THE ROOTS OF INNOVATION

U.S. Chamber International IP Index | Fifth Edition

LEVERAGING LICENSING FOR TECHNOLOGY DIFFUSION, INNOVATION, AND ECONOMIC ACTIVITY

GIPC
Global Intellectual Property Center
U.S. CHAMBER OF COMMERCE

The U.S. Chamber of Commerce's Global Intellectual Property Center (www.theglobalipcenter.com) is working around the world to champion intellectual property rights as vital to creating jobs, saving lives, advancing global economic growth, and generating breakthrough solutions to global challenges.

The U.S. Chamber of Commerce is the world's largest business federation representing the interests of more than 3 million businesses of all sizes, sectors, and regions, as well as state and local chambers and industry associations.

This report was conducted by Pugatch Consilium (www.pugatch-consilium.com) a boutique consultancy that provides evidence-based research, analysis, and intelligence on the fastest growing sectors of the knowledge economy. Authors of this report are Meir Pugatch, Rachel Chu, and David Torstensson.

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Prof. Pugatch founded Pugatch Consilium in 2008. He specializes in intellectual property policy, management and exploitation of knowledge assets, technology transfer, market access, pharmacoeconomics and political economy of public health systems. He has extensive experience in economic and statistical modeling and indexing, valuation of assets and design of licensing agreements, and providing strategic advice to international institutions, multinational corporations, and SMEs from all sectors of the knowledge economy. In addition to his work at Pugatch Consilium, he is an IPKM Professor of Valorisation, Entrepreneurship and Management at the University of Maastricht in the Netherlands, as well as the Chair of the Health Systems Administration and Policy Division at the School of Public Health, University of Haifa in Israel. He is author and editor of an extensive number of publications and serves as a referee and editorial board member of numerous peer review journals.

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Leveraging Licensing for Technology Diffusion, Innovation, and Economic Activity

Since 2012, the U.S. Chamber has produced an annual International IP Index (Index), which benchmarks the IP environment in economies around the world. The Index examines a country's IP framework across six categories of indicators – patents, copyrights, trademarks, trade secrets and market access, enforcement, and ratification of international treaties – to create a snapshot of a country's IP system. This paper builds upon the data in the Index and examines the proper legal framework needed to facilitate licensing and technology transfer.

An effective IP framework is critical to enabling technology transfer, a crucial driver of innovative growth. Technology diffusion includes both in-flows of technology and domestic technology transfers. In order to facilitate technology transfer, countries can employ a number of positive measures, such as R&D tax credits and market-based incentives. Utilization of these incentives leads to a number of concrete economic benefits, including higher levels of innovation, greater access to cutting-edge technology, and a stronger capacity to leverage technology to support economic growth.

Yet, some countries have embraced punitive, top-down measures – such as administrative hurdles, legal obstacles, and forced technology sharing – that act as barriers to licensing new technology. The Index reveals that countries that embrace these punitive incentives are denied the economic benefits other countries receive as a result of their use of market-based measures. Thus, in order to gain a competitive advantage in high-tech sectors and attract world-class investment, countries should implement positive, voluntary licensing policies to facilitate technology transfer. The utilization of these positive measures, underpinned by a robust IP system, places countries on the path to becoming globally competitive knowledge based economies.

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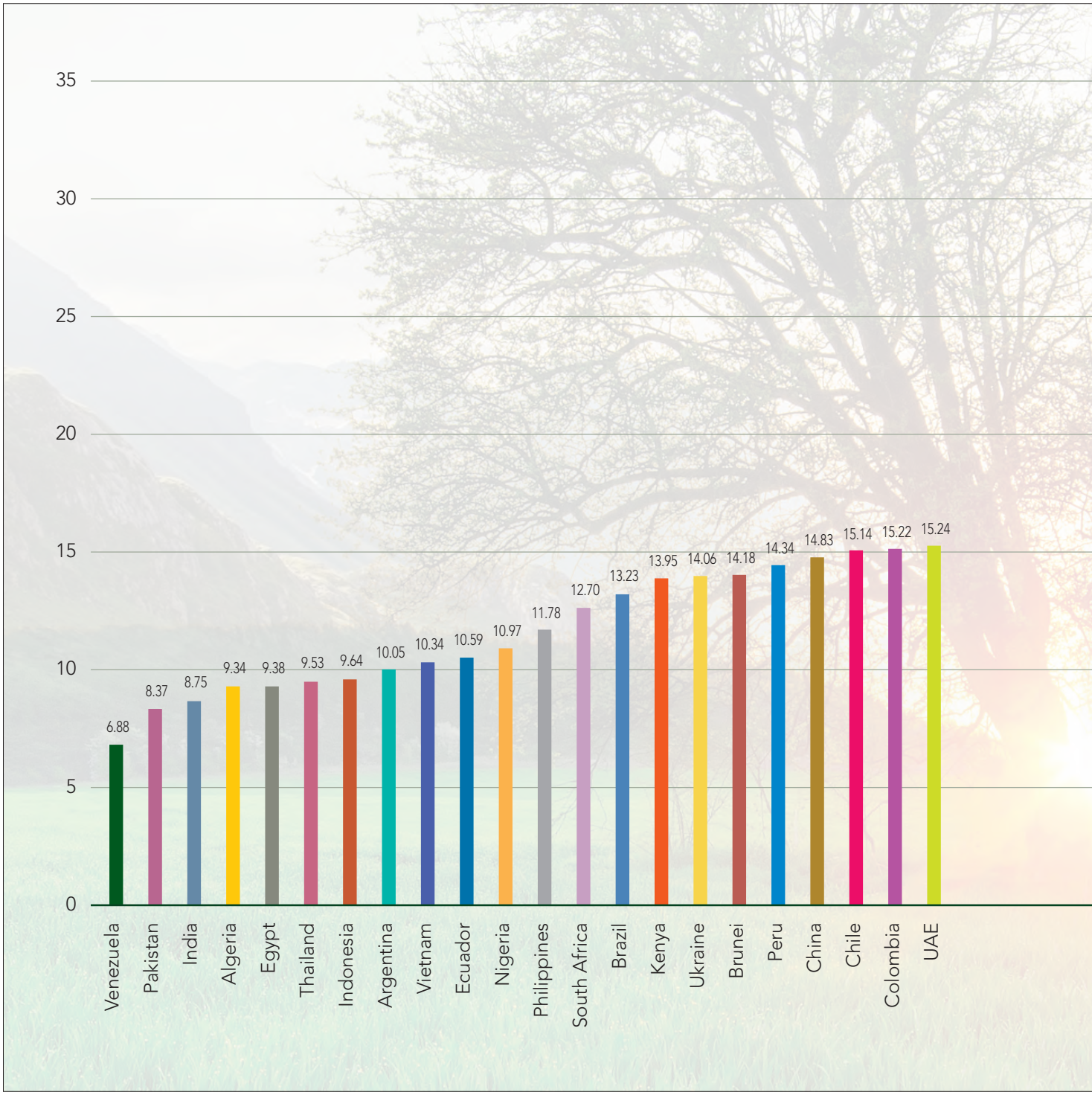
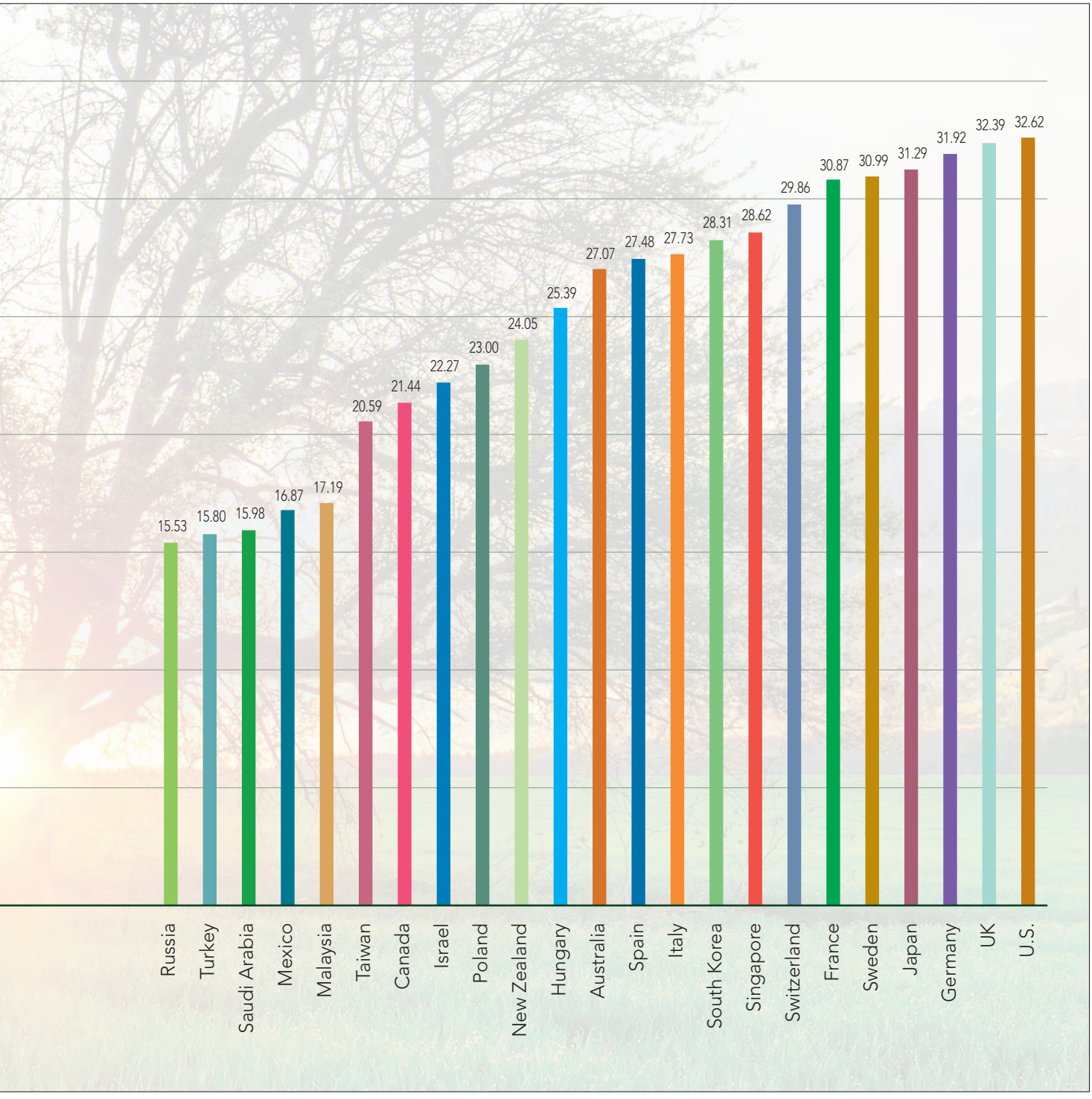
2017 Overall Scores



Leveraging Licensing for Technology Diffusion, Innovation, and Economic Activity



Leveraging Licensing for Technology Diffusion, Innovation, and Economic Activity

Global technology flows and the commercialization of IP assets are crucial drivers of innovation. They rely on a supportive and efficient regulatory and IP framework that minimizes red tape, facilitates market-based partnerships, and upholds the integrity of partnerships.

Through licensing, technology is transferred to other companies and eventually to the public in the form of new products. In other words, licensing facilitates technology diffusion by making usable technologies and content widely available.[1] In fact, technology diffusion between private entities and to the public is an integral factor in creating solutions for many of today's global challenges.[2]

1. The Types of Licensing Policies and their Impacts on Technology Diffusion, Innovation and Economic Growth

Each year, the U.S. Chamber publishes its International IP Index, which uses 35 indicators to map out IP systems in countries around the world. The fifth edition of the Index added five new indicators, one of which captures IP licensing – "regulatory and administrative barriers to the commercialization of IP assets." This indicator captures the extent to which mechanisms within an economy allow IP owners the "freedom to operate" as part of their commercialization activities. Examples of practices that act as barriers to commercialization activities include:

- Blanket requirements for forced disclosure of technologies without the consent of the IP owner;
- Governmental pre-approval for any licensing agreement between parties;
- Pre-determined licensing terms, including FRAND, for proprietary technologies that have not been part of any standard setting process (so called market-driven de *facto* standards as opposed to *de jure*, formally created standards);
- Restrictions on commercializing IP by public research organizations, academia, public hospitals, etc.; and
- Discriminatory conditions affecting the licensing of technologies by foreign IP owners.

Leveraging Licensing for Technology Diffusion, Innovation, and Economic Activity

Globally, the data shows that supportive licensing conditions and a robust IP environment promote technology diffusion. What is particularly interesting is that opposite policy conditions (use of punitive incentives and other barriers to licensing) tend to be exceptionally deterrent to technology diffusion even when other positive conditions and growth aspirations are present.

Many governments – in developed and developing economies alike – dedicate significant efforts to enhancing innovation using a wide variety of measures. As the Index demonstrates, IP protection in economies around the world varies widely. Yet, each economy benchmarked in the Index has made conscious policy decisions to invest in IP protection at some level. An effective IP framework is critical to facilitating technology transfer. This paper examines the approaches to licensing and technology diffusion taken in a variety of countries relative to the countries' overall IP systems and uses empirical data to determine the effectiveness of these efforts.

For example, China is one economy that has placed great emphasis on building national innovation capabilities through acquiring technologies and know-how and controlling the licensing conditions in the country.[3] Brazil has also introduced a number of policies and legislative initiatives aimed at enhancing investment in research and development (R&D) and facilitating public-private cooperation (in some cases through mandating technology transfer).[4] South Africa has sought to encourage technology transfer and R&D partnerships with international innovators as part of its Ten-Year Innovation Plan and Industrial Policy Action Plan, through R&D tax benefits as well as through local partnering requirements and forced sharing of proprietary technologies with local partners.[5] Developed countries have also utilized various measures to promote licensing and technology diffusion. For instance, the U.S.' Bayh-Dole Act and Stevenson-Wydler Technology Innovation Act, introduced in the 1980s, put in place clear, market-based structures and incentives for technology transfer, particularly between public research institutes/universities and companies.[6] Of these and other measures taken by countries, what approaches are working?

Empirical data indicates that providing supportive licensing conditions and a strong IP environment promotes technology diffusion and innovation in key high-tech sectors.[7] This includes both in-flows of technology from abroad and domestic technology transfer.[8] Figure 1 illustrates the way the United States has benefitted from technology diffusion and licensing, listing benefits like access to cutting-edge advances, job creation, economic growth, and continued investment in R&D. In contrast, the presence of barriers to licensing and to the use of IP rights deters technology diffusion and innovation. In fact, putting such barriers in place can mean that economies that desire to lead, and should be leading, the world in attracting technology and generating innovation fall well below their potential and fail to realize the depth of innovation, economic growth, and access to technologies they seek.

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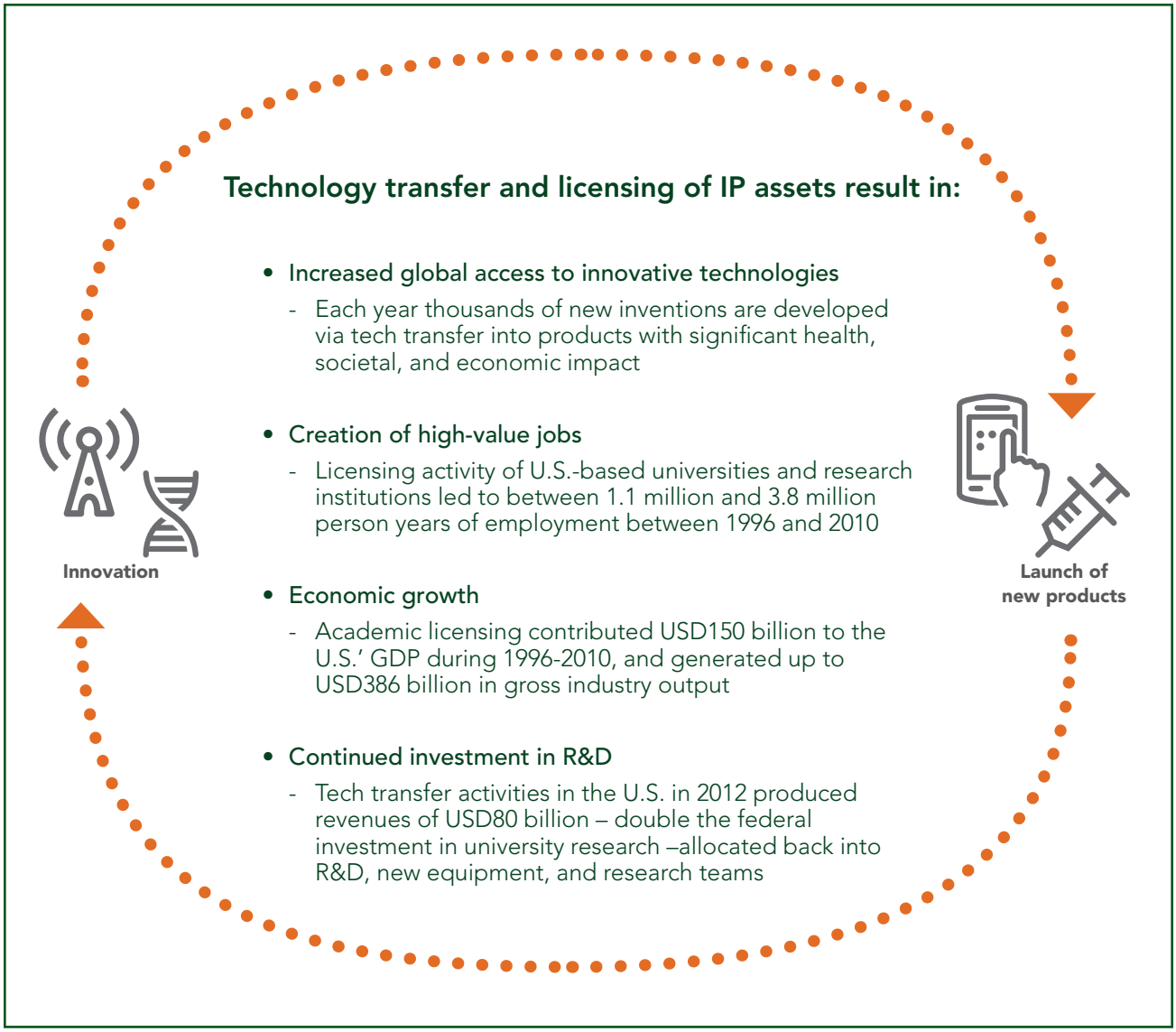
Figure 1: Key social and economic benefits of technology diffusion: Case study of the U.S.



Source: AUTM (2016), Pressman et al (2015), Chatterjee & Rohrbaugh (2014); analysis: Pugatch Consilium[9]

2. IP and licensing regimes in international comparison: Unleashing or impeding technology diffusion?

Economies utilize different measures that aim to stimulate domestic technology diffusion. These measures may manifest as positive incentives and supportive conditions, including tax credits for investing in local R&D, streamlined and market-based licensing procedures, and an overall robust IP environment that ensures the integrity of licensing agreements and protected assets.

At the same time, technology transfer regimes in place in some economies take an entirely different path: a more top-down approach that seeks to mandate when and how technology transfer takes place. These can involve burdensome and costly administrative procedures or comprise of legal rules and policies that discriminate against rights holders. Figure 2 outlines different types of barriers to licensing of proprietary technologies and other assets that are visible in different economies today, with examples from four major emerging economies.

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Figure 2: Types of barriers to licensing in different economies

Administrative hurdles: Undue procedural requirements and sluggish administrative processes governing certain types of licensing can introduce substantial delays and costs for innovators, raising the bar for R&D partnerships and other types of technology diffusion

Legal barriers: Additional requirements on top of standard legal issues, that substantially increase the risk for investors, such as shifting legal liability for infringement to licensors (particularly foreign licensors), arbitrary influence over licensing terms by regulators or courts, or additional domestic investment as part of the agreement

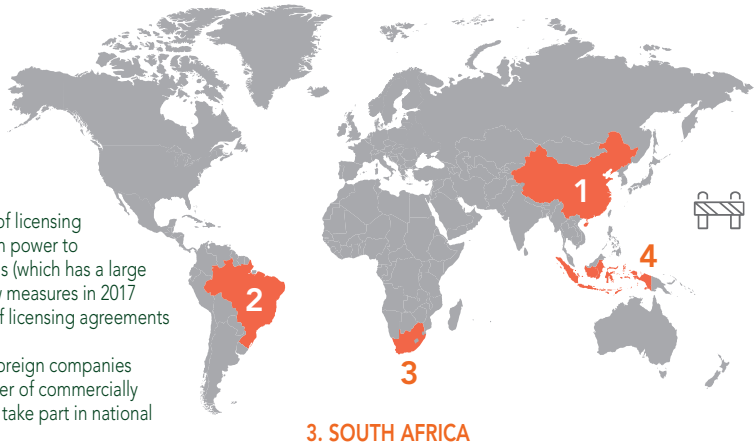
Coercive licensing and technology sharing: Measures and practices that condition market access on the sharing of technologies or force licensing of assets

1. CHINA

Growing number of regulatory and procedural barriers to licensing that impede technology flows and R&D cooperation, e.g. 2015 Foreign Investment Law requires pre-approval/detailed account data for investment

Discriminatory conditions for foreign licensors (e.g. indemnification against third party infringement and loss of ownership of future innovations)

Forced transfer of proprietary technologies in procurement, joint ventures and standardization cornerstone of China's innovation policy



2. BRAZIL

Up until 2017, approval of licensing agreements by INPI, with power to amend commercial terms (which has a large backlog of patents); new measures in 2017 remove INPI oversight of licensing agreements

Local establishment of foreign companies (which can involve transfer of commercially sensitive information) to take part in national bidding in some sectors

3. SOUTH AFRICA

Number of policies conditioning market access on local partnering and sharing proprietary technologies (e.g. foreign suppliers in National Industrial Participation Program must commit to set level of local investment in R&D and tech transfer)

4. INDONESIA

2016 Patent Law requires greater domestic investment (supporting tech transfer, investment absorption and/or employment) for patented products marketed locally

Source: Based on GIPC (2017)[10]

Arguably, no economy is more concerned with technology transfer and generating domestic innovation than China. China's model has diverged from international standards through use of coercive licensing and the presence of other barriers (as reflected in its Index score at 14.83 out of 35 in 2017). This creates a question for policymakers in China as to whether control of licensing leads to technology diffusion and innovation.

Similarly, for a number of years, regulatory and formal requirements have limited the attractiveness of licensing IP assets in Brazil. The Brazilian patent office (INPI) has controlled licensing agreements and held the power to oversee and amend commercial terms of agreements. This structure has added substantial uncertainty and delays to the process of licensing, especially given long-standing and significant backlogs at the INPI. However, in 2017, the Brazilian government took important steps to lift barriers to licensing by removing INPI as regulator of licensing agreements.[11] Under Rule 17/2017, though licensing agreements must still be registered, INPI no longer has oversight or inclination to amend commercial terms.[12]

3. Do barriers to technology diffusion pay off? Comparing economies' IP environments and licensing activity, rates of innovation, and access to technologies

What does empirical evidence indicate about the impact of technology diffusion regimes that seek to manipulate the licensing process and prioritize local entities, and regimes that make licensing overly difficult or insecure? Have controls on licensing led to increased rates of diffusion of technologies? Perhaps even more importantly, have controls enabled economies to better leverage technologies to generate domestic innovation and related socioeconomic benefits, or have they had the opposite effect?

3.1 International licensing rates

One proxy for technology flows, particularly of the most high-value assets, is rate of international trade in charges for the use of IP (including royalties and license fees). Various measures exist, but one measure that captures in-flows of technology and different types of IP assets is the World Bank's indicator on payments by residents to non-residents for the use of IP rights.[13] Figure 3 compares the performance of a sample of high- and middle-income economies on this indicator (standardized by population). Figure 4 looks in more depth at licensing rates in comparison to economies' overall IP environment, market size, and income level. The IP environment is measured by the Index, which gauges the overall protection of IP, including licensing conditions.

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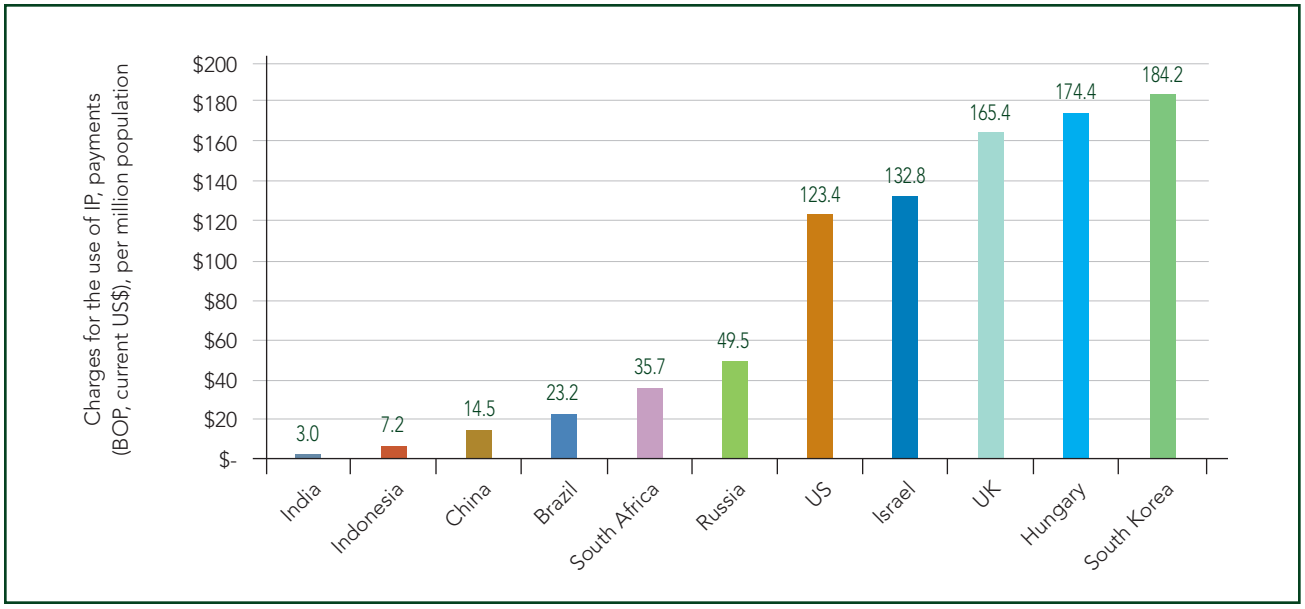
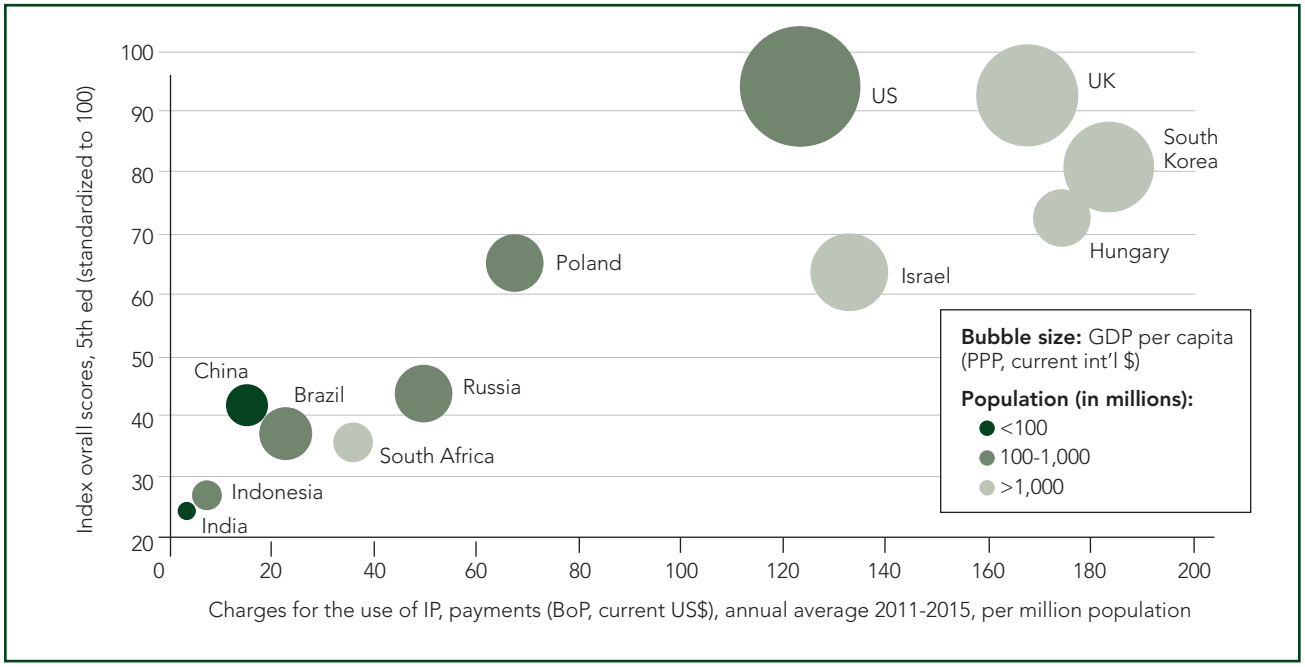
Figure 3: In-licensing rates, average 2011-2015



Source: The World Bank (2016)

Figure 4: In-licensing rates, in relation to national IP environment, population, and income, average 2011-2015



Source: GIPC (2017); The World Bank (2016)

Figures 3 and 4 suggest that barriers to commercialization of IP assets – even barriers that are intended to promote greater licensing and technology diffusion through use of punitive incentives – do not result in higher rates of payments to foreign entities for use of IP compared to relative peers. Instead, rates of payments for IP in emerging economies with barriers to licensing and weaker Index performance, such as China, Indonesia, and South Africa, are substantially inferior to those of economies who tend to provide market-based incentives for technology diffusion and have put in place more robust IP regimes. Notably, Brazil also sees low rates of payments for IP, suggesting that requirements for INPI approval of licensing agreements in place prior to 2017 have significantly hampered its efforts to increase technology transfer through licensing. It also suggests that Brazil could see a rise in rates of licensing and related innovation under the new reform, if fully implemented.

Even when market size and income are relatively equal, in-licensing rates in economies with stronger IP protection are significantly higher than rates in economies that utilize punitive, non-voluntary measures. For example, countries like Poland and Hungary markedly improved their IP and licensing environments by adopting positive IP and licensing standards imposed by EU membership, whereas China's IP environment has lagged, although all three countries share a similar level of per capita GDP. Poland and Hungary display more than three times higher rates of in-licensing in terms of payments abroad for the use of IP per million people, relative to China.

From the perspective of market size, economies with relatively large populations and strong IP environments, such as the U.S. and the UK, exhibit significantly higher rates of licensing compared to China. Considering China's market potential, on top of an ongoing, concerted effort to promote technology transfer, one would expect China to experience much higher rates of licensing. This data reveals that countries that create punitive incentives to facilitate technology transfer have lower rates of in-licensing, which in turn, deters new, innovative products from entering the market.

Digging deeper: Rates of innovation and access to technologies as the ultimate litmus tests

Acquiring new technologies through in-licensing is an important phase in building a knowledge-based economy, but is not in itself the "end-game." Rather, technology diffusion through in-licensing is a platform for enabling domestic innovation, developing new products, and making these products available to people and firms. Therefore, the true test of whether technologies have actually been acquired, disseminated, and utilized is the extent to which economies experience greater innovative activity, further development of technologies, generation of commercially available products, and demonstrable access to these products. In fact, according to empirical data on these activities, in many cases, economies with low levels of in-licensing rates also experience low rates of innovation and access. In contrast, economies that build a wider, "grassroots" ecosystem for innovation through in-licensing and employ positive incentives for technology transfer and partnerships see higher levels of innovation and access to technologies.

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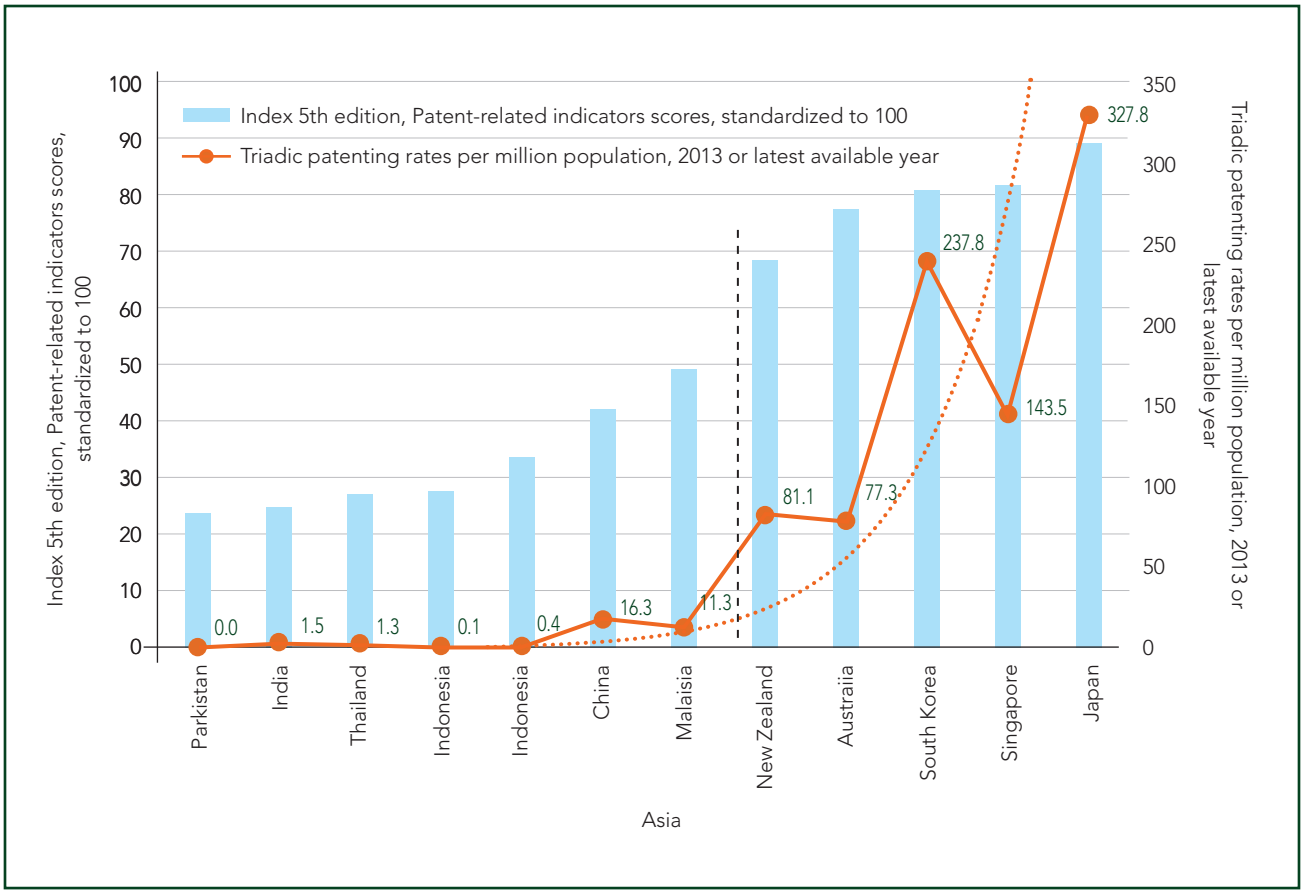
For instance, examining high-value patenting rates – a quintessential measure of innovation – suggests that economies with strong IP environments, along with other market-based enablers, are more likely to possess a store of high-value inventions (whether ground-breaking or developed from acquired technologies). In turn, these inventions reflect domestic potential for cutting-edge R&D and new innovative firms. A particularly good measure of a country's high-value invention store is a country's rate of triadic patenting: the volume of patents registered in the three major patent offices in the world – the U.S. Patent and Trademark Office (USPTO), the European Patent Office (EPO), and the Japanese Patent Office (JPO); triadic patenting rates tend to reflect the rate of patent applications of high value.[14]

The Index scores display a strong relationship (a correlation of 0.75) with triadic patenting rates standardized by population. For instance, as demonstrated in Figure 5, Asian economies with relatively strong IP environments on average record an over 15 times greater volume of triadic patent applications than those Asian economies with relatively less supportive IP environments – including those that have introduced barriers to licensing of IP. China's high-value patenting volume is low (despite having comparatively high rates of patenting rates overall in terms of applications under the Patent Cooperation Treaty); in contrast, South Korea and Singapore, though filing fewer patents in total terms, rank much higher in triadic patenting per capita.

Figure 5: Association between the Index patent-related indicators' scores and triadic patenting rates: Focus on Asia Pacific



Source: OECDStat (2016); World Bank (2016); GIPC (2017)

Economies with supportive IP and licensing environments successfully develop new technologies into valuable and useful products and make these products broadly available to customers. An important gauge of the level and quality of access to technologies in a given economy is the perspective of executives concerning whether the latest technologies are available to firms and/or the wider public (as captured in the World Economic Forum's Executive Opinion Survey and Global Competitiveness Index). In fact, according to the latest survey data from the World Economic Forum, a number of countries with barriers to technology licensing do not ultimately experience a higher rate of access to cutting-edge technologies. Instead, such economies, including China, Brazil, and Indonesia, experience a relatively low availability of technologies, as reported by executives. Figure 6 indicates that, as of 2016, nearly 50% of major economies worldwide display a higher level of access than China, Brazil, and Indonesia, despite their status as three of the largest and fastest growing markets globally.

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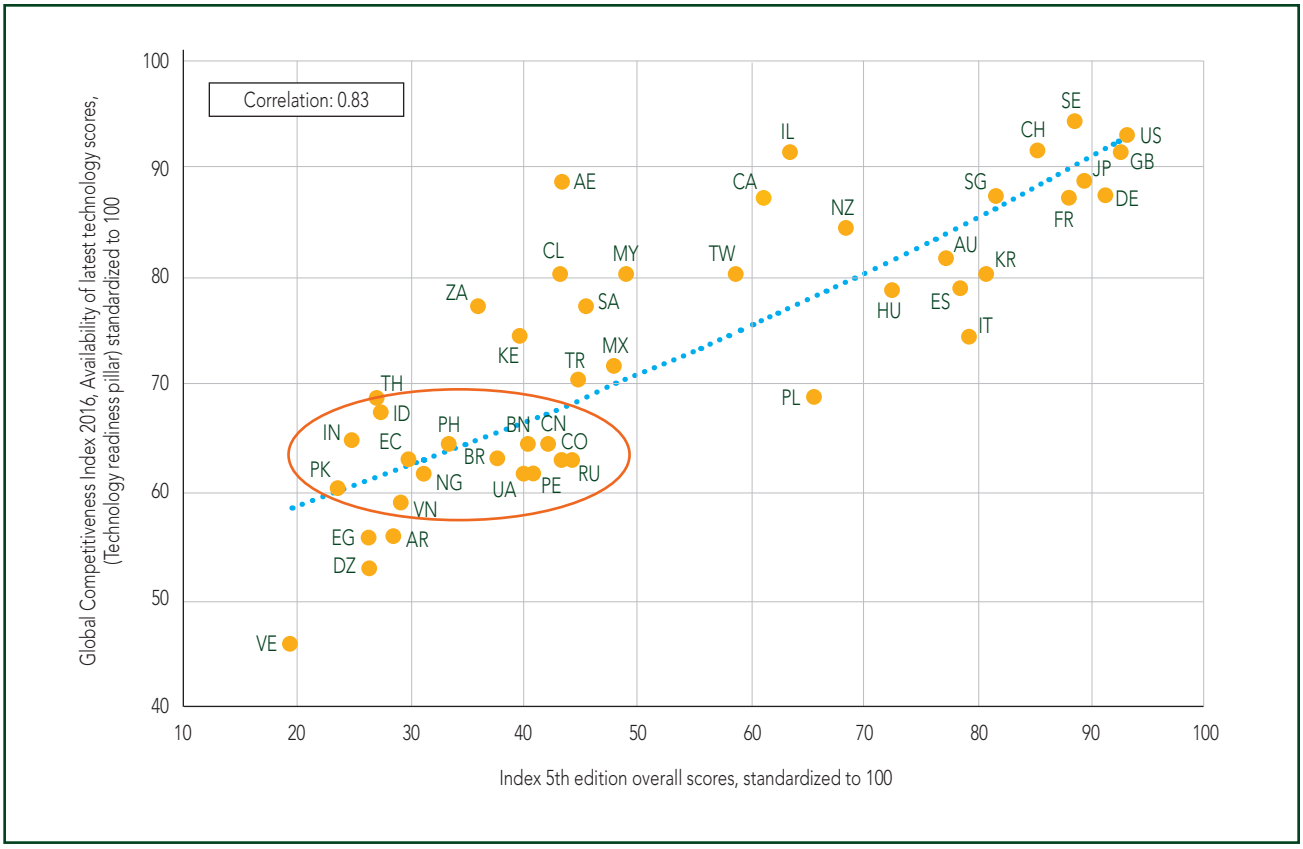
Economies that have employed positive incentives and conditions for technology licensing and innovation, including robust IP protection, benefit from the highest rates of technologies available.

Figure 6: Association between the Index scores and the Global Competitiveness Report's Availability of latest technologies scores



Source: World Economic Forum/Executive Opinion Survey (2016); GIPC (2017)

Legend: AE – United Arab Emirates, AR – Argentina, AU – Australia, BN – Brunei, BR – Brazil, CA – Canada, CH – Switzerland, CL – Chile, CN – China, CO – Colombia, DE – Germany, DZ – Algeria, EC – Ecuador, EG – Egypt, ES – Spain, FR – France, GB – United Kingdom, HU – Hungary, ID – Indonesia, IL – Israel, IN – India, IT – Italy, JP – Japan, KE – Kenya, KR – South Korea, MX – Mexico, MY – Malaysia, NG – Nigeria, NZ – New Zealand, PE – Peru, PH – Philippines, PK – Pakistan, PL – Poland, RU – Russia, SA – Saudi Arabia, SE – Sweden, SG – Singapore, TH – Thailand, TR – Turkey, TW – Taiwan, UA – Ukraine, US – United States, VE – Venezuela, VN – Vietnam, ZA – South Africa.

Leveraging Licensing for Technology Diffusion, Innovation, and Economic Activity

A similar trend is visible when exploring the degree to which new technologies have been integrated into a given economy. As one illustration of the degree of integration, the Global Information Technology Report's Network Readiness Index examines impact and use of information and communication technologies (ICTs) in businesses and in public and private services (for instance, in health, education, and financial services). Comparing the Network Readiness Index scores with U.S. Chamber International IP Index scores (as in Figure 7) suggests that supportive IP environments are associated with a greater leveraging of ICTs to support economic growth and build knowledge-based economies. Economies scoring in the top half of the Index display a 40% greater capacity to generate positive value from ICTs. Economies with less enabling environments in the context of developing and commercializing IP assets exhibit less developed ICT sectors and weaker integration of technology. China ranks below the top 25 countries worldwide in use of ICTs in business, public, and private services. One would expect China to have a higher rate of integration of technology, closer to other high-tech hubs like Singapore and Taiwan (which have 25-50% higher rates). A key difference between China and these countries is the approach taken to stimulate technology diffusion and innovation – Singapore and Taiwan maintain more supportive IP frameworks than China.

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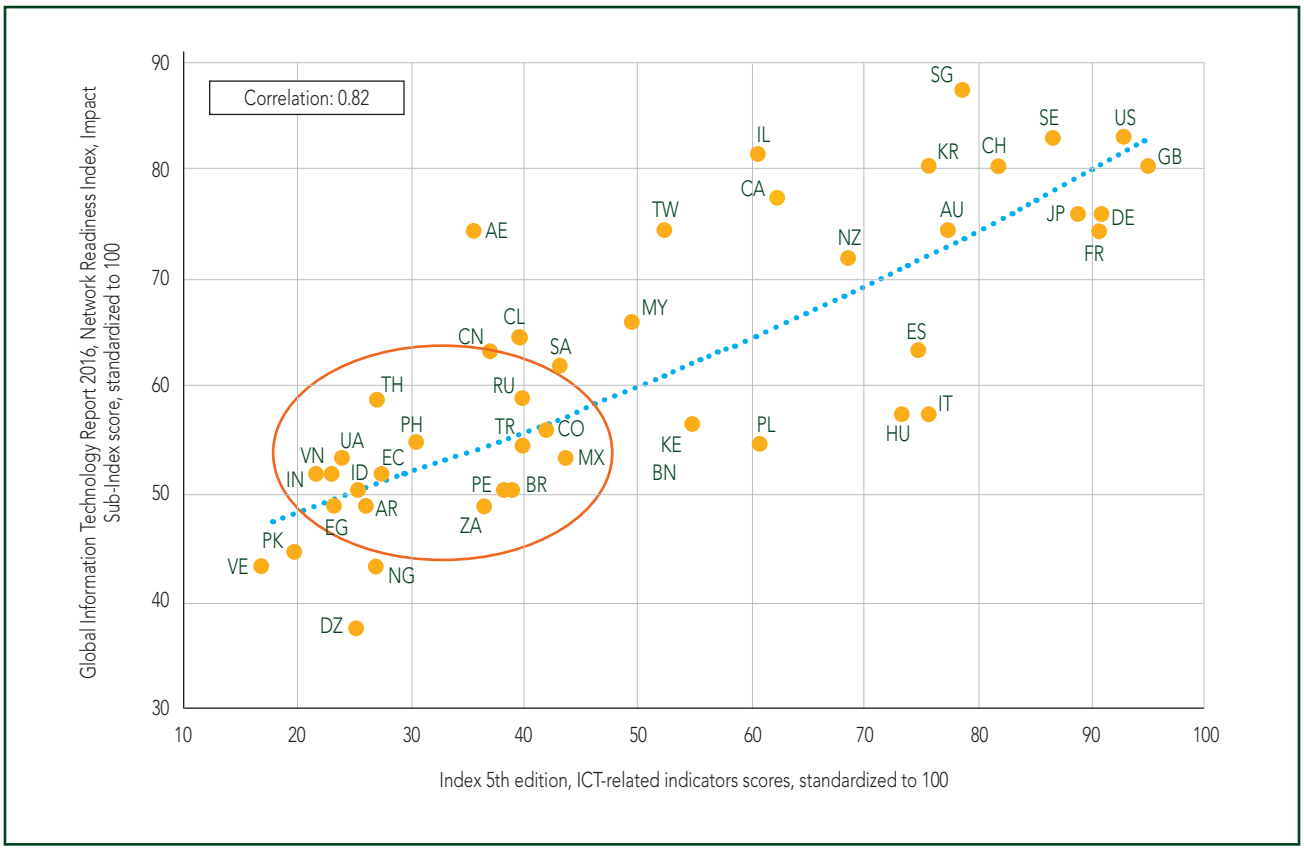
Figure 7: Association between the Index ICT-related indicators' scores and the Global Information Technology Report's Network Readiness Impact scores



Source: World Economic Forum, INSEAD (2015); GIPC (2017)

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Summing it up: IP barriers are hindering, not helping

Global technology flows and the commercialization of IP assets are crucial drivers of innovation and the diffusion of knowledge and creative works – and global technology flows and the commercialization of IP assets rely on a supportive and efficient regulatory and IP framework that minimizes red tape, facilitates market-based partnerships, and upholds the integrity of agreements.

Frameworks governing technology licensing that focus on punitive incentives at the expense of healthy IP and licensing systems are not delivering the desired benefits. Without an environment conducive to technology diffusion and licensing, large and growing economies with aspirations to secure technological know-how underperform in diffusion and access to new technologies. As the Index and its Statistical Annex suggest, these countries are also experiencing negative effects on domestic innovation, international competitiveness, and economic development.

On the other hand, economies that avoid mandatory technology diffusion regimes and provide a strong IP environment tend to receive much greater flows of new technologies and content and utilize these flows effectively to generate local innovative sectors and reap the associated socio-economic benefits. **In order for economies to develop competitive advantages in high-tech sectors and attract world-class investment, positive, voluntary licensing policies must be in place to facilitate technology use and enhance existing capabilities.**

Endnotes

1 Park, W.G. & Lippoldt, D. (2008), "Technology Transfer and the Economic Implications of the Strengthening of Intellectual Property Rights in Developing Countries", *OECD Trade Policy Working Papers,* No.62, OECD Publishing; Yang, G. & Maskus, K. (2001), "Intellectual property rights, licensing, and innovation in an endogenous product-cycle model", *Journal of International Economics,* Vol.53, Iss.1, pp.169-87.

2 See for example: Pugatch, M. (2010), "Mitigating Climate Change through the Promotion of Technology Transfer and the Use of Environmentally Sound Technologies (ESTs): The Role of Intellectual Property Rights", *European Journal of Risk Regulation,* Vol.4, 2010

3 For instance, technology transfer requirements have been introduced in a wide range of areas under the umbrella of the Plan for Development of Science and Technology (2006-2020) and numerous subsequent measures. Such requirements may impact investment, procurement, regulatory and standardization processes, among other areas.

4 See for instance, Law 13.243/2016 on the Regulatory Framework for Science, Technology and Innovation; Law on Research relating to Biodiversity and Biotechnology No 13123/2015; and a 2014 Ministry of Health ordinance on "Productive Development Partnerships"

5 South African Department of Science and Technology, (2008), *Ten-Year Innovation Plan;* Ministry of Science and Technology (2014), *The Bio-Economy Strategy,* pp. 3-4; DTI (2016), Industrial Policy Action Plan 2016/17 to 2018/19

6 V. Loise & A.J. Stevens (2010). "The Bayh-Dole Act Turns 30", *Les Nouvelles,* December 2010, pp. 185-186

7 Cavazos Cepeda, R., Lippoldt, D. & Senft, J. (2010), "Policy Complements to the Strengthening of IPRs in Developing Countries", *OECD Trade Policy Working Papers,* No.104, OECD Publishing; Branstetter, L., Fisman, R., Foley, C. and Saggi, K. (2011), "Does Intellectual Property Rights Reform Spur Industrial Development?", *Journal of International Economics,* Vol.83, Iss.1, pp.27–36

8 V. Loise & A.J. Stevens (2010). "The Bayh-Dole Act Turns 30", Les Nouvelles, December 2010, pp. 185-186, www.bu.edu/otd/files/2011/02/The_Bayh-Dole_Act_Turns_30.pdf.

9 Association of University Technology Managers (2016), *The AUTM Briefing Book 2015,* pp.2-5; Pressman, L.et al (2015), *The Economic Contribution of University/Nonprofit Interventions in the United States: 1996-2013,* March 2015, p.3; Chatterjee, S.K. & Rohrbaugh, M.L. (2014), "NIH interventions translate into drugs and biologics with high public health impact", *Nature Biotechnology,* Vol.32, No.1, pp.52-8

10 For a detailed discussion of barriers to licensing of IP assets outlined in Figure 2, see: GIPC, *The Roots of Innovation: U.S. Chamber International IP Index,* 5th edition, February 2017; NB Icons

11 Licks Legal, "Brazilian PTO (INPI) issues Rule #70/2017 introducing new procedures for the recordal of technology transfer agreements", 4/17/2017, http://lickslegal.com/client-alerts/the-brazilian-pto-inpi-issues-new-rule-for-the-recordal-of-technology-transfer-agreements/

12 Ibid.

13 Charges for the use of IP are defined as the "payments and receipts between residents and nonresidents 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)", based on the International Monetary Fund, Balance of Payments Statistics Yearbook and data files. See: The World Bank, 2016. NB: While other global and country-specific measures exist - such as examining licensing as a share of trade or in relation to market size and income - the World Bank's indicator provides consistent and global coverage making it a relatively good proxy for levels of technology transfer and licensing activities. Two important caveats are of note: the indicator does not provide a breakdown on the type of IP or licensing agreement, and is measured in terms of the agreement's value, which does not necessarily reflect volume.

14 Triadic patenting is generally considered as the best indicator of the perceived overall value and quality of a patent. The patent application is filed in three separate locations and filing costs are quite high. The three major patenting offices in which protection is sought are: the European Patent Office (EPO), the US Patent Office (USPTO) and the Japanese Patent Office (JPO). Source: OECDStat, Patents by technology, Triadic patent families, Total patents, Inventor country of residence, Priority date, 2013 or closest available year; World Bank (Population).

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