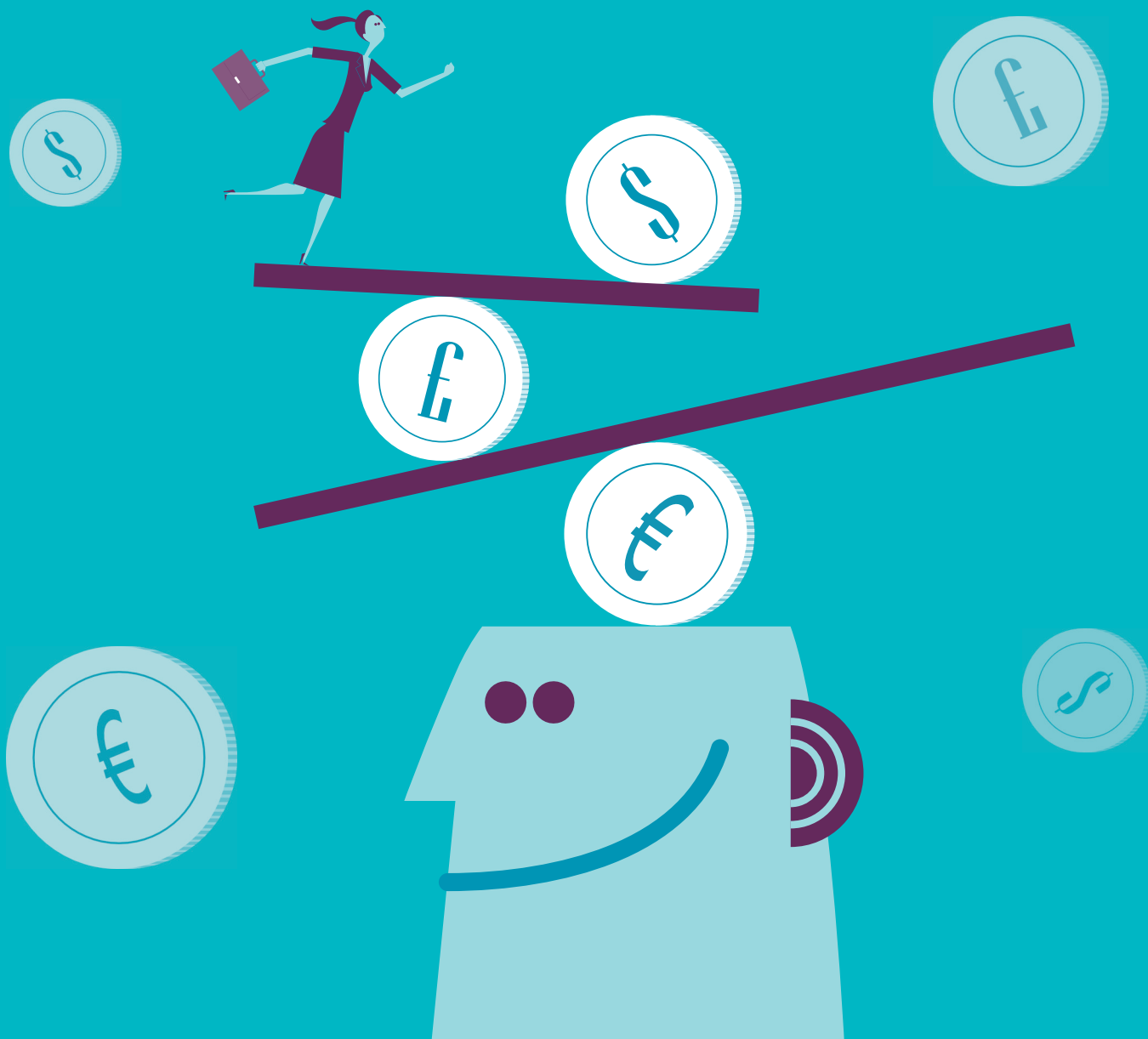




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## Patent Tigers and Global Innovation

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# Patent Tigers and Global Innovation<sup>1</sup>

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## Executive Summary

This paper, together with an earlier paper by the same author<sup>3</sup>, provides empirical evidence that casts doubt on conventional wisdom that patent protection impedes economic development and local innovation in developing and emerging-market countries. Over a period of more than fifty years, patenting trends by non-U.S. inventors, and in particular inventors from formerly developing countries, suggest that patents can enable innovators in emerging-market jurisdictions to monetize R&D investments through global technology supply chains that service the world's most commercially attractive consumer markets.

The dataset comprises all utility patents issued at the U.S. Patent & Trademark Office (“USPTO”) during 1965-2018. The study reaches three principal findings.

- *Globalization of Innovation:* There has been an increasing globalization of innovation activities, as indicated by the fact that non-U.S. inventors have represented a slight majority of all utility patents issued annually at the USPTO since 2008. East Asia (principally, China, Japan, Singapore, South Korea and Taiwan) now represents the largest regional group among non-U.S. inventors at the USPTO. The globalization of innovation provides an alternative innovation-driven explanation for the significant increase in patenting that has been widely attributed to increased patent protection by U.S. courts starting in the early 1980s.
- *Patent Tigers:* When normalized to adjust for population size, three smaller countries, Israel, Taiwan and South Korea, have consistently outperformed since the mid to late-1990s in terms of annually issued utility patents. Starting in 1996, 2005 and 2009, respectively, Taiwan, Israel and South Korea have ranked among the top five country-level patent grantees at the USPTO on a per-capita basis. Similar rankings are observed when these countries' patenting activities are adjusted on a per-GDP basis. These countries' significant advances in the USPTO patenting rankings have coincided with significant advances in economic development and movement into the middle-income tier of developed countries.
- *Innovation Tigers:* By itself, patenting intensity is not necessarily indicative of innovation intensity. It is therefore necessary to gather additional data relating to innovation capacity and performance. Relevant data favors the view that the three “patent tigers” have invested significantly in acquiring robust innovation capacities, which has then translated into

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<sup>1</sup> “Patent Tigers and Global Innovation,” *Regulation* 14-18 (Winter 2019-2020). Available at: <https://www.cato.org/sites/cato.org/files/2019-12/v42n4-2.pdf>

<sup>2</sup> Torrey H. Webb Professor of Law, Gould School of Law, University of Southern California.

<sup>3</sup> Jonathan M. Barnett, “Patent Tigers: The New Geography of Global Innovation,” *Criterion Journal on Innovation* 2: 429-489 (2017). Available at: <https://www.criterioninnovation.com/articles/barnett-patent-tigers.pdf>

robust innovation performance. These countries lead internationally in terms of several standard metrics of innovation inputs, including R&D investment per GDP and number of researchers per total employees. Using grant rates as a measure of patent quality, applicants from these countries match or slightly outperform benchmarks for U.S. and non-U.S. applicants, after having lagged those benchmarks when they started patenting intensively at the USPTO. Using existing citation data as a measure of patent quality identifies a similar “catch-up” pattern for inventors from these jurisdictions.

It is widely argued that international extension of the patent system hinders innovation and growth in developing countries by raising the cost of accessing technological inputs and products in which those inputs are embedded. The innovation success of the patent tigers casts doubt on this proposition. In particular, it suggests that patents (and, specifically, patents issued in a target consumer market) can facilitate development by enabling innovators in smaller home markets to extract returns on investments in intellectual capital by accessing supply chains that lead to larger foreign markets. Patents may promote this outcome by mitigating the knowledge leakage risks inherent to negotiating and implementing cooperative relationships between upstream firms that specialize in innovation and downstream firms that specialize in production and distribution capacities. Counterintuitively, patents can reduce entry costs by enabling a specialist firm to monetize its intellectual capital through a discrete segment of a technology supply chain, rather than having to finance, construct and maintain an end-to-end pathway from R&D through market release.

This interpretation of the data is supported by the fact that the patent tigers, and in particular Israel and Taiwan, are characterized by relatively small domestic markets that are geographically isolated from the world’s principal consumer markets. A closer look at these countries’ innovation ecosystems, using both quantitative and qualitative data, shows that R&D-intensive firms and other entities in these countries have tended to specialize in particular niches of the innovation ecosystem. In Israel, academic institutions regularly engage in technology transfer in the life sciences markets, realizing the economic value of R&D investments through IP licensing and related transactions with corporate partners that have in place the necessary testing, production and distribution infrastructure to achieve commercialization in target foreign markets in an efficient and timely manner. In Taiwan, leading “foundries” such as Taiwan Semiconductor Manufacturing Corporation provide chip production services to firms worldwide that specialize in chip design for certain segments of the semiconductor markets. As indicated by R&D, patenting and other data, Taiwanese foundries invest heavily in process-related innovation and appear to rely on patents and other IP rights to protect informational assets in interactions with chip design customers.

Both quantitative and qualitative evidence suggest that patents and other IP rights play an important function in promoting the division of labor in the global innovation ecosystem, which in turn generates specialization efficiencies that benefit a wide range of stakeholders. Specialization benefits both consumers, who enjoy the low prices that result when markets are free to customize supply chains in order to deliver product to market at the lowest possible cost, and innovation specialists, who can achieve entry without having to assemble a stand-alone pathway

from lab to market. In the aggregate, these positive-feedback relationships between IP rights, specialization efficiencies, and innovation incentives cast doubt on the standard tradeoff between secure patent protection on the one hand and economic development and local innovation on the other hand. In the case of jurisdictions that invest in developing and maintaining a robust innovation infrastructure, the patent system appears to provide an efficient mechanism for realizing returns on those investments.