement Concerning the International Registration of Marks and the Madrid Protocol.

Costs of IP operations and procedures

There are several types of costs associated with registering IP. For patents, costs include administrative fees such as filing, search, examination, country designation and grant/publication fees; process costs associated with drafting of rather complex applications, monitoring, which can be in-house or outsourced; translation costs where applications are made abroad; and maintenance costs including renewal fees. For registered industrial design, PVP and utility models – all of which are awarded based on novelty requirements – several of these fees also arise since the novelty requirement also imposes an examination process. The application process is, however, much lighter for utility models. The case of trademarks differs since the award is based on "uniqueness".

Those costs have impacts on would-be users of the IP system. Fees also finance the processing costs and, thus, the functioning of the IP-granting system. In the context of OECD countries, the major costs are process and enforcement costs, as well as translation costs for patents targeting more than one market. A main policy concern is that certain would-be inventors – namely small entities – face substantial costs and may be discouraged from using the system. Filing and search fees have less of an impact on applicants from advanced countries compared to processing and maintenance costs (EPO, 2010). In the case of developing and emerging countries, however, filing and search fees can be a barrier for some applicants as financial constraints are commonly higher. It is also worth noting that the geographical distance to the IP office can impose an additional cost on inventors if IP cannot be applied for online. The fee system should not exclude inventors whose contributions can be substantial. For that reason, discount fees have been introduced where those costs might represent a barrier, such as for small firms and universities. This is also the case for Colombia and Indonesia, as discussed in Chapters 2 and 3. At the same time, institutions in charge of innovation, which provide IP support policies that substantially reduce the costs involved in seeking patents, need to consider whether some of these policies support patent applications that add to backlogs, but do not necessarily "add value". This can notably be the case if the "quantity" rather than "quality" of IP applications is rewarded, where "quality" can be

defined as the probability that the invention will be granted an IP title and, moreover, that it will be successfully commercialised. Such policies might also increase the performance costs of the IP system.

A major challenge regarding procedures is delays in processing IP applications. The surge in patent applications in many jurisdictions has led to substantial delays in decisions on IP applications. Delays create uncertainty that can be detrimental to contributions towards innovation. Inventors may not proceed with efforts aimed at commercialising their inventions and competitors may be deterred from engaging in related research until patent decisions are made. Moreover if inventors expect long delays in decisions, this will reduce their incentives to engage in investments in the first place. This applies particularly to industries where inventions quickly become obsolete due to rapid technological change. If IP systems are to offer incentives for inventions as well as support innovation, they should ensure a reasonable duration for processing patents. Furthermore, it is critical that the quality of the examination process is not compromised. Raising fees is an option, but one that can only be used to a limited extent, as the IP system should not exclude groups of inventors by imposing unaffordable high fees.

A common approach adopted by many IP offices is to reduce procedural fees to avoid excluding certain kinds of innovators, while at the same time increasing renewal fees. IP offices can thus finance examination costs for unsuccessful applications by cross-subsidising low procedural fees that enable their access (EPO, 2010). Possible opportunities for improved pricing for specific types of procedural fees, include filing, search and examination fees, and can create a more efficient system. Some applicants strategically seek to delay the patent granting process in order to distort investment decisions by competitors. Delays impose a negative externality by contributing to uncertainties. Hence, mandatory fees for further processing request applicants, who fail to comply with set time limits, could be increased to reduce delays and avoid such abuse.[2]

The patent system has to preserve "legal quality", which renders simple approaches towards speeding up procedures more complex. Patent examiners have to maintain quality of the examination process to ensure that only a low share of IP titles are rejected in courts. Otherwise the value of IP titles would be diluted because owners of patents, if challenged, could never be sure that their rights would be upheld in courts. Moreover if many patents were wrongly granted, this would mean that competition would be blocked where it should not be. This could increase incentives to those seeking additional IP only to block competitors, even in cases where applications should have a low probability of actually receiving patents. This distortion of the process could lead to an even higher rate of patent applications, which increases backlogs. In developing and emerging countries the challenges are similarly important, particularly as the resources available to IP offices are limited. While providing IP offices with more resources can be an effective solution, developing and emerging countries should carefully consider any additional investment. This is particularly the case for increasing the share of highly skilled staff, such as engineers, whose resources are scarce in the overall economy and thus are needed as key contributors to the innovation system.

Satisfying the "legal quality" requirements for IP operations and procedures at reasonable cost is challenging and requires investment in opportunities for raising productivity. Improvements can be made by taking advantage of ICT systems to automate processes and speed up the retrieval of relevant information for the examination process. Many developing and emerging countries including Colombia and Indonesia (as discussed in Chapters 2 and 3) are currently engaged in such efforts, often in co-operation

with WIPO and IP offices in other countries. Some IP offices have experimented with outsourcing some examination procedures. They have to ensure competitive criteria for selection, including pricing and quality of the service provided by the external parties. Some IP offices share examination results obtained for patents that were deposited previously in the other IP offices. Moreover, innovations in processing IP in other offices can prove helpful adding to the pay-offs from co-operation.

Enforcement

The legislative context is a pre-condition for obtaining rewards from IP ownership. If IP cannot be enforced because of a weak legal system, then potential inventors will not perceive much value in obtaining IP ownership, and the system will fail to provide incentives. In the case of all unregistered IP (i.e. copyright, trade secrets and, in some cases, industrial design), enforcement is the main cost component ensuring whether or not inventors are rewarded. IP rights are private rights and, thus, the main responsibility for taking measures to protect and enforce IP should lie with rights holders. However, opportunities for enforcement depend on: (i) a functioning court system and (ii) effective police and law enforcement bodies. A functioning court system for IP law offers dispute resolution where IP law is interpreted in a consistent and predicable way. Moreover, because litigation cases can be very costly and take considerable time, alternative procedures are valuable, such as mediation services which can help reach agreements over IP conflicts. This approach is beneficial because high enforcement costs can substantially reduce the resources available for innovation. What is more, enforcement might be perceived as too costly for some firms to derive actual value from their IP and, in consequence, these firms might not use the IP system. Where this is the case, policies that provide support by covering IP registration fees will be insufficient to incentive the use of the IP system by firms. Another key element is effective implementation of court decisions. Adequate training of agents in charge of enforcement is similarly critical.

International dimensions

IP provides national rights; that is they provide territorial rights which apply only to the country for which they have been granted. This also applies to PCT applications (described in Box 1.4) although a single PCT application can seek patent protection in multiple countries to facilitate cost savings for those inventors who aim for an international IP strategy. Several international and regional agreements have introduced more harmonised IP rights and modifications in national legislations, including the TRIPS agreement, which have led to international standards regarding IP. This also includes major international IP agreements (Box 1.4). Regional country unions, such as the Andean Community, also have provisions for IP as have bilateral free trade agreements. As innovation activities are increasingly globalised, such international dimensions might effectively form a natural extension of national IP systems. Developing and emerging countries that participate in the global economy can benefit from engaging in discussions over the design of IP internationally. Moreover, internationalisation can also benefit national IP systems, for example, by sharing examination results to reduce processing costs across IP offices.

Box 1.4. Major international IP agreements

Major international agreements, which are administered by WIPO, include the following (see Box 1.3 for an overview of the TRIPS agreement):

Paris Convention (initially adopted in 1883/in force since 1884) contains substantive provisions regarding all types of industrial property including patents, trademarks, industrial designs, geographical indications, trade secrets and utility models, and also provisions against unfair competitive practices. It has a total of 175 contracting parties (July 2013).

Madrid System for the International Registration of Trademarks (Madrid System) (initially adopted in 1891 and in force since 1892**)** functions under the Madrid Agreement of 1891 and the Madrid Protocol of 1989. The Madrid Protocol has 91 contracting parties, 56 of which are also contracting parties of the Madrid Agreement (July 2013).

Hague Agreement Concerning the International Deposit of Industrial Designs (Hague Agreement) (initially adopted in 1925 and in force since 1928) provides a single application mechanism for registering a design in the contracting parties to the Agreement. It has 60 contracting parties (July 2013).

Patent Cooperation Treaty (PCT) (initially adopted in 1970 and in force since 1978) provides the possibility of seeking patent rights in a large number of countries by filing a single international application (PCT application) with a single patent office (receiving office), and then entering the national stage in the desired countries at a later date. It has 148 contracting parties (July 2013).

Berne Convention for the Protection of Literary and Artistic Works (Berne Convention) (initially adopted in 1886 – last amended in 1979 – and in force since 1984) contains a series of provisions determining the minimum protection to be granted, as well as special provisions available to developing countries that want to make use of them. It has 166 Contracting Parties (July 2013).

Trademark Law Treaty (TLT) (adopted in 1994) aims to simplify and harmonise the administrative procedures of national applications and the protection of marks. Individual countries and intergovernmental organisations that have regional offices for the registration of trademarks may become party to the Treaty. It has a total of 53 contracting parties (July 2013)

Patent Law Treaty (PLT) (adopted in 2000/in force since 2005) contains provisions to harmonise and streamline formal procedures in respect of national and regional patent applications and patents. It provides maximum sets of requirements that the patent office of a contracting party may apply. It has 34 contracting parties (July 2013).

IP skills and training

The quality of IP systems depends on highly qualified and trained IP staff from the public sector and on well-informed and experienced end users from the private sector. Among the many required actors are policy makers who design innovation policy with knowledge about how IP can best serve their policy objectives, examiners with the appropriate skills to ensure the examination quality of the IP system, and qualified lawyers and judges to ensure enforcement. On the end user side of the IP equation are informed universities and businesses with a sufficient understanding of IP to serve their interests. Lack of awareness on either side will reduce the efficiency of the IP system. This is not to say that all end users in the innovation system need to have an intimate knowledge of IP. Rather, those with the highest potential should be most aware about the forms of IP most relevant to their businesses. If firms are not sufficiently informed, they might not know how to use IP or use it inadequately with low returns to the firm. In either case, uninformed end users neither support innovation nor create a dynamic whereby local businesses take more advantage of IP. National IP offices and other national institutions offer a variety of training modules. Support is also offered from abroad (e.g. WIPO, IP offices from other countries, etc.).

IP, markets and diffusion

Competition

Competition authorities in developing and emerging countries have to be prepared to address abuse of IP systems that work to the detriment of promoting innovation. It is important to stress the following points:

- IP rewards inventors by guaranteeing exclusive monopoly rights over their inventions. This is the essential incentive mechanism well-functioning IP systems provide. However, IP systems do not operate well in monopolistic contexts since competition critically impacts firms' innovation activities (e.g. Ederington and McCalman, 2008; Fernandes and Paunov, 2013; Thoenig and Verdier, 2003). Market concentration in emerging markets poses challenges for innovation that, while independent from IP per se, need to be addressed. If they are not, businesses may not actively seek inventions and, therefore, refrain from using IP at all.
- IP can create a challenge for innovation activities if used by incumbents to block competitors or, alternatively, to enter collusive licensing agreements to create greater rents on the basis of their IP. Some types of practices such as cross-licensing threaten competition and have been used for collusion, creating barriers to entry. Abusive behaviour by powerful incumbents, in particular, needs to be addressed by competition authorities to avoid weaker market participants being driven out by anti-competitive uses of IP. The role of competition authorities in the case of IP is not to deny monopoly rights, nor the returns that markets provide for them (as this forms part of the very rationale for IP-provided incentives), but to ensure that IP is not used as a tool to exclude competitors.
- Challenges to competitive markets can be particularly important in sectors where network effects are strong because emerging standards can fundamentally affect the value of some IP, namely that which acts as gatekeepers for firms to operate in certain markets (Foray, 2004).

Competition questions will become even more challenging as markets for IP develop further, notably with regard to cross-licensing agreements and patent pools. If competition authorities are not well prepared, the potentially positive effects of markets for technology can foster monopolistic market structures to the detriment of innovation and development.

Licensing and markets for IP, open innovation and open-source models

The contributions of IP towards innovation also depend on the extent to which open innovation initiatives and markets for IP are developed in their economies. If national actors follow an open-innovation approach by seeking inventions externally, this creates a larger market for inventions. This approach can increase incentives to obtain IP because it will also enhance its attractiveness to inventors who do not have the resources to commercialise their inventions. These markets create an opportunity to derive value from it. Otherwise IP will only provide value to owners with the adequate manufacturing capacity, while providing limited value to university researchers and many smaller start-up businesses. Box 1.5 summarises the benefits of developing markets for IP. Moreover, licensing agreements are also critical for businesses to access technologies as a way to tap into knowledge to stimulate learning and raise their innovation capacities.

Box 1.5. Benefits of developing markets for IP

Developing markets for IP will benefit emerging economies for the following reasons:

- Inventions are born out of a combination of existing ideas, data and insights, which are initially separate and need to be brought together for new ideas to emerge. Hence, easier conditions for explicit knowledge flows will foster innovation, and will allow for a better exploitation of complementarities across innovative entities, hence boosting the collective efficiency of the involved innovators. For instance, new drug treatments are increasingly the result of joint work of biotech companies specialised in the identification and analysis of genetic pathways and of pharmaceutical companies specialised in the effects of drugs on human health. Complex products like aeroplanes involve complex structured supply chains comprising numerous businesses, each contributing its own innovations.
- Knowledge flows make possible a broader, more diverse and better use of existing competences and knowledge, beyond the uses or applications foreseen by the sole proprietor. A skilled biotech expert can apply ingenuity to solving a problem raised by a chemist. Likewise, a new material invented for aircraft can find use in bicycle production. The circulation of explicit knowledge on markets for technology is essential to productivity growth, as inventing and manufacturing goods are two distinct activities that rely on different competencies and facilities. Knowledge flows allow companies to specialise in what they do best. They allow inventions to be implemented by actors other than inventors, who are not necessarily good at manufacturing and marketing products. They facilitate the emergence of companies that specialise in research in disciplines such as biotech, chemicals and ICT. While young firms are not necessarily equivalent to small technology-based business, the data shown in Figure 1.5 give at least an approximate indication of the potential importance of these businesses.

Figure 1.5. Patenting activity of young firms, 2009-11

Share of young patenting firms and share of patents filed by young patenting firms, EPO and USPTO

Sources: OECD (2013), OECD Science, Technology and Industry Scoreboard, OECD calculations based on the Worldwide Patent Statistical Database, EPO, April 2011; and ORBIS© Database, Bureau van Dijk Electronic Publishing, December 2010; matched using algorithms in the Imalinker system developed for the OECD by IDENER, Seville, 2011. See notes provided in OECD (2011a).

- By making inventions available to a broader range of potential manufacturers, knowledge transfers allow for the implementation of inventions on a larger scale, in greater quantities and variety. If, for example, a young firm invents a specialised electronic device, it can be implemented in many products manufactured and marketed by global companies. With the emergence of global value chains, multinational firms can better exploit the comparative advantage of developing and emerging countries, either for inventing or manufacturing.

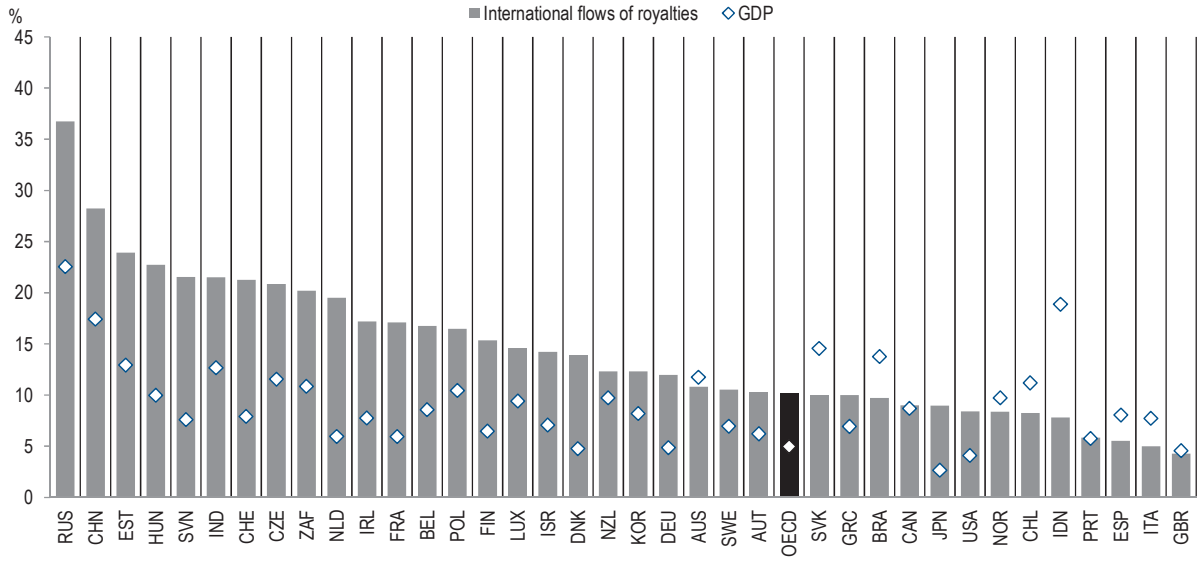
Source: Based on OECD (2010), "Knowledge Networks and Markets: A Typology of Markets in Explicit Knowledge", internal working document, OECD, Paris.

Independent of the development of such national markets, the role of markets for technology and IP is increasing, as knowledge becomes an increasingly important source of competitiveness. The concept of the "knowledge society" has been widely used to indicate an increased role for the intangible aspects of products. In consequence, IP has become an even more important asset. On a global scale, innovation processes are increasingly based on explicit knowledge created outside the boundaries of the company. Thus co-operation has become an important way of tapping into outside knowledge in order to generate new ideas and bring them quickly to markets. In almost all countries for which data are available, transactions involving royalties and license fees grew faster than GDP over the last decade (Figure 1.6). Companies that enter into such transactions are motivated by new business opportunities, being able to share risks, taking advantage of complementary resources and realising synergies. In addition, companies can achieve higher flexibilities in responding to fast-moving markets, while reducing the costs required for inventions. For firms in emerging and developing countries, opportunities to enter into licensing agreements at affordable terms constitute a critical way of accessing knowledge.

In addition to these transactions, ICT offers companies the ability to facilitate innovation processes that move beyond traditional in-house innovation production models. ICT has probably affected the trade-offs of developing in-house production versus outside production of technology. At the same time, ICT acts as an enabler of an alternative model of open innovation, the open-source model, which applies IP in a rather different way. Such models potentially offer a powerful means of encouraging joint modes of invention that might also involve end users. In conclusion, the value and contribution of IP will evolve with global and national trends and, thus, it is essential that developing and emerging countries monitor developments to use IP to best support their innovation systems.

Figure 1.6. International technology flows of royalties and licensing fees, 2000-11

Average growth rate, based on current USD, percentages



Note: average of receipts and payments.

Source: OECD (2013), *OECD Science, Technology and Industry Scoreboard 2013: Innovation for Growth*, OECD Publishing. doi: 10.1787/sti_scoreboard-2013-en.

Markets for finance

IP can potentially support access to finance for innovators if IP titles can serve as collateral. However, this depends on whether financial markets provide corresponding opportunities. Often commercial banks do not have the necessary competencies to value technology, and they are oriented towards funding projects with lower risk profile. Fostering different financial models to provide opportunities for risky innovation projects is, thus, a precondition for IP to play such a role. Moreover, a critical factor in this regard is IP valuation (i.e. assessing economic value of different types of IP), a rather complex activity as much depends on the final product and its future success on markets. This will require training of professionals who are equipped with the requisite knowledge and experience to handle the valuation of IP assets. This is not exclusively a challenge faced by developing and emerging countries; it also is a challenge for many OECD countries.

Principles for country policy assessments

Box 1.6. Principles for country policy assessments: Legal and administrative conditions for IP systems

Binding constraints for IP to foster innovation.

Binding conditions for IP relate to the organisation of the IP system, where legal quality needs to be ensured, as well as to markets where competition is particularly critical. Other factors that shape impacts are markets for finance and technology, as well as open innovation initiatives.

Legal quality is needed to provide adequate legal and administrative conditions for IP.

For IP to offer incentives for inventors, national IP systems have to provide legal quality. Ensuring legal certainty requires adequate IP legislation and application procedures at IP offices. Two steps are required: (i) evaluating whether the existing legislative framework provides legal certainty and (ii) checking whether services provided by IP offices ensure quality in the examination procedures.

Legal provisions are a first condition for legal quality.

Legal provisions are the primary ingredient to provide legal certainty, as they offer clarity as to the ownership rights the inventor can expect to receive. With the TRIPS agreement, WTO member countries have agreed to a common approach along several dimensions. The scope for national policy requires clarity on subject matter for certain issues, such as the question of genetic resources, and use of some types of IP, such as utility models. The major decisions, however, involve how IP procedures are applied in practice, such as how to apply the disclosure requirement and the threshold on the inventive step for patents. Both can be critical for the operations of the IP system.

Innovation systems in developing and emerging countries can benefit from *effectively using information contained in IP applications to avoid costly duplication and orient research to more competitive uses.* As disclosing information is not necessarily in the interest of inventors, adequate legal provisions regarding disclosure and their practical implementation are important. IP offices should also provide users with online access to patent databases. These efforts need to be complemented by training particularly for smaller businesses to ensure information contained in IP applications is effectively used.

Operations and procedures in IP systems need to be in place for legal quality.

Emerging and developing countries have to ensure that operations and procedures in IP systems support legal quality. To reach this objective the following points are important:

- IP offices should invest in co-operating with patent institutes from foreign countries with similar IP characteristics with respect to examination, seeking efficient types of outsourcing of processes and supporting automation processes. This can allow productivity gains to improve performance without raising costs or compromising quality. This will also allow saving on scarce skilled human capital that is needed in the economy, particularly in the form of innovators. …/…

Box 1.6. Principles for country policy assessments: Legal and administrative conditions for IP systems *(continued)*

- Fees charged for processing applications should not create access barriers for inventors. Cross-subsidising low procedural fees and reduced fees for certain categories of applicants, usually "small entities" such as universities and small firms, by raising renewal fees is a reasonable approach. In addition, renewal fees reduce the monopoly rights over patents by shortening the duration of such rights for those patents for which renewal is not sought.
- Certain fee structures can contribute towards reducing workloads and avoid some abuses of the IP system by applicants who ultimately reduce its effectiveness. IP offices should consider raising fees for further processing, as such additional processing may often be used for ulterior strategic purposes and can slow down the system's performance.
- Support policies aimed at increasing IP applications should not lead to an increase in low-quality applications with limited contributions to invention, as these add to the workload of IP systems and impede efforts to reduce processing times and preserve quality. Ensuring this often requires setting up more complex IP support policies than simple fee coverage including, for example, additional financial returns for inventors if IP titles are granted and further rewards if those inventions are turned into innovations.

IP offices must have the right incentives to ensure the system works optimally. For self-funded institutions, incentives might lead to fee structures that do not serve innovation, such as charging fees that are unaffordable for some potential applicants. On the positive side, reliance on own funding generated can support a service culture that seeks to serve applicants better than would otherwise be the case. Periodic evaluations of policies of IP offices to ascertain how well they serve innovation systems can be useful as a control mechanism, with the adoption of measures to address potential problems.

Enforcement is critical for legal quality.

Enforcement including effective litigation is critical because it affects legal certainty. Efficient enforcement should be fair to the inventor so that the IP system works to the advantage of innovation. Since litigation is very costly, arbitration mechanisms that can help avoid costly litigation are beneficial. Supporting courts with the required skills is often critical and its absence effectively weakens the system's capacities.

Skills are a further requirement.

IP systems need qualified IP-trained staff at key institutions to provide high quality services to support innovation. This includes appropriate skills and training of those working in institutions implementing IP policies, processing IP applications and ensuring enforcement.

Inventors will only use the system if they are aware and sufficiently trained. While general awareness campaigns are useful, middle-income economies should also seek to offer services that help firms identify how IP best suits their own purposes (e.g. tailored training for those with highest potential gains). Chambers of Commerce could also play a role in identifying firms and research institutions with the biggest potential for innovation based on the nature of their products or their internal resources, as well as identifying businesses with an interest in exploring IP strategies.

Competition policy has to contribute towards an environment that is conducive to innovation.

IP systems have to strike the right balance between granted monopoly rights and competition, given the latter's substantial contributions to innovation. Strong competition policy is essential to ensure that the IP system operates in a competitive environment. This requires adequate legal provisions and measures to ensure that competition authorities take action to restrain abuse where collusive behaviour prevents competitive markets from operating freely. The separation of the competition authority and IP office is critical to avoid conflicts of interest.

Developing opportunities for inventors to receive financing could raise the contributions of IP towards innovation. These types of financial markets are weakly developed in developing and emerging countries, so government support for credit schemes, where IP can serve as collateral, are worthy of consideration.

Monitoring and assessing how IP policies can best support innovation is important.

The value and contributions of IP evolve with changing global and national trends. Countries have to critically assess and monitor these developments so as to inform their IP policies with the best approaches for supporting innovation performance. Support for economic analysis units in IP offices is one possible approach to help ensure IP policy is informed by such changing trends.

Table 1.3. Categorisation of types of innovators and most relevant IP policy principles

Groups of innovators and policy aims and objectives	Type/source of invention/ innovation and dissemination	Main agents involved	Example of activities and innovations	IP policy principles
Innovators in traditional and informal sectors *Overall aim* To support these activities to reach subsequent "catching-up" stages and to help include marginalised groups *Policy objectives* To support grassroots innovation including by mobilising traditional knowledge to support welfare To address challenges of traditional and informal sectors, which often employ a large share of the labour force To support incipient and "promising" but undeveloped economic activities	Incremental innovations based on intelligently applying existing innovations and traditional knowledge and, in some cases, based on using external scientific expertise to optimise impacts and increase economic returns	Informal businesses engaged in various types of economic activities Groups both in rural and urban areas not engaged in formal economic activities Public institutions, research universities and networks contributing work relevant for grassroots innovation, the informal sector and traditional industries	Innovative product developments in traditional industries such as handicrafts including types of furniture and textiles, and food-based activities such as coffee Developing products based on insights from traditional medicines such as *Ayurveda* Innovation activities of the Honey Bee Network	Support enhanced commercial use of trademarks, design geographical indications (GI) for traditional industries, and copyright for artistic creations and related innovation activities Organise collective action efficiently to build economic value by supporting effective collecting societies for copyright or industry associations for GI and trademarks to protect handicrafts or food products Enable access for certain groups Build awareness-raising activities for actors to use IP in support of their economic activities
"Catching-up" businesses *Overall aim* To support businesses in building initial innovation capacities to advance towards the "frontier" and overcome "middle-income traps" *Policy objectives* To establish capacities to adapt technologies and innovations To build up innovation capacities and establish niche competencies To ensure widespread dissemination of innovation among businesses	Incremental innovation based on innovations and technologies developed by others including abroad Dissemination of innovative technologies across businesses especially those generating more substantial generic benefits	Universe of private businesses of all types including small and medium-size establishments Public institutions and industry organisations to address co-ordination challenges for building up new activities Universities and research institutes allowing adaptation and support for building up capacities of businesses	Development of new plant varieties for agriculture Efforts at developing new methods for mineral extraction in the Chilean copper industry to satisfy local needs	Support innovation activities by facilitating use of trademarks, design and utility models Ensure fees are kept low for small and medium-sized firms including fees for applications, processing, renewals and enforcement costs Facilitate licensing agreements to enable access to knowledge and raise opportunities for financing based on IP Build awareness-raising activities for actors to use IP in support of their economic activities.

Table 1.3. Categorisation of types of innovators and most relevant IP policy principles *(continued)*

Groups of innovators and policy aims and objectives	Type/source of invention/ innovation and dissemination	Main agents involved	Example of activities and innovations	IP policy principles
Leading "frontier" businesses *Overall aim* To support leading businesses to successfully compete internationally, reaping revenue from foreign markets *Policy objectives* To ensure their position on the value ladder in global value chains To keep competitiveness in industries where the country is "at the frontier"	Innovation is identical to developed countries exposed to developments in global market, and involves incremental and radical innovation	Involves private sectors with support from public agents and intermediaries; large firms can be important Involves mainly private sector in interaction with leading public research institutions and universities; global partnerships are often equally of relevance for world-leading innovations	India's software industry Brazilian company Embraer or Colombian company Ecopetrol	Provide support for obtaining IP abroad and strategic positioning with respect to international competitors, so as to tap into larger markets and foreign markets for technology Strategically use patent information to define fields for internationally competitive research for identifying such IP Critically assess the value-added of additional innovation support policies, such as R&D tax credits Ensure adequate incentives for researchers and their institutions
Research institutions and universities *Overall aim* To support contributions towards innovation for socio-economic objectives *Policy objective* To produce inventions for innovation systems in emerging countries Develop capacities of research institutions to support private sector innovation activities To develop research capacities for addressing social challenges To strengthen capacities for developing a sufficiently advanced skills base	Wide range from major inventions and scientific research conducted in global partnerships, as well as support for social and grassroots innovation including those that help introduce technical innovations to disadvantaged communities	Public and private universities and research institutions connected to global networks in their capacity to address socio-economic challenges Public and private universities and research institutions engaged with the private sector jointly collaborating on research to: help incipient industries and/or activities; support catching up; and help maintain frontier innovation capacities	Innovations developed by universities to address soil degradation Brazil's Escola de Minas, in particular its leadership in the steel sector	Ensure adequate incentives for researchers and their institutions Ensure support for organisational context to help obtain IP, for example, efficient TTOs at regional level to exploit economies of scale Ensure opportunities for commercialisation activities including markets for technology, linkages with industry and regulations for researchers Build awareness-raising activities for actors to use IP in support of their research

1.4. Adapting IP systems to users in a development context

Innovation is important at all stages of development, and different types of innovation play different roles. Incremental innovation is often associated with the adoption of foreign technology, while social innovation can improve the effectiveness of business and public services. High-technology R&D-based innovation matters more at later stages of development, when it acts as both a factor of competitiveness and of learning (facilitating completion of the "catch-up "process). Annex A describes those multiple contributions in more detail. In order to support those opportunities for innovation in a context of substantial heterogeneities, it is critical to adapt national IP systems to the needs of the different actors in the production sector. This is an important step to reduce the IP commercialisation gap with developed countries, which unlike the gap with developed countries, in terms of IP titles, shows no signs of narrowing (Ghafele and Gibert, 2012).

Users of IP

Four "stylised" groups of innovators can be identified: (i) innovators in traditional and informal sectors, (ii) "catching-up" businesses, (iii) leading "frontier" businesses; and (iv) research institutions and universities (Table 1.3). The first three groups are essentially, but not entirely, progressive stages of development in innovation capacities. Different processes occur within the same country for different sectors and activities and frequently also within the same sectors and activities. No one type of actor matters exclusively in a different country context; rather it is essential to consider in each country each of these groups as they all have a role to play for innovation. Focusing on the different types of actors has to, therefore, form the core of analysis on IP and its contributions towards innovation for development. The group of distinct IP issues are discussed in Table 1.3. The IP policy issues questions, raised for specific groups, will also affect some of the other innovators.

Innovators in traditional and informal sectors

From a social and economic perspective, support for local and inclusive innovation is important because those sectors often employ a substantial share of the labour force in developing and emerging countries. However, IP for innovators in traditional and informal sectors is less relevant than it is for the other three groups of users because activities in this group are much more incremental and often involve very small local markets. They might, therefore, not be of sufficient quality for IP and patents, in particular, might be out of reach. This said, low use of other types of IP might be due to limited awareness or concern over enforcement rather than limited potential returns. Evidence on the relative importance of these factors to date is still scarce (WIPO, 2013a).

Several IP-related opportunities arise for IP policy. These include GI for traditional activities and other IP rights that closely affect agricultural products, handicrafts and *traditional knowledge.* Types of IP such as GI offer the opportunity to include specific regions that might otherwise remain marginal in standard innovation processes. The introduction of GI can result in economic benefits to local communities, such as higher prices for local agricultural products compared to those from other regions. Examples include locally grown coffee beans that are recognised as "community-owned". GI can thus generate resources in support of regional development and offer opportunities to integrate this group of innovators into innovation systems.

Traditional knowledge can provide opportunities for innovation but pose challenges for the current IP system, as knowledge belongs to communities not individuals. In the area of healthcare, for example, traditional medicines, such as *Ayurveda*, which is native to the Indian subcontinent, can act as inputs for local groups to patent and develop innovations. Research institutions and companies can provide needed research capabilities to effectively turn products with economic potential into IP-protected products that generate economic returns for local groups. Products must pass regulatory tests before they can be sold on foreign markets, a process that also requires support from research institutions. It is worth noting that local entrepreneurs have also deployed non-IP strategies to successfully market these types of products.

Discussions around IP for traditional knowledge are complex because they refer to collective ownership of existing knowledge rather than "new" knowledge. However, they are of particular interest to developing and emerging countries as they can potentially result in profitable assets for local groups. (The topic is also of concern to some developed countries, such as Australia and Canada.) Moreover, traditional knowledge can also be a means to support marginalised groups that are weakly positioned to compete in innovation systems. Similarly, claiming national or group ownership over traditional knowledge can help these groups to engage in innovation activities. However, this will be the case *only if* traditional knowledge is applied to specific economic activities, such as the development of novel entertainment products. In sectors such as furniture or textiles, developing and emerging economies have traditional advantages and could extend their markets to developed country markets. The exploitation of traditional knowledge in such cases might provide a competitive advantage.

Support for discussions on IP regarding traditional knowledge is therefore crucial, as is creating a record of such knowledge. Currently a portal of online databases and registries of traditional knowledge and genetic resources is available on the WIPO website.[3] The portal aims to act as the clearing-house mechanism of the Convention for Biological Diversity (CBD). In addition to the Traditional Knowledge Digital Library project from India (described in Box 1.7), three other databases are available from China, India and Korea. These sources not only facilitate prior art searches by patent offices, but also help potential innovators to make commercial use of such knowledge to the benefit of the communities owning that knowledge.

Box 1.7. India: Traditional knowledge and digital library project

The Traditional Knowledge Digital Library project (TKDL) is an initiative of several Indian Government agencies, proposing to document the disclosed traditional medicinal knowledge available in the public domain by sifting and collating information on TK for the existing disclosed literature covering *Ayurveda*. The TKDL compiles the information in digitised format in five international languages: English, German, French, Japanese and Spanish. To create the TKDL of Ayurveda, an inter-disciplinary team of Ayurveda experts, patent examiners, information technology experts, scientists and technical officers have worked together for one-and-half years. TKDL seeks to give recognition and legitimacy to existing traditional knowledge and protect it from being misappropriated.

Source: WIPO, Booklet No. 2, Intellectual Property and Traditional Knowledge.

However, as is the case for other types of IP, ownership rights do not alone generate economic value to the economy or to specific groups. Substantial investment is needed. In the case of GI, action needs to be undertaken on behalf of the collective to obtain added value. Producers need to maintain product quality and develop effective marketing

strategies to ensure brand recognition. Adequate positioning in international distribution chains is also important. If producer associations are weak or even nonexistent, GIs will encounter major problems on the road to success. Complementary policies will be essential to support associations in their functions, rather than only supporting GI registrations. If a large number of products are registered using GI, such investments will be costly and difficult to maintain. A more reasonable strategy is to focus on a few selected products with the highest potential. Taking this approach also helps to avoid the risk of diluting impact by registering too many GIs.

In general, collective action is more important for innovators in informal and traditional sectors because many firms are small, have limited resources and lack sufficient skills. Developing a successful strategy through the use of trademarks, for example, will not be feasible unless these are provided externally by a regional or sector-based business association. This underlines the importance of complementary policies and supporting associations to use IP for the economic benefit of these groups. (The account of Colombia's Juan Valdez described in Chapter 2 provides an example of a successfully deployed GI.) Collective management is also relevant for the entertainment industry, which can provide opportunities for generating income for groups in traditional and informal sectors. Copyright is the main type of IP here. In this case, effective collective management organisations are critical for supporting the local creative industry. They provide one-stop access to a wider body of creations, simplifying negotiations for potential users (who would otherwise have to negotiate individually). These organisations also have greater resources to represent and raise awareness of the rights and interests of their users than their individual members.

A key issue for individuals in informal and traditional sectors is the access costs generated by IP protection. IP protection imposes particularly high costs on the lowest income groups, which may be excluded from consuming products based on these inventions. This is particularly relevant for pharmaceuticals. IP constitutes a barrier if it restrains access by these groups to necessary technologies. Given the often very traditional modes of production, this is probably less of a challenge for most producers. However, it is important to ensure that IP does not become a barrier, in particular during the process of upgrading production technologies as a part of business growth.

"Catching-up" businesses

"Catching-up" businesses are formal businesses, including small and medium-size firms, engaged in incremental innovations based on technologies developed by others, including from abroad. These firms are often in the early stage of building internal innovation capacities, reflected in a workforce that lacks advanced skills. These businesses face the following opportunities and challenges regarding IP:

- Awareness of relevant IP for business strategies is low. Many firms lack awareness about the creation and protection of their IP, such as negotiating and drafting license agreements and patent applications.
- Several types of IP including patents, trademarks, design rights and utility models, can be attractive for "catching-up" firms in different sectors. Utility models can also help support "catching-up" phases of development (Box 1.8). Being more affordable and easily accessible, IP can provide legal protection of firms' activities from potential infringement accusations by subsequently granted patents.

- Ensuring payoffs for IP requires evaluating the impact of processing and enforcement costs including potentially substantial litigation costs. For small companies, enforcement costs are a key challenge as the costs are not proportional to firm size. For example, attorney fees, management costs and the time required to deal with litigation issues can be substantial. What is more, large players often have the means, which small firms lack, to avoid costly litigation by using cross-licensing strategies by holding a portfolio of patents. Large firms can also reach agreements more easily because of repeated interaction with competitors (Lanjouw and Schankerman, 2004). Moreover, the fact that smaller companies are less prepared to withstand litigation increases their risks of facing further litigation. These costs lower their potential returns on IP and thus reduce the potential incentives IP provides for small firms to engage in innovation. Firms lacking confidence in their capacity to enforce rights will refrain from filing IP applications.
- The development of markets, where IP can be traded or used to obtain finance, can empower inventors. By providing them with a title over their inventions, IP, with the exception of trade secrets, signals the value of inventions to financial markets without exposing the innovators to the risk of revealing the nature of their inventions to others. Such access to finance or opportunities to trade IP can in turn facilitate the commercialisation of inventions. For instance, it will be critical for IP titles from universities since these lack manufacturing capacities needed for commercialising inventions. The process is challenging even in many developed countries, however. Licensing is also a key instrument for accessing knowledge for "catching-up" and can be fostered by reasonable licensing norms that balance profits for licensees (including those based abroad) with returns for licensors.

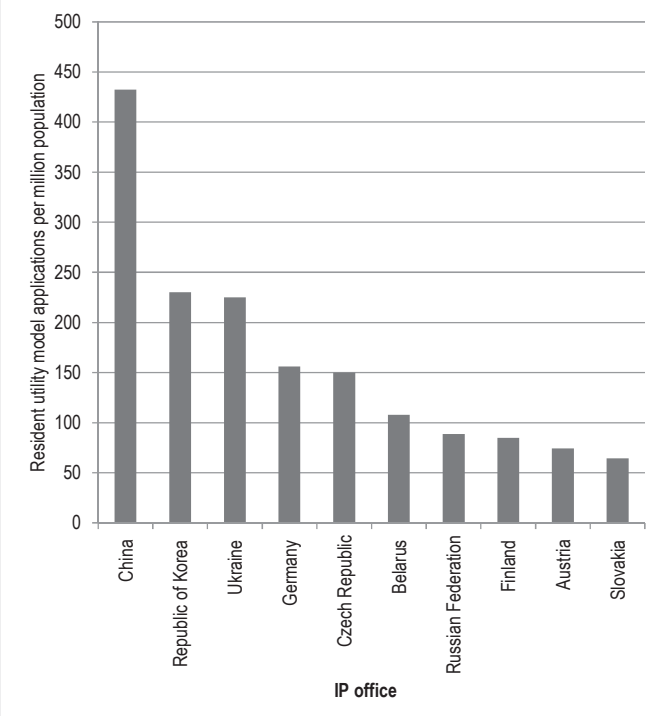
Box 1.8. Utility models and their contributions

Utility models (or "petty patents") provide seeming opportunities for protecting incremental innovations and, thus, potentially for a wider group of innovators. This is particularly relevant in developing and emerging countries where for a large share of firms the distance to the global frontier is large, creating a substantial threshold for obtaining patents. At the same time it might not be attractive to lower the incentive step for patents because in that case the system would provide weaker incentives for more substantial inventions. Moreover, such a step would extend stronger protection provided by patents to inventions of lower value. In this context, protection of minor innovations could be a way to support businesses as they build up capacities, and support wider adoption of patents in the future (Kim et al., 2012, Suthersanen, 2006). Both China and Korea have actively embraced utility models as part of their development process (Figure 1.7). Inventors in a range of middle-income countries, but also some of the leading innovating countries such as Germany and Finland, also use the utility model intensively. In other words, effective systems of utility model protection could address the transformative difficulties that developing countries experience as they move from imitation to innovation, amid a strong regime of patent protection and enforcement. A study of Japan's system of utility model protection, for instance, showed that it contributed positively and significantly to Japan's post-war productivity increases (Maskus and McDaniel, 1999). Such contributions can be particularly substantial where a gap exists between the global frontier and the innovation capacities of a large share of national innovators.

…/…

Box 1.8. Utility models and their contributions *(continued)*

Figure 1.7. IP offices with highest resident utility model applications per million populations for selected IP offices, 2011



Source: WIPO Statistics Database.

However, utility models are not universally adopted in development contexts. The evidence shows that while adoption occurred in some Asian countries (e.g. Korea and Thailand) in the past, many developing and emerging countries firms do not use utility models even if they are made available. One explanation for weak usage is that the system is not quick and simple in practice, diminishing the incentives for firms (WIPO, 2013). Indeed, the application procedure should be low-cost and simple to promote usage, as adequate conditions are critical for the system to operate effectively.

Moreover, a critical challenge, which applies not so much in a development context but more for advanced economies, is where to set the "novelty" requirement. If set too low, there is a risk that the model will create barriers to competition but not support innovation. It might also allow for "evergreening" of prior patents that arguably might provide little rewards when it comes to innovation. Such risks formed the basis for debates on reforms on the utility model system in Australia (IP Australia, 2013). Thus, the threshold for inventiveness has to be set at reasonable levels and depends critically on how it compares to patents.

Leading "frontier" businesses

Many developing and emerging economies boast innovative world-class businesses or "islands of excellence". These businesses often undertake a substantial share of a nation's private sector R&D and have sufficient research capabilities to obtain national IP and, moreover, international IP. When tapping into larger international markets, "frontier" businesses can obtain larger returns on their inventions than would be the case within national markets. They also constitute possible partners for international collaborations in research activities. In certain sectors, such as pharmaceuticals, businesses have to exploit

patent application information from their global competitors more strategically in order to design research agendas for international competitiveness.

Tapping into knowledge from abroad can be more accessible for these businesses and IP can thus provide opportunities, given licensing opportunities. In this context, considering IP as a challenge is probably too simplified an approach. Often locating suitable partners can prove more difficult, than setting up licensing agreements.

Certain challenges do need to be addressed to foster the innovation performance of "frontier" firms. If these firms operate as monopolies without competitive pressures, they may lack incentives to innovate. In this case, IP will not act as an incentive mechanism. Moreover, it is worth exploring the extent to which other support policies are needed and are *complementary* to the rewards provided by IP, from which large firms can reap the largest benefit, particularly compared to smaller entities.

Research institutions and universities

The role of universities and public research institutes (PRIs) in innovation systems is complex, and has been and continues to be the subject of much discussion. Importantly, multiple channels exist by which public research can contribute to innovation, including via advice, consultancy and extension services, dissemination of research findings via publications. In addition, universities have a critical role to play in providing the skills needed for innovation. They have received substantial policy attention with regard to their role as innovators. However, with the exception of a few leading institutions in selected sectors (e.g. pharmaceutical, biomedical and software) and in some countries (notably the United States), universities and public research institutes have so far made minor direct contributions to innovation, and licensing revenues or income from spin-off activities have been modest (OECD, 2013b; WIPO, 2011).

In emerging and developing countries this potential contribution has received particular attention since the business sector is often weak, while research capacities are concentrated in universities and PRIs. The potential benefits for innovation might thus be particularly attractive. University spin-offs can help to create an emerging innovative business sector. However, potential costs also have to be considered, particularly when considering the other key roles that universities and PRIs play in emerging and developing countries (Table 1.4). With weak business framework conditions the extension services provided to industry, for instance, might be equally relevant. In particular, the role of universities and PRIs in ensuring the wide dissemination of knowledge is critical and might be compromised if preserving novelty does not allow the immediate dissemination of findings.

Another key issue is the impacts on research activities themselves. In order to address these concerns several recommendations have been made regarding reservation rights, such as research exemptions notably for research tools, to ensure inventions with a primary function to facilitate research remain accessible, as well as safeguards to ensure dissemination of technologies with humanitarian and social impacts (So et al., 2008). Furthermore, *provisional patents* and *grace periods* are legal devices that maintain an inventor's right to patent an invention in the future, while not having to fulfil all necessary conditions immediately in terms of exact description and non-publicity before filing. These devices are well suited to inventions at a very early stage, when all properties have yet to be worked out and the inventor might wish to publish preliminary results in a scientific publication.

Table 1.4. Impact of IP-based technology transfer policies on universities/public research institutes and firms

	Potential benefits	Potential costs (or investment)
Universities and PRIs	**1) Increased IP ownership facilitating entrepreneurship and vertical specialization** • Reinforcing other policies aimed at academic entrepreneurship (e.g., enhancing access to finance) • Licensing and other revenues (e.g., consulting) can be invested in research **2) Cross-fertilisation between faculty and industry** • Intangible benefits to university reputation and the quality of research • Helping to identify research projects with a dual scientific and commercial purpose **3) Increased student intake and ability to place students in firms**	**1) Diversion of time away from academic research** • Distorting incentives for scientists and potentially also for the nature of public-oriented institutions • Reorganizing university processes and culture with a view to commercialization **2) IP-related establishment and maintenance costs** • Establishing and maintaining a TTO and related IP management, including investment in expertise and human resources • Spending time on IP filings and technology transfer (even if contracted out to a TTO) • Additional financial and reputational costs associated with defence of IP rights
Firms	**1) Facilitates the revelation of useful university inventions to the business sector** • Enabling firms to have access to top scientists and to collaborate with the scientific community in developing innovation within a clear contractual setting **2) Enables the creation of a market for ideas and contracting with universities** • Framework diminishes transaction costs and increases legal certainty, facilitating investment by private sector • Securing an exclusive license increases incentives for further investment • Ability to specialize is competitive advantage (vertical specialization) **3) Commercialization of new products generating profits and growth**	**1) Barriers to access of university inventions** • Precludes free access to university inventions – including the more basic research fields and research tools, except where research is the result of a sponsored contract • Lack of access if another firm has secured an exclusive license **2) IP-based transaction costs and tensions in industry-university relationships** • University scientists lack an understanding of development costs and market needs (cognitive dissonance) leading to higher probability of bargaining breakdown • IP negotiations can interfere with establishment of joint R&D and university-industry relations, where universities act as revenue maximize with strong stance on IP

Source: WIPO (2011), *World IP Report: The Changing Face of Innovation*, WIPO, Geneva.

Fostering university spin-offs or licensing activities to increase the payoff of public research for innovation has proven challenging for developing, emerging and developed economies alike. This is because a variety of factors beyond granting IP ownership need to be in place for them to serve as an instrument for innovation. IP ownership is only a first step in a process that requires additional steps before inventions can be commercialised. The fundamental questions arising are: (i) incentives for researchers to obtain IP and engage in commercialisation activities, (ii) questions regarding the ownership of IP, (iii) TTOs and related service infrastructures, and (iv) the capacities of the private and public sectors to play their respective roles.

Incentives

Researchers' incentive schemes are based on the publication track record of university science researchers rather than on IP and, even less, their commercialisation. The relative payoff given to IP over publications plays a key role. If publications result in higher returns than the returns from IP titles, then the IP incentive scheme provided will be weakened. However, as publications also support innovation systems, then it is not necessarily the case that all decisions should favour fostering IP titles. How IP is integrated into incentive schemes is an additional challenge. If researchers are rewarded

for every patent application they file, the intended effect might not necessarily benefit high-quality innovation, as researchers might decide to file low-quality patents. Rewards for "quantity" rather than "quality" might even distort the nature of the inventions undertaken, favouring less relevant inventions over more fundamental ones. Furthermore, if no further rewards are available beyond those for IP granted, researchers might not provide often needed effective support for the commercialisation of their inventions.

Moreover, if legal or administrative barriers render participation in spin-offs difficult or costly, this will further reduce the incentives for researchers to fully participate in such activities and thus any potential success. To benefit from the innovation system, researchers must apply and use their knowledge. However, additional investments are often needed in order to progress from the invention phase to the commercial product. Common approaches involve licensing-out patented technologies or creating spin-offs. The latter approach depends on suitable market conditions, such as markets for technology, and on regulations. Some national regulations, for example, do not allow researchers who are public sector employees to create start-ups. Another barrier is the lack of flexible employment contracts among researchers, for example, contracts allowing sabbaticals without compromising university career paths.

A further issue is the need to raise awareness among researchers, as commercialisation of knowledge does not form part of the core activities of many researchers. Providing information on opportunities and rewards is often critical and cannot be taken for granted (Zuniga, 2011).

Ownership

A fundamental issue is the way in which IP ownership of universities and research universities is handled. This determines incentives for researchers and universities, both in terms of applying for IP and seeking commercialisation. Among the different approaches adopted, many are influenced by the 1980 Bayh-Dole Act, which instituted a uniform patent policy across US federal agencies and removed many restrictions on licensing. The Act allowed universities to own the patents produced from research financing by federal research grants. Bayh-Dole also stipulated that researchers working on federal research grants are required to disclose their inventions to the Technology Transfer Office, which then takes a decision on whether or not to patent the innovations. Similar legislation was passed in almost all OECD countries in the 1990s and early 2000s, replacing previous systems including the "professor's privilege", whereby inventors could decide for themselves whether or not to patent an invention they owned. If research institutions do not receive returns from inventions of their professorial staff, they have only limited incentives to provide them with support, particularly to produce commercial products out of IP. At the same time, evidence on the impacts of Bayh-Dole and related legislation in developed countries shows that more efforts are required to ensure successful commercialisation strategies by universities and PRIs (Geuna and Nesta, 2006; Mowery et al., 2001).

Technology Transfer Offices (TTOs)

One way to provide such support is through the creation of TTOs. These offices help support adequate linkages between universities and the private sector to develop innovations. This is a vital first step since the success of such links often determines the extent to which university IP can contribute to innovation. The role of TTOs is important to provide researchers with necessary support in their use of IP. This includes (i) informing

and raising awareness regarding the benefits they can derive from IP; (ii) providing assistance with filing patent applications and legal advice regarding IP; and (iii) supporting the commercialisation of IP by providing partnership advice. Many research institutions have set up TTOs, but shortcomings in funding, management and incentives remains a major challenge to their provision of effective services. Reaching sufficient economies of scale is important for sustainable business models for TTOs. Since individual institutions might not have sufficient scale, the creation of regional TTOs might be of interest (Zuniga, 2011).

Private partnerships

Universities and PRIs often cannot fully exploit their inventions as they lack the necessary manufacturing facilities and marketing departments. Private sector partners can play a key role here either as licensees of their inventions or as partners of spin-offs. Linking up with partners thus represents a major opportunity for research organisations seeking to commercialise their inventions. However, challenges frequently arise at this stage, particularly with a weak private business sector. This is where adequate legal and regulatory frameworks become essential. Standard collaboration agreements can help support public-private collaborations (e.g. the Lambert toolkit) (UK IPO, 2013). While they cannot address all challenges that inevitably arise given the unpredictable nature of research, they can provide a starting point for negotiations. However, ways of identifying suitable partners often present a more significant challenge. TTOs need to play a critical role in this regard. Moreover, another key condition is the availability at universities of research capacities that can support private industry needs adequately.

IP and its potential differential impacts across users and aggregate implications

Aside from specific opportunities and challenges provided by IP to different types of users on the producer side, there is the question of differential impacts across users and aggregate implications on innovation performers. This is particularly relevant as there are substantial performance differences in emerging and developing economies (see section 1.2). Larger firms with stronger performance, as indicated by their exporter status, with access to skills, financial services and technology, are more likely to hold quality certifications or patents (Table 1.5). While this is in part related to their stronger research capacities, two other factors might further explain these results and also indicate why IP systems favour larger leading businesses:

- The first concerns the operational and procedural costs of the IP system, such as large sunk costs related to IP enforcement. These favour larger businesses. The issue is even more important in emerging countries as market failures, including lack of access to external sources of finance, are even more substantial and may reduce the ability of small entities to pay IP application, maintenance and enforcement costs. Reducing fees for small entities and implementing policies that prevent the IP system from discriminating against small entities are therefore essential. Effective arbitration mechanisms are important to reduce substantial litigation costs, which would more meaningfully be deployed for investments in innovation.
- The second concerns a more fundamental challenge to effectively using IP for payoffs: smaller businesses and universities and PRIs are disproportionately affected by those difficulties. In particular, universities and PRIs will need to engage in collaborations since they lack the manufacturing capacities to com-

mercialise their IP. Smaller businesses are often more affected by shortcomings in market failures since they cannot internalise some types of activities (e.g. distribution networks if these are weak). They are also more likely to suffer from information asymmetries, which may have a critical effect on financial market performance, and have more limited access to skills than larger businesses. Such differential effects also arise, for example, from the impacts of corruption on business activities, as larger businesses can find alternative approaches for dealing with such challenges (Paunov, 2013). Therefore, the capacity to benefit from IP would, if no corresponding complementary policies were implemented, disproportionately accrue to larger businesses.

Table 1.5. Profiles of firms holding quality certifications and patents in developing and emerging countries, 2009-11

	Quality certification	Domestic patents	Patents abroad
Firm size	+	+	+
Firm age	+	+	0
Exporter status of the firm	+	0	+
Importer status of the firm	+	+	+
Firm has its own website	+	+	+
Firm has access to financial services	+	+	+
Firm provides formal training	+	+	+
Share of skilled workers	+	+	+
Firm uses of foreign technology	+	+	+

Notes: Results are based on probit regressions and also include controls for size of locality, sector and country-year fixed effects, as well as investment in fixed assets, foreign and government ownership. The share of skilled workers is defined as the share of permanent full-time non-production workers over total full-time workers. Size is defined as the natural logarithm of employment, and access to finance indicates whether the firm has an overdraft facility or not. Results for quality certification regressions are based on 19 239 firm observations and regression on domestic patents and patents abroad are based on 9 711 and 9 714 firm observations.

Source: Paunov (forthcoming), "Democratising Intellectual Property Systems: How Corruption Reduces Opportunities" [working title], based on World Bank Enterprise Surveys.

However, this is not equivalent to saying that some users in the production sector necessarily lose out because of the IP system, whereas others benefit. As discussed above, the IP system provides opportunities for different activities including for informal and traditional activities. These opportunities, however, need to be supported by policy. The risk of employment and output losses for local industries can be reversed by the creation of competitive IP-based industries and by enabling the different actors with opportunities to benefit from IP. Complementary policy support is vital to ensure that benefits arise also for more disadvantaged users. These will be equally important from a political economy perspective as perceived benefits for large businesses could lead to opposition to IP systems in spite of wider available benefits. Clearly, competition authorities also have to play their roles in ensuring that use of IP does not lead to abuse of market power.

IP fields of use

The use of IP and its role in offering incentives for innovation varies *across different fields of activity*. For example, pharmaceuticals, chemicals, machinery, computer equipment and precision instruments represent an important share of total patents and play an important role in these industries (OECD, 2009; US Department of Commerce, 2012). For trademarks, the most intensive user sectors include audio and video equipment manufacturing, but also pharmaceutical and medicine manufacturing (US Department of Commerce, 2012).[4] Different types of IP are used for specific activities, such as PVP and GI rights, in addition to patents, utility models and design rights, which are broader in scope. Trademarks differ in this regard as they cover a wider field. With the strong concentration of leading activities in development contexts (Table 1.2), it is useful to focus on types of IP of particular relevance for those activities. Often, as in the case of Chile, agricultural products (e.g. wine and fruit) are of particular importance (WIPO, 2013).

Beyond differences in the type of IP, sector-specific characteristics impact on the use made of IP. For instance, the legal framework for patents treats all sectors equally, but their implementation in practice imposes differences (e.g. some fields require much more extensive documentation than others). There are also other grounds for differences in terms of private returns – explaining different use patterns – as well as social returns:

- One factor is the *speed of innovation cycles*. High turnover rates render IP requiring lengthy registration processes less valuable as it might, once granted, be rendered obsolete by a new invention. The use of IP in such circumstances might heighten the attractiveness of providing protection for unregistered IP (e.g. design rights for textile sectors) as a way to incentivise innovation. This approach might also require focusing on improvements in registration processes.
- Another factor is whether the sector involves *complex or simple technologies*. The former (e.g. for electronics products) will result in hundreds of patentable elements, whereas the latter case (e.g. chemicals) will involve a relatively discrete number of patentable elements. Complex technologies will effectively enhance the importance of cross-licensing agreements, which will then require the close attention of competition authorities.
- An additional factor concerns the *relationship of the IP-protected invention with the commercialised product*. In the case of pharmaceutical inventions, the patent specification corresponds to the manufactured product that will be sold on markets. In the case of engineering, the link between the patented invention and the related innovation process is more complex, as incremental changes normally occur from the development stage to product release on the market (Matthews, 2010). The link between innovation and inventions is, thus, less close for certain sectors; however, this heightens the value of IP to generate the necessary funding.
- Lastly, certain types of IP, such as patents, are also less attractive *where innovations can be kept secret.* For that reason, product innovations are more commonly protected by patents than processes. This suggests that a focus on other types of innovation policy is necessary to complement impacts.

Principles for country policy assessments

Box 1.9. Principles for country policy assessments: Adapting IP systems to users in a development context

Ensuring different groups benefit requires creating a level-playing field

National IP policies need to create opportunities for different groups of actors. This will require targeting particularly those groups that will suffer most from challenges imposed by the development context. This includes providing opportunities for informal and traditional sectors to benefit in their economic activities from IP.

Universities and Public Research Institutes (PRIs)

It is important that the role of universities as innovators does not compromise the important role they play in advancing research and also in disseminating knowledge widely. The following safeguards will thus be critical:

- ensuring research exemptions, notably for research tools
- allowing for grace periods so that inventors can publish results without compromising the novelty requirement needed to obtain patents
- balancing incentives for researchers in such a way that basic research is not compromised by continuing to provide career rewards for publications in peer-reviewed journals.

If the objective is to commercialise IP, then regulations and institutional practices have to provide researchers and their institutions with incentives both to seek IP for inventions with a higher potential of industrial application and to support the commercialisation of those inventions. This requires the following:

- Rewards should be conditional on IP applications with higher potential of subsequent industrial application. Such an evaluation could be done by the institutions' TTOs. Additional rewards can be provided for any invention that reaches the commercial stage.
- Flexibilities in regulatory frameworks that allow researchers in public universities to engage in spin-offs are another important way of supporting IP more effectively. Another alternative is providing inventors with a share of the income from future innovations.

Dealing with IP effectively will require well-funded and equipped TTOs with qualified staff. Moreover, senior management at institutions will need to support these efforts. Given scarce resources, institutions that co-operate with each other in providing services jointly might allow for economies of scale and facilitate better-functioning TTOs. *Regional TTOs can also prove to be useful.*

IP polices have to be part of a broader commercialisation policy mix for university IP to contribute to innovation. This requires *engaging in activities that result in making connections with the private sector to bring in the needed expertise and manufacturing capabilities.* Such activities could include:

- setting up joint university databases on IP available for licensing
- investing in strengthening capacities of private local companies (given their often substantial weaknesses)
- attracting international partners for joint research and/or to commercialise IP generated by universities and public research institutes.

…/…

Box 1.9. Principles for country policy assessments: Adapting IP systems to users in a development context *(continued)*

Traditional and informal sectors

Supporting the use of trademarks, design rights, copyright and GI can help local and traditional industries and thereby facilitate more inclusive innovation processes.

To avoid seeing IP as a threat, traditional producers and local groups have to be aware of the benefits they can derive from IP. *Awareness-raising campaigns* provided by IP offices to these groups and their producer associations are therefore important.

Policies need to ensure that the IP obtained is commercially exploited. This is not a task these often very small and resource-constrained businesses can easily take on. For this reason, *one critical factor is effective collective action, which might involve either producer associations to market GI and promote trademarks effectively, or collecting societies to exploit artistic creations effectively.* It is often better to focus on a few selected cases and provide wider support than to aim for many IP titles, which could receive only limited support.

Establishing databases of traditional knowledge can allow businesses to identify traditional knowledge that can form a basis for innovation. In this way traditional knowledge can act as a lever for local innovation rather than as just a repository of established knowledge.

"Catching-up" businesses

For IP policies to support "catching-up", the innovation performance policy of firms must ensure that the IP system does not exclude these firms. *Policy approaches include offering reduced fees for IP applications and, more importantly, helping to reduce enforcement costs, which represent bigger burdens to small businesses.* Offering effective arbitration and mediation services in case of conflicts over IP is also an approach to consider.

Entering into licensing agreements, especially with foreign inventors, can provide vital support for the transfer of knowledge during the "catching-up" phase. There are several key points involved:

- Such contracts have to be enforceable. If national courts do not treat foreign firms and national firms equally and licensing norms are not perceived as reasonable for both licensors and licensees, then this would likely lead foreign firms to refrain from entering into licensing agreements.
- Services to help potential licensors and licensees identify suitable partners are valuable, given that search costs can be high. IP offices and Chambers of Commerce could advertise IP-protected inventions available for licensing by using online databases. *Sector-specific databases targeted at specific users are particularly useful. Presenting licensable technologies to potential licensees can be particularly powerful as a way of reducing search costs.*
- Licensing support services that help firms to set up licensing arrangements, while the provision of standard contracts can constitute another approach to effectively reducing barriers.
- An on-going process of strengthening absorptive capacities of local businesses is necessary to enhance opportunities for " catching up".

Awareness of how IP can best serve the business objectives of firms and how it can reward innovation activities is often low and a major barrier to the effective use of IP. Compared to developed countries, innovators in emerging countries (including those with the highest potential gains) suffer more from a lack of awareness about how IP can be used best for their business. Chambers of Commerce can also play a role in identifying firms with the biggest innovation potential, based on both the nature of their products and their internal resources, as well as their motivation.

Utility models can help to reward incremental innovation efforts of "catching-up" businesses for inventions that do not meet the inventive step required for patents. The success of such a system depends on the simplicity and affordability of the application processes, and awareness among businesses of the availability of such utility model systems. …/…

Box 1.9. Principles for country policy assessments: Adapting IP systems to users in a development context *(continued)*

IP can also assist businesses in raising finance for innovation activities, and thus make a substantial contribution to their innovation performance. Since markets for finance based on IP are weakly developed, policy intervention will be needed to drive such developments. One possibility is *publicly supported credit schemes that provide financing for businesses to develop innovations based on IP-protected inventions.*

It is important to provide adequate market opportunities for inventors in emerging and developing countries, and also to prevent the most talented inventors and entrepreneurs from moving to developed countries where obtaining IP and developing innovative businesses can be easier.

Leading "frontier" firms

For leading firms with the capacity to compete internationally, *public support to facilitate obtaining IP abroad* is crucial. This will allow tapping into bigger markets and thus leads to larger payoffs for IP. Three approaches are worth considering:

- The first is providing expert support services at national IP offices for successfully filing applications to IP offices abroad, including options of use of PCT applications, as they can facilitate such processes.
- The second is raising awareness about cost-effective opportunities to target international markets that include IP among their components.
- The third is developing international filing strategies to compete with international competitor networks and, in particular, potentially patent pools and cross-licensing arrangements. This includes identifying upfront potential market opportunities in global production.

Competing internationally in sectors, such as pharmaceuticals, requires *identifying research areas with potential market opportunities and strategically exploiting information contained in patent applications filed by competitors nationally and abroad*. Support for such strategy can be based on the following conditions:

- Providing easy online access to patent information is a critical precondition.
- It is important to raise awareness among businesses of the potentially high payoffs from those strategies and help them to make better use of information provided by IP application files.
- Specialised expert services should be provided to firms, possibly with private sector funding.

The value-added proposition of providing complementary innovation support to frontier firms, such as R&D tax credits, needs to be assessed. Frontier firms are best placed to benefit from IP systems. However, if they are insulated from competition, then IP will contribute minimally to incentivising their innovation performance. Complementary IP support policies targeting these firms have to ensure that they lead effectively to more innovation efforts.

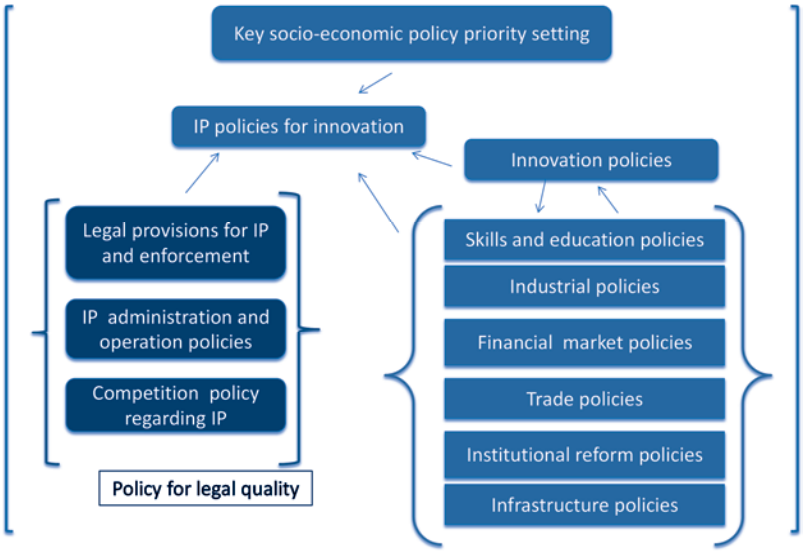
1.5. Connecting IP to innovation policies

Governance of IP systems

National IP systems are inherently complex. They require legal provisions to define the rights and conditions that determine how IP is granted and enforced. IP standards are, as described above, also defined by international, regional and bilateral agreements. Moreover, procedures are required for granting different IP types and implementing IP policies as part of innovation policy. Finally, international policy covers negotiations of free trade agreements that often have IP components, and likewise covers regional and other international negotiations on IP matters. As the IP system covers such a diverse range of legal, economic and strategic functions, its management is increasingly shared

among various institutions. In the past, it was often the case that IP offices took the leading role. This reflected a strong disconnect between IP and innovation policy. Bearing in mind the comparative advantages of different institutions, shared institutional responsibilities are not in themselves problematic. However, in order to ensure IP policy is coherent in its support of innovation, horizontal co-operation is necessary across different institutions *with an explicit focus* on innovation. Co-operation is critical at the top because different institutions in charge might be at cross purposes with one another. As a result, decisions might be contradictory and consequently weaken the contributions of IP to innovation. This is particularly important in development contexts where complementary policies are critical for impacts on innovation. Figure 1.8 illustrates the wider set of relevant policies. The examples of Colombia and Indonesia provided in Chapters 2 and 3 illustrate different types of approaches and the continued challenges that arise for operating such governance effectively. A particular challenge is ensuring wide consultations that include potential IP users, as the most powerful players usually have a stronger voice, while others are less integrated and often lack a stronger political voice.

Figure 1.8. IP policies for innovation in the wider policy context



Characteristics of IP policies relative to others

IP policies are a type of policy tool within the set of alternative and complementary innovation policies. It is important to emphasise their key characteristics to better understand where they can be most powerful. This section provides key characteristics for the case of patent systems as well as, in most cases, for other types of IP (Guellec and van Pottelsberghe, 2007):

Funding for inventors is provided by customers, not by government resources. The fact that taxpayers do not fund IP allows the system to operate at a much larger scale than most other types of innovation policies. R&D tax credits and policies aimed at generating adequate framework conditions, such as competition policy, are similar in that respect. However, an important caveat to this statement is the fact that the IP system will not be equally accessible to all users, particularly small entities. This might bias the support for innovation provided by the IP system unless, as discussed earlier, it is implemented in conjunction with complementary policies. These, however, frequently involve public funding and thus will operate at a smaller scale.

Funding for the inventor is provided ex-post for the value of the invention, rather than upfront to cover the costs of the invention. With patents, the funding that accrues to the inventor is closely related to the value of the invention. The volume of sales and willingness of customers to pay a higher price is the "patent premium". A patent gives its holder the right to market exclusively, although customers retain a strong influence and competition still prevails. Only by convincing customers and outperforming competitors can the patent holder realise gains to their title. Thus, the rewards are decided by markets. The same principle applies for all other types of IP. Inventors still face a series of risks, including market and technological risks, that might compromise their incentives to innovate – and might even challenge their survival[5] – which IP systems do not address. Moreover, lack of access to finance for viable innovation investments substantially constrains the extent to which a wider set of actors are incentivised. This factor becomes even more challenging in development contexts given the well-known shortage of access to sources of finance.

Applied research receives most support from the IP system as it rewards commercialisation. One of the criteria for patent grants is industrial applicability, thus, complementary policies will be needed to support more basic research. In addition, because successful commercialisation leads to rewards, the IP system should provide businesses with incentives to develop innovations, rather than simply developing inventions. This also holds for other types of IP. However, this will only be the case if market conditions allow for fair competition among firms, if the IP system provides for legal quality, and if conditions for the commercialisation of IP are provided (in the case of universities and public research institutes).

Companies or research institutions take economic and technical decisions, not governments. Local or state authorities might not be in the best position to take optimal decisions regarding how to go about generating inventions. If the inventor can obtain returns from IP, then incentives should be set so that inventors will optimise investments. From that perspective, such a system can enhance efficiency and reduce costly control mechanisms for other types of initiatives. However, this is based on the assumption that companies are well equipped to take those decisions and inhabit an environment allowing them to operate optimally.

Patents and other types of IP have exclusionary effects. The potential returns on patents come with a large price tag: the cost of access to innovation goes up because of the need to privatise the invention. The exclusionary effect is highest for those at the lower end. This dilemma raises issues of inequalities for end users and businesses. With highly unequal business structures, gaps in industrial performance may be pushed wider apart. The exclusionary effect can also perpetuate inequalities in opportunities and welfare. The critical factors will be measures to help ensure a level-playing field, not only in principle, but also in practice (implying that unfavourable conditions will be adjusted). This challenge also arises for most other types of IP including design right, copyright and PVP.

The prize-type incentive system provided by patents has mixed effects. On the positive side, the competitive element of patents – the inventor who files first gets the reward – can speed-up invention processes. However, this system comes at a potential cost, namely "patent wars". Competitors may over-invest in research activities to collect the entire reward, when from a social perspective all sides might benefit from a joint reward. This question can similarly arise for other types of IP that are rewarded based on "novelty" including, notably, those where substantial research investments are required. But there are situations in which this concern will be weakened, such as when inventions produced by competitors are ultimately quite different in nature, or are not equivalent, or might serve other purposes rather than becoming fully redundant.

Policy design: Prioritisation, compatibility and trade-offs

Prioritisation from the perspective of highest socio-economic payoffs

Type of policies

Achieving legal quality and ensuring that the consequent legal and administrative conditions for IP hold are preconditions for allowing IP to operate to the advantage of innovation (Figure 1.8). Therefore, the relevant policy recommendations for achieving legal quality and ensuring competition (section 1.4) have to be clear priorities. Institutional weaknesses must become key targets in development contexts, particularly when it comes to enforcement, but also in terms of operations and procedures.

However, achieving those baseline conditions might fall short of effectively supporting innovation, particularly with shortcomings in framework conditions in development contexts (as described in Table 1.2). For instance, incentivising a move towards innovation will require ensuring that finance markets for IP exist and stimulating markets for technology including, notably, suitable buyers and sellers of IP. Other complementary policies will similarly be relevant.

Thus, priorities regarding types of policies are much less feasible since payoffs will not materialise if legal and administrative conditions for IP or complementary policies are not in place. Prioritisation of specific types of IP or specific actors and/or sectors is a more reasonable approach to follow if resources and/or time constraints do not permit addressing all policy factors simultaneously.

Actors

Prioritisation among actors should focus on where IP can have greater payoffs and, when it comes to complementary policies, where contextual conditions create strongest bottlenecks for impacts on innovation performance. This suggests a focus on universities and PRIs in innovation contexts where these concentrate leading research capacities. Initial success can provide further support for additional reforms so as to successively involve an even larger group of actors. However, it is also important to actively involve a large group of actors as a way to avoid bias in the IP system and confront corresponding political pressures, as well as to provide wider innovation opportunities. Therefore, specific projects to support the informal and traditional sectors can be valuable even if initially adopted at a smaller scale.

Types of IP

Weaknesses in research capacities suggest a need to explore other types of IP than patents, in particular trademarks and possibly utility models. PVP and industrial design can similarly be important, notably where the agriculture and textile sectors are significant. The most advanced sectors and those that employ the most are equally relevant factors in setting priorities with regards to types of IP.

Compatibility

The impacts of IP policies will depend on innovation policies and other types of policies (Figure 1.8). While complementary policies are needed to support innovation, other policies may be incompatible and effectively reduce potential impacts. This is particularly the case for IP policies to support the commercialisation of IP by public universities and PRIs. Such policies will only be successful if universities have policies in place that permit licensing to the private sector or alternatively the creation of spin-offs,

as well as adequate incentive schemes to encourage researchers to seek longer term engagements for the development of innovations based on initial inventions. IP support policies are incompatible with a rigid legal context.

Trade-offs

The trade-off between *static loss* over *dynamic efficiency* lies at the heart of IP policy. Exclusive ownership rights provide incentives to generate inventions and innovations (thus reducing access to them). It is difficult to determine where the line should be drawn and, thus, the question as to whether IP systems provide insufficient incentives or excessive rewards to inventors is in many ways inherent to IP policy. The difficulty of assessing social returns and costs, as these not only consider inventions produced but also those that will materialise for a given level of rewards, and the impossibility of doing so on a case-by-case basis, impose a necessarily imperfect approach to addressing the issue. The question of exemptions arises in this specific context with regard to cases where social welfare would be strongly diminished by costs imposed by IP. However, the costs of such measures in terms of future inventions can be substantial. Compliance with international treaties and access to foreign technologies impose additional costs. Provisions such as limited durations for IP, renewal fees, and disclosure and novelty requirements, seek to provide mechanisms for raising social returns without at the same time reducing dynamic gains.

Several additional trade-offs arise for different dimensions of the IP system:

- Regarding patents, setting the incentive step at a higher level could provide incentives for more substantial inventions and lower the number of applications and their impacts, including processing delays and costs. However, this approach might exclude a substantial number of valuable inventions from the system, which would then not be disclosed. The threshold level is difficult to determine and has triggered substantial debates between the US and European models. Where the diversity of innovation capacities is substantial, as is the case for developing and emerging countries, a utility model system can help to reconcile different objectives.
- Another trade-off relates to duration and subject matter and patent scope as they critically set the reward for the inventor and the economic costs that patents generate.[6] In such cases the impacts depend on the fields of IP use as well as the competitive environment, and critically affect access to knowledge and dissemination. The fundamental question here is the extent to which these can be set to avoid restraining future innovations excessively. Moreover, exclusive rights over an invention can impose particularly high social costs if there are few close substitutes for the invention. At the same time a proliferation of patents of smaller scope can be a restraint if it leads to excessively dispersed ownership of parts of an innovation.
- The question of IP ownership of research results produced by universities and public research institutes, and funded by public resources, has also been raised as a possible barrier to the dissemination of knowledge. It has been argued that having such knowledge in the public domain could facilitate future research over the potential of IP to help foster the commercialisation of such IP. However, exclusive rights are sometimes a necessary condition for a business to invest in an invention.

Principles for country policy assessments

Box 1.10. Principles for country policy assessments: Connecting IP to innovation policies

Creating a powerful functioning co-ordinating body for IP from the perspective of innovation.

The existence of a functioning co-ordinating body that supports IP-related policies from the perspective of innovation is necessary for effective IP policies for innovation. Co-ordinating bodies for IP policy have been created in several countries including Colombia and Indonesia. The challenge often consists of ensuring the following functions are provided:

- Governmental institutions closely involved in economic development and innovation strategies should shape the agenda and policy orientations. Otherwise such bodies risk focusing only on questions more closely associated with the operation of IP systems, such as procedures and enforcement.
- A council positioned at the highest level of the executive (i.e. presidential or prime ministerial level) will ensure that IP systems are accorded sufficient importance. An example is Japan's IP commission.
- The co-ordinating body has to have the authority to take decisions and assess their enforcement by different IP institutions. In its absence the co-ordinating body will not have the capacity to put in place needed reforms.
- Transparency on the part of institutions is needed to avoid the risk of capture by specific interest groups.
- Consultations should be open to a variety of actors including representatives from diverse IP user groups. The private sector should also be involved.

IP systems can be powerful in development contexts, but also have limitations.

The patent system rewards inventions with the highest commercial value and allows for incentives on a larger scale compared to other innovation policy schemes, because customers rather than government budgets finance rewards. The system also places on the government less of a burden for "getting it right", compared to other types of innovation policies, such as innovation grants, since customers decide on rewards. These factors make the patent system an attractive tool for innovation policy for all countries. *Thus, IP systems should also be used in development contexts in support of innovation.*

IP-based innovation policies have their limitations. Patent-based support schemes give rewards only to those inventors who already fulfil relevant pre-conditions for conducting research at a high enough level to stand a chance at obtaining patents. This applies less strongly for other types of IP such as trademarks, utility models and design rights. However, taking advantage of IP systems generally requires access to finance, suitable skills, infrastructure and having opportunities for commercialisation. In an economic system with multiple market failures and less developed markets for technology, IP titles alone might not offer sufficient rewards. *Complementary innovation policies will be necessary to support the entire innovation system and the performance of the IP system.* This is even more so for development challenges.

IP policies have to combine types of policies, but should prioritise actors with the highest potential and largest constraints.

IP systems require adequate legal and administrative conditions and adjustments for users in a development context if they are to successfully support innovation. Priorities should be set by supporting actors for activities with the highest potential return from IP use and for those most in need of complementary support. While arguments can be made as to why the IP system cannot from a legal and administrative perspective treat users differently depending on their sectors of activity, the same does not have to apply to innovation policies using IP. Such an approach maximises opportunities for initial policy success and supports future reforms.

IP policies must be compatible with a wider set of policies that impact innovation.

IP policies will not be successful in isolation. Moreover, if they are in conflict with other relevant policies for innovation, they will likely have no impact. To avoid incompatible policies it is important that the design of IP systems considers the perspective of potential users and the conditions they face in innovating. This not only requires adequate governance of IP systems, but also close assessment of user needs so as to provide corresponding policies.

Trade-offs should be set to best service development contexts.

Trade-offs necessarily arise when setting IP policies. These should be set with a view to best supporting users in specific contexts. With respect to the inventive step, the trade-off can be effectively addressed by implementing adequate utility model systems.

Notes

1. OECD (2009) provides a more detailed description.
2. EPO (2010) provides a more detailed discussion.
3. Refer to www.wipo.int/tk/en/databases/tkportal/.
4. In fact, some of the increase in patent registrations in leading IP offices is due to increased applications for biotechnology and IT.
5. Fernandes and Paunov (2012) analyse the innovation-survival link and how it relates to various types of risks associated with innovation.
6. By reducing competition and increasing prices, they exclude some consumers. Customers willing to pay more than the marginal cost but less than the mark-up price cannot buy the good. This generates an economic inefficiency, a deadweight loss.

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Annex 1.A1

Implications for conducting analyses of IP systems

An analysis of IP systems in emerging countries based on this framework will require collecting different types of information through desk research, so as to identify specific policy recommendations. In order to assess different challenges posed by the IP system, analysts will need to interview the key actors of the IP and innovation system and, in so doing, should focus on the IP system dimensions described by the framework. The following five types of information will be required for the assessment:

Information on the legal and administrative conditions of IP systems

This covers various aspects of operations of the IP system including the legal and procedural dimensions of national IP systems. Over the past years, WIPO has implemented a variety of surveys and country case studies on specific IP issues that provide access to relevant information on those questions. This includes: (i) the Questionnaire on Exceptions and Limitations to Patent Rights, (ii) the Questionnaire on Trademark Law and Practice, and (iii) the 2010 Surveys of Existing Practices, Protocols and Policies relating to the safeguarding of, access to, ownership of and control over cultural heritage. However, consultations with national IP offices will be important to complement the information for the purposes of conducting a country assessment. They will notably provide an opportunity to discuss bottlenecks faced by various institutions and the (often unexpected) challenges that arise when taking steps to address some of these shortcomings.

Information on policy making regarding IP and innovation

This is information on IP support policies, including those related to procedures and to the wider set beyond, such as complementary efforts aimed at supporting commercialisation. Information has to be gathered on the governance of innovation and IP systems, and the nature of co-ordination among the various actors. Consultations with various institutions are useful, since institutional practice is critical to understand governance.

Statistical information on the use of IP

Statistical information on some types of IP will be important to understand the relative and absolute importance of the use of IP. At the same time, it is worth noting that such statistics are also partly affected by shortcomings of the system, as there might be potential demand that is not taken up because of the weaknesses of national IP systems. Box 1.A1.1 provides a basic list of indicators of interest.[1] The information provided for registered IP allows, moreover, for a much richer assessment of use profiles. A wide set

of basic statistics are available from the WIPO IP Statistics Data Center with an annual overview provided by the World Intellectual Property Indicators publication.

In this context, it is particularly important not only to know about a country's overall IP performance, but also how different groups of users benefit and operate with IP. Some information is available from firm innovation surveys with the shortcoming that the information on IP titles is often limited. In order to have better information it is necessary to link information from IP databases with information on firm characteristics from firm surveys. Several initiatives have started to systematically link firm and IP information. These allow the collection of economically relevant factors as to types and issues affecting patenting. Notably, WIPO has supported efforts aimed at linking information on different types of IP such as patents, trademarks, utility models and design, and matching them to the firm-level census data and innovation surveys. Two studies on Brazil and Chile provide the resulting statistical evidence (WIPO, 2013b, 2013c). The OECD has also conducted work to link firm micro data from the Orbis firm database with IP data, both to produce statistical indicators and to conduct analytical studies on their basis.

Box 1.A1.1. List of quantitative indicators on IP needed for analysis

Patents:

- national patents, resident and non-resident, by office, origin and technology class, relative to regional and world performance
- patenting abroad: PCT, patent family databases, Triadic Patents, USPTO, EPO, JPO and domestic patents.

Utility models:

- breakdown of models, resident and non-resident, by office, origin and technology class, relative to regional and world performance.

Trademarks:

- national trademarks, resident and non-resident
- trademark application abroad: USPTO, Madrid system where applicable

Design rights:

- breakdown, resident and non-resident, by office, origin and technology class

Royalties and licenses:

- possible use of data on net payments and receipts on royalties and licensee fees

Survey data on firm's use of IP:

- relevant questions on IP use and licensing activities from innovation surveys or statistics based on matched firm-IP databases, where available, linking firm characteristics with IP uses

Information on the socio-economic context

The socio-economic context is of relevance in identifying particularly important groups of innovators. It also helps to assess the framework conditions that these groups face and thereby ascertains the necessary operational conditions for the IP system to support innovation. Understanding developmental objectives and opportunities can also help to highlight the areas where IP can make meaningful contributions. Box 1.A1.2 describes those dimensions and a selection of relevant indicators.

Box 1.A1.2. Relevant country information and indicator requirements on economic characteristics and social challenges

- *Macroeconomic performance*: GDP, GDP growth, GDP per capita, trends over past years including major crises, major developments and forecasts
- *Social challenges*: absolute and relative poverty indices, inequality
- *External trade, international competitiveness and foreign investment*: trade/GDP, FDI, FDI by sector, position in global value chains, main traded products and markets, main trade partners, trade policy, trade agreements, tariff policies
- *Productivity performance*: TFP and labour productivity measures
- *Economic structure*: structure of manufacturing including share of low-tech, medium-tech and high-tech industries, share of agriculture, manufacturing and services in GDP, importance of raw material-based industries, existence of biological resources, relevance of traditional knowledge
- *Industry structure*: importance of small, medium and large firms, entrepreneurship, rate of firm creation and firm exit, state of competition across different sectors, informal sector
- *Education and skills*: literacy, educational attainment levels, PISA quality of education indicators, evidence on reported shortages of skills in labour markets
- *Financial sector*: financial sector and access to finance, government involvement, other financial markets especially for innovation, such as VC, equity/stock market capitalisation
- *Framework conditions*: administrative burdens and red tape faced by entrepreneurs, costs of opening and operating businesses, major constraints faced by businesses including corruption, transport and ICT infrastructure, access to finance
- *Policy*: main national development objectives as well as aid policies and actions undertaken by NGOs as they relate to applying technologies to inclusive development, health, environmental and social questions.

Information on innovation systems and their relation with IP policy

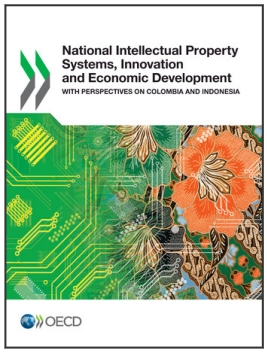
It is essential to focus on the national innovation system to position IP policy accordingly (see Box 1.A1.3 for some key indicators, although a full assessment of innovation policies will provide even better insights). As discussed in the framework, it is critical that the process take into account different groups on the production side and their conditions for engaging in innovation activities. Consultations with national stakeholders will be important for discussion of specific bottlenecks and experiences with potential solutions. The WIPO Methodology for the Development of National Intellectual Property Strategies addresses some of the relevant questions.

Box 1.A1.3. The national innovation system, its performance and policy

- *General characteristics*: GERD/GDP, general performance, patents, evolution and weight of specific sectors/activities, trademarks, human resource indicators most specific to innovation, such as engineering and scientific disciplines
- *Government and university research sector*: GOVERD, HERD, scientific publication statistics, organisations, leading institutions, private vs. public funding, leading research domains, and nature of public governance of research, policies regarding research including funding conditions and amounts, levels of independence, performance-based efforts, policies and state of commercialisation, research quality of universities, national universities in international rankings, publication statistics for national institutions, major international co-operation agreements and co-operation among researchers, international co-publications, exchange programmes for researchers with foreign universities
- *Business performance*: BERD, export performance, levels of machinery investments, top national and foreign R&D investors, R&D by industry, firm size, performance of foreign compared to domestic businesses, export unit values, additional data from innovation surveys if any, and other specific sources on specific domains
- *Innovation policy*: national innovation strategy and its objectives, government support, policies, agencies, statistics, both direct and indirect measures for businesses, specific policies on clusters, thematic programmes especially health and social challenges.

Note

1. Refer to country profiles at www.wipo.int/ipstats/en/statistics/country_profile/ and statistical data at www.wipo.int/ipstats/en/.



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