Capturing Value from IP in a Global Environment

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Executive Summary

This paper documents the strong growth in tools used by firms to protect their intellectual property (IP), develop their know-how, and build and maintain their reputation globally. We focus on three tools that have become increasingly important in the last several decades: patents, trademarks, and industrial designs. We find that, although most IP applications come from a few countries (the United States, the European Union, Japan, China, and South Korea), most growth in IP activity has come from middle-income countries, especially in Asia. We observe important differences in the origins of this growth. For example, while in India most applicants were foreign firms, in China most were local. However, most Indian innovations were also applied overseas, while Chinese innovations rarely made it out of China. Interestingly, growth in applications varies by IP tool, with industrial designs experiencing the most growth.

These trends in applications are less evident when we study which applications are actually granted. For example, the shift in IP activity toward middle-income countries and Asia is less pronounced, and the most developed countries still lead globally. Moreover, there seems to be an important difference in the quality of patent applications and grants across countries, with very few patents granted to Chinese applicants overseas.

Although globalization and IP tools give firms an opportunity to leverage their know-how and reputation across countries to *create* value, it remains challenging to *capture* that value. For example, IP protection remains fragmented and it is very costly to develop a comprehensive IP footprint worldwide. Furthermore, larger numbers of applications are causing backlogs and delays in numerous Patent and Trademarks Offices; as a consequence, weaker patents and industrial designs are granted. Litigation over the validity and violation of IP rights has also become expensive, and its outcome uncertain. Suits and counter-suits among different players in the value chain across countries are more common due to weaker patents, a hyper-fragmented IP space, and the costs of patenting globally. For trademarks and industrial designs, globalization has created more potential infringers and an increase in piracy, as evidenced by a significant increase in customs seizures. The problems with IP even go beyond individual firms, as when governments use IP policies to favor local firms and thereby change which firms get to manufacture and capture value from IP (as in the case of wind turbines in China). Our second section describes these challenges in more detail.

Our third section confronts the fact that, although changes in the global IP system are desirable, they are unlikely to happen in the near future due to the complexity of crafting new treaties across countries. We discuss how multinational firms are dealing with the challenges of capturing value from their know-how

and reputation in the existing global IP system, and review mechanisms, both market and non-market, that have been leveraged successfully. Different mechanisms are not equally effective across industries and regions. Under strong IP regimes, firms can use monopoly rights to sell their products exclusively, or license or trade their IP. However, even under these regimes firms must resort to secrecy, superior lead times, complexity, or complementary assets to maximize value capture from their IP. In fact, many of today's multinationals rely on a combination of these mechanisms, depending on their regions of operation. Some firms seeking to improve their relative positioning in the value-capture game even resort to collective action, using patent pools or standards-setting organizations, increasing surveillance, and collaborating with governments on seizures.

The overall picture that emerges—a growing number of applications and grants, fragmented rights, and patents of questionable quality—leaves plenty to be desired. What is clear is that the challenges to capturing value from know-how and reputation using an array of IP tools will be an increasingly important matter of strategy for organizations that depend on global IP. This has important implications for management practice in this area, as we discuss in our concluding section. Global companies will need to organize cross-functional *value capture* teams focused on appropriating value from their know-how and reputation by combining different institutional, market, and non-market tools, depending on the institutional and business environment in a particular region.

Introduction

The pace of globalization has accelerated significantly in the last forty years. Changes in technology and global political economy have eroded barriers that limited the geographic scope of firms, unleashing a seemingly unlimited set of new threats, challenges, and opportunities for creating value globally using firms' intangible assets, including their know-how and reputation. However, the institutional framework that allows firms to capture value globally has not evolved at the same pace, creating an imbalance that undermines firms' ability to realize the full potential of globalization. Moreover, with innovation and intellectual capital becoming increasingly important sources of competitive advantage for firms, we can expect that the imbalance between value creation and value creation will continue to grow.

Our main objective is to highlight the challenges that managers face when trying to appropriate value from their intellectual property (IP) globally. Managers have three types of tools to appropriate value: institutional tools such as patents, trademarks and industrial designs[1]; market mechanisms such as the use of complimentary assets and secrecy; and non-market mechanisms such as group-based piracy deterrence.

Based on a review of trends in the use of institutional IP tools to protect firms' know-how and reputation across countries and technologies, we conclude that the global institutional system to protect IP and guarantee value capture from intangibles is not working globally. Specifically, we identify the main obstacles for managing IP across countries and discuss the innovation and performance implications of relying on institutional IP tools to appropriate value globally. We end by summarizing market and non-market mechanisms to appropriate value that are grounded in the academic research in IP. We illustrate these solutions with examples from firms that are successfully appropriating value globally and conclude with some implications for management practice.

Capturing value globally using institutional tools

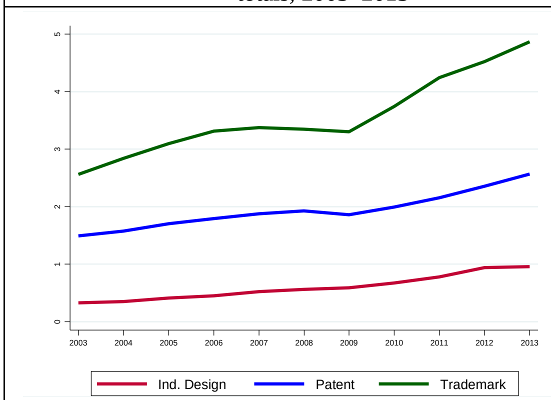
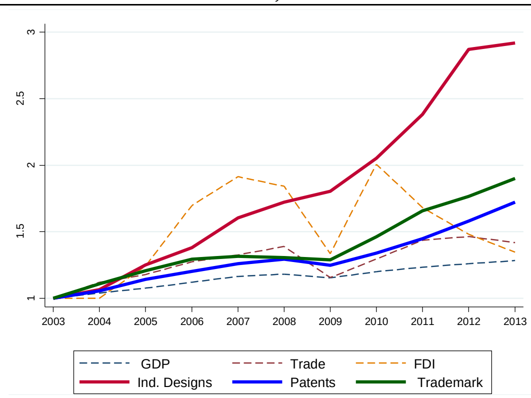
Fueled by an emphasis on innovation in products and services, the number of applications for patents, trademarks, and industrial designs has skyrocketed in the last 10 years (see Exhibit 1). By 2013, the last year for which comprehensive data are available, patent and trademark offices (PTOs) around the world received roughly 2.57 million patent applications, 4.87 million trademark applications, and 957,000 industrial design applications—almost double the number submitted in 2003.

[1] Although the term 'industrial design' is common in the United States, the same concept is known as design or community designs (both registered and unregistered) in Europe. We follow the World Intellectual Property Office (WIPO) in using the term industrial design to refer to IP related mainly to the shapes and contours of a product.

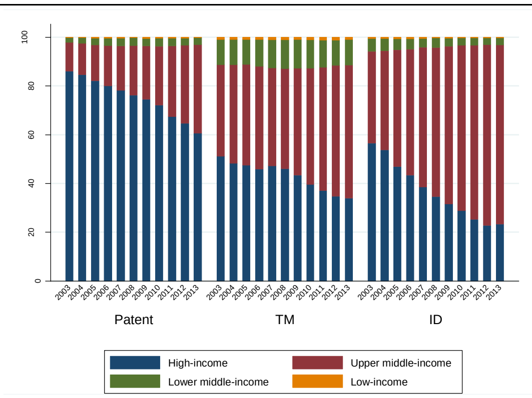
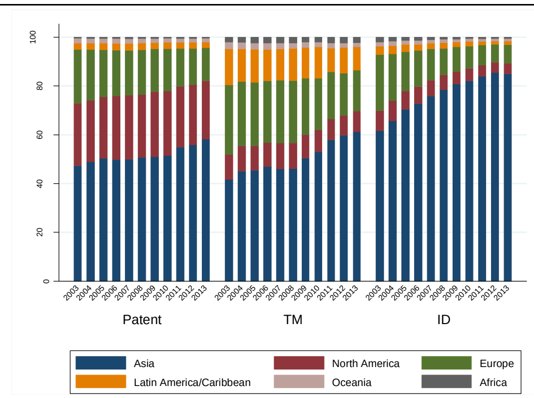
To assess whether global IP trends mirror the broader economic picture of the past decade, Exhibit 2 compares the growth of IP to the growth of potentially related economic indicators such as GDP, trade, and foreign direct investment (FDI). (Note that yearly figures were standardized to their 2003 values to facilitate comparisons.) Although the drop in IP applications during the economic crisis of 2008 was not as pronounced as for other economic indicators, time-series correlations show a strong link between GDP or trade levels and all types of IP applications (average correlation of 0.95 with GDP and 0.82 with trade).

Note that growth in the use of IP tools has outpaced growth in both GDP and trade. Interestingly, industrial design applications—which were lower in absolute terms than applications for the more-favored IP tools of patents and trademarks—have grown even faster than FDI for substantial parts of the decade.

Many factors have contributed to the growth of industrial design applications. In some cases, products cannot be protected using the more traditional tools of trademarks and patents. As pirated versions of such products have skyrocketed in number, firms have embraced industrial design as a cost-effective alternative for IP protection. Additionally, as firms started differentiating their products not only through technology innovation but also through design innovation, including the aesthetic aspects of a product, they combined patent applications with design applications. Apple provided an example of this trend when it filed for 92 industrial design applications just before launching the iPhone in 2007 (application data retrieved from DesignView). On the other side of the Atlantic, industrial design applications grew in the European Union (EU) following legislation, passed in 2004, granting industrial rights valid in all European countries simultaneously, thus removing the need for multiple applications to local PTOs and reducing the cost of protecting IP.

Exhibit 1: Number of IP applications by type. Worldwide totals, 2003–2013	Exhibit 2: Growth of IP applications by type. Worldwide totals, 2003–2013
	
Source: WIPO	Source: WIPO, World Indicators, World Bank

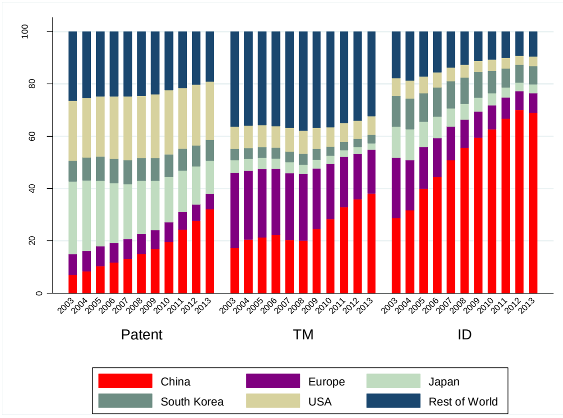
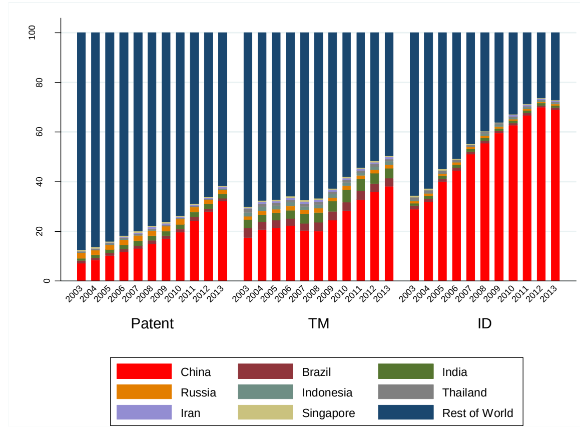
The pronounced growth of IP applications globally has been unevenly distributed across countries, with most of the growth coming from upper-middle- and lower-middle-income countries (see Exhibit 3) and from Asia and North America (see Exhibit 4). Growth in Asia was particularly strong in industrial design and trademarks (17% and 12% CAGR for 2003–2013, respectively) while Europe showed the lowest growth in all IP types. Notwithstanding strong growth in the rest of the world, high-income countries were still attracting the most patent applications globally in 2013.

Exhibit 3: IP applications by type and country income groups, 2003–2013	Exhibit 4: IP applications by geographic regions, 2003–2013
	
Source: WIPO	Source: WIPO

A granular analysis at the country level suggests that most IP applications in 2003–2013 were concentrated in five PTOs: the United States, the European Union, Japan, South Korea, and China (see Exhibit 5). In 2003, these five PTOs accounted for 74% of patent applications, 64% of trademarks applications, and 82% of industrial design applications globally; in 2013 they accounted for 81%, 68%, and 91%, respectively.

The growth of IP applications in China has been remarkable. Patent application in China grew at an astonishing 26% CAGR during the 2003–2013 period, followed by an increase of 25% CAGR in industrial design applications, and 17% in trademark applications. In fact, in 2011 China surpassed the United States to achieve the highest total number of patent applications. Japan, meanwhile, saw a negative CAGR for patent (-3%), industrial design (-3%), and trademark applications (-1%) in 2003–2013. Among the more mature markets, the United States showed healthy growth across all IP types, with a CAGR of 6% in patents and 5% in trademarks and industrial design applications.

Other emerging markets also increased their number of IP applications, though not to the same extent as China (see Exhibit 6). For example, India experienced a CAGR of 9% in patent and trademark applications and 11% in industrial design applications. Even Russia, the BRIC country with the lowest growth in 2003–2013, grew by 3% (patent), 7% (trademark), and 5% (industrial design) CAGR.

Exhibit 5: IP applications by filing office and type. Larger PTOs, 2003–2013	Exhibit 6: IP applications by filing office and type. Larger emerging markets, 2003–2013
	
Source: WIPO	Source: WIPO

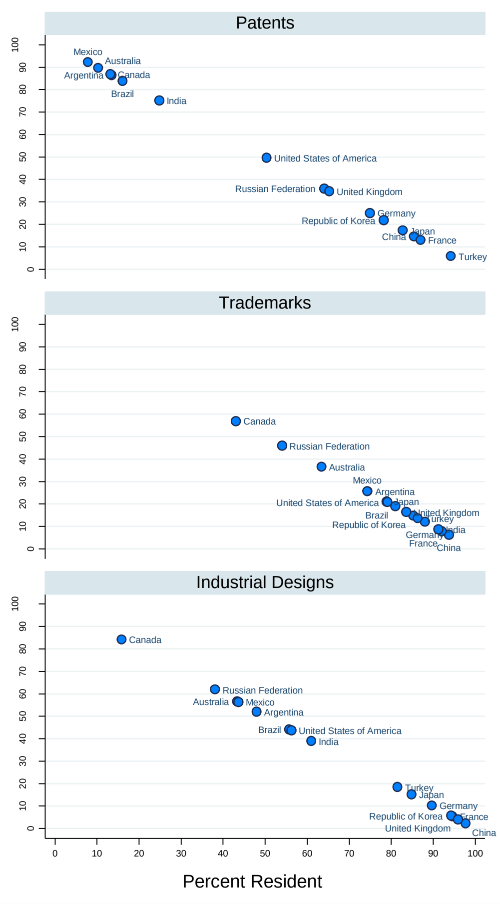
Looking at aggregates masks some important differences across countries and may lead to misconceptions about their innovative capacity. For example, foreign firms may file for IP in a large market to protect their products and services there, while the innovation occurs somewhere else. Although we don't have information on the location of inventors for all countries, we have explored the trends of IP applications by residents and non-resident in the filing country, an approximation that can indicate the level of global connectivity of a country in terms of innovation.

Exhibit 7 shows the result of this analysis. It shows the top 20 countries in terms of IP applications in 2013 divided into resident applicants and non-resident applicants. The division among patent applications is particularly illustrative. The United States falls in the middle of the graph, signaling that almost 50% of applications for American patents came from non-U.S. applicants. Given the large number of applications filed at the U.S. Patent Office (USPTO), the exhibit suggests that the United States is a place that generates high levels of local innovation while also attracting applications from foreign firms and inventors interested in manufacturing or selling their products there or in conducting R&D. In the upper left corner we find countries like Mexico, Australia, Argentina, Canada, Brazil and, to a lesser extent, India, where the majority of applicants were foreign, suggesting lower levels of local innovation. On the lower right corner we observe countries like Turkey, France, Japan, China and South Korea, where most patent applications were submitted by residents.

For trademarks, countries tend to be more similar in their breakdown of resident vs. non-resident applications, in part because small firms that are more locally oriented, and wish to establish a local brand (e.g. grocery stores, pizzerias, restaurants, nightclubs, and hairdressers), commonly use trademarks for IP protection. The data patterns for industrial designs are similar to those in patents. Three groups of countries emerge: those where the ratio of residents to non-residents balances and those where one group (residents or non-residents) is clearly dominant.

Exhibit 8 gives the historical trend of applications by residents vs. non-residents for three archetypical countries: Canada (with high levels of non-residents applications), China (with high levels of resident applications), and the United States (with a balance between resident and non-resident). The exhibit suggests that the patterns found in Exhibit 7 are stable across time and not the result of an atypical year.

Exhibit 7: IP applications by type and country. Resident vs. non-resident. Top 20 countries, 2013



Source: WIPO

Exhibit 8: IP applications by type. Resident vs. non-resident. Canada, China and the United States, 2003–2013

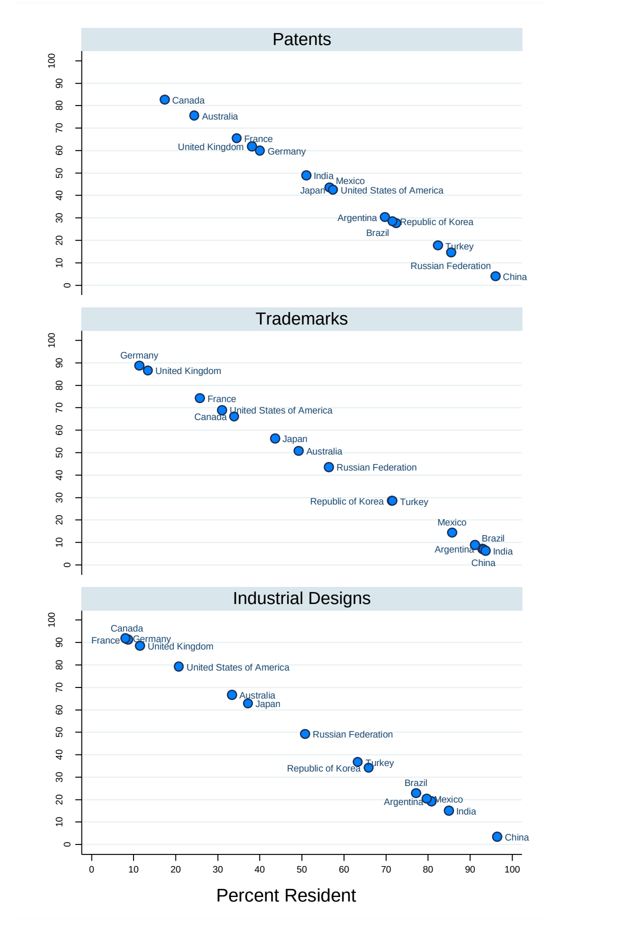
Source: WIPO

An alternative way to identify whether IP application by residents are associated with larger innovation by residents is to identify where applicants for a given country apply for IP. There are multiple reasons why an applicant might prefer to apply abroad vs. in his/her home country. For instance, it might be that the IP regime in the home country is not strong, that the innovative capacity is located abroad, that the home market is very small (forcing local firms to expand abroad), or that the applicant is solely interested in his/her own market, which is located abroad.

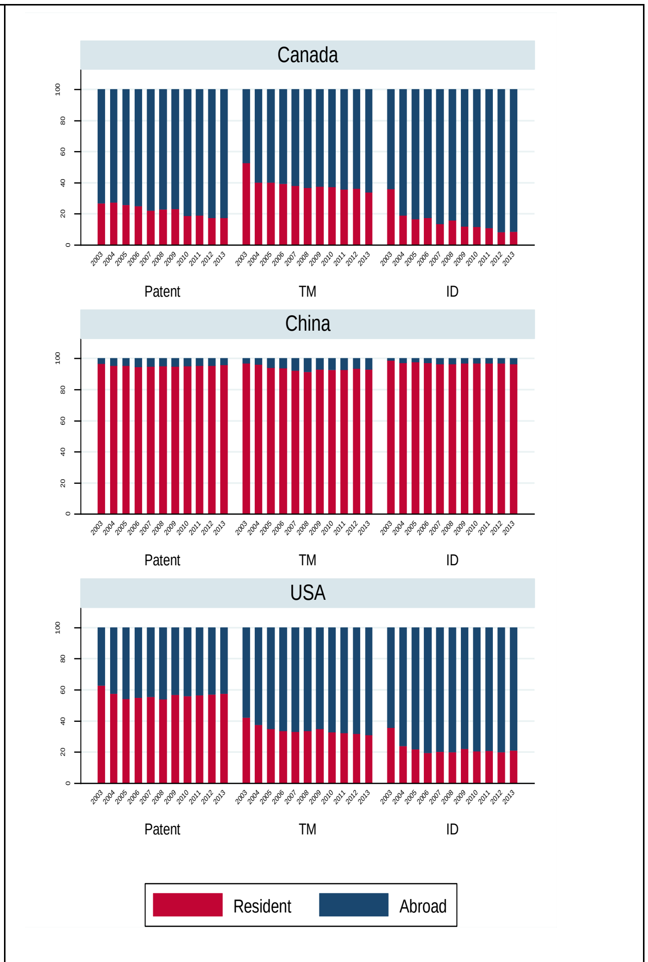
Exhibit 9 shows an almost continuous and equally spaced line from the upper corner (countries where most innovation is applied abroad) to the lower left corner (countries where most innovation is applied in the home market). Canada, China, and the United States again provide canonical examples of the distribution. Most Canadian citizens and firms apply for IP overseas, Chinese citizens and firms apply mostly in China, and U.S. citizens fall somewhere in between.

These exhibits examine the behavior of residents who apply for a particular IP tool. However, a recent OECD study (Dernis et al. 2015) investigated the top 2,000 corporate R&D spenders around the world and found a strong complementarity between patent and trademark applications. It also found important variation in corporate practices across industries: in Chemicals, for example, a large percentage of companies apply simultaneously for patents and trademarks. Such dual protection is less common in textiles and apparel. Nevertheless, many of these corporations are building their global IP footprint using both tools.

Exhibit 9: IP applications by type and country. Resident vs. abroad. Top 20 countries, 2013	Exhibit 10: IP applications by type. Resident vs. abroad. Canada, China, and the United States, 2003–2013



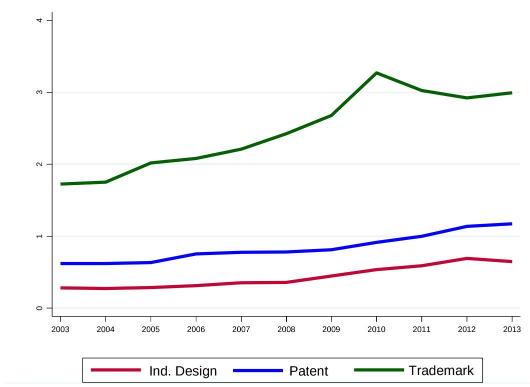
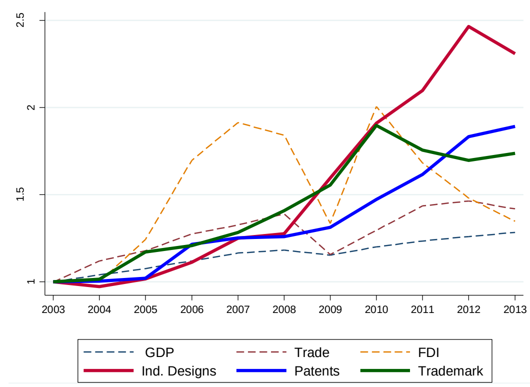
Source: WIPO



Source: WIPO

Further conclusions drawn from application data may be misleading, since applying for IP doesn't guarantee that an applicant obtains it. While the intensity of review varies by PTO, the norm is an exhaustive review of each application in order to compare it to granted patents, trademarks, and industrial designs and verify its novelty. In the case of patents, the subject matter should be patentable (a definition that varies by country), novel, non-obvious, and useful. There can therefore be many reasons why an IP application may be denied by a specific PTO. Exploring approved applications, also called IP grants, provides a better sense of innovation quality.

Exhibits 11 and 12 show that IP grants increased in 2003–2013, although at a slower pace than the growth in applications evidenced in exhibits 1 and 2. In 2013, 1.17 million patents, 3 million trademarks, and 647,000 industrial designs were granted. In terms of growth, industrial designs were the IP tool that increased most in popularity, followed by trademarks and patents. Contrary to the case of applications, the link between number of grants and other macroeconomic indicators of growth is weaker, with GDP and trade growth linked statistically only to the growth in patent grants, and FDI growth linked only to trademarks growth. We need to interpret this correlation carefully, however, as there are important lags between an application and an IP grant.

<table>
<tr><td>Exhibit 11: Number of IP grants by type. Worldwide totals, 2003–2013.</td><td>Exhibit 12: Growth of IP grants by type. Worldwide totals, 2003–2013.</td></tr>
<tr><td>
</td><td>
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Upper-middle-income countries were the main contributors to growth in granted patents (16%), trademarks (12%), and industrial designs (18%) (See Exhibit 13). Contributions from lower-middle-income and low-income countries were negligible and even negative in some cases, such as among patent grants to lower-middle-income countries. But contrary to the trend with IP applications, most IP grants went to high-income countries, suggesting that innovations in these countries are more likely to survive the evaluation process. Trademarks and industrial designs, on the other hand, are easier to obtain, and therefore the gap between more- and less-developed markets is smaller.

In terms of specific countries, the trend to concentrate IP in a few PTOs (first documented among applications) is also present among IP grants. Among patents, the top PTOs went from accounting for 70% of all grants in 2003 to 82% of all grants in 2013. Among industrial designs, concentration levels increased by 8% in the same period, from 81% to 89%. Interestingly, the level of concentration remained similar for trademarks (65% in 2003 and 67% in 2013).

China, among the top five PTOs in terms of IP grants (see Exhibit 14), again experienced fast growth from 2003 to 2013 (21%, 17%, and 21% CAGR for patents, trademarks, and industrial designs granted, respectively). China's growth in patent grants was not enough, however, to propel it past the total number of grants in the United States, where patent grants increased by 6% CAGR in 2003–2013. Within emerging economies, growth and total numbers of IP grants for countries like Brazil, Russia, and India were more modest, especially among patents.

Exhibit 13: IP grants by type and country income groups,	Exhibit 14: Patent grants by country. Five largest PTOs, 2003–

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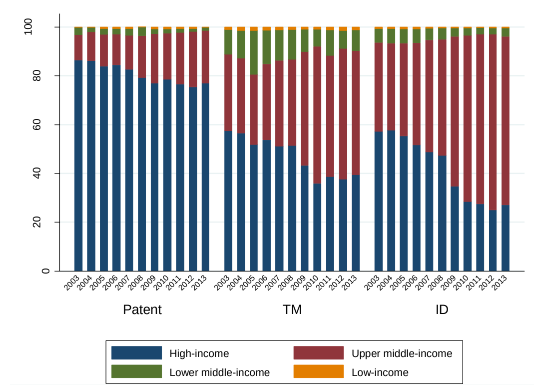
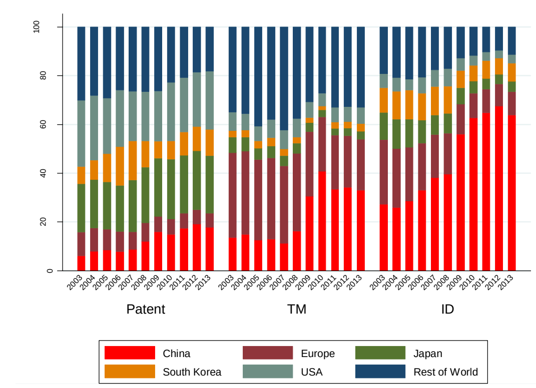
<tr><td>2003–2013</td><td>2013</td></tr>
<tr><td>
</td><td>
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<tr><td align="right">Source: WIPO</td><td align="right">Source: WIPO</td></tr>
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Although the growth of patent applications and grants is remarkable, there is increasing skepticism about the quality of those patents. For example, Lemley and Shapiro (2005) found that “roughly half of all litigated patents are found to be invalid, including some of great commercial significance.” Bessen (2007) found that 20% of U.S. patents were not renewed after 3 years. This issue is becoming more salient as larger volumes of patents come from IT technology and are related to methods. The concern about low-quality patents is even larger for countries like China, where government efforts to promote and advertise innovative activity may influence how rigorously IP applications are examined.

To provide a sense of whether low-quality patents have driven the growth in patent grants, we explored the likelihood that a country’s patents are granted abroad. Gauging the quality of a patent is not a straightforward exercise (see Squicciarini, Dernis, and Criscuolo 2013 for a detailed comparison of different indicators). Among the many indicators suggested in the literature, we find that the best indicator—albeit still an imperfect one—is the number of countries in which a patent is granted. Filing for patents is costly, so only patents that are perceived to be valuable would be submitted in multiple countries. Equally important, patents granted in multiple countries will have been examined by numerous PTOs, providing “second opinions” in support of the quality of a patent’s claims.

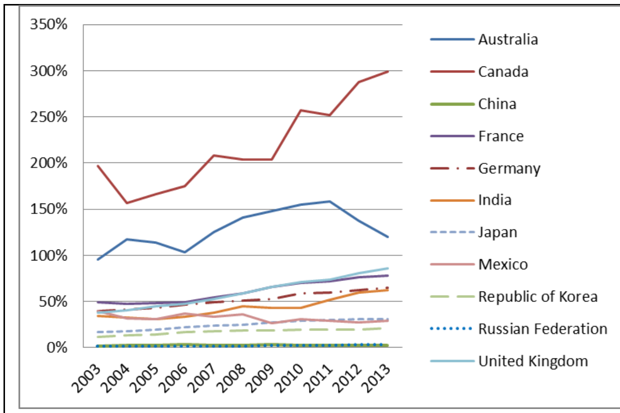
Because not all PTOs are equally rigorous during the examination process, we examined the percentage of patents from applicants for a given country that also received a patent from the USPTO. Countries with a high percentage of patents also granted by the USPTO would be considered countries that produce high-quality patents, while countries with low percentages would more likely produce low-quality patents. We are aware that this measure is far from perfect; certain countries’ residents might have stronger trade relationship with the United States and would therefore be more likely to apply for patents there. However, given that the U.S. market is large and governed by a strong IP regime, it is likely that most foreign patent applicants would apply for an equivalent patent in the United States.

Exhibit 15 shows the percentage of patents from a set of countries that were also submitted to the USPTO. Among the countries we analyzed for 2013, China (2%) and Russia (3%) submitted the lowest percentages of patents for consideration by the USPTO, suggesting that patents from these countries may be of low quality. We analyzed further whether the low percentage was due to Chinese patents applications abroad being submitted in countries other than the United States. This didn't seem to be the case, as 53% of all Chinese patent applications abroad in 2013 were made in the United States. India, another emerging market, showed a very different trend: 62% of the patent applications submitted by Indians in India in 2013 were also submitted in the United States. In that sense, Indian patents followed a pattern more similar to those of Western countries such as Germany (where 65% of German patent applications were submitted also to the USPTO) and France (78% to the USPTO). Canada and Australia were on the other side of the spectrum: Canadian and Australian applicants applied for patents more often in the United States than in their home country.

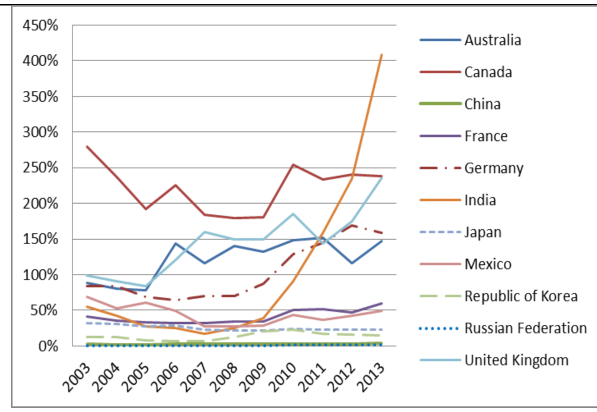
Exhibit 16 shows the relative number of patent granted in the United States divided by the number of patent registrations in the home country. The results indicate that India evolved from being a local-patent-applicant country into being a highly active international player. Indian applicants had four times as many patents registered in the United States in 2013 than they had registered in India. Also in terms of U.S. registrations, China remained at the bottom of the distribution; U.S. patents granted to Chinese applicants accounted for only 4% of patents registered in China by Chinese applicants. To put it in perspective, the total number of patent registrations by Chinese in the United States in 2013 was less than the number issued to IBM in the U.S. in the same year (China=5,928 vs. IBM=6,788).

These figures suggest that the remarkable growth in patent applications and grants worldwide may well have been composed of low-quality patents that might not have survived examination in the U.S. system.

Exhibit 15: Percentage of patent applications in home country submitted in the U.S., 2003–2013	Exhibit 16: Percentage of patent registrations in home country granted in the U.S., 2003–2013



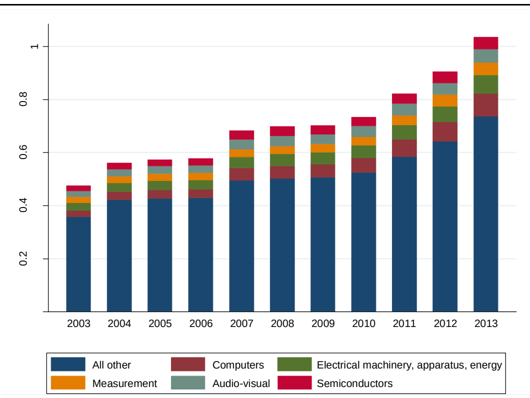
Source: Authors calculations based on WIPO data



Source: Authors calculations based on WIPO data

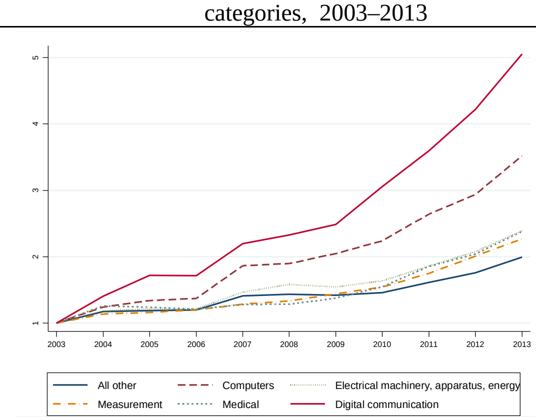
Finally, patent grant data makes it possible to explore differences in IP activity by technology. Although the bulk of patents were granted in traditional areas such as electrical and mechanical engineering and chemistry (see Exhibit 17), the areas of fastest growth in the last five years were associated with technologies for which the scope of the patent was harder to define, such as IT methods for management, digital communication, and medical technology (see Exhibit 18).

Exhibit 17: Patent grants by technology. Top five categories, 2003–2013



Source: WIPO

Exhibit 18: Patent grants by technology. Top 5 fastest growing categories, 2003–2013



Source: WIPO

Challenges with using institutional tools to capture value from IP

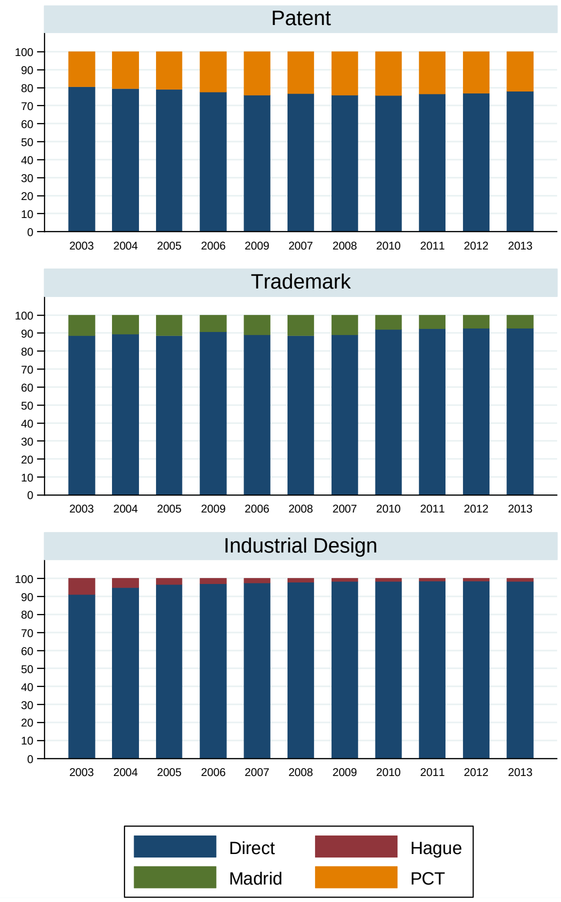
Although the healthy growth rate among all types of IP protection may suggest that institutional tools are helping firms to appropriate value globally, the reality is quite different. At the same time that managing global IP is becoming more important, protecting it with existing institutions is complex and costly. Different factors contribute to this situation:

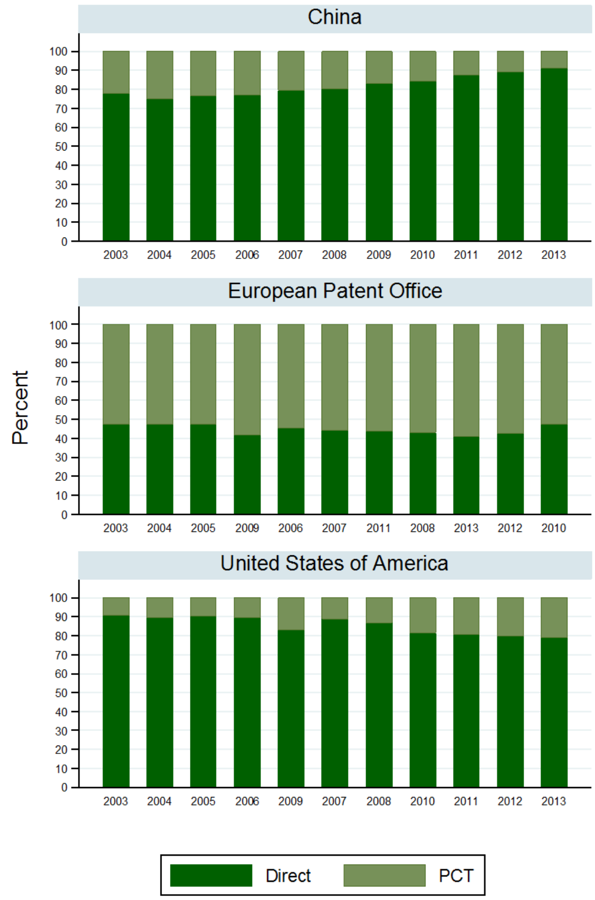
- *The global IP system hasn't been updated in 50 years, forcing firms to depend heavily on country institutions*. Institutions for overseeing global IP were created more than 100 years ago and, although they have evolved over time, they have not kept pace with changes from globalization. For example, the Paris Treaty, the institutional feature that established rules to govern IP across counties, was signed in 1883. The Patent Convention Treaty (PCT) application system, the most practical tool for global IP in use today and the closest to a global patent, was signed in 1970.[2] For trademarks, the Madrid system was born from the Madrid protocol signed in 1891.[3] For industrial design, the Hague system was created in 1925.[4]

  Exhibit 19 shows the use of these IP tools across time. Among the various mechanisms, the PCT for patents seems to be the most popular, with roughly 20% of applications received through the PCT system. The least used is the Hague system, with less than 5% of all applications invoking the treaty. Applications through the Madrid system decreased over time to account for less than 10% of all applications in 2013.

Exhibit 19: IP applications by source. Local filing vs. global methods (PCT, Madrid, and Hague)	Exhibit 20: Patent applications. Local filing vs. global methods (PCT)

[2] By filing one international patent application under the PCT, applicants can simultaneously seek protection for an invention in 148 countries throughout the world.
[3] The Madrid system is a simple, centralized, cost effective, and flexible solution to register your trademark with up to 95 contracting parties.
[4] The Hague System for the International Registration of Industrial Designs provides a practical business solution for registering up to 100 designs in more than 64 territories by filing a single international application.



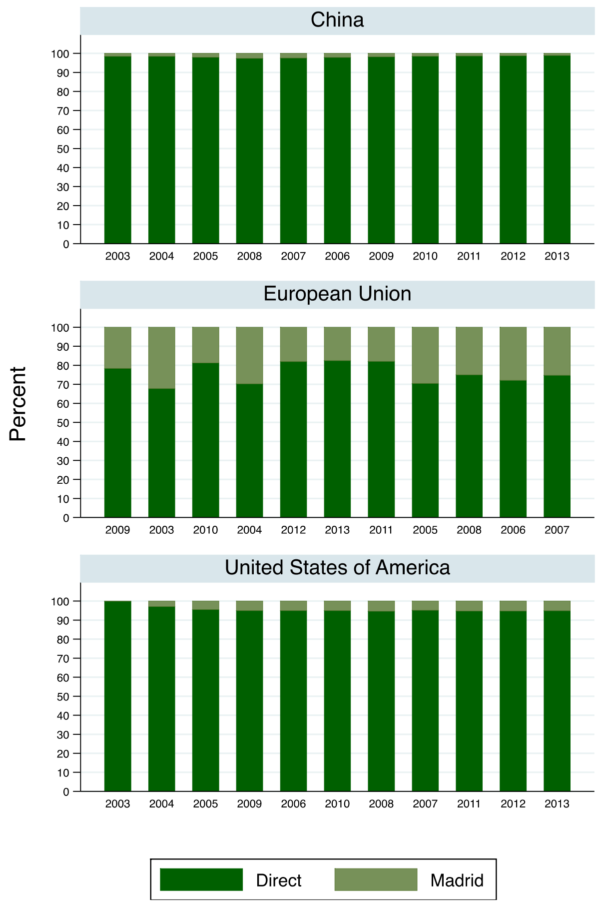


Source: WIPO	Source: WIPO

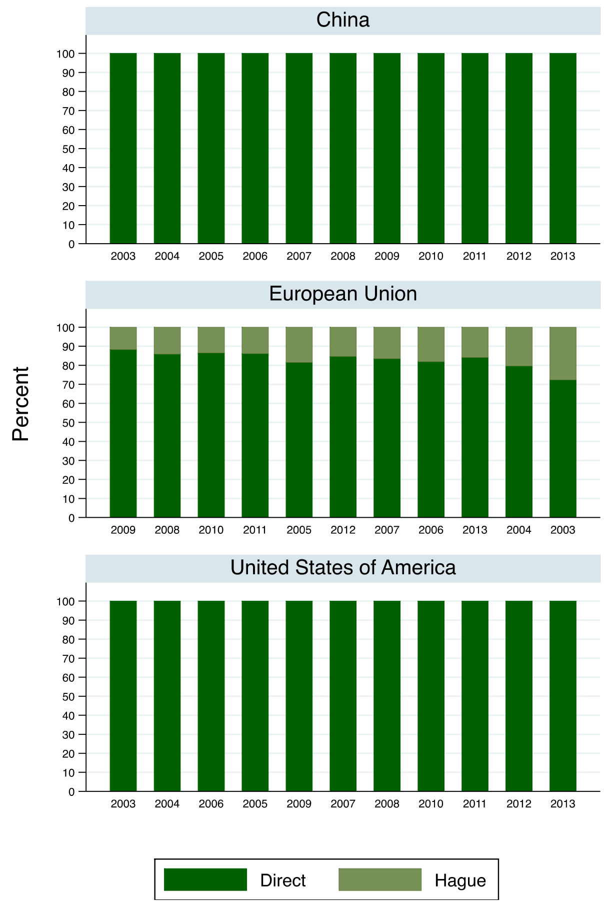
These basic global trends vary by country. For example, more than 50% of patents applied for in the European Union were submitted using the PCT—one of the highest percentages in the world—while in China, less than 10% of patent applications were submitted through the PCT in 2013, down from around 25% in 2003 (see Exhibit 20). The United States was somewhere in between these cases, with an increase in PCT applications from around 10% of the total in 2003 to almost 20% of the total in 2013.

Global mechanisms for applying for trademarks and industrial designs were used even less often than global mechanisms for patents. Exhibits 21 and 22 show use of the Madrid and Hague systems.

Exhibit 21: Trademark applications. Local filing vs. global methods (Madrid)	Exhibit 22: Industrial design applications. Local filing vs. global methods (Madrid)



Source: WIPO



Source: WIPO

Again E.U. applicants seem more likely to have used global mechanisms, followed by U.S. and Chinese applicants. For the latter, the use of global mechanisms was extremely low, with less than 3% of trademarks and industrial designs being applied for using the Madrid or Hague systems.

Another piece of the global system to protect IP is the agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), an international agreement that brought IP issues to the world trade system that emerged when the World Trade Organization (WTO) was established. TRIPS requires all 160 country members of the WTO to implement and enforce some basic levels of IP protection: copyrights and patent-length protection is standardized to minimums of 50 and 20 years, respectively; copyrights are granted across all countries without multiple registration processes; protection is given to software, media content producers (such as broadcasting organizations and producers of records), geographical indications (e.g. appellations of origin for agricultural products such as wines and cheeses), varieties of new plants, designs of integrated circuit layouts, and trade secrets. TRIPS is also in charge of enforcement and conflict resolution in cases brought to its attention.

Almost 20 years after its creation, the results of TRIPS are mixed (see Table 1). In almost 20 years, only 34 cases have been brought forward by a member country. Of those, many are still in process. Most of the initial cases were between large markets with strong property rights and the outcomes tilted towards the homogenization of existing laws in areas such as music records (United States and European Union against Japan) and strengthening IP law enforcement (United States versus specific Nordic European countries).

Although more substantial cases against India (in pharmaceuticals) and China (IP law) produced beneficial changes in the laws in both countries, the practical implication of TRIPS is still to be determined. Moreover, smaller countries have recently opened cases against developed countries with strong IP regimes, based on seizures of counterfeits (Brazil and India against the European Union, claiming that generic drugs were in transit to other countries where they would be legal) or challenges to laws protecting health (Cuba, Dominican Republic, Honduras, Indonesia and Ukraine against Australia, for a law that requires tobacco packaging to highlight the health hazards of smoking). Only in one case, the European Union versus the United States in copyrights, have retaliatory measures been generated in favor of the infringed firms.

Overall this tool for enforcing IP rights appears to be of limited use to particular firms. This is because cases have to be brought by countries, they have to be related to trade, their resolution by the WTO takes considerable time, and result of any case (when there is one) must be implemented by country legislation.

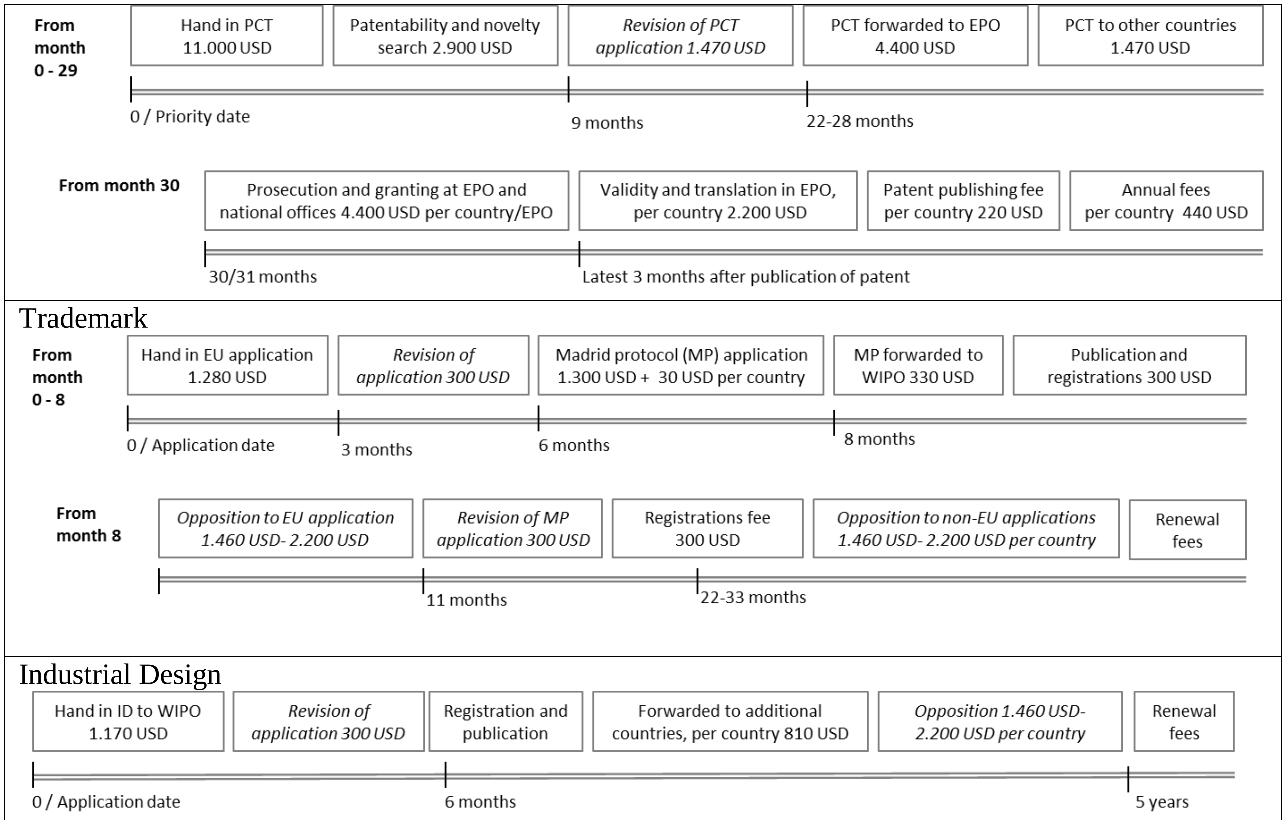
Table 1: IP litigation cases related to TRIPS and brought to the WTO

Complainant	Respondant	Industry	Year	Status
Indonesia	Australia	Tobacco	2013	In consultation
Cuba	Australia	Tobacco	2013	In consultation
Dominican Republic	Australia	Tobacco	2012	In consultation
Honduras	Australia	Tobacco	2012	In consultation
Ukraine	Australia	Tobacco	2012	In consultation
Brazil	European Union	Pharmaceuticals	2010	In consultation
India	European Union	Pharmaceuticals	2010	In consultation
European Union	China	Financial Services	2008	Withdrawn
United States	China	IP law - misc	2001	Change in IP law in China
Australia	European Union	Agricultural	2003	Change in EU policy in denomination of origin
Brazil	United States	Patents from federal grants	2001	In consultation
United States	Brazil	IP law - local content	2000	Withdrawn
United States	Argentina	IP law enforcement	2000	Withdrawn
European Union	United States	1930 Tariff Act	2000	In consultation
European Union	United States	1998 Omnibus Act	1999	US postponed implementation
United States	European Union	Agricultural	1999	Change in EU policy in denomination of origin
United States	Argentina	Pharmaceutical, chemicals	1999	Withdrawn
United States	Canada	Patent law	1999	Canada modified law
European Union	United States	US copyright act	1999	US had to change law, retaliation approved
Canada	European Union	Pharmaceutical, chemicals	1998	In consultation
United States	Greece	IP right for media	1998	Withdrawn
United States	European Union	IP right for media	1998	Withdrawn
United States	European Union	Copyrights	1998	Withdrawn
European Union	Canada	Pharmaceuticals	1997	Canada implemented changes
United States	Sweden	IP enforcement	1997	Withdrawn
United States	Denmark	IP enforcement	1997	Withdrawn
United States	Ireland	IP law	1997	Settled
European Union	India	Pharmaceuticals	1997	India changed regime
United States	Indonesia	Automobiles	1997	Indonesia changed regime
United States	India	Pharmaceutical, chemicals	1996	India changed regime
European Union	Japan	Music records	1996	Settled
United States	Portugal	IP	1996	Settled
United States	Pakistan	Pharmaceutical, chemicals	1996	Settled
United States	Japan	Music records	1996	Settled

Source: Authors, based on WTO data.

- *Protecting IP globally is expensive.* The lack of a unified global system means that most applications for IP rights were conducted country by country, driving up costs. The final cost of pursuing IP protection depends on several factors: the type of IP protection sought (patent, trademark, or industrial design); the availability of global channels (PCT, Madrid, or Hague); a patent's complexity (normally measured by its length); the period of time targeted for protection; the number of countries where applications are made; and the extent to which external lawyers are involved. Exhibit 23 shows some average costs per stage in the process of applying, obtaining, and maintaining a patent, trademark, or industrial design.

Exhibit 23: Cost of applying for Patents, Trademarks, and Industrial Designs (March 2015 prices)
Patent



*Events written in italics are potential costs
Source: Calculations based on data from http://www.iprcostbenefitguide.dk

We illustrate the financial and strategic impact of applying for IP for the case of patents. Table 2 shows eight patent-costs scenarios that vary by country coverage and patent length.

Table 2: Cost of patent, $US

	Short patent		*Long patent*	
Country list	*10 years*	*20 years*	*10 years*	*20 years*
Narrow – 6 countries	57,190	112,181	78,190	133,192
Broad – 30 countries	262,780	502,040	363,160	602,280

Source: Inspicos, estimator from Quantify IP.
Short patent application is defined as a patent application with 15 pages of description/claims (=5,400 words) and 5 pages of drawings.
Long patent application is defined as a patent application with75 pages of description and claims (=27,000 words) and 5 pages of drawings.

Note that the costs of a patent vary dramatically, with the most expensive scenario (long patent, wide geographic coverage, and long period of protection) costing more than 10 times the cost of the least expensive scenario (short patent, narrow geographic scope, and short period of protection). To put it in perspective, had Intel followed the most expensive approach for its U.S. stock of patents in 2013 (1,454 patents granted), it would have incurred costs of US$ 0.87 billion, or almost a tenth of its annual budget for R&D (US$ 10.6 billion in 2013).

The geographic dimension varies not only by the number of countries but also by country-specific costs. Exhibits 24–27 show this cost variation for patents with different characteristics in terms of length, duration, and country. Note that European countries were among the cheapest options. Comparatively, the other large PTOs— those of the United States, China, and Japan—were among the most expensive jurisdictions in which to apply for patents. The calculations also suggest that countries differ in the degree to which annual fees increase toward the end of a patent's lifetime. Relative to the cost of a full lifetime patent (20 years), the average cost of a ten-year patent was 48% cheaper for short patents and 40% cheaper for long patents. Larger PTOs, however, were relatively more costly for the first 10 years than for the later years: for short patents, the U.S. was 60% more costly in the first 10 years, China was 52% more costly, and Japan was 65% more costly; for long patents, the U.S. cost 60% more in the first 10 years, China cost 60% more, and Japan cost 75% more.

Exhibit 24: Estimated costs (US$) of patenting in largest PTOs for 10 and 20 years. Short patent.

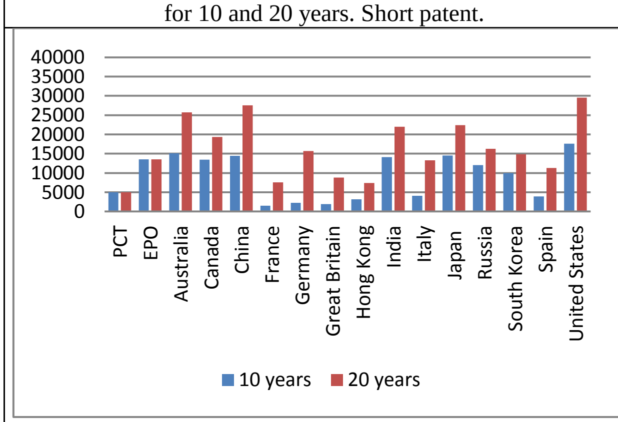


Exhibit 25: Estimated costs (US$) of patenting in Small PTOs for 10 and 20 years. Short patent.

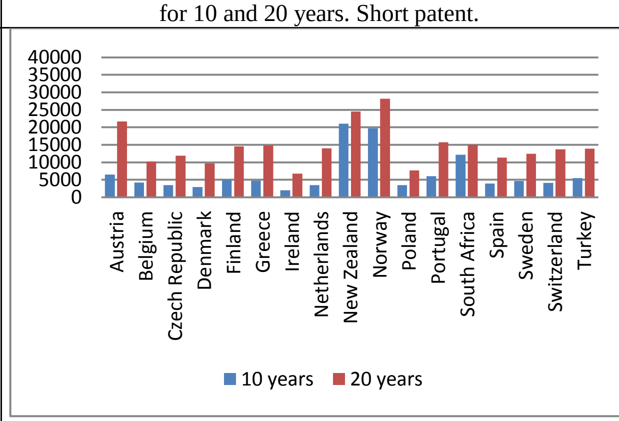


Exhibit 26: Estimated costs (US$) of patenting in largest PTOs for 10 and 20 years. Long patent.

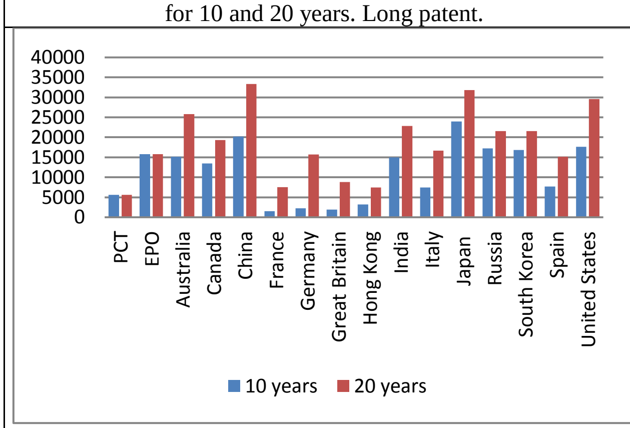
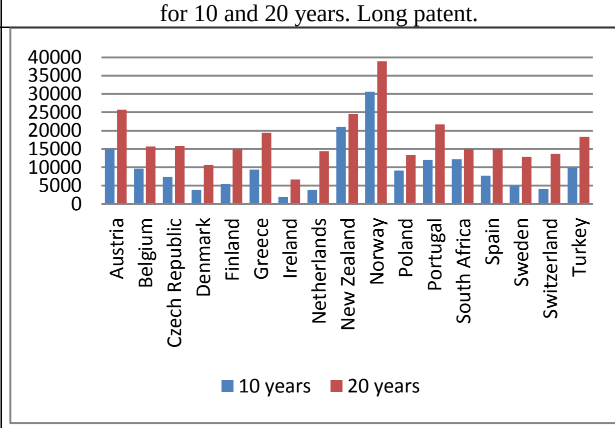


Exhibit 27: Estimated costs (US$) of patenting in Small PTOs for 10 and 20 years. Long patent.



Source: Inspicos is the source of the data and the Global IP Estimator from Quantify IP.
Short patent application is defined as a patent application with 15 pages of description/claims (=5,400 words) and 5 pages drawings.
Long patent application is defined as a patent application with 75 pages of description/ claims (=27,000 words) and 5 pages drawings.

The costs of registering trademarks and industrial designs were much lower than the costs for patents, representing between 5% and 10% of the cost of applying for a patent covering the same number of countries (see Table 3).

Table 3: Cost of trademarks and industrial designs, $US

Country list	Trademarks		Designs	
	Registrations	*If oppositions*	Registrations	*If oppositions*
Narrow – 6 countries	5,740	2,930- 4,400	2,275	8,800 – 13,200
Broad – 30 countries	15,800	2,930- 4,400	16,000	44,000 - 66,000

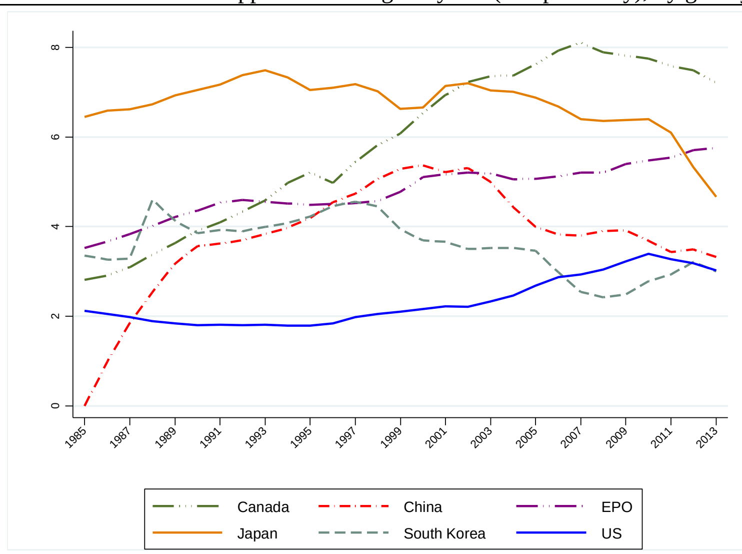
Source: Calculations based on www.iprcostbenefitguide.dk
Calculations for trademarks are based on trademark applications covering three NICE classifications, when the process is handled with an advisor.
Calculations for ID are based on an ID application of one image, when the process is handled with an advisor.

Because these costs are indeed substantial, most firms develop IP strategies where core innovations, brands, and product shapes are protected in most countries, while peripheral innovations are protected in only a few (normally in larger markets). Our interviews with IP professionals suggested that this process has become more complex for several reasons: firms sell in more markets (directly and through third parties), their value chains are more geographically diversified, and IP protection has become a more common method of competing across markets (multimarket suits and counter suits in litigation). Moreover, firms need to foresee countries of interest for their business for the next 20 years to ensure that the IP they apply for today will cover their main markets in the future. Deciding *what to protect where* thus becomes an increasingly daunting exercise, and often leaves firms exposed in some markets.

- *No substantial new improvements to the current system for global IP are likely to happen.* While patent law harmonization has been an issue since the Paris Convention Treaty in 1883, recent attempts to forge a harmonized global patent law have been unsuccessful. The most recent attempt was in the early 2000s, when the WIPO's Standing Committee on the Law of Patents (SCP) initiated work for a new treaty, the Substantive Patent Law Treaty (SPLT). The effort ended in 2006 when WIPO members failed to agree on the proposed treaty's scope. The negotiations also highlighted several rifts among WIPO members on matters that are unlikely to be resolved in the foreseeable future, such as software patents. Although the existing global system for patents is fragmented, and constructed around country-specific territoriality, policies, and cultural norms, we cannot expect any major changes in the near future. Therefore, firms operating globally should design products, services, and strategies that protect their IP based on the existing global IP system.

- *PTOs are overwhelmed with the number of IP applications, creating lags and a lower-quality process of examination*. In most PTOs, the surge of IP applications has not been matched with increases in resources to process them. As a result, the time a patent is under evaluation has been inching up during the last 20 years. For example, the elapsed time between application and grant year has gone from 2 to 3 years in the United States, from 3.5 to 5.75 years in Europe, and from 0.93 to 3.32 years in China. Countries like South Korea and Japan seem to have taken measures to reduce evaluation times, but the elapsed time nevertheless remains longer than in the United States.

Exhibit 28: Years between application and grant years (exit pendency), by grant year.



Source: Authors' calculations based on data from Thomson Innovation

This index—elapsed time between application and grant—underestimates the real magnitude of the problem, as it doesn't consider applications that were never approved. Although information on backlogs is not readily available, Francis Gurry, director of the WIPO in 2009, mentioned an increase of 8.7% from 2002 to 2007, with an estimated 4.2 million patents waiting to be processed.[5] In the United States, a common index is the unexamined backlog, or the number of new patents awaiting a first action by an examiner. That number was close to 600,000 in the United States[6] in February 2015 (the latest figure offered by the USPTO), and the time elapsed before an examiner's first action was 14.7 months.

[5] http://www.wipo.int/pressroom/en/articles/2009/article_0035.html, accessed in September 1, 2015.
[6] The actual number is 598,284. Source: http://www.uspto.gov/dashboards/patents/main.dashxml accessed in March 23 2015.

- *Litigation is becoming more common and more expensive, and its outcome is less predictable.* An important implication of the astonishing increase in IP applications and grants worldwide is that the chance of overlapping IP rights is large, and that the IP landscape is hyper-fragmented within and across countries, creating the scenario for more litigation. This trend is exacerbated by the incomplete geographic scope and lower quality of IP rights and protections across countries.

  Exhibits 29 and 30 illustrate this point for patents by showing the number and growth of cases brought to courts in China, the European Union, and the United States. As no database contains numbers of patent litigations across jurisdictions, we based our analysis on data available in recent academic publications (Yang 2011,Cremers et al. 2013, Graham and Van Zeebroeck 2014, Trimble forthcoming) and from China IP litigation Analysis (CIELA), which is owned and controlled by the UK-based global law firm Rouse and Co.[7]

  For Europe, 80% of cases come from Germany. However, the real number is lower since, in the German system, validity disputes are litigated in separate cases. For example, a patent litigation entailing both an infringement and a validity dispute will result in two litigations, rather than the single case litigated other countries. For Germany, validity cases accounted for 25% of overall patent litigations in 2000–2012. Any conclusions from Exhibit 29 and 30 should therefore be drawn carefully.

Exhibit 29: Growth in patent litigations in the United States, China, and Europe, 2000–2012.

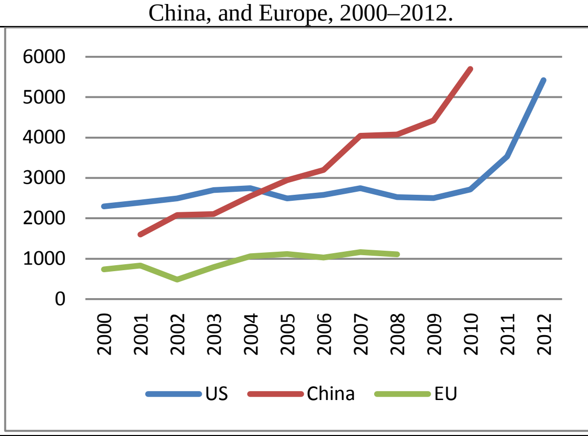
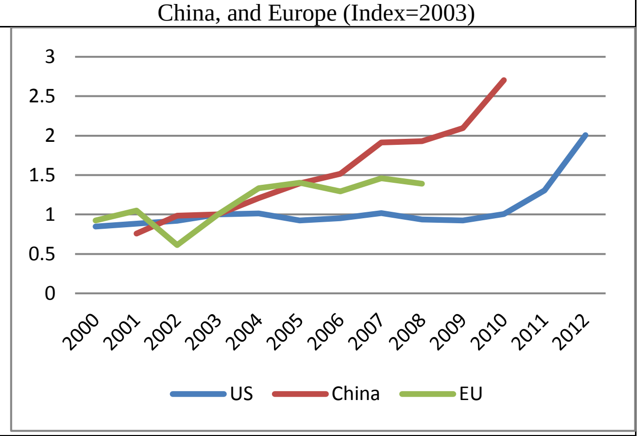


Exhibit 30: Growth in patent litigations in the United States, China, and Europe (Index=2003)



Sources:
*Data on U.S. patent litigations is based on Trimble (forthcoming) and resembles the full dataset on U.S. patent litigations.

[7] Note that the data is not easily comparable. Data on Chinese patent litigations is generated by using the aggregated number of Chinese patent litigation cases; however, for China inventions, industrial designs, and utility models belongs to the ‘patent category’, making the number of patent cases overall much higher than in the U.S. and the EU. From the CIELA data we know that only 15% of the Chinese patent cases would be considered “real” patent cases as understood in the U.S. and EU data. Also, the EU data only contain litigation data from four countries: Germany, France, Netherlands and United Kingdom.

*Data on patent litigations in Europe is based on Cremers et al., 2013; the data is the aggregated number of patent litigations in the most active courts: DE, FR, NL, and UK. Data only available until 2008.
*Data on Chinese patent litigations uses the aggregated number of patent litigation cases in China (where inventions, designs, and utility models belong to the patent category). This data has been reported by IBM (2011), referring to statistics from Chinese Judge He Zhonglin, and in the statistical judicial enforcement of patents in China presented by Thomas Patloch (2010).

In terms of litigation intensity, the United States outnumbered both China and Europe for the period 2003–2013 (see Exhibit 29). In terms of growth, Exhibit 30 indicates a two-digit annual increase in cases in China since 2003 and a stable growth rate in Europe (with little fluctuation between 2003 and 2008). For the United States, the number of patent litigations was stable between 2003 and 2010, but the annual growth rate increased dramatically after 2010 (30% in 2011 and 54% in 2012). This increase was precipitated by the Americas Invent Act (AIA) and by the emergence of the Non-Practicing Entity (NPE). AIA stipulates that serial plaintiffs (most often NPEs) cannot sue several defendants in one court case, but that the plaintiff needs to divide the case per defendant. This created a rush to file patent cases engaging serial plaintiffs before AIA came into force in September 2012 (RPXCorporation 2014). The relatively high number of patent litigations in China can be viewed as a positive thing, as the system will learn by each case it takes on, and prior cases build precedence that in turn brings transparency to future patent litigations.

Although this analysis is illustrative, it is important to realize that IP litigation varies in important ways by jurisdiction. Litigation differs in terms of how the division between infringement and validity cases is done; how damages are calculated; whether there is a need for a separate trial to get damages; whether there are punitive damages; the average length it takes to get the case to trial, as well as through the court system to a final verdict; the number of courts in which IP litigations are conducted; the presence of specialized patent courts; and the degree to which a ruling can be enforced after a verdict. Table 4 highlights the main features of patent litigation.

Table 4: Patent litigations main features in United States, China, Germany, and United Kingdom

	United States	*China*	*Germany*	*United Kingdom*
Average month to judgement	18-42	6-24	12-18	24-36
Damages	Very high	Low	Average	High
Specialized courts	Yes	Yes	Yes / No	Yes
Preliminary injunctions	Yes	Limited	Limited	Yes
No. courts, first instance	94	77	13	2

Source: Graham, 2014, CIELA.cn, Shangcheng IP

Differences in the institutional features of each jurisdiction translate directly into differences in litigation costs. Table 5 shows these cost differences for the main jurisdictions.

Table 5: Litigation costs by jurisdiction (in '000$)

Country	Belgium	France	Germany	Italy	Netherlands	Spain	United Kingdom	United States
Average Low	53	53	53	212	64	53	159	1,060
Average High	106	212	265	424	212	106	1590	10,600

Source: Graham and Van Zeebrock 2014

The United States is by far the most expensive jurisdiction. Getting a case through the courts costs US$1– US$10 million on average, depending on its complexity. Costs in most European countries are 10 to 20 times lower than in the United States. Within Europe, the UK stands out as being the most expensive system at more than double the cost in any other European country reported. Both the U.K. and the U.S. are common-law regimes, whereas the remaining European countries in the figure are civil-law regimes. The discovery phase, where prior to a trial each party is allowed to request material that could lead to admissible evidence from the opponent, is arguable responsible for up at least half the cost of U.S. litigation, and these costs grow exponentially depending on the amount at risk.

In China the average cost of patent litigation in 2006–2013 was US$900– US$6,355, suggesting that patent litigation is substantially cheaper than in Europe and the United States. However, this amount changes if we focus on cases in which a foreign firm is plaintiff, where the costs reportedly rose to US$5,509– US$180,586.

Given the differences across jurisdictions, firms often need to choose the appropriate trial location. In the cases of patents at a global level, the patent on trial may differ in claims across jurisdictions. Especially important is the choice of the first court for filing litigation, as its outcome will impact subsequent cases in other jurisdictions.

A third element in global IP beyond jurisdiction characteristics and litigation costs is the propensity for foreign firms to be treated fairly. As in many other areas of overseas operations, foreign firms face the "liability of being a foreigner," a liability that is rooted in the lack of deep understanding of the judicial system as well as in the biases that courts may have against foreigners. Studies of the social psychology of juries suggest that bias is apparent (Krieger 1995). The explanation used is that members of a jury consciously or unconsciously favor persons like themselves, e.g. Americans favor Americans. Moore (2003) studied 4,247 U.S. patent litigations in 1999 and 2000 and found that American juries sided with non-residents in only 36% of cases and with residents in 64% of cases. When judges made the final decision, however, residents and non-residents were equally likely to prevail.

Biases against foreigners are more likely to emerge in countries with weaker judicial systems or where the government plays an important protectionist role. For example, numerous foreigners have voiced concerns that the IP judicial system favors locals. To get at this issue, we explored data from 1,044 patent litigations made public by the government in China. Of those, 245 cases had a foreign plaintiff or defendant, and the foreign party won 75% of the time. (We observed the same pattern when looking at industrial design litigation in China). In cases where the defendant was foreign, the outcome of the litigation was not biased (an outcome strangely close to 50/50, although the number of patent litigations in this category was very low, n=10). These results could be explained by several reasons: that non-resident firms in China only take patent cases to court when they are very certain of winning; that the Chinese government only released data that would indicate transparency; or that Chinese judges are biased against their own residents (a very unlikely explanation).

To more fully explore these possibilities, we compared the number of cases where foreign firms were defendant or plaintiff across several countries. Table 6 captures the essence of this exercise. We pieced together the data from numerous sources, reported in overlapping but different time periods, making it necessary to draw conclusions carefully. Note that although the estimates for China vary significantly by source, most of them are low, indicating that foreign firms do not often go to court there. What is most striking is the low percentage of U.S. patent litigations with non-residents as plaintiffs or defendants, especially given that almost half of the patents granted were filed by non-residents.

Table 6: Percentage of patent litigations with foreign plaintiff or defendants, by country

	Percentage of foreign plaintiff	Percentage of foreign defendants
United States	15%	17%
Germany	51%	62%
France	51%	52%
Netherlands	38%	39%
United Kingdom	39%	37%
China	(a) 23% / (b) 3,4%	1%

Sources:

*Data on U.S. patent litigations are based on Trimble (forthcoming). Average is calculated from patent litigations in 2004, 2009, and 2012. Trimble reports on a random sample (n=6,420). Data on U.S. patent litigation in 1999-2000 (n= 4,247) reports lower figures: foreign plaintiff 13% and foreign defendants 17% (Moore 2003).

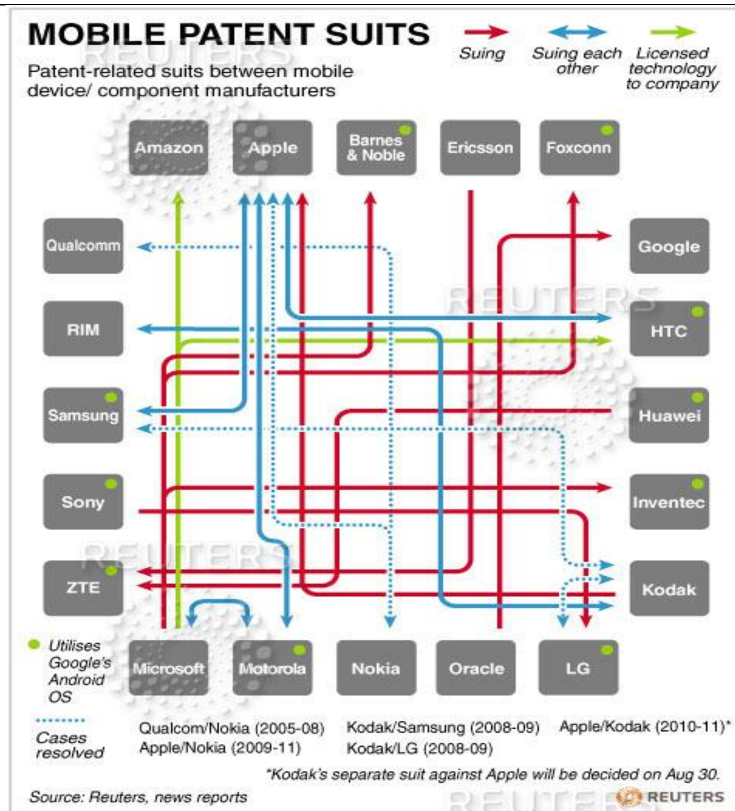
*Data on DE, FR, NL, and UK patent litigations are based on Cremers et. al (2003), which reports on patent litigations from 2004-2008.

*Data on CN patent litigations (a) is based on data from CIELA.org, with a sample size of 1,041 patent invention litigations. The sample is the publically available cases (not random). The cases are from 2000-2013, with a majority of cases belonging to more recent years. (b) At the same time we report data from (Yang 2011), who studied 3,000 cases from 2010 published by the China court website: www.chinacourt.org. In his sample, not only patent invention cases were included, but also industrial design and utility models, which both fall under the category of patents in China. CIELA also offers information on foreign parties in this broader category of patents. In their (non-random) sample, we found 7.5% of Chinese patent litigations involved foreign parties.

Besides helping to understand litigation figures across countries, acknowledging differences in jurisdictions also illustrates how defending IP globally is a complex task that consumes substantial financial and managerial resources—a reason why most firms refrain from engaging in patent litigations abroad.

- *Complex value chains across countries create more potential infringers*. As technologies become more complex and products draw on larger value chains, the impact of litigation extends from a focal firm to the many suppliers and buyers in its value chain. The mobile data industry provides a good example of the complexity of patent litigation in a global context (see Exhibit 31). Each smart phone is said to carry more than 250,000 patents (Carrier, 2012). In October 2009, Nokia sued Apple for infringing on 10 patents, triggering a countersuit involving 13 patents. Instead of suing Google, Apple sued HTC in 2010 for features in the Android operating system, indirectly forcing Google to build up a patent portfolio from thin air to protect all manufacturers using Android. When its first attempt—buying Nortel's patents in 2011—failed, Google moved to buy Motorola in 2012, offering some relief from the multiple suits to members of the Android ecosystem.

Exhibit 31: Smartphones patent wars up to December 2011



Source: Reuters

- *Enforcement of trademarks and industrial designs is more complex in a global context.* Enforcing industrial designs and trademarks differs greatly from enforcing IP rights contained in patents, as often it does not take a specialist and a long legal process to identify whether an infringement has occurred. Infringing on trademarks, in particular, is very common since the benefits are large (trademarks are associated with brands, an incredible leverage of value, as Exhibit 1 suggests) and it does not require advanced skills. At the same time, it is one of the most dangerous forms of infringement, since the value of trademarks (see Table 7) is built on a perception of quality built over many years—a perception that can evaporate quickly when a product is copied with low quality standards. As a result, trademark infringement has the potential to exact immediate and important effects, up to and including damaging the reputation of a global company.

Table 7: World's most valuable brands, 2014

Rank	Brand	Brand value (in billion USD)	Industry
1	Apple	124.2	Technology
2	Microsoft	63.0	Technology
3	Google	56.6	Technology

4	Coca-Cola	56.1	Beverages
5	IBM	47.9	Technology
6	McDonalds	39.9	Restaurants
7	General Electric	37.1	Diversified
8	Samsung	35.0	Technology
9	Toyota	31.3	Automotive
10	Louis Vuitton	29.9	Luxury
			Source: Forbes.com

Another reason why trademark infringement is so common is that trademark piracy can be difficult for consumers to identify. For example, Apple discovered 22 fake Apple stores in China in 2011. Everything from the employee uniforms to the layout of the store resembled a trademarked Apple Store, and even store employees believed they had been hired by Apple.[8] In 2004, the Japanese corporation NEC found a parallel fake firm operating in China: a replica of NEC that included 50 factories producing fake goods, using fake business cards, production plans, R&D commissions, and so on.[9]

Although there are not official, comprehensive data on industrial design and trademark infringement, one can get a sense of the magnitude of the problem by examining customs seizures, as they are a common way of dealing with trademarks and industrial design infringements.

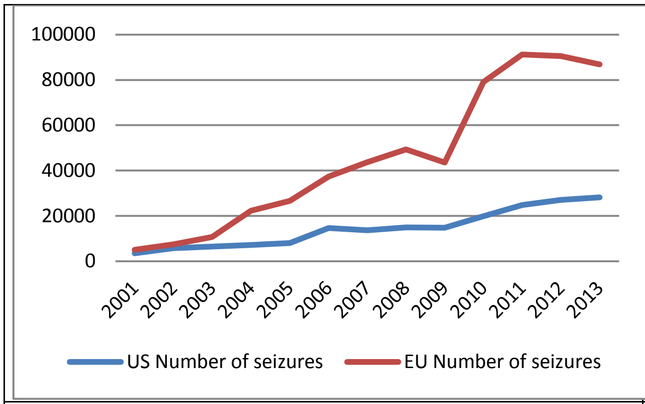
In the last ten years, U.S. customs has seized pirated goods at the border 179,972 times, with a total value of US$6.7 billion. The number of seizures increased in both the U.S. and the EU from 2001 to 2013, from 3,585 to 28,212 in the United States and from 5,056 to 86,854 in the EU (see Exhibit 32). The estimated average value of the goods seized annually in 2010–2013 was US$10.1 billion in the United States and more than US$18.4 billion in Europe. The majority of pirated goods stopped at borders are stopped for trademark infringements. According to the European statistics, roughly 95% of goods seized are based on trademarks, with the remaining 5% associated with industrial designs, copyrights and related rights, plant variety rights, supplementary protection certificates, and patent rights.

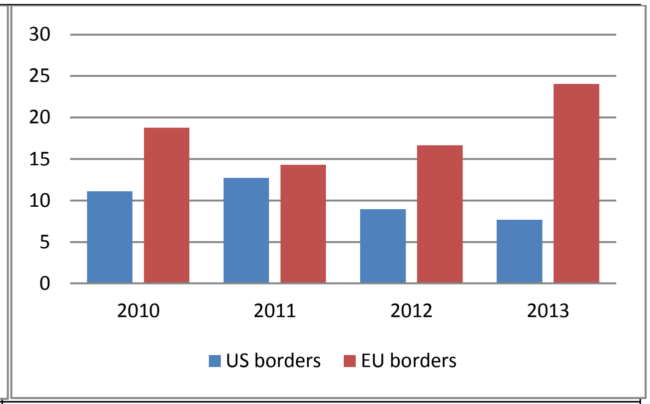
Exhibit 32: Number of seizures at U.S. and EU customs borders, 2001–2013	Exhibit 33: Estimated value[10] of seizures (in billion USD) at U.S. and EU customs borders, 2010–2013

8 Dailymail, July 22, 2011

9 New York Times, April 27, 2006

10 The estimated value is the price at which the goods would have been sold at retail on the Member State market had they been genuine.

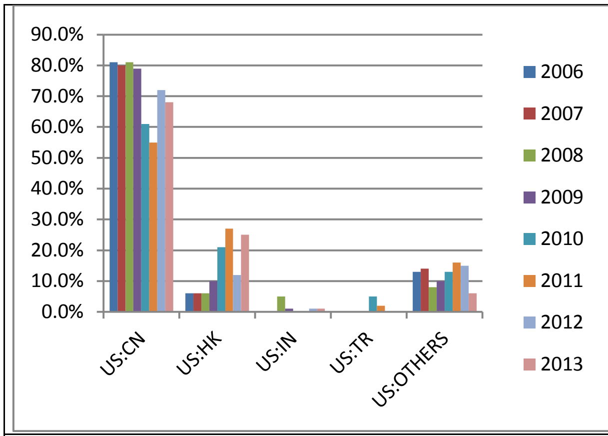


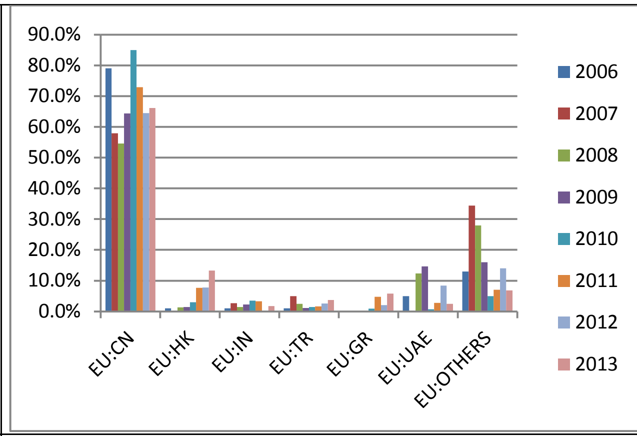


Source: U.S. Customs and Border Protection & European Commission, Taxation and Customs Union	Source: U.S. Customs and Border Protection & European Commission, Taxation and Customs Union

Exhibits 34 and 35 show the percentage of seizures per country of origin. China is (and has been for as long as data on customs seizures is available) the main country where pirated goods are manufactured and shipped to the rest of the world. An annual average over the last 10 years shows that 71% of the goods seized at U.S. customs originated in China (with the annual total fluctuating from 55% to 81%). Goods from China seized in the period had an estimated value of more US$4.6 billion. During the same time period, European customs conducted more than 3 times as many seizures, reaching the astonishing number of 581,385 seizures (and each seizure can encompass several products, often many thousands of fake products). The fake goods seized at the European borders most often also originated from China (averaging 71% of all seizures in 2004–2013). European customs authorities have only reported the retail value of goods the last four years; in that period seized pirated goods had an estimated value of more than US$4 billion. Besides China, most U.S. and EU seizures originated in Hong Kong, India, and Turkey, with additional EU seizures coming from Greece and the United Arab Emirates.

Exhibit 34: Percentage of seizures at U.S. borders originating from main countries: China, Hong Kong, India and Turkey, 2006–2013	Exhibit 35: Percentage of seizures at EU borders originating from main countries: China, Hong Kong, India, Turkey, Greece, and United Arab Emirates, 2006–2013



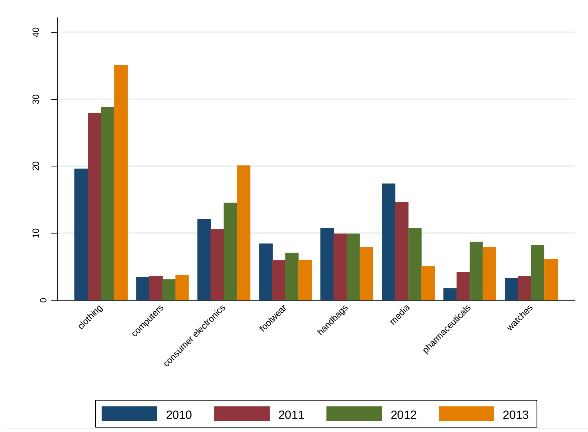


Source: U.S. Customs and Border Protection	Source: European Commission, Taxation and Customs Union

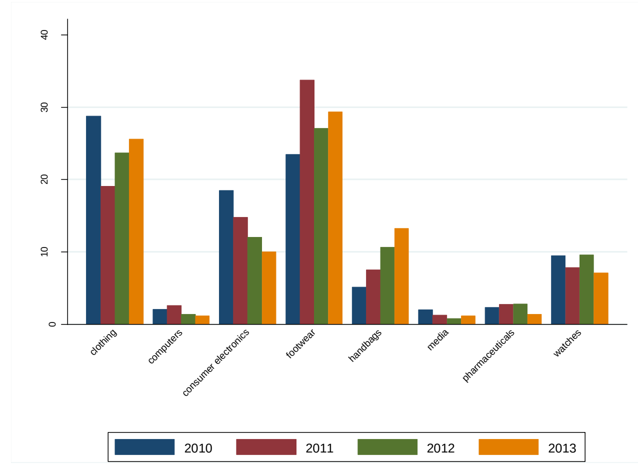
The mix of products that are pirated varies by country and across time. Clothing, shoes, handbags, and wallets accounted for most U.S. and EU seizures. Anecdotal evidence suggests that although luxury goods (handbags, wallets, watches, and jewelry) are still popular among pirated products, pirated electronic consumer products, and cell phones in particular, are on the rise. In the cell phone industry it is common that counterfeited batteries or phones explode when heated, putting consumers at risk. The original brand owners often have difficulty responding to these situations since it can take days before the brand owner is certain of a product's origin, hampering its ability to limit a negative impact on sales. Another disturbing trend is the increase in counterfeited pharmaceuticals and drugs with potentially damaging effects on public health. Although fake drugs are rare in Western countries (because the distribution channels are hard to penetrate), they are common in developing countries. In Africa, for example, estimates suggest that roughly 1/3 of all malaria pills are counterfeited. As these pills have no active ingredients, it has been estimated that counterfeited pills cause up to 100,000 deaths annually.[11]

Exhibit 36: Number of seized products at U.S. border, 2010–2015. By product type, % of total	Exhibit 37: Number of seized products at EU border, 2010–2015. By product type, % of total

[11] Bate, R. Phake. "The deadly world of falsified and substandard pharmaceuticals". AEI Press,Washington, DC; 2012

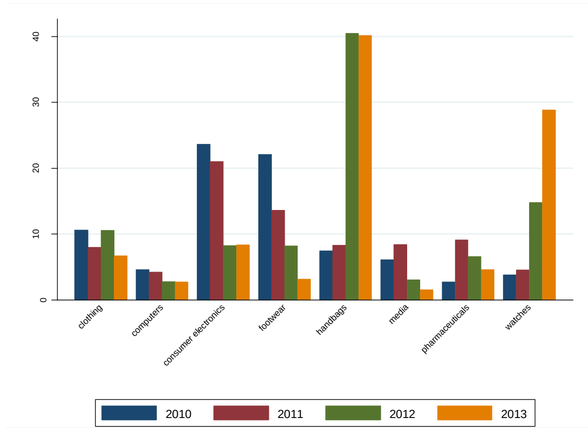


Source: U.S. Customs and Border Protection



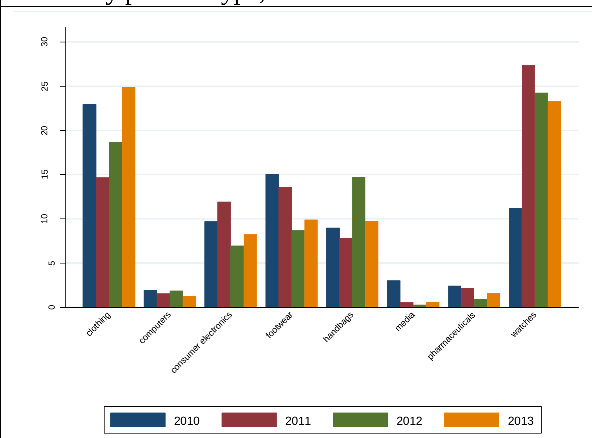
Source: European Commission, Taxation and Customs Union

Exhibit 38: Value of seized products at U.S. border, 2010–2015. By product type, % of total



Source: U.S. Customs and Border Protection

Exhibit 39: Value of seized products at EU border, 2010–2015. By product type, % of total



Source: European Commission, Taxation and Customs Union

- *Technology helping to find infringers…but not necessarily to solve the problem*. New technologies are improving the ability of firms to detect whether their products or services are infringed. For example, the Norwegian firm Kezzler allows firms to assign an individual identification number for each product, similar to the Vehicle Identification Number (VIN) used by the automobile industry or the International Mobile Station Equipment (IMEI) number for wireless phones (both with the idea of discourage theft of legally sold products).

  Finding infringers is just a first step in the process to protect IP, as the case of Getty Images demonstrates. In 2011, Getty, the largest holder of IP on photographs and images in the world, acquired PicScout, a small company that developed software to crawl websites to identify unauthorized uses of copyrighted pictures and visual content. It found that millions of its photos were being used without proper licensing.[12] Facing the gigantic task of suing millions of users around the world, Getty opted instead to open its library of images to individuals and non-commercial websites by creating iFrame; software for embedding images that gives the company some control over how its images are shown. Any infringement cases are now directed at commercial sites, mostly large corporations that had existing contracts with Getty Images but failed to recognize the extent to which Getty images were being used. With this approach Getty Images hopes to do for images what iTunes did for music: provide a space where users can access copyrighted material at low costs.

- *Government Policy in IP affects the competitive advantage of firms*. Government policies can affect the opportunities of different players to capture value from their IP. Wind turbines in China are a case in point. Although China urged foreign firms to enter the local market for wind turbines in the early 2000s, it restricted their actions once they brought in their technology. In particular, the National Planning Commission launched regulation that required a minimum of 50% of wind turbines to be locally manufactured, a requirement that increased to 70% in 2005. Foreign firms were therefore forced to move manufacturing and technologies to China. Shortly thereafter, the Chinese government implemented the National Indigenous Innovation Regulations (NIIP), which limited commercialization of foreign innovations, modified the Anti-Monopoly laws to limit mergers and acquisition by foreign firms, and changed tax regulations for foreign players to increase their cost structure.

  The NIIP,[13] in particular, was a policy move related to IP that changed the structure of the industry globally. Through NIIP, foreign firms were banned, in practice, from government bids, and benefits were extended to local firms that showed a good track record of innovations. The consequences were dramatic. Local firms took advantage of the recently transplanted technology, copied it, modified it, and applied for property rights in China in large numbers. For example, between 2003 and 2011, patent families related to wind turbines with Chinese applicants increased from 5% of global patent applications to an astonishing 45% (see Table 8). However, many of these patents by Chinese applicants failed to be granted, and those that were granted weren't transferred to other jurisdictions. Rajaram (2015) analyzes a sample of recent U.S. wind turbine patents (patents issued from January 2013 to July 2014) and, in a

[12] See Joshua Brustein, "Since it can't sue us all, Getty Images embraced embedded photos" in Bloomberg Business week: http://www.businessweek.com/printer/articles/187953-since-it-cant-sue-us-all-getty-images-embraces-embedded-photos; accessed September 1, 2015.

[13] National Indigenous Innovation Product Accreditation System (Circular 618) on 15 November, 2009.

sample of 105 patents, finds that 42 originated from U.S. residents, 24 from Germany, 16 from Denmark, 10 from Spain and rest from the United Kingdom, Japan, Norway, Netherlands, Singapore, and Belgium. Not a single U.S. wind turbine patent had been issued to a Chinese resident.

Table 8: Worldwide patent application families (n=27,793) and Chinese applicants

Year (priority year of patent application)	Number of patent applications by Chinese residents/applicants	Number of patent families (applications) world wide	Chinese residents' share of worldwide patent application families (in %)
(a)	(b)	(c)	(d)
1995	2	176	1%
1996	7	206	3%
1997	16	231	7%
1998	5	272	2%
1999	17	347	5%
2000	16	529	3%
2001	23	768	3%
2002	29	785	4%
2003	44	886	5%
2004	112	981	11%
2005	169	1,110	15%
2006	425	1,641	26%
2007	663	2,165	31%
2008	1,030	3,239	32%
2009	1,650	4,466	37%
2010	1,988	4,903	41%
2011	2,303	5,088	45%

Source: Authors calculations based on Derwent World Patent Index
Technology defined through IPC codes.[14]

On the product side, by 2013 three Chinese manufacturers were among the top ten wind turbine manufacturers (Goldwind at number 2, Mingyan at number 9, and Guodian United Power at number 10). Moreover, Chinese firms collectively manufactured most of the wind turbines produced globally.[15] In other words, the market in China went from

[14] F03D 1/00-06: Wind motors with rotation axis substantially in wind direction; F03D 3/00-06: Wind motors with rotation axis substantially at right angle to wind direction; F03D 5/00-06: Other wind motors; F03D 7/00-06: Adaptations of wind motors for special use; F03D 11/00-04: Details, component parts, or accessories not provided for in, or of interest apart from, the other groups of this subclass; B60L 8/00: Electric propulsion with power supply from force of nature, e.g. sun, wind; B63H 13/00: Effecting propulsion by wind motors driving water-engaging propulsive elements

[15] BCC research report 2013

being an industry with foreign firms providing 71% of wind capacity in 2005 to a market with local suppliers providing 89% of the wind capacity in 2010. Table 9 shows the top ten wind turbine markets and the top three wind turbine providers in each. Note that in most countries, with the exception of China, foreign players took substantial market shares (while in China, local firms are the main providers). This example makes clear how government policies in IP and innovation can affect demand in particular countries and restrict value capture from IP by the leading global players in an industry.

Table 9: Leading wind turbine firms in top 10 markets in 2010

Positions in the top ten markets	**Country**	**Total MW installed**	**No#1**	**No#2**	**No#3**
1	China	18,928	Sinovel	Goldwind	Dongfang
2	USA	5,115	GE wind	Vestas	Siemens
3	India	2,139	Suzlon Group	Enercon-India	Vestas
4	Germany	1,551	Enercon	Vestas	Suzlon group
5	UK	1,522	Siemens	Vestas	Gamesa
6	Spain	1,516	Gamesa	Vestas	GE wind
7	France	1,186	Enercon	Suzlon group	Vestas
8	Italy	948	Gamesa	Vestas	Suzlon group
9	Canada	690	Siemens	GE wind	Enercon
10	Sweden	604	Vestas	Enercon	Siemens

Source: International Wind Energy Development by BTM consult (2011)

Capturing value from IP: a Conceptual Framework

In an ideal scenario, an institutional framework for the assignment and enforcement of IP rights should satisfy, to large extent, the needs of firms to protect intangibles such as innovation, business models, and knowledge. However, as the two previous sections suggest, the existing IP institutional framework is overwhelmed by the volume and complexity of requests, as well as by the herculean effort needed to enforce existing rights. Although this problem impacts both local and multinational firms, it is especially acute for the latter, since the success of global firms oversees depends in part on intangible assets such as know-how and reputation (Vernon, 1973; Morck & Yeung, 1991).

Although changes in the global IP system, such as the introduction of global patents, trademarks, or industrial designs, or the establishment of a global court system for IP disputes, may be desirable, the likelihood of these changes is slim at best. Moreover, ongoing research suggests that some potential solutions, including patents that cover multiple countries, may negatively impact innovation (Alcacer, Beukel, and Luo, 2015). Without such a system, what steps can firms take to capture value from their investments in know-how and reputation globally?

To answer this question we turn to the academic literature that has identified mechanisms to appropriate value when the IP system is lacking (Liebskind, 1996; Anand and Galetovic, 2004; Fisher & Oberholzer-Gee, 2013). We complement and illustrate these mechanisms with examples of global firms that have developed practices and routines to appropriate value in challenging environments. Although many of these mechanisms were conceptualized, developed, tested, and discussed in a single-country context, we emphasize the pros and cons of applying them in a global context. We have observed that firms that excel at appropriating value globally don't favor one single mechanism, but are flexible enough to choose and apply multiple mechanisms depending on the characteristics of specific markets, the activities they perform there, and the products they sell. Most of these firms have moved from looking at IP as a legal issue to treating it as an integral part of their business model and competition strategy. We collect these mechanisms to capture value from IP into two groups: market and non-market.

- **Market mechanisms**. Often firms design or change their business model to incorporate mechanisms that capture value under the existing IP institutional framework.

  While we have documented important differences in the effectiveness and cost of formal IP tools across regions and authorities, there are also important differences across industries in the effectiveness of different mechanisms for capturing value from IP. Table 10 indicates the percentage of firms that considered a particular mechanism very effective for maintaining or improving the competitiveness of their firm based on innovative products, services, or processes introduced between 2010–2012. The survey was conducted in Belgium as part of the Eurostat Community Innovation Survey.

Table 10: Effectiveness of IP mechanisms

Sector	Patents	Industrial Designs	Copyrights	Trademarks	Lead Time	Complexity	Secrecy
Chemicals	18%	3%	2%	19%	24%	27%	29%
Pharmaceuticals	60%	22%	22%	40%	10%	22%	50%
Mechanical Engineering & Machinery	16%	4%	0%	6%	13%	22%	11%
Textile & Clothing	12%	12%	2%	6%	14%	16%	10%
Food & Beverages	7%	1%	0%	12%	18%	15%	9%

Wood & Paper	0%	0%	0%	3%	21%	17%	10%
Transport Equipment	17%	3%	0%	6%	15%	20%	6%
Metal Products	14%	6%	0%	7%	12%	15%	6%
Furniture	7%	3%	3%	7%	14%	15%	7%
	0%	0%	0%	0%	0%	0%	0%
Research Service	61%	14%	4%	15%	17%	45%	58%
Wholesale	9%	4%	2%	14%	11%	17%	9%
Computer Services & Software	3%	1%	7%	10%	18%	30%	11%
Transport Services	3%	3%	0%	0%	11%	11%	3%
Financial Services & Insurance	4%	4%	4%	8%	19%	12%	4%
Total	16%	6%	3%	11%	16%	20%	16%

Source: Authors calculations using Eurostat Community Innovation Survey. ECOOM Belgium

Interestingly, formal IP tools are not systematically rated more effective compared to other mechanisms of protection, such as secrecy, superior lead time, or making an innovation more complex. In pharmaceuticals or research services, patents play a very important role in capturing value from IP, with 60% of the firms rating them as very effective. In chemicals, however, only about 18% of firms rated patents as very effective. They actually rated lead time, complexity and secrecy as being more effective, on average. This corresponds to what Cohen et al. (2000) found for a large sample of U.S. R&D labs in the 1994 Carnegie Mellon survey, namely that secrecy and lead time are rated more effective in protecting and capturing value from innovations. In addition, they found that complementary manufacturing or service activities were highly effective for capturing value from product and process innovations.

Nevertheless, we need to interpret these results with caution. Formal IP tools might be a necessary, but not sufficient, condition for capturing value from firm innovations. Actually, as shown in Table 12, the correlations between the different mechanisms are positive and significant. In particular, secrecy is highly correlated with other IP tools. For example, in pharmaceuticals and research services, secrecy is rated very effective by more than 50% of the firms surveyed. Complexity, while important for research services, seems less relevant in an industry with a more discrete technology such as pharmaceuticals. Overall, complexity as a mechanism to protect innovations is less correlated with the other IP tools, but is (perhaps not surprisingly) very related to protection through superior lead time.

Table 12: Correlation between IP mechanisms

	Patents	Ind. Des.	Copyright	Trademarks	Lead Time	Complexity	Secrecy
Patents	1						
Ind. Des.	0.6192	1					
Copyright	0.2832	0.5273	1				
Trademarks	0.3875	0.421	0.4271	1			
Lead Time	0.1789	0.1503	0.2008	0.2957	1		
Complexity	0.0933	0.084	0.1861	0.2582	0.5976	1	
Secrecy	0.4903	0.3701	0.1852	0.3409	0.3761	0.399	1

Source: Authors calculations using Eurostat Community Innovation Survey. ECOOM Belgium

We grouped market mechanisms depending on the level of development of the formal IP regime a firm faces, which can obviously depend on the region and the sector where the firms play.

- *Strong IP regimes*:
  - *Exercising market power*. IP rights provide a mechanism to exclude others from appropriating value. Although previous sections uncover the problems of the global IP regime, applying for patents, trademarks, and industrial design is still an important building block to appropriate value globally and the main reason for applying for formal IP rights (Cohen et al. 2000). The big challenge for firms is to decide, given financial and managerial constraints, what to patent where.

    This decision depends on a set of parameters: the potential decrease in revenue if infringement occurs, the probability of such event, the cost of obtaining IP rights, and the cost of enforcing those rights.

    Markets where the potential erosion of revenues from infringement is high are good candidates to obtain an IP right, which explains why the majority of patents, trademarks, and industry designs are concentrated in a few larger markets. High application and enforcement costs and high probability of infringement make using IP rights less attractive. In the extreme, a high probability of infringement (e.g. in a very weak IP regime) will discourage firms from entering a market or force them to search for alternative mechanisms to capture value from their IP.

    Applying and obtaining IP rights across markets has an extra advantage: they can be used as a negotiation chip when firms litigate in a given market and protect the firm from suits against them (Cohen et al. 2000). Moreover, using multimarket contact to deter and retaliate for actions in a given market may decrease the number of markets a firm needs to apply for IP rights.

Even in markets with strong IP regimes, firms might decide not to protect their IP formally. For a large sample of US R&D labs, the main reason for not patenting IP was because of the disclosure requirements and the ease of inventing around the invention. Especially when firms worry about the difficulty of demonstrating novelty, they might decide not to patent and not disclose information about their innovation efforts to potential rivals (Cohen et al. 2000).

- *Sale or licensing*: In a regime with strong IP protection IP can be traded. Either ownership is transferred or IP is licensed to other firms. Actually, Gans et al. (2002) argue that the stronger the IP regime, the more likely one should observe collaboration and licensing or sale of the technology as the incumbent has an incentive to buy out any potential contender for the market and avoid competition. Serrano (2010) studies the transfer of patents to different owners. On average 13.5% of all granted patents are traded at least once over their life cycle. For small firms this even goes up to 24% when patents weighted by patent citations received. In the Computer & Communication technology field small firms trade 23.9% of their patents and in Drugs & Medical this is 20.1%. The picture that emerges is that of small firms in ICT and the Medical field selling their IP to larger players in the sector. Much less data is available on licensing agreements in technology, but similar patterns are discussed in the literature for example in the case of alliances between biotech firms and pharma companies (Lerner and Merges, 1998) or licensing agreements between specialized engineering firms and large chemical firms in the chemical processing industry (Arora et al. 2001). The overall conclusion is that strong IP rights and larger markets favor the use of the markets for technology in order to capture value from IP.

  While IP trading and licensing or cross-licensing is a bilateral transaction, in recent years patent pools have started to flourish as a means to appropriate returns from IP by simplifying the transactional aspects of licensing by creating bundles of licenses to license to third parties. These licenses include the relevant IP to use a particular invention based on IP owned by different players.

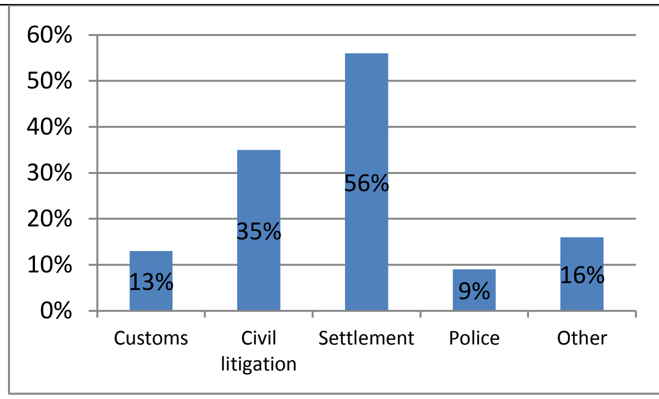
- *Collaboration*: Where selling and licensing IP is an opportunity for firms to capture value from their IP after the fact, firms can also organize collaborative agreements to develop new (shared) IP based on their existing knowledge base. These agreements might involve the (cross-) licensing of existing IP, but with the explicit objective of exploiting existing IP and developing new IP. This new IP can be exploited by the partners individually or can be exploited by a different organization, such as a joint venture between the partners. Disputes over value capture are more likely to arise when the partners are competitors, customers, or suppliers. Collaboration in early-stage projects with universities raises less concern (Cassiman and Veugelers 2002). Tesla Motors, a front-runner in electrical vehicle technologies, chose a different approach to collaboration based on strong IP. Tesla developed groundbreaking technology to minimize the time it takes to recharge batteries. Although these technologies are protected by a strong portfolio of over 400 patents, Elon Musk, Tesla's CEO, announced on June 14, 2014 that *"Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology."*[16] Tesla believed that utilizing an open source approach to its patents would speed up the rapidly evolving technology platform for electrical vehicles—and ultimately help Tesla more than it helps Tesla's competitors.

- *Litigation*: Litigation is a very expensive response to infringement. In countries with strong IP protection, firms can approach the party that infringed on its IP and try to negotiate a settlement that includes either selling or licensing the IP that has been infringed.

  Although data on settlements that lead to licensing or transferring ownership of IP rights is practically impossible to obtain, there are clear indications of active licensing to solve, and even prevent, IP infringement. For example, a survey of 1,235 random Danish firms that hold IP revealed that settlement was the preferred action taken after the firm experienced piracy (see Exhibit 40).

Exhibit 40: Did the IP-active firm that experienced piracy take any of the following actions?

[16] http://www.teslamotors.com/blog/all-our-patent-are-belong-you, accessed September 1, 2015.



Source: "Patents and other IP rights" survey. Statistics Denmark, data provided by Danish PTO

- *Combining different IP tools*: As discussed earlier, companies can also combine IP tools, such as patents, industrial designs, and trademarks, to reinforce protection and value capture from innovation (Dernis et al. 2015). Apple combines trademarks, patents, and industrial designs in their iPhone products.

- *Weak IP regimes*:
- *Owning or controlling complimentary assets*. A firm can appropriate value if a product/service that has weak IP rights or is easier to copy can only create value if it is bundled with another product/service that is either protected or hard to imitate. AKB48, a Japanese entertainment concept associated with the giant advertising firm Dentsu provides an example. AKB48 is a set of musical idol groups, each formed by 16 amateur young girls, which rotate to perform in a small theater in the Akihabara district in Tokyo. The concept, based on the idea of idols that you can meet, has been extremely successful and it could be easily replicated. However, most of the revenues come from advertising campaigns that Dentsu and its clients develop to leverage the notoriety of AKB48 members. In a relation-based culture like Japan, it is the links that Dentsu has developed across the years with firms like Toyota and Honda, links that can't be protected through IP rights, that are the real key to untapping value created by AKB48.

  Apple offers another example of using complimentary assets. Apple stores were introduced for many reasons; one of them was to guarantee consumers that they were buying an original product. Moreover, Apple is actively involved in the design of the equipment that will produce critical elements of their products and provides this equipment to their suppliers in order to guarantee the quality of their products. In industrial products it is common practice to link maintenance and repair services to proof of original equipment. For example, General Electric Medical Systems (GEMS) offers repair and maintenance services only to its medical devices and excludes third-parties from the market.

The pharmaceutical industry in the United States and Europe provide an example of using complimentary assets that are not owned by firms that hold the IP. In Europe, most drugs are bought in bulk by government agencies—agencies that would not buy from unknown distributors that may carry counterfeit drugs. In the U.S. sales of drugs to consumers is in the hands of a few pharmacy chains (like CVS or Walgreens) that would hesitate to buy from obscure providers. By controlling the most common (and legal) distribution channel, pharmaceutical firms prevent fake drugs from taking hold in the marketplace.

- *Imposing secrecy*. Secrecy is an alternative to public IP rights when intangibles can't be patented, trademarked, or protected through industrial design. Apple is again a good example. Although some of their designs and technology are patented in advance, every product launch is shrouded in high-secrecy to protect the company's lead time and make imitation less likely.

  Secrecy as a tool to protect IP is commonly used with the workers of a given firm, using hierarchical structures or cultural norms that limit opportunistic behavior. It can also be extended to suppliers and buyers by using "carrots" in the form of higher prices paid, or "sticks" in the forms of strict confidentiality and exclusivity rules in contracts, the threat of reputational losses, and the loss of future contracts. In order to keep new products secret, industry sources report that Apple pays a premium to Foxconn to keep exclusive production lines and workforce that can't be used for other customers.

  Non-compete clauses are part of contracts under which one party, usually an employee, agrees not to enter into or start a similar business in competition against another party, usually the employer. Although these contractual clauses are not valid in all jurisdictions, they offer a way for firms to keep the IP resident in employees within the boundaries of the firms.

While secrecy and the restriction of mobility of inventors can be leveraged as a protection mechanism for IP, Cassiman et al. (2015) show that this mobility of researchers and inventors is actually critical to capture value from formal IP in collaborative agreements the semiconductor industry. Inventions from researchers that have interacted actively with other research environments lead to more valuable IP for the firm and are an essential step in capturing value from this knowledge.

- *Using complexity as protection*. IP that is inherently complex is harder to infringe on since it requires a higher level of resources and knowledge, as well as more capable human capital.

  Complexity also allows firms to use another tool to protect IP: dividing knowledge and skills across the organization so that, even if some IP is leaked, it cannot be replicated due to missing pieces. Zhao (2006) finds that multinational firms are more likely to conduct R&D in China when the local project requires inputs from projects in other locations. Alcacer and Zhao (2012) documented the same principle in the semiconductor industry: fragmenting innovation across locations, even in countries with strong IP, prevents anyone from seeing the whole picture. Consistent with this idea, Cassiman (2009) documents the fact that firms that combine different innovation activities, such as internal R&D, external R&D, contracting, and licensing, rate the effectiveness of protection through strategic measures (complexity, secrecy, lead time, etc.) more highly. Firms also combine internal and external knowledge into more complex innovations. Access to external knowledge allows them to move faster and create lead time, while integrating and using internal knowledge improves secrecy about the innovation and enhances protection.

- *Using speed and lead time*. To the extent that infringement requires time, firms can enjoy periods of protection by staying ahead of potential copycats. Bilir (2014) shows that multinational firms are more likely to locate in countries with weak IP regimes in industries with short-life cycles because "offshore imitation is less likely to succeed before obsolescence" of the technology. Nokia was an example of this approach. By bringing its design-production cycle for new cell phones under the two-year industry standard in the late 1990s early 2000s, Nokia was able to stay ahead of competitors and imitators for a few months.

- *Deploying outdated IP*. In environments where imitation, IP leakage, and piracy are common, it may be worthwhile to enter with technology that is outdated, thus reducing the potential loss if technology or knowledge is pirated. For example, when Intel opened its plants in China, it decided to use semiconductor technologies that were two generations older.

- *Changing the business model*. Often small changes in a business model can help to protect IP. AKB48 is an example. Sales of CDs and DVDs are the second source of revenue from AKB48 after advertising. Although media piracy is low in Japan, it is very high in other places in Asia where the concept has expanded, such as China and Indonesia. To avoid having value from media appropriated by other firms, the creators behind the concept tried to change the perception of value that a CD would bring to a consumer. Beyond providing music or videos from AKB48 and its sister groups, purchasing a CD or DVD will give fans voting rights in the annual contest that chooses the top performers that will be part of the all-star AKB48 team. The desire to influence the outcome leads extreme fans to buy multiple CDs or DVDs to get more voting rights and regular fans to prefer the original copies to the pirated ones. Verifying that a CD or DVD is legitimate is easier as the whole system is in Dentsu's control. As a result, media sales of AKB48 music and movies are significantly higher even in countries with rampant piracy.

  The business model can be adjusted by country to adapt it to the IP risks in a given country or to adopt the best model to capture value from their IP. In 2015 Barco, a Belgian technology company, had a leading global market share in digital cinema systems for movie theatres. Since the late 1990s, Barco had been working on the technology for digital projection based on digital light processing technology licensed from Texas Instruments (TI). Only two other players in the market, NEC and Christies, were developing similar systems based on the same technology. Most players in the value system agreed that digital cinema was an innovation that could create tremendous value for the movie business. In particular, digital transmission of movies would eliminate the very costly transport and shipping of movie reels and allow worldwide releases of movies on the same day. The industry calculated that, on a yearly basis, about $1.5 billion could be saved on distribution alone, not to mention all the advantages of digital filming, editing, and special effects development. It nevertheless took until 2009 for this innovation to take hold in the movie business and for firms to be able to capture value from their innovation.

Movie theatres were not at all excited about replacing their analog equipment. The movie theatre business had very slim margins and the new equipment was expensive and reputably less durable than analog projectors. While the technological innovation for digital cinema systems was in place, it wasn't until the United States instituted a virtual print fee that U.S. movie theatres began replacing their analog machines. Movie producers and equipment manufacturers created a fund that paid a fee-per-viewing of a movie in digital format. The fund would buy the digital projection equipment with these proceeds and lease the equipment to the movie theatres. This reduced the upfront investment that theatres had to make to switch to digital. As a result, it was not the technological innovation of digital projection that revolutionized the movie business, but rather a financial innovation instituted by the studios and equipment manufacturers. Based on this experience in the United States, Barco decided to provide direct vendor leasing opportunities for movie theatres in Europe in order to overcome the same bottleneck. In China, meanwhile, many of the medium-sized movie theatres were run by the China Film Group. Only after Barco instituted a joint venture with China Film Group did movie theatres in China begin to convert their analog systems, allowing Barco to capture value from its IP.

The original technology was patent-protected by TI and licensed by Barco. Barco developed a digital cinema projector based on its signal processing capabilities and gradually patent-protected this technology worldwide. However, it was only able to capture value from its innovation after it developed complementary activities to incentivize movie theatres into converting their systems: the virtual print fee in the U.S., direct vendor leasing arrangements in Europe, and a joint venture in China. These complementary activities were tailored to the specifics of the region where they intended to sell their systems.

- **Non-market mechanisms**. Sometimes firms attempt to change the IP environment they face by changing rules, norms, and procedures that affect more than one firm. Often these actions, e.g. non-market mechanisms, imply some sort of collaboration with other firms to gain leverage that a single firm could not achieve.
    - *Participating in patent pools and common-standards organizations*. Facing hyper-fragmented IP rights, acquiring critical mass in patent portfolios, and minimizing the probability of litigation are the main drivers that motivate firms to pool their patents. Although patent pools have been around for years—the patent pool for sewing

machines in the United States, for example, was formed in 1856—they have gained notoriety since the mid-1990s, when they became more common and well known, with examples such as the pool for MPEG-2 technology created in 1997 and the pool for DVD technology enacted in 1999.

More recently, the same concept has been used as a business model to solve imperfections in the IP market. For example, Intellectual Ventures, a firm created in 2000, has aggregated patents through purchases and agreements with other firms to become one of the top five patent-holders in the United States, without any innovative activity of its own. The IV business model consists of selling "insurance" against litigation to firms that either contribute with their patents or pay a fee to use the patents in IV's stock in case of litigation.

- *Fighting counterfeiting by cooperating with governments*. Governments play an important role in developing legislation that enables IP owners to operate effectively against the spread of counterfeit products, especially in countries where the IP regime still isn't sound. Although, firms may want to cooperate with governments to improve local institutions, the actions of one firm may not be enough to change the system. Moreover, governments may not be willing, or even able, to engage cooperatively with multiple individual firms.

  To build a bridge between individual companies and governments in countries with weak IP regimes, firms have started to organize themselves in communities, to raise a single strong 'IP voice'. One example is the Quality Brands Protection Committee in China, where 190 firms, representing many of the world's most famous brands, collectively aim for the common goal of enhancing the IPR legal framework in China. They do so through interaction with the Chinese government at various levels, as well as through discussions with the judicial and administrative enforcement agencies.

- *Boosting market surveillance*. Multinational firms have limited resources to track counterfeits and infringements globally, and might not always be in a position where they can access this knowledge. At the same time, a limited understanding of the scope and scale of infringers may lead to poor enforcement strategies. A solution to imperfect knowledge access is engaging stakeholders, both downstream and upstream in the value chain, to identify infringements. For example, when Danfoss, a global leader in compressors and thermostats, learned in 2013 that counterfeit compressors had overtaken 7% of its market volume in China; it initiated an awareness campaign to boost surveillance and to minimize the damages caused by the fake products. In a series of seminars in both urban and rural areas in China, Danfoss informed their OEMs, distributors, project contractors, installers, and other local stakeholders of the risks of counterfeit compressors in terms of safety, efficiency, and performance, while also giving them technical instructions on how to identify a counterfeit Danfoss compressor, and information about whom to contact when a counterfeit is detected.

Conclusion and Implications for Management Practice

The overall picture that emerges from our analysis—a growing number of applications and grants, fragmented rights, and IP of questionable quality that is difficult and expensive to enforce—leaves plenty to be desired. At the same time, what is clear is that the challenges to capturing value from know-how and reputation through the use of different IP tools will be an increasingly important matter of strategy for global enterprises. This has important implications for management practice in this area.

As argued, global enterprises will need to combine different institutional, market, and non-market mechanisms to capture value from a company's know-how and reputation. Moreover, the precise combination of tools will depend on the local and regional institutional and market conditions. As a result, organizations interested in optimizing value capture from innovation may need to adjust their innovation, IP, and business structures.

Such an environment requires early involvement by a *value capture (VC) team*—a globally oriented, cross-functional team focused on capturing value from its company's know-how and reputation, using a combination of different institutional, market, and non-market tools optimized for the business environment of a particular region. These teams will combine business development staff with IP experts (e.g. R&D, operations, and production, sales and marketing, finance and accounting, legal staff with a business background).

To understand the role a VC team can play in managing value capture for global firms, we suggest three central principles. First, a VC team should move beyond case handling to include strategic thinking. Clearly, it is not sufficient to think about IP protection without considering the overall IP portfolio and positioning of the business in the region.

Second, a VC team should not only be reactive; it should be proactively engaged in its firm's innovation process. Early engagement will allow a VC plan to be developed as soon as possible. Even innovations that are not breakthroughs can provide better value capture opportunities if handled strategically from the outset. Changing the business model or considering complementary assets in an innovation’s early stages can radically change the value capture opportunities and might even change the technology’s development trajectory.

Third, a VC team’s mission should include working with traditional firm teams to develop creative new mechanisms for value capture. Currently, many IP teams are only concerned with the institutional demands of IP—registration, fees, search reports, revisions, etc. However, taking patents as an example, a VC team should provide its firm with an in-depth understanding of the technological landscape from a patenting perspective, and then leverage that understanding in brainstorming sessions and other processes for developing design. A VC team should also be active in scouting the IP landscape for market and product opportunities, thereby providing valuable insights for a firm’s R&D.

Creating a VC team is an emerging imperative for global enterprises navigating the complexities of global IP, one designed to ensure that the failure of existing institutional tools in some regions can be turned into opportunities by exploiting different mechanisms.

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