Economies with Effective IP Systems

- Double the innovative output
- 10 times more clinical trials
- Double the access to new music through legitimate platforms
- 40% higher levels of international trademark applications
- 46% more likely to attract venture capital and private equity
- 40% more attractive to foreign investment
- 25% more competitive

Pugatch Consilium
Spring 2022
Introduction

More important than ever: IP-intensive industries and the global economy

Intellectual property (IP) and knowledge-intensive industries make up a greater proportion of global economic output today than at any other time in modern economic history. Both at the global total and at the level of individual economies, several different economic indicators suggest that these industries and sectors are responsible for a considerable and growing proportion of international trade, national employment, and aggregated economic activity. For example, looking at international commerce, two good trade-related economic indicators for the increased importance of IP and knowledge-intensive industries are levels of high-tech exports and receipts from IP assets; both are measured by United Nations Conference on Trade and Development and the World Bank. As defined by the World Bank and the UN COMTRADE database, high-tech exports are "products with high research and development (R&D) intensity, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery." Similarly, the international trade in charges for the use of IP (including royalties and license fees) is a good proxy for IP-intensive industries and technology flows, particularly of the most high-value assets. The World Bank defines these charges for the use of IP as "payments and receipts between residents and non-residents for the authorized use of proprietary rights (such as patents, trademarks, copyrights, industrial processes and designs including trade secrets, and franchises) and for the use, through licensing agreements, of produced originals or prototypes (such as copyrights on books and manuscripts, computer software, cinematographic works, and sound recordings) and related rights (such as for live performances and television, cable, or satellite broadcast)." As figures 1 and 2 show, the total global value of high-tech exports and receipts from IP assets (including licensing income) has more than doubled and quintupled, respectively, since the turn of the century.
From the global to the national: IP-intensive industries and national economic activity

The importance of IP and knowledge-intensive industries to economic activity can also be seen at the national level. Growing numbers of economies are measuring the contribution that IP and knowledge-intensive industries make to their national economies. Since the eighth edition, the Index has sought to measure the extent to which the relevant authorities in a given economy seek to map and measure the economic impact and importance of IP-intensive industries to their national economies (see the Index “Indicator 43. IP-intensive industries, national economic impact analysis” for full details). Although different economies use slightly different methods of assessing and counting the contribution that IP-intensive industries make to their national economies, the data is unambiguously clear: IP and knowledge-intensive industries make a substantial and mounting contribution to national output and employment.

For example, since 2012, the United States Patent and Trademark Office (USPTO) has measured the economic contribution of IP-intensive industries to the U.S. economy. The latest report from 2022, *Intellectual Property and the U.S. Economy: Third Edition*, found that IP-intensive industries made up an estimated 41% of national economic output. With respect to national employment, IP-intensive industries supported an estimated 63 million jobs directly and indirectly, or 44% of all national employment. The contribution of IP-intensive industries to national gross domestic product (GDP) is growing rapidly. Adjusting for inflation the USPTO estimates suggest that between 2014 and 2019, *GDP attributable to the IP-intensive industries increased by roughly 12%, or by an annual rate of 2.3%.* Figure 3 shows the growth in economic contribution of IP-intensive industries in the United States since 2010.
Similarly, a whole swath of European institutions study the economic impact of IP-intensive industries in the European Union (EU) and Europe. Major institutions that publish research on various aspects of the economic contributions of IP-intensive industries include the European Patent Office (EPO), European Union Intellectual Property Office (EUIPO), Eurostat and the European Commission. In 2019 the EUIPO and EPO published their latest study *IPR-intensive Industries and Economic Performance in the European Union*. This report found that IP-intensive industries contributed an estimated 44.8% of the EU's GDP and 29.2% of direct employment (this aggregated estimate includes estimates for the United Kingdom [UK], which was still an EU member state at the time the study was conducted). As with the United States, this report, compared with previous studies, also found that there had been a notable increase in the contribution of IP-intensive industries to EU GDP and employment. Figure 4 shows the economic contribution of IP-intensive industries in the EU.

In 2018 the Korea Intellectual Property Office (KIIP) released the *Economic Contribution Analysis of IP-Intensive Industry*, a comprehensive assessment of the contribution of Korean IP-intensive industries to national GDP, employment, and R&D investment. Based on 2015 statistics collected by the national statistics agency, the report found that IP-intensive industries are a major contributor to national Korean output, employment, and R&D spending, constituting an estimated 43.1% of GDP and employing over 6 million people (29.1% of the entire workforce); IP-intensive industries were responsible for close to 80% of R&D investment in Korea. Just as in the EU and United States, all major indicators studied by the KIIP showed substantive increases compared with the same data for previous years. Figure 5 shows the economic contribution of IP-intensive industries in South Korea.
In 2020, Australia’s national IP office, IP Australia, released Australian Intellectual Property Report 2020, its eighth report on the national IP environment. For the first time the report contains a focus on IP-related economic activity. Using 2019 data collated by the Australian Bureau of Statistics, chapter 7 of the report dedicated a section to understanding the link between economic activity and the use of IP rights by Australian businesses. As the report rightly points out, “One of the key purposes of the IP system is to promote economic development by creating an innovation-friendly and fair competition environment.” The chapter makes several important findings on the use and positive economic impact IP rights have had on the Australian economy; for example, firms making use of IP rights tend, on average, to have higher profit levels per employee than those firms not owning any IP rights; the profit levels were estimated at AUD 48,368 for IP-rights-owning firms compared with AUD 23,404 for non–IP-rights-owning firms. Of the IP rights examined (registered patents, trademarks, and design rights), firms with the highest profit levels were those with registered patent rights (AUD 61,394 per employee) and combined registered patent rights and trademarks (AUD 101,278 per employee). The report also finds that there is a reasonably strong relationship between average profits measured as a percentage of invested capital and registered IP rights, although this finding is not as consistent as average profit per employee. Firms owning registered IP rights, and particularly multiple IP rights, had higher average profits as a percentage of invested capital than did non–IP-rights-owning firms. Figure 6 shows the results of this research.
In May 2021 the national IP office (INPI) in Brazil released *Intensive Sectors in Intellectual Property Rights in the Brazilian Economy (Setores Intensivos em Direitos de Propriedade Intelectual na Economia Brasileira)*, a comprehensive assessment of the contribution of Brazilian IP-intensive industries to national GDP, employment, and exports. Based on statistics from 2008 to 2016, the report finds that IP-intensive industries are a major contributor to Brazilian national output, employment, and trade. In the latest three-year period studied (2014–16), IP-intensive industries contributed an estimated 44.2% of total gross value added, and IP-intensive industries directly employed, on average, over 19 million people (36% of the workforce). The study—the first of its kind in Brazil—was a joint effort between INPI and other government departments and agencies including the Agency for Industrial Development. Figure 7 shows the economic contribution of IP-intensive industries in Brazil.

In partnership with the European Commission, EUIPO, and under the umbrella of the IP Key Latin America Project, the Mexican national IP office in March 2021 presented the results of *La contribución económica de la Propiedad Intelectual en México*. Modeled on existing research in the United States and EU, this study is the first of its kind in Mexico. The report measures the economic contribution of IP-intensive industries to the Mexican economy. Overall, the report finds that IP-intensive industries are a major contributor to national output, employment, and trade. For 2019, IP-intensive industries contributed an estimated 47.8% of national GDP, and IP-intensive industries directly and indirectly employed over 17 million people (33.6% of the workforce). Figure 8 shows the economic contribution of IP-intensive industries in Mexico.
In late 2020, the UK Intellectual Property Office published *Use of Intellectual Property Rights across UK Industries*, providing a detailed overview of IP-intensive industries, the types of rights they use, and their contribution to British economic activity. Specifically, the study employs a stratified research approach examining the intensity of IP rights usage rates both by different industries and by type of IP right (registered and unregistered). Overall, the study echoes the results of similar European studies, carried out by the EPO and EUIPO, and finds that IP-intensive industries make a substantial contribution to national economic output and employment. Industries with an above average (defined as “high” and “medium”) IP usage rate and intensity accounted for an estimated 15.5% of UK employment and approximately 27% of gross value added to the nonfinancial business part of the national economy; the latter is estimated at about two-thirds of the entire British economy. Figure 9 shows the results of this research.

Together, the results of these studies paint a clear and unambiguous picture: Regardless of size, geographic location, structural composition, or level of development, IP-intensive industries are a critical—and growing—part of national economic activity across Index economies.

### Zooming in on employment: IP-intensive industries and high-value, high-paying jobs

“"We're going to create millions of good-paying jobs. We're going to ease inflationary pressure and allow us to win the competition of the 21st century in a global economy where the competition has become more intense.”

— U.S. President Joseph Biden, September 3, 2021

“And that is the direction in which this country is going now: towards a high-wage, high-skill, high-productivity, and yes, thereby a low-tax economy, that is what the people in this country need and deserve.”

— British Prime Minister Boris Johnson, October 6, 2021

As the above quotes from President Biden and Prime Minister Johnson illustrate, creating high-value and high-skilled jobs is a priority for governments and economic policymakers around the world.

As the accumulated data and research carried out together by national IP authorities, international institutions, and correlations presented in this Statistical Annex, suggests, IP-intensive industries are leading the way in providing this type of high-value and high-skilled job-creation. Critically, these employment opportunities cut across all levels of education and are not just for the PhDs and staff in lab coats. As the below data shows (especially for the United States), IP-intensive industries create jobs in the industrial and manufacturing sector as well as through a range of support services, such as construction, transportation, and retail.

This subsection zooms in on the accumulated evidence that clearly shows how IP-intensive industries are responsible for generating a growing proportion of high-value, high-paying jobs in economies around the world.

To begin with we can examine the accumulated evidence and correlation analysis of the Statistical Annex since 2013.
IP-intensive industries and employment: Evidence from the Statistical Annex

As the Index and Annex have documented and measured over the last decade, the link between the strength of a national IP environment and the creation and provision of knowledge-intensive and high-skilled employment opportunities is very strong. Economies that provide clear and strong IP rights and protections have significantly higher levels of knowledge-intensive and high-skilled workers, as measured by two independent variables:

1. the share of the workforce employed in knowledge-intensive activities (as measured by the International Labor Organization (ILO) and housed in the ILO Department of Statistics (ILOSTAT) Database and the Global Innovation Index); and

2. the number of researchers in R&D on a per capita basis (as measured by the World Bank).

Since the third and fourth editions of the Index, the Statistical Annex has measured the correlation between these two variables and Index scores, consistently finding a correlation of between 0.67 and 0.84. The correlation suggests a strong to very strong relationship between the level of IP protection in a given Index economy and level of knowledge-intensive employment and R&D workers. Figure 10 shows the strength of these correlations as measured in each individual Statistical Annex since 2014.

In addition to the evidence accumulated in the Statistical Annex, similar research is also being carried out at the national level.

IP-intensive industries and employment: National
economic analysis

As the preceding subsection showed, a growing number of economies are actively mapping the share of national employment in IP-intensive industries. Although the accounting methodology varies from economy to economy, the conclusion is the same for all economies: IP-intensive industries provide high-value, high-paying jobs across the world. Figure 11 summarizes the findings of employment-related studies conducted over the last five years.

Figure 11: % Direct Employment, EU, South Korea, Mexico, and Brazil

IP-intensive industries and employment: Zooming in on the United States

As noted above, the USPTO released *Intellectual Property and the U.S. Economy: Third Edition* in March 2022. In addition to capturing the overall contribution of IP-intensive industries to national economic output and employment, this report also includes a detailed analysis of the types of employment opportunities IP-intensive industries create. A few things about the data stand out.

First, IP-intensive industries are largely concentrated in traditional industrial sectors, as defined by the Bureau of Labor Statistics, including Manufacturing; Wholesale and Retail Trade; and Professional, Technical, Management, and Administrative Services. As figure 12 shows, together these industrial sectors make up over two-thirds (68%) of all employment in IP-intensive industries; this is more than double the same total for non-IP-intensive industries (28%).

Figure 12: Distribution of Employment across Select Industrial Sectors, IP-intensive industries vs. non-IP-intensive Industries, 2019
Second, the USPTO’s data also show how workers in IP-intensive industries receive higher weekly earnings. As figure 13 makes clear, this “earnings premium” was, on average, 60% for all IP-intensive industries compared with non–IP-intensive industries. (Of note is that this premium was even for workers in utility patent-intensive industries and copyright-intensive industries.)

![Figure 13: Average Weekly Earnings, IP-intensive Industries vs. non–IP-intensive Industries, 2019](image)

Finally, the USPTO’s data confirm how IP-intensive employment opportunities cut across all levels of education and are not exclusively concentrated on workers with graduate degrees. As figures 14 and 15 show, while most workers in non–IP-intensive industries (63.40%) do not hold a completed bachelor’s or graduate degree; for IP-intensive industries this ratio is almost 1:1, with 53.60% of all workers holding a bachelor’s or graduate degree versus 46.40% of workers who had no or limited tertiary education. This means that almost half of all workers in IP-intensive industries do not have a university degree. In other words, IP-intensive industries create jobs for workers across all levels of education.

![Figure 14: Percentage of Educational Characteristics of Workers in IP-intensive and non–IP-intensive Industries, non-University Graduates, 2019](image)
In summary, the USPTO’s data paint a detailed picture of the economic contribution IP-intensive industries make to the U.S. economy and national employment. The data confirm that:

- workers in IP-intensive industries are concentrated in traditional industrial sectors such as manufacturing and retail;
- compared with workers in non–IP-intensive industries, workers in IP-intensive industries have substantially higher (over 60%) average weekly earnings; and
- IP-intensive industries create jobs for workers across all levels of education, not just PhDs, with almost half of all workers in IP-intensive industries not having completed a university degree.

IP-intensive industries and employment: Sector-specific research 1—The research-based biopharmaceutical industry

Similarly, data from individual IP-intensive industries and economic sectors show the extent to which IP-intensive industries contribute to the creation of knowledge-intensive jobs. For example, hosting a research-based biopharmaceutical industry is a huge socioeconomic boon for any economy or region. The development of new biopharmaceutical treatments and products saves and extends lives. Today new treatments for cancer, diabetes, and cardiovascular conditions mean that patients can live longer, more productive lives than ever before. The research-based biopharmaceutical industry is one of the most R&D-intensive industries in the world. In 2019 Deloitte estimated that total global life sciences R&D spending was around $177 billion. A substantial proportion of this expenditure comes from members of the Pharmaceutical Research and Manufacturers of America (PhRMA) trade association. In its 2021 industry profile PhRMA estimated that R&D expenditure by member companies in 2020 totaled USD91 billion and that biopharmaceutical companies invested more than a trillion dollars in R&D over the last decade. In fact, the research-based biopharmaceutical industry invests significantly more in R&D in absolute terms and as a percentage of sales than does any other industry. Figure 16 from the EU’s 2017 Industrial R&D Investment Scoreboard (which measures the total amount of corporate R&D spending by the top companies in the world), shows how the biopharmaceutical sector spent over EUR140 billion in corporate R&D in 2017. This amount was well ahead of those of the second and third largest spenders (in the technology hardware and equipment industry and automotive industry, respectively).
Given the scale of this R&D investment, the biopharmaceutical industry is a major employer and, as an industry, job creator. Indeed, from a national or regional economic employment perspective, this is a high-tech sector whose contributions are considerable. Estimates from the International Federation of Pharmaceutical Manufacturers & Associations show that the industry employed over 5 million people directly worldwide with millions more supported and created indirectly in 2014. Similarly, more recent estimates from the United States from PhRMA show the scale of job creation and employment. In its 2021 industry profile PhRMA estimated that in the United States, the research-based industry “supports more than 4 million jobs across the country, including 120,000 high-wage manufacturing jobs, and directly employs more than 811,000 Americans.”

Critically, like the data from the USPTO cited above, employment in the biopharmaceutical industry is not confined exclusively to university graduates and scientists in lab coats. A high number of jobs are in the manufacturing sector and indirectly in support services and industry, such as construction, retail, logistics, and supply-chain services. According to 2021 findings by the Pharmaceutical Industry Labor Management Association, “Between 2015 and 2020, the pharmaceutical and biotech industry required 58.7 million labor hours from construction workers on research and manufacturing facilities” in 14 states in the United States.

Similar figures are available from Europe. Figures from the European Federation of Pharmaceutical Industries and Associations show that the European research-based industry provided nearly 740,000 direct jobs (with over 113,000 in high-skill R&D jobs), over EUR33.5 billion in R&D investments, and over EUR238 billion in production in 2015 alone.

IP-intensive industries and employment: Sector-specific research 2—Copyright-based and creative industries

Economic impact analysis for other IP-intensive industries paints a similar picture, including with respect to copyright-related industries. In the early 2000s, the World Intellectual Property Organization (WIPO) began to study the creative economy under the rubric of “copyright-based industries.” In 2003, it published the Guide on Surveying the Economic Contribution of the Copyright-Based Industries, which was followed by several country-specific assessments of the economic contributions of these industries. This guide was revised and updated in 2015. So far, WIPO and member economies have produced studies in 42 economies, many of which are middle- and low-income economies. The data illustrate that the copyright industries make up a significant portion of national economic output and employment around the world. Figure 17 shows the estimated percentage contribution of the copyright-based industries (as defined by WIPO) to employment for the 23 Index economies for which WIPO studies have been carried out.
The economic rationale for IP rights – In a post-COVID-19 world and beyond

Since 2015, the Index has included a Statistical Annex, which investigates a series of correlation, or the statistical likelihood of two variables occurring together. The correlations examine the relationship between the strength of national IP environments, as measured by the Index scores, and different types of economic activity including rates of R&D spending, innovation, technology creation, and creativity. The first Annex, published with the third edition of the Index, tested the relationships between the Index scores of 30 economies and 15 economic variables. This year’s Statistical Annex mirrors the growth of the wider Index and surveys the relationship between the Index scores of 55 economies and a set of 29 economic variables, representing an increase of over 75% in the number of economies sampled and close to a doubling in the number of economic variables.

More recent national data reinforce how important copyright-based industries and the creative sector is to job creation and economic activity. Looking, for example, at the United States, the U.S. Bureau of Economic Analysis (BEA) in 2022 released an update to the national satellite account for “Arts and Cultural Production.” This account provides an in-depth estimate and accounting of the economic contributions copyright-based and creative industries make to the U.S. economy.

In 2020 the sector accounted for just under USD1.5 trillion (USD 1,458,938 millions) nominal gross output. Like all industries and sectors of the economy, this figure was lower than it had been in preceding years due to the negative socioeconomic impact of the COVID-19 pandemic. In 2019 the economic contribution of these industries (nominal gross output) amounted to almost USD1000 billion more, at over USD1.6 trillion (USD1,541,080 millions). Similarly, the data released by the BEA show the high number of jobs created by these industries. The BEA estimates that, despite the negative impact of the COVID-19 pandemic—which resulted in a 11.6% decline in employment—the arts and cultural industries employed more than 4.5 million Americans in 2020.

Since 2015, the Index has included a Statistical Annex, which investigates a series of correlation, or the statistical likelihood of two variables occurring together. The correlations examine the relationship between the strength of national IP environments, as measured by the Index scores, and different types of economic activity including rates of R&D spending, innovation, technology creation, and creativity. The first Annex, published with the third edition of the Index, tested the relationships between the Index scores of 30 economies and 15 economic variables. This year’s Statistical Annex mirrors the growth of the wider Index and surveys the relationship between the Index scores of 55 economies and a set of 29 economic variables, representing an increase of over 75% in the number of economies sampled and close to a doubling in the number of economic variables.

As more economies and more social and economic variables are added to the Statistical Annex, the picture becomes more vivid and sharp: IP protection is a critical instrument for economies recovering in many parts of the world, there will likely be an extended period before both the global economy and individual economies return to pre-pandemic levels of activity and growth levels.

This message is particularly important in light of the negative economic impact of the COVID-19 pandemic. Although economic activity is (thankfully) recovering in many parts of the world, there will likely be an extended period before both the global economy and individual economies return to pre-pandemic levels of activity and growth levels.

This year’s Statistical Annex and correlations show, again, the strong, direct, and statistically significant relationship between the strength of the national IP environment as measured by the Index and rates of innovation, growth, and high-tech economic development. Table 1 presents the main findings of the analysis in this year’s Annex.
Table 1: Economic Benefits of Improving IP Protection: Findings from 29 Correlations

<table>
<thead>
<tr>
<th>Factor</th>
<th>2018 (strength of correlation)</th>
<th>2019 (strength of correlation)</th>
<th>2021 (strength of correlation)</th>
<th>2022 (strength of correlation)</th>
<th>Economies with robust IP protection (scoring above 50% on the Index) on average tend to experience the following benefits compared with economies scoring below 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Readiness for the fourth Industrial Revolution</td>
<td>NA .85 .83 .84</td>
<td></td>
<td></td>
<td></td>
<td>39% more likely to adapt to the fourth Industrial Revolution and secure new growth opportunities</td>
</tr>
<tr>
<td>Technology &amp; innovation</td>
<td>NA .87 .85 .85</td>
<td></td>
<td></td>
<td></td>
<td>54% more likely to be able to transform their economies using sophisticated, state-of-the-art technologies</td>
</tr>
<tr>
<td>Global trade &amp; investment</td>
<td>NA .71 .70 .71</td>
<td></td>
<td></td>
<td></td>
<td>40% more open for business and attractive to foreign investment</td>
</tr>
<tr>
<td>Resources to innovate</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Innovation capability</td>
<td>NA .88 .87 .87</td>
<td></td>
<td></td>
<td></td>
<td>63% more likely to maintain sophisticated environments capable of producing innovative outputs</td>
</tr>
<tr>
<td>Enabling infrastructure</td>
<td>NA .79 .79 .82</td>
<td></td>
<td></td>
<td></td>
<td>70% more likely to experience the benefits of an innovation-driven economy, ranging from high-skilled and high-paid workers to increased R&amp;D activity</td>
</tr>
<tr>
<td>Availability of R&amp;D funding</td>
<td>.71 .71 .69 .70</td>
<td></td>
<td></td>
<td></td>
<td>32% more likely to see private-sector investment in R&amp;D activities</td>
</tr>
<tr>
<td>Access to venture capital and private equity funds</td>
<td>.79 .78 .75 .79</td>
<td></td>
<td></td>
<td></td>
<td>46% more likely to attract venture capital and private equity funds compared with economies whose IP regimes lag</td>
</tr>
<tr>
<td>Availability of skilled researchers</td>
<td>.82 .81 .80 .84</td>
<td></td>
<td></td>
<td></td>
<td>Over five times more likely to have highly skilled researchers in a given labor force</td>
</tr>
<tr>
<td>Talent competitiveness</td>
<td>NA .82 .82 .86</td>
<td></td>
<td></td>
<td></td>
<td>48% more competitive human capital</td>
</tr>
<tr>
<td>Quality of local scientific and technical knowledge</td>
<td>NA .85 .83 .84</td>
<td></td>
<td></td>
<td></td>
<td>Over five times more knowledge output in terms of scientific and technical journal articles</td>
</tr>
<tr>
<td>Growth of knowledge-based economies</td>
<td>.83 .83 .85 .82</td>
<td></td>
<td></td>
<td></td>
<td>34% more likely to fully leverage information and communications technology (ICT)</td>
</tr>
<tr>
<td>Global networking impact</td>
<td>NA .84 .84 .82</td>
<td></td>
<td></td>
<td></td>
<td>47% more likely to support a dynamic ICT sector and experience the indirect benefits it generates</td>
</tr>
<tr>
<td>Outputs of a competitive knowledge-based economy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Economies are 25% more competitive</td>
</tr>
<tr>
<td>Global competitiveness</td>
<td>NA .86 .86 .85</td>
<td></td>
<td></td>
<td></td>
<td>Twice as likely to produce and export complex, knowledge-intensive products</td>
</tr>
<tr>
<td>Economic complexity</td>
<td>NA .82 .77 .70</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Innovation</td>
<td>.86 .85 .85 .76</td>
<td></td>
<td></td>
<td></td>
<td>Almost double the innovation output as measured by the Global Innovation Index</td>
</tr>
<tr>
<td>Triadic patenting</td>
<td>.68 .65 .64 .65</td>
<td></td>
<td></td>
<td></td>
<td>Over 550 more high-value inventions per million population</td>
</tr>
</tbody>
</table>

Table 1: continued

<table>
<thead>
<tr>
<th>Factor</th>
<th>2018 (strength of correlation)</th>
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<th>Economies with robust IP protection (scoring above 50% on the Index) on average tend to experience the following benefits compared with economies scoring below 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment in knowledge-intensive sectors</td>
<td>.67 .69 .73 .75</td>
<td></td>
<td></td>
<td></td>
<td>Share of workforce employed in knowledge-intensive sectors is 62% higher</td>
</tr>
<tr>
<td>Growth of high-tech sectors</td>
<td>.75 .79 .76 .74</td>
<td></td>
<td></td>
<td></td>
<td>Produce 83% more knowledge and technology outputs</td>
</tr>
<tr>
<td>Biotech innovation</td>
<td>.78 .79 .81 .82</td>
<td></td>
<td></td>
<td></td>
<td>Almost twice as likely to provide environments that are conducive to biotech innovation</td>
</tr>
<tr>
<td>Biomedical activity</td>
<td>.72 .73 .74 .74</td>
<td></td>
<td></td>
<td></td>
<td>Over 10 times more clinical trial activity</td>
</tr>
<tr>
<td>Cutting-edge clinical trials</td>
<td>.73 .76 .77 .78</td>
<td></td>
<td></td>
<td></td>
<td>Over 17 times more early-phase clinical trials</td>
</tr>
<tr>
<td>Development of biotech therapies</td>
<td>.76 .77 .77 .77</td>
<td></td>
<td></td>
<td></td>
<td>Over 12 times more clinical research on biologic therapies</td>
</tr>
<tr>
<td>Value added and creativity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creative outputs</td>
<td>.84 .82 .79 .80</td>
<td></td>
<td></td>
<td></td>
<td>71% more likely to benefit from the growth in both volume and value of the dynamic content and media sectors</td>
</tr>
<tr>
<td>Online creativity</td>
<td>.84 .81 .81 .81</td>
<td></td>
<td></td>
<td></td>
<td>Generating almost two times more online and mobile content</td>
</tr>
<tr>
<td>Added value of licensed software</td>
<td>.82 .81 .77 .77</td>
<td></td>
<td></td>
<td></td>
<td>Higher contribution of licensed software to GDP</td>
</tr>
<tr>
<td>Global reach of local brands</td>
<td>NA .86 .76 .77</td>
<td></td>
<td></td>
<td></td>
<td>Almost 40% higher levels of international trademark applications</td>
</tr>
<tr>
<td>Access to licensed music outfits</td>
<td>.79 .76 .75 .74</td>
<td></td>
<td></td>
<td></td>
<td>Almost double the access to new music through legitimate and secure platforms</td>
</tr>
<tr>
<td>Video on demand (VOD) penetration</td>
<td>.66 .66 .65 .65</td>
<td></td>
<td></td>
<td></td>
<td>Generate more than twice as many video-on-demand and streaming services</td>
</tr>
<tr>
<td>Consumption of audiovisual content</td>
<td>.72 .72 .69 .69</td>
<td></td>
<td></td>
<td></td>
<td>Generate almost double the number of theatrical screenings of feature films</td>
</tr>
</tbody>
</table>
Methodology

The Pearson Correlation Coefficient is the statistical analysis used to test the relationship between the Index’s scores and other economic variables in this Statistical Annex. Simply put, the Pearson Correlation Coefficient is a widely used statistical method of establishing whether two variables are related to each other. This statistical test provides a value between –1 and 1, which represents the strength of this correlation. Thus, the Pearson Correlation Coefficient tells us whether a linear relationship exists between two variables and if it is positive or negative.

In this Annex, the strength of a given positive correlation follows this legend:

- .00 to .19: “very weak”
- .20 to .39: “weak”
- .40 to .59: “moderate”
- .60 to .79: “strong”
- .80 to 1.0: “very strong”

Each individual test of the correlation between two variables was performed under a confidence level of 0.95, which means that if this procedure was repeated on multiple samples, the calculated confidence interval (i.e., a range estimation that is calculated from the observation and therefore would be different for each sample) would encompass the true parameter 95% of the time. In other words, the confidence interval represents values for the parameter, for which the difference between the parameter and the observed estimate is not statistically significant at the 5% level.

However, it is important to note that correlation—a statistical test of the existence of a linear relationship between two variables—does not imply causation (i.e., the fact that two variables are very strongly correlated does not mean that one has caused the other). That said, a strong to very strong correlation does imply that a linear relationship exists between the two variables, the nature of which depends on the variables.

Readiness for the Fourth Industrial Revolution

Economies with Robust IP Environments Are Significantly Better Positioned to Capitalize on the Fourth Industrial Revolution

Association between the Index scores and the Readiness for the Future of Production Assessment, Drivers of Production pillar scores

Data not available (NA) for Brunei, Taiwan, and Venezuela

- The Readiness for the Future of Production Assessment’s Drivers of Production pillar
scores gauge performance in key sectors and themes that enable economies to capitalize on emerging technologies to compete in future production systems. These Readiness Assessment scores display a very strong association—a correlation of 0.84—with the Index scores.

- This relationship adds to the strength of the overall findings of the Statistical Annex to date—namely, that robust IP protection is a critical component of the 21st-century knowledge-based economy.
- In fact, a positive stepwise improvement can be seen across both measures: Economies with robust IP environments are 39% more likely to adapt to the fourth Industrial Revolution and secure new growth opportunities.

A Strong IP Framework Equals Greater Capacity for Innovation and Technological Absorptive Capacity

Association between the Index Scores and the Readiness for the Future of Production Assessment, Driver of Production Pillar Scores: Division by Thirds in Index Scores, Average Scores per Third

- The Readiness for the Future of Production Assessment’s Technology & Innovation sub-pillar measures how advanced, digitally secure, globally connected, and interoperable the economic production system is—a critical element for economies’ ability to foster and commercialize new and innovative technologies.
- The Index exhibits a very strong correlation of 0.85 to the Technology & Innovation sub-pillar scores. In fact, compared with economies whose IP systems require improvement, economies with strong IP systems are 54% more likely to be able to transform their economies using sophisticated, state-of-the-art technologies.
Favorable IP Regimes Promote Trade Openness and Attractiveness to Foreign Investments

Association between the Index Scores and the Readiness for the Future of Production Assessment, Global Trade & Investment sub-Pillar Scores

Data NA for Brunei, Taiwan, and Venezuela

- The Readiness for the Future of Production Assessment’s Global Trade & Investment sub-pillar measures economies’ levels of openness to international trade and the availability of capital directed to production-related development. There is a strong relationship (at a correlation strength of 0.71) to the Index scores, suggesting that the strength of a national IP environment is a contributing factor to economies’ ability to bolster knowledge and skill attainment, increase technology transfer, and boost productivity and competitiveness.

- Compared with weaker economies, those with fair to strong IP environments are 40% more open for business and attractive to foreign investments in their production systems.

Resources to Innovate

Robust IP Protection Is a Key Component in Developing a Strong Innovation Capability

Association between the Index scores and the 2019 Global Competitiveness Report, Innovation Capability pillar scores

- A very strong relationship (a correlation of 0.87) was found between the Index scores and the Global Competitiveness Report’s Innovation Capability pillar scores.

- Economies with fair to strong IP regimes are on average 63% more likely than weaker economies to maintain an environment capable of producing innovative outputs.

- The link between the two variables is particularly strong when looking at group averages by quartiles of Index scores: Economies scoring within the third and fourth quartile of the Index are much more capable of innovating and benefiting from local innovation activities compared with economies scoring within the second and first quartiles of the Index.
Supportive IP Regimes Are Essential for Creating Environments Conducive to Innovation

The Global Innovation Index’s Business Sophistication pillar measures the availability of competent talent, levels of innovation linkages and infrastructure, and levels of foreign direct investment (FDI) and reliance on high-tech imports. There is a strong correlation of 0.82 to the Index scores.

As a result, economies with strong IP protection are 70% more likely to experience the benefits of an innovation-driven economy, ranging from more high-skilled and high-paid workers to increased R&D activity.
Companies Are More Likely to Spend on R&D in Favorable IP Environments

Association between Index Scores and the 2017-18 Global Competitiveness Report, Company Spending on R&D Scores

- A strong correlation of 0.70 exists between the Index scores and private sector’s propensity to spend on R&D.
- Economies with robust IP environments, scoring over 50% on the Index, are 32% more likely to see private-sector investment in R&D activities compared with companies in economies with less supportive IP environments.

Economies with Robust IP Regimes Are More Attractive to Investors

Association between the Index scores and the 2021 Venture Capital & Private Equity Country Attractiveness Index Scores

- There is a strong correlation of 0.79 to the IESE and EMLYON Business Schools’ Venture Capital & Private Equity Attractiveness Index scores.
- Innovators and companies in economies with higher Index scores and stronger national IP environments are 46% more likely to attract venture capital and private equity funds compared with economies whose IP regimes lag.

Data NA for Brunei, Costa Rica, and Honduras
Strong IP Environments Encourage the Development of Human Capital

Data NA for Dominican Republic, Peru, Saudi Arabia, and Taiwan

- The relationship between the Index scores and levels of human capital has remained very strong (a correlation strength of over 0.80) over the past five editions of the Statistical Annex.
- Economies with favorable IP regimes are over five times more likely to have highly skilled researchers in a given labor force.
Favorable IP Environments Are Better Positioned for Competing in the Global Innovation Arena

Association between the Index Scores and the 2021 Global Talent Competitiveness Index

- IP protection displays a very strong relationship—at a correlation strength of 0.86—with economies’ performance on the Global Talent Competitiveness Index, which benchmarks economies’ ability to develop, attract, and empower human capital, measuring both inputs, such as enabling landscape, market openness, quality of learning and sustainability, as well as outputs, such as mid- and high-level skills and overall talent impact.

- Economies with higher Index scores are 48% more competitive than weaker economies on the Global Talent Competitiveness Index.

- When dividing the Index scores into quartiles, a corresponding stepwise increase is revealed in economies’ talent competitiveness, suggesting that the overall strength of economies’ IP protection goes hand in hand with a strong and competitive workforce.

Data NA for Taiwan
Supportive IP Frameworks and Science and Technology Knowledge Production

Association between the Index Scores and the Number of Scientific and Technical Journal Articles per Million Population

- The population-adjusted rate of scientific and technical journal articles—a robust measure for the quality and productivity for the human capital in the fields of life sciences, technology, and engineering—displays a very strong correlation (0.84) with the Index life sciences–related scores.
- Economies with robust IP systems, as measured by the Index, have over five times more knowledge output, in terms of scientific and technical journal articles, than do economies without such IP systems.

Data NA for Taiwan
IP Protection Contributes to the Growth of the ICT Sector and Knowledge-based Economies

Association between the Index’s ICT-related Indicators Scores and the 2021 Network Readiness Index, Impact Pillar Scores

- There is a strong correlation (0.82) between the Index's ICT-related indicators and the extent to which an economy leverages ICT and benefits from its economic and societal impact, as measured by the Network Readiness Index.

- Economies with stronger Index scores are 34% more likely that those with weaker Index scores to fully leverage ICTs for increased productivity and technology development.

Data NA for Brunei, Taiwan, and Venezuela

Note: Data NA for Taiwan

- The Index's ICT-related indicators' scores display a very strong correlation of 0.82 with the ICT Development Index.

- Economies with favorable IP environments are 47% more likely than those without favorable IP environments to support a dynamic ICT sector and experience the socioeconomic benefits it generates.
Outputs of a competitive knowledge-based economy

Economies with Favorable IP Environments Are More Globally Competitive

- The Global Competitiveness Index is a comprehensive benchmark of the set of institutions, policies, and factors that determine economies' productivity and competitiveness. There is a very strong relationship (at a correlation strength of 0.85) with the Index scores.

- On average, economies with stronger Index scores are 25% more competitive than economies scoring below 50%.

- When dividing the Index scores into thirds, a corresponding stepwise increase is revealed in economies’ competitiveness, suggesting that the overall strength of economies’ IP protection goes hand in hand with overall levels of international economic competitiveness.
Robust IP Protection and Economic Complexity

Association between the Index Scores and the Observatory of Economic Complexity’s Economic Complexity Index

Data NA for Brunei

The Observatory for Economic Complexity’s Economic Complexity Index measures the multiplicity and complexity levels of the knowledge required to produce a given product and the level of its exports. There is a strong correlation of 0.70 with the Index scores.

Economies scoring above 50% of the Index, compared with economies scoring below it, are, on average, twice as likely to produce and export complex, knowledge-intensive products and reap the associated social and economic benefits.

Strong IP Environments Have Higher Levels of Innovative Output

Association between Index Scores and the 2021 Global Innovation Index, Innovation Output sub-index scores

Data NA for Taiwan and Venezuela

- The Global Innovation Index’s Innovation Output sub-index is an aggregate measure that looks at a wide variety of indicators reflecting knowledge creation and development, including intangible assets, research publications, and high-tech production. When compared with the Index there is a strong correlation of 0.76 to the Index scores.

- Economies with robust IP regimes experience almost double the innovation output of that of economies with weaker national IP environments.

- When dividing the Index scores into thirds, a corresponding stepwise increase is revealed in economies’ innovation output, suggesting that the overall strength of economies’ IP protection goes hand in hand with overall levels of innovation.
Inventive Intensity Depends on Strong Patent Protection

Data NA for Brunei, Dominican Republic, Ghana, Honduras, and Vietnam

- Triadic patenting rates are a measure of patent protection granted by the three biggest patent offices (the USPTO, EPO, and Japan Patent Office (JPO)) and serve as a good indicator of the development of high-value innovations with significant commercial potential.

- The Index patent-related indicators' scores display a strong relationship (a correlation of 0.65) with triadic patenting rates standardized for population. Strong IP environments generate more triadic patenting, while weaker environments see virtually no triadic patenting.

- Economies with the strongest IP frameworks have over 550 more high-value inventions patented per million population than do economies with weaker IP environments.

- Economies in the lower two quartiles see rates of triadic patenting activity in the low single digits per million population.
A Robust IP Regime Promotes the Growth of Knowledge-intensive Sectors

Association between the Index Scores and the 2021 Global Innovation Index, Share of Workforce Employed in Knowledge-intensive Services

• There is a strong correlation (0.75) between Index scores and the share of the workforce employed in knowledge-intensive activities, as measured by the 2021 Global Innovation Index.

• The share of the workforce concentrated in knowledge-intensive sectors in economies with robust IP environments is 62% higher than that of economies with weaker national IP environments.

Patent Protection Is Linked to the Growth of High-tech Sectors

Association between Index Patent-related Indicators Scores and the 2021 Global Innovation Index, Innovation Output sub-Index Knowledge and Technology Output Pillar Scores

• The Index’s patent-related indicators exhibit a strong correlation of 0.74 with knowledge and technology outputs, as measured by the Global Innovation Index’s Innovation Output sub-index.

• Economies with strong patent environments, scoring 50% or above on the Index, produce 83% more knowledge and technology outputs than do economies whose patent environments trail behind.

Data NA for China, Colombia, Kenya, New Zealand, Taiwan, and Venezuela

Data NA for Taiwan and Venezuela
Biotechnological Innovation Depends on Protecting IP

Association between the Index’s Life Sciences–related Indicators Scores and the Scientific American WorldView Scores

- Protecting IP rights related to the life sciences (such as patents, regulatory data protection, and patent term restoration) has a very clear and direct correlation with an environment where biotech innovation can thrive.

- The Index scores on life sciences–related indicators correlate very strongly—at 0.82—with the Scientific American WorldView overall scores (as a measure of biotech innovation).

IP Rights Lead to Biomedical FDI

Association between Index Life Sciences–related Indicators Scores and the Number of Clinical Trials per Million Population

- Economies’ clinical trial intensity, serving as a proxy for life sciences FDI, displays a strong association—a correlation of 0.74—with biopharmaceutical IP rights, as measured by the Index’s scores on life sciences–related indicators.

- Economies that score 50% or more on the Index’s life sciences–related indicator host over 10 times more clinical trials than do low-scoring economies.
IP Protection Is Critical to Greater Investment in Cutting-edge Clinical Research

Association between Index Life Sciences–related Indicators Scores and the Number of Early-Phase (I+II) Clinical Trials per Million Population

- The Index scores for life sciences–related indicators exhibit a strong correlation of 0.78 with rates of early-stage (phase I and II) clinical trial activity.
- Economies that maintain robust IP environments tend to see, on average, over 17 times more early-phase clinical trials than do economies whose life sciences–related IP environments trail behind.

Development of Biological Therapies Is Closely Linked to IP Protection

Association between Index Life Sciences–related Indicators Scores and the Number of Biologic Clinical Trials per Million Population

- Biological medicines—gene-, cellular-, or protein-based therapies produced from living organisms—are at the forefront of medical research. The trials involved in developing these biologics are highly complex and require high levels of skill and technical infrastructure; this is the high end of the value chain in clinical research.
- There is a strong correlation of 0.77 between the population-adjusted number of clinical trials on biologic drugs and the Index scores for life sciences–related indicators.
- Economies with strong to robust IP frameworks for the life sciences host over 12 times more clinical trials on innovative biologic drugs than do economies with a weaker environment.
Value added and creativity

Robust Copyright Protection Encourages Creative Activity

Association between Index Copyright-related Indicators Scores and the 2021 Global Innovation Index, Innovation Output sub-Index, Creative Output Pillar Scores

- The Index's copyright-related indicators' scores display a very strong relationship (at a correlation strength of 0.81) with online creativity as measured by the 2021 Global Innovation Index.
- Economies that provide and enforce strong copyright protection, including for digital and online works, generate almost two times more online and mobile content, such as websites, applications, and audiovisual media.

Robust Copyright Protection Encourages Online Creativity

Association between Index Copyright-related Indicators Scores and the 2021 Global Innovation Index, Innovation Output sub-Index, Creative Output Pillar, Online Creativity Scores

- Copyright protection, measured by the Index’s copyrights-related indicators, displays a strong correlation of 0.80 to the creative outputs pillar within the 2021 Global Innovation Index.
- Economies scoring above 50% on the Index’s copyright-related indicators are 71% more likely than economies with weaker national IP environments to benefit from the growth in both volume and value of the dynamic content and media sectors.

Data NA for Taiwan and Venezuela
IP Rights Equals Greater Added Value of Properly Licensed Software

Association between the Index Scores on ICT-related Indicators and the GDP Benefit from a 1% Increase in Software Use

![Graph showing the association between index scores and GDP benefit](image)

**Data NA for Brunei, Dominican Republic, Ghana, Honduras, and Taiwan**

- The Index’s ICT-related indicators scores are strongly related to the benefits of properly licensed software as a percentage of GDP (a correlation strength of 0.77) as measured by BSA | The Software Alliance and INSEAD.
- Economies that provide strong ICT-related protection have a higher contribution of licensed software to GDP than do economies that do not offer such strong protection.

Strong IP Environments Promote International Brand Use

Association between the Index Trademark-related Indicators Scores and the 2019 Global Competitiveness Report, Innovation Capabilities Pillar, Trademark Applications Scores

![Graph showing the association between index scores and trademark applications](image)

**Data NA for Brunei, Dominican Republic, Ghana, Honduras, and Taiwan**

- Obtaining international trademark protection and enforcing it across multiple jurisdictions requires significant financial resources; a high rate of international trademark applications provides a good indication of the quality and value of companies and products within a given economy. In other words, high rates of international trademark applications suggest high rates of international competitiveness linked with a given economy.
- Economies with effective IP systems have almost 40% higher levels of international trademark applications than those whose IP regimes lag.
- The Global Competitiveness Index’s Trademark Applications indicator, which offers a population-adjusted, standardized measure of international trademark applications, exhibits a strong relationship (at a correlation strength of 0.77) with the Index’s trademark-related indicators scores.
Strong Copyright Protection Encourages Increased Availability of Legitimate Online Music Outlets

There is a strong correlation of 0.74 between the Index’s copyright-related indicators’ scores and the number of online licensed music services as measured by Pro-Music.org.

- Economies that maintain robust copyright environments enjoy almost double the access to new music through legitimate and secure platforms.

Mature IP Environments Experience Wider and More Convenient Access to Video Content

Data are NA for Algeria, Brunei, Chile, Costa Rica, Dominican Republic, Egypt, Ecuador, Ghana, Greece, Honduras, Jordan, Kuwait, and Venezuela.

- The overall Index scores present a strong association between rates of VOD and television streaming services penetration, as measured by the Connected Consumer Survey, with a correlation of 0.65.

- Consumers in economies with strong IP protection can access more than double the number of VOD and streaming services.
IP Protection Supports Wider Access to Audiovisual Content

Association between Index Copyright-related Indicators Scores and the Number of Admissions to All Feature Films Exhibited per Million Population

Data are not available for Brunei, Kenya, Pakistan, Saudi Arabia, Taiwan, and Vietnam

- Index scores on content-related indicators are strongly correlated with the quantity of theater admissions for feature films, with a correlation of 0.69.
- Economies with strong copyright protection have almost more than double the number of theatrical screenings of feature films.

Endnotes

1. World Bank data bank, high-tech exports (current USD).
2. Ibid.
3. World Bank data bank, charges for the use of IP; receipts.
5. USPTO (2022), p. 3.
15. Ibid.

22. WIPO (2003), Guide on surveying the economic contribution of the copyright-based industries.

23. WIPO (2014), WIPO studies on the economic contribution of the copyright industries, overview, summary table, annex 1, p. 29.

24. BEA (2022, Mar 15) Arts and cultural production satellite account, U.S. and states, table 7, p. 16.


27. Algeria DZ
Argentina AR
Australia AU
Brazil BR
Canada CA
Chile CL
China CN
Colombia CO
Costa Rica CR
Dominican Republic DO
Ecuador EC
Egypt EG
France FR
Germany DE
Ghana GH
Greece GR
Honduras HN
Hungary HU
India IN
Indonesia ID
Ireland IE
Israel IL
Italy IT
Japan JP
Jordan JO
Kenya KE
Kuwait KW
Malaysia MY
Mexico MX
Morocco MA
Netherlands NL
New Zealand NZ
Nigeria NG
Pakistan PK
Peru PE
Philippines PH
Poland PL
Russia RU
Saudi Arabia SA
Singapore SG
South Africa ZA
South Korea KR
Spain ES
Sweden SE
Switzerland CH
Thailand TH
Turkey TR
UAE AE
UK GB
Ukraine UA
US US
Vietnam VN


31. The Global innovation index’s Business Sophistication pillar is comprised of three sub-pillars: Knowledge workers—measuring both inputs and outputs for human capital in the public and private sector; Innovation linkages—measuring the levels of collaborative R&D activities; and Knowledge absorption—measuring innovation capacity as well as attractiveness to foreign direct investments. See Cornell University, INSEAD, and WIPO (2021) The global innovation index, Ithaca, Fontainebleau, and Geneva.

32. The company R&D spending score is based on responses to the question, “In your country, to what extent do companies spend...
on research and development? where 1 = do not spend on R&D and 7 = spend heavily on R&D (standardized to 100), in the World Economic Forum’s 2017-18 Global competitiveness report. As this variable is no longer measured in the latest edition of the Global competitiveness report series, this edition of the Annex continues to use the data from the 2017-18 edition.

33. The IESE and EMYLON Business Schools’ Venture capital and private equity country attractiveness index measures economies’ attractiveness to venture capital and private equity funding by examining a range of factors including the capital market, taxation environment, investor protection, entrepreneurial culture, and deal opportunities. See Groh, A., Liechtenstein, H., Lieser, K., & Biesinger, M. (2021) The venture capital and private equity country attractiveness index: 2018 annual, IESE Business School and EMYLON Business School.

34. World Bank data bank, researchers in R&D (per million people)

35. The Global talent competitiveness index by INSEAD is an international benchmark of 134 economies based on the policies and practices that enable an economy to develop, attract, and empower human capital, measuring both inputs, such as enabling landscape, market openness, quality of learning and sustainability, as well as outputs, such as mid- and high-level skills and overall talent impact. See Lanvin, B., & Monteiro, F., (eds) (2021) The global talent competitiveness index, INSEAD.

36. Scientific and technical journal articles refer to the number of scientific and engineering articles published in the fields of physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences in 2018 or latest available year, adjusted per million population. Source: World Bank data bank. Life sciences-related indicators consist of indicators that fall under the Patent category of the GIPC Index (excluding patentability of computer-implemented inventions), as well as indicators in Trademarks and Trade Secrets, Market Access, Commercialization of IP Assets, Enforcement, Systematic Efficiency and International Treaties categories that are relevant to life sciences.

37. The Impact sub-index of the Network readiness index measures economic and social impacts of ICT, including value added, employment, and access to public and private services. Source: Dutta, S., & Lanvin, B., (2021) The network readiness index, Portulans Institute. ICT-related indicators consist of indicators falling under the Patent, Copyright, Trademarks and Trade Secrets categories, as well as relevant indicators in Enforcement and International Treaties.

38. The ICT development index measures the level of ICT development across 176 economies by examining the availability of ICT infrastructure and access, level of ICT usage, and the capability to use ICTs effectively, derived from relevant skills. Economies are benchmarked based on their ICT frameworks’ readiness, usage, and impact on the economy. Source: International Telecommunications Union. ICT-related indicators consist of indicators falling under the Patent, Copyright, Trademarks and Trade Secrets categories, as well as relevant indicators in Enforcement and International Treaties.


40. The Economic complexity index (ECI) measures the multiplicity and complexity levels of the knowledge required to produce a given product and the level of its exports. A higher economic complexity coefficient entails higher capabilities to produce knowledge-intensive products as well as higher levels of productive outputs.

41. Innovative output is measured by the Global innovation index Innovation Output subindex score. The Innovative Output sub-index accounts for knowledge and technology outputs, knowledge impact including labor productivity and high-tech outputs, and the diffusion of knowledge including high-tech and ICT exports as well as licensing fees and FDI outflows.

42. Triadic patenting (patents filed with the three major patent offices in the world: the USPTO, EPO and IPO) is generally considered to be the best indicator of the perceived overall value and quality of a patent. The patent application is filed in those three separate locations and filing costs are quite high. In this edition of the Statistical Annex, the triadic patent rates are calculated as the sum of triadic patents over a 17-year period from 1999 to 2016, adjusted per million population to get a standardized rate of triadic patenting intensity. Source: OECDStat, Patents by technology, Triadic patent families, Total patents, Inventor country of residence, Priority date, 1999 to 2016 inclusive; World Bank (population). Patent-related indicators consist of indicators that fall under the Patent category of the Index, as well as those indicators in Trade Secrets, Commercialization of IP Assets, Enforcement, and International Treaties categories that are relevant to patents.

43. Knowledge creation, impact, and diffusion is measured by the Global innovation index, Innovation Output sub-index, Knowledge and Technology Outputs pillar score. This score comprises variables such as patenting activity, growth of high-tech businesses, and knowledge-based exports.


45. Clinical trial activity is measured as the gross number of clinical trials to date per economy, as registered in the clinicaltrials.gov database housed by the National Institutes of Health in the United States, standardized per million population. Population data is extracted from the World Bank. Life sciences-related indicators consist of indicators falling under the Patent category of the GIPC Index (excluding patentability of computer-implemented inventions), as well as indicators in Trademarks and Market Access, Enforcement, and International Treaties categories that are relevant to life sciences.

46. Ibid. Early-phase clinical trial activity is measured as the gross number of phase I and phase II clinical trials to date per economy, as registered in clinicaltrials.gov database, standardized per million population.

47. Ibid. Clinical trial activity on biologics is measured as the gross number of biologics clinical trials to date per economy, as registered in clinicaltrials.gov database, standardized per million population.

48. Creative output is measured by the score of the Creative Outputs pillar of the Global innovation index, Innovative Output sub-index, which captures outputs such as exports of creative services, entertainment, media and ICT spending, and local creation of webpages and audiovisual content. Copyright-related indicators consist of indicators that fall under the Copyright category of the GIPC Index, as well as those indicators in Commercialization of IP Assets, Enforcement, and International Treaties categories that are relevant to copyrights.

49. Online creativity is measured by the score of the Online Creativity sub-pillar of the Creative Outputs pillar under the Innovative Output sub-index of the Global innovation index, which captures local creation of webpages and online audiovisual content.

51. The Global competitiveness index’s Trademark Applications indicators measures the number of international trademark applications by country of origin, adjusted per million population and standardized by log transformation to a score of 0 to 100. See World Economic Forum (2019). The Index’s trademark-related indicators consist of indicators that fall under the Trademark category of the GIPC Index, as well as indicators in Commercialization of IP Assets, Enforcement, and International Treaties categories that are relevant to trademarks.

52. The availability of licensed online music services is measured by the number of online licensed music services per country that offer music as a download, stream, or ringtone, based on information from local industry groups that is compiled by the International Federation of the Phonographic Industry. Source: Pro-Music.org (2021).

53. VOD and streaming services penetration is gauged by responses to the question, “Thinking about the last month, have you watched TV programs using VOD and streaming services?” in the 2017 Connected consumer survey. Source: Google Consumer Barometer (2017).

54. UNESCO Institute for Statistics, online database, Total number of admissions to all feature films exhibited per million population, 2017 or latest available year. IP Index Copyright-related indicators consist of indicators that fall under the Copyright category, as well as relevant indicators in Trade Secrets, Commercialization of IP Assets, Enforcement, and International Treaties.