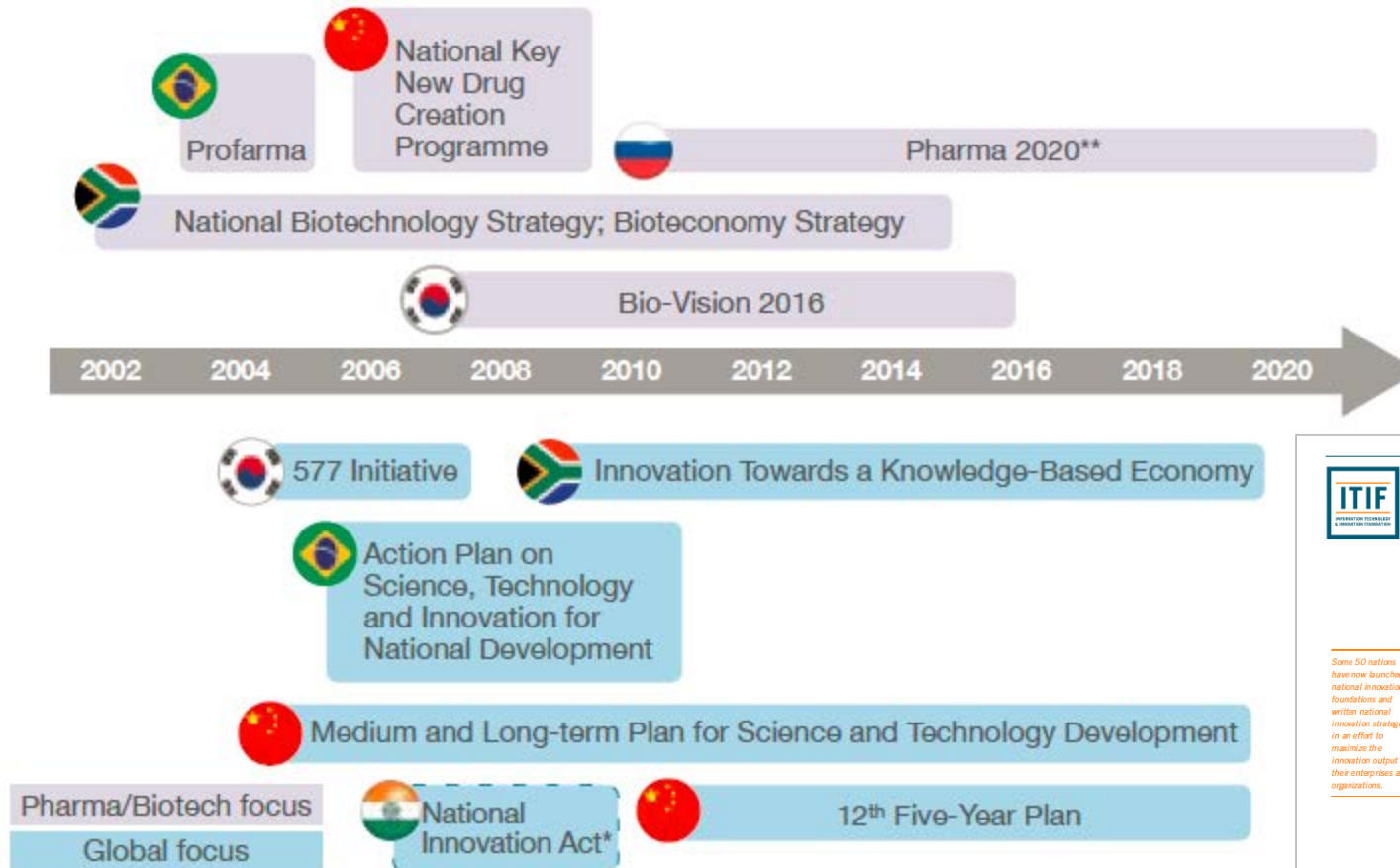


How Developing Countries Can Excel in Knowledge-Based Industries

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Develop a National Innovation Strategy





The Global Flourishing of National Innovation Foundations

BY STEPHEN EZZELL, FRANK SPRING, AND KATARZYNA BITKA | APRIL 2015

Some 50 nations have now launched national innovation foundations and written national innovation strategies in an effort to maximize the innovation output of their enterprises and organizations.

As the race for global innovation advantage accelerates, a growing number of countries continue to do all they can to maximize innovation-based economic growth in their nations. Increasingly, this has taken the form of countries establishing national innovation foundations and articulating national innovation strategies in an attempt to coordinate disparate policy areas and government agencies in a coordinated manner to promote innovative activity by commercial, nonprofit, and government actors in their economies. Some 50 nations now field national innovation foundations: this report assesses the roles they play and some of their successes to date.

Innovation is, to all appearances, an idea whose time has come. Innovation has featured as a major theme in all of President Barack Obama's State of the Union addresses and the administration is in the process of developing a third version of its *Strategy for American Innovation*, to be released in spring 2015. Yet innovation's high profile in political discourse is not unique to the United States: innovation was the overarching theme of the "12th Five Year Plan" of the People's Republic of China, and British Prime Minister David Cameron has made innovation the central part of his call for Britain to develop a modern industrial strategy.

Frequency of innovation can rob a term of its meaning, but "innovation," at least in a policy context, has so far managed to retain and even sharpen its significance: the Organisation for Economic Cooperation and Development (OECD) offers this handy definition of innovation as "the implementation of a new or significantly improved product"

THE INFORMATION TECHNOLOGY & INNOVATION FOUNDATION | APRIL 2015 PAGE 1

Source: ITIF, *The Global Flourishing of National Innovation Foundations*
 Charles River Associates, *Policies That Encourage Innovation in Middle-Income Countries*

Key Factors for Developing Countries

1. Strengthen intellectual property rights protections.
2. Implement an attractive environment for FDI.
3. Provide enterprises access to large markets.
4. Invest in R&D, science, knowledge, and education.
5. Get tax policy for knowledge-based industries right.

IPRs Deliver Five Key Benefits, As They:

1. Create incentives for domestic innovation.
2. Induce knowledge spillovers that help others innovate.
3. Ensure companies can focus on innovating; not on having to protect their IP.
4. Promote the international diffusion of technology, innovation, and knowhow.
5. Boost domestic levels of exports, R&D, and FDI.

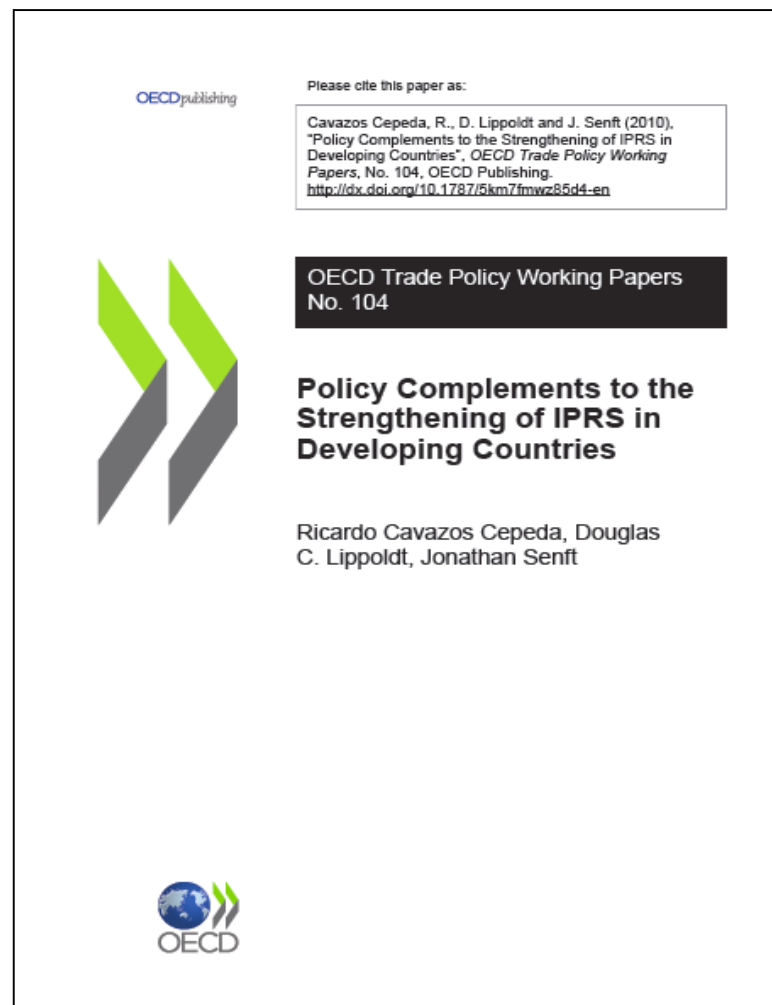
Stronger IPRs Lead to Increased Exports, R&D, and FDI

- Strengthened trademark and copyright protections have a “statistically significant” association in relation to export turnover, sales, and total assets.
- A 1% ↑ in:
 - copyright protection = 3.3% ↑ in domestic R&D
 - trademark protection = 1.4 % ↑ in domestic R&D
 - patent protection = 0.7 % ↑ in domestic R&D
- A 1% ↑ in:
 - copyright protection = 6.8% ↑ in FDI
 - trademark protection = 3.8 % ↑ in FDI
 - patent protection = 2.8 % ↑ in FDI

Source: OECD: *Policy Complements to the Strengthening of IPRs in Developing Countries*

Strong IPRs Benefit Developing Countries

“The results point to a tendency for IPR reform to deliver positive economic results, for developed and developing nations alike.”



IPRs and Biopharma in Developing Countries

Ryan: “Patents provided incentives for biomedical technology entrepreneurs to make risky investments into innovation in Brazil.”

Ache Laboratorios Farmaceuticos
PeleNova Biotechnologia
Genoa Biotechnologia
Recepta Biopharma



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Patent Incentives, Technology Markets, and Public–Private Bio-Medical Innovation Networks in Brazil

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Summary. — Contested is whether patent laws promote indigenous technology invention and innovation in developing countries. Brazil reformed its patent laws in 1996 to permit pharmaceutical product patents. Study of five post-patent law reform bio-medical technology invention and innovation projects in the state of Sao Paulo supports the propositions that patents provide incentives to Brazilian bio-medical technology entrepreneurs to make risky investments into innovation and that patents facilitate technology markets among public-private technology innovation networks, both Brazilian collaborations and North-South collaborations. Brazil enacted a technology law in 2005 that encourages public-private technology innovation through patent incentives and patent-facilitated technology markets.
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Key words — technology innovation, technology networks, patents, intellectual property rights, bio-medical technology, Brazil

1. INTRODUCTION

The 1994 World Trade Organization Agreement regarding Trade-Related Intellectual Property Rights obliges all WTO members to meet certain minimum standards of intellectual property law and enforcement and this means that scores of developing countries must provide higher levels of protection than has been their policy and practice in the past. Contested is whether patent laws promote indigenous technology innovation in developing countries. Runge (2006) rejects enclosure through intellectual property protections to promote technology progress in the North and says that the countries of the South have even more to lose from patent-based enclosure. Evans (2005) calls for an open science model for technology progress in developing countries. The development model should be non-proprietary and non-intellectual property-oriented. A developing country-based scholar says that stronger intellectual property rights in countries such as her Colombia will inhibit scientific research (Forero-Pineda, 2006). She argues that developing country scientists should participate in international professional networks to achieve science and technology advancement.

Though these scholars do not provide empirical evidence to support their arguments, they do ask important questions for development studies. Research universities, scholarly journals, and science conferences are the institutions that drive scientific progress (Pyenson & Sheets-Pyenson, 1999), but are these institutions sufficient to drive national technology innovation in developing countries (or developed countries, for that matter)? Technology innovation drives long-run national economic growth (Romer, 1986, 1990). Technology stasis leads to national economic stagnation; technology progress leads to national economic growth (Grossman & Helpman, 1991), so it is important to identify the institutional frameworks that best promote national technological innovation in developing countries. Do patent laws provide incentives to entrepreneurs in developing countries to make risky investments into technology innovation? Do patent laws facilitate the development of technology markets among public-private technology innovation networks? Do patent laws facilitate North-South technology innovation collaborations?

This is a study of invention and innovation in national technology development.

“Invention is the first occurrence of an idea for a new product or process, while innovation is the first attempt to carry it out into practice. ... While inventions may be carried out anywhere, for example in universities, innovations occur mostly in firms, though they may also occur in other types of organizations, such as public hospitals. To be able to turn an invention into an innovation, a firm normally needs to combine several different types of knowledge, capabilities, skills, and resources” (Fagerberg, 2005, p. 4).

Post-patent law reform bio-medical technology invention and innovation in Brazil is studied here. Brazil has a long-established pharmaceutical industry, but Brazilian bio-medical R&D traditionally meant that their public and private drug-makers reverse-engineered international pharmaceuticals so that they could manufacture and market medicines and vaccines innovated in the North to the Brazilian marketplace. Brazilian pharmaceutical makers were at liberty to reverse-engineer, manufacture, and market products under patent in the United States and Europe because pharmaceutical compositions were not patentable subject matter in Brazil. But, in 1996 the Cardoso administration led the Brazilian congress to amend the patent laws with Law No. 9,279 to allow for the patentability of pharmaceutical product patents so that, subject to procedural processes and some restrictions, only patent-holders or their licensees would be permitted to market under-patent medicines.

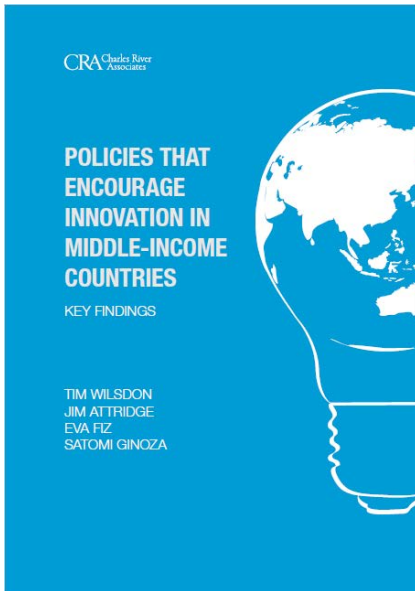
Bio-medical technology invention and innovation in the state of Sao Paulo is the focus of study. The state of Sao Paulo is the wealthiest state of Brazil, representing some 40% of the gross domestic product of the country, and is the main scientific and business center of the country. Federal research support and “the strong support by the state government makes the state

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1082

IPRs and Biopharma in Developing Countries

“For countries which seek to develop an innovative biopharmaceutical industry, intellectual property is a necessary building block.”

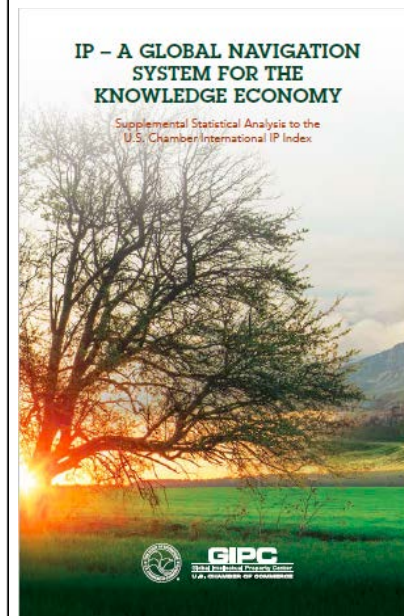
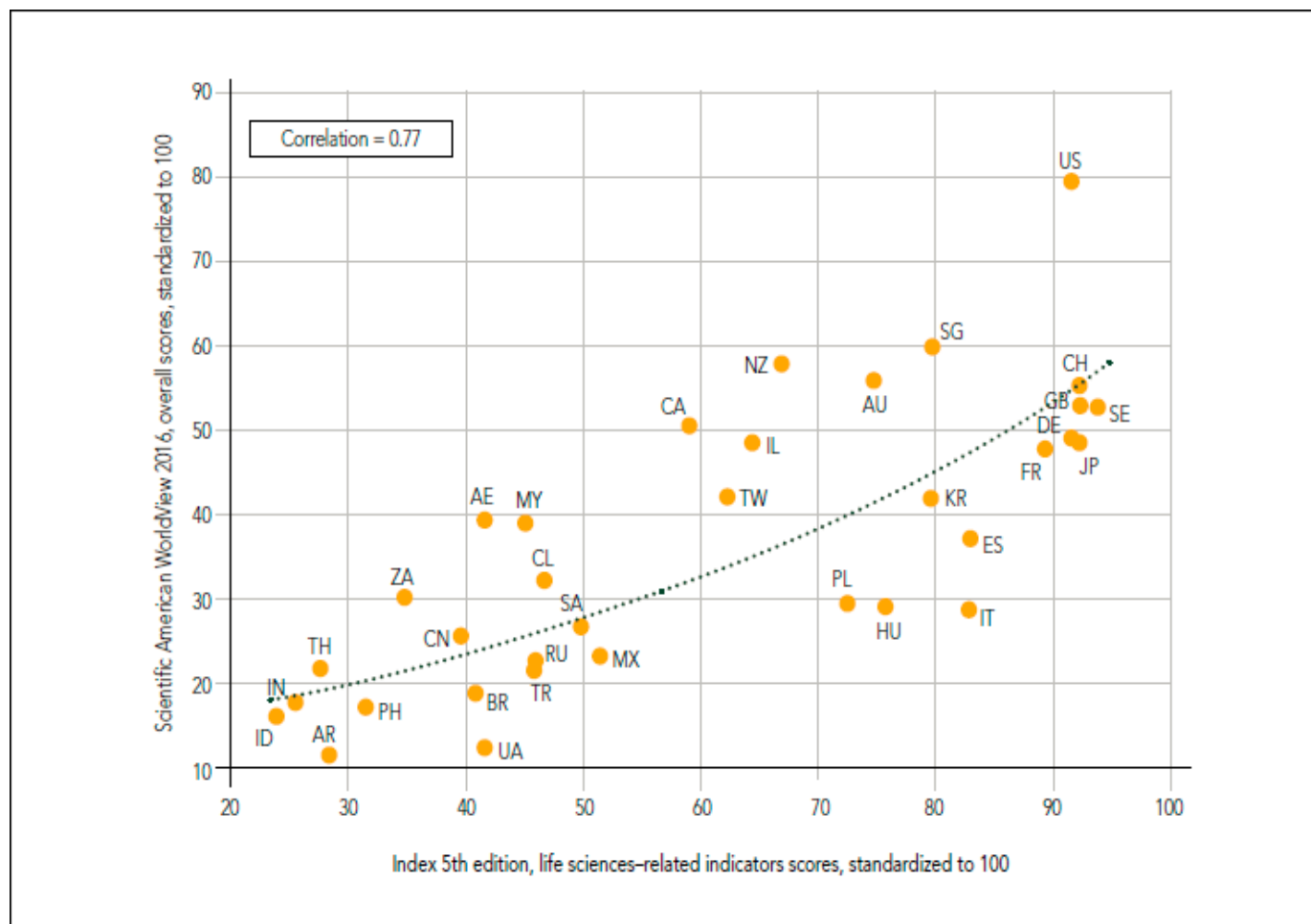


INNOVATION INDICATORS	BRAZIL	COLOMBIA	CHINA	INDIA	MALAYSIA	RUSSIA	SOUTH AFRICA	SOUTH KOREA
Total R&D spending	Medium performance	Poor performance	Medium performance	Poor performance	No information available	Medium performance	Poor performance	Excellent performance
Biopharmaceutical R&D spending	Medium performance	Poor performance	Medium performance	Medium performance	No information available	Medium performance	Poor performance	Good performance
Clinical trials	Medium performance	Poor performance	Good performance	Medium performance	Poor performance	Medium performance	Medium performance	Good performance
Employment in total R&D	Medium performance	Poor performance	Good performance	Medium performance	Poor performance	Good performance	Poor performance	Good performance
Publications	Good performance	Poor performance	Excellent performance	Good performance	Poor performance	Medium performance	Medium performance	Good performance
Patents	Medium performance	Poor performance	Good performance	Good performance	Medium performance	Medium performance	Poor performance	Good performance
Novel medicines	Poor performance	No information available	Medium performance	Medium performance	No information available	Poor performance	No information available	Medium performance

Excellent performance
 Good performance
 Medium performance
 Poor performance
 No information available

MIC countries like Colombia and Malaysia that have fallen behind peers in biotech innovation have done so because they “lack a consistent system for securing intellectual property rights.”

Leadership in Biotechnological Innovation Requires Robust IP Protection



Source: Global Intellectual Property Center, *IP-A Global Navigation Center for the Knowledge Economy*

FDI Key to Diffusion of Technology & Knowhow

- Trade and FDI the main market-mediated channels by which ideas & intangible assets are disseminated internationally.
- Dahlman: “Higher rates of FDI helps explain the relatively higher technological growth rates in East Asian countries.”
- “The volume of FDI and level of capital formation have significant positive effect on changes in real GDP.”
 - Study of FDI impact on Bangladesh, 2011.



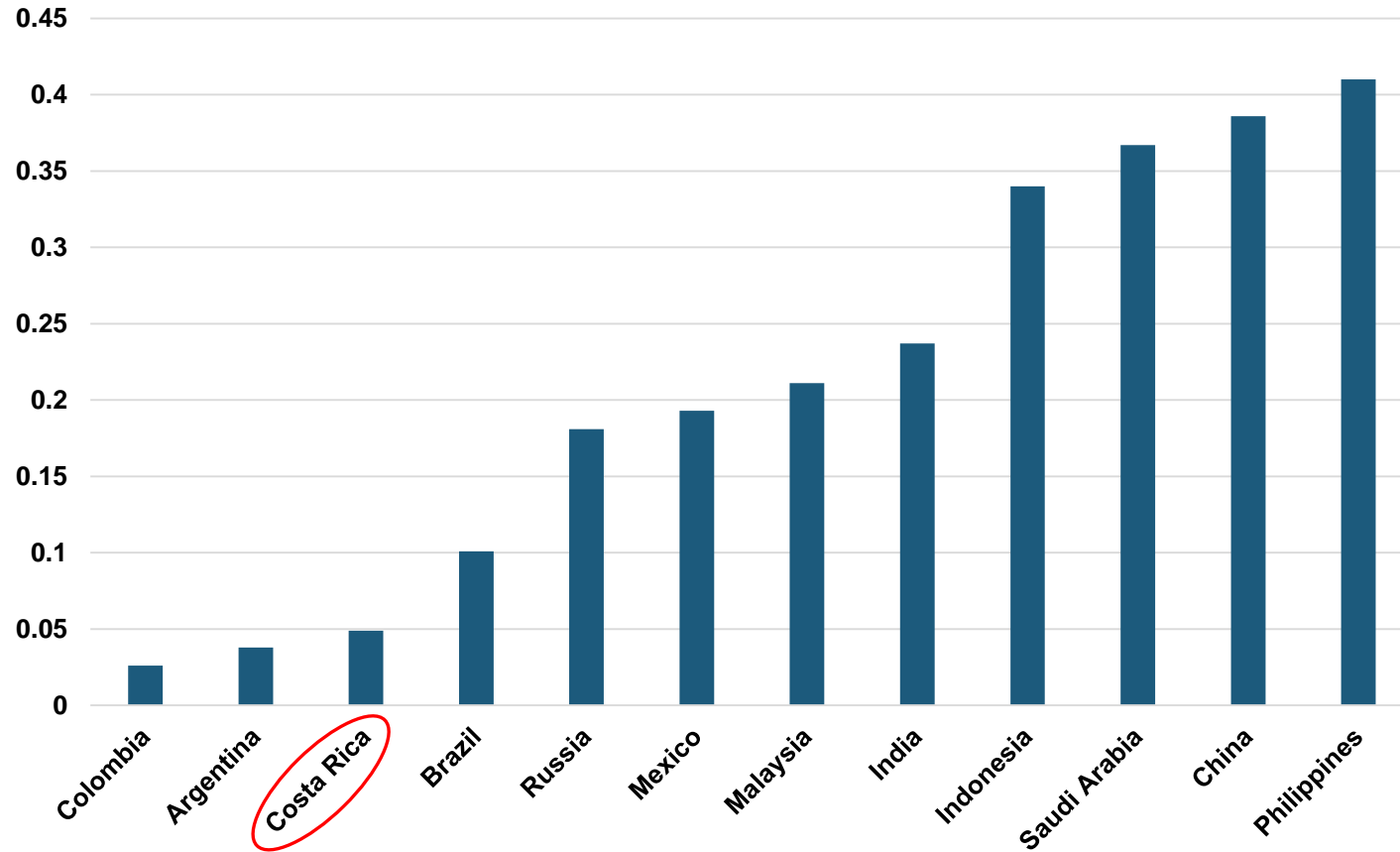
Costa Rica FDI Case Study

- Since 1990 has “progressively shifted its export composition from primary products to high-tech manufacturing and services, thanks to targeted actions to attract FDI.”
- Costa Rica is the world’s fourth-most intensive high-tech exporter per capita. FDI has led to increased exports in knowledge-intensive sectors.
- FDI-supported enterprises accounted for 22% of formal private-sector employment in 2016.
- FDI inflows regularly equivalent to 6-7% of GDP.



Openness to FDI Matters Greatly

FDI Restrictiveness Index, 2015



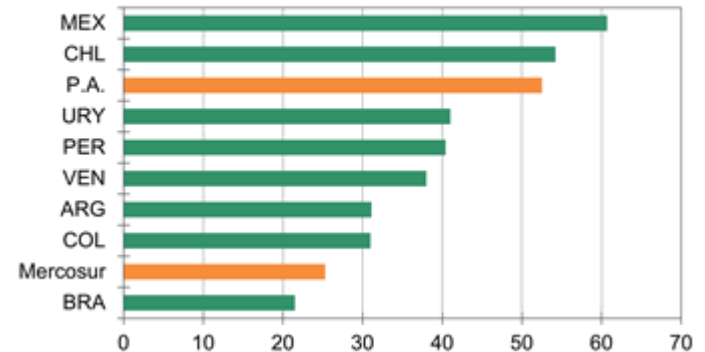
Source: OECD *FDI Restrictiveness Index, 2015*

Expand Access to Markets of Scale



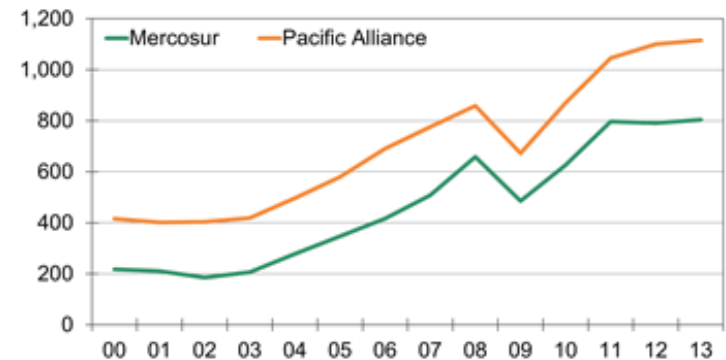
Pacific Alliance Boasts an Open Economy

Overall trade over GDP, %



Pacific Alliance Exports Top Mercosur's

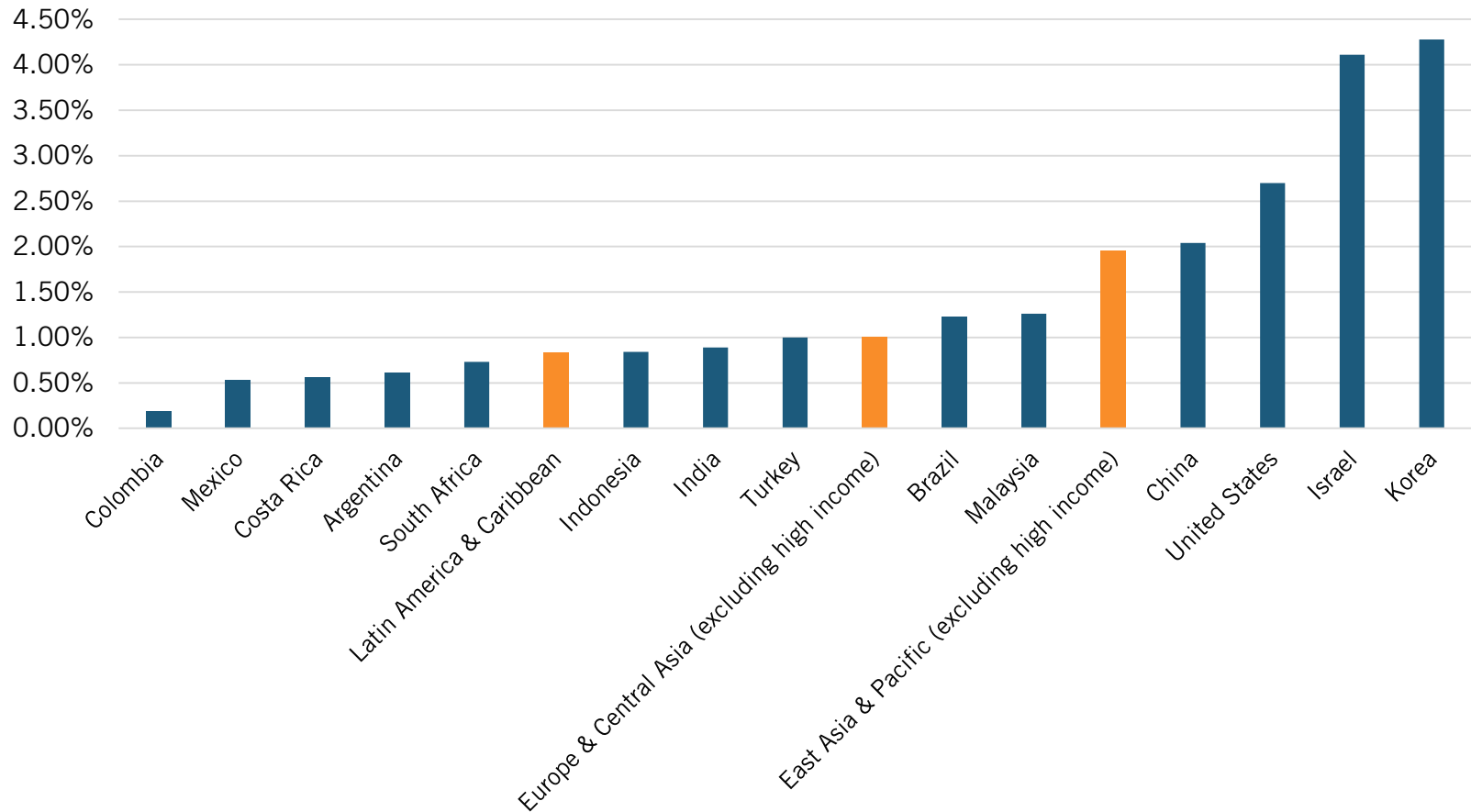
Total trade (exports + imports), USD bil



Source: The Economist; Moody's Analytics/Economy.com

Increase National/Regional R&D Intensity

R&D Investment as Share of GDP



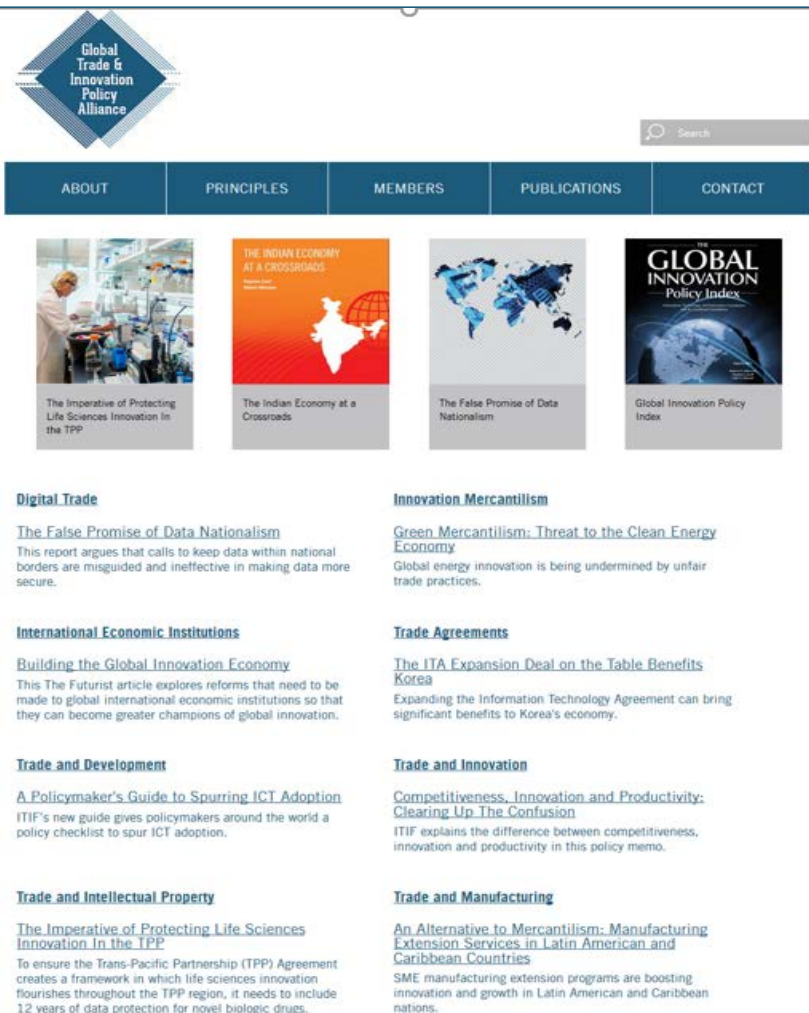
Source: World Bank, 2014 or most recent available year

Leverage Tax Policy to Spur Knowledge-Based Innovation

- ✓ Generous R&D tax credits (e.g., Brazil, China, India, Malaysia).
- ✓ Robust collaborative R&D tax credits (Chile, Thailand, Turkey).
- ✓ Patent boxes (China, Hungary).

Sources: ITIF, *We're #27: The United States Lags Far Behind in R&D Tax Incentive Generosity*
ITIF, *Creating a Collaborative R&D Tax Credit*,
ITIF, *Patent Boxes: Innovation in Tax Policy and Tax Policy for Innovation*

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SME manufacturing extension programs are boosting innovation and growth in Latin American and Caribbean nations.

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- Center for Social and Economic Research (Poland)
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- Fundación Idea (Mexico)
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- ITIF (U.S.)
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- Swedish Agency for Growth Policy Analysis (Sweden)
- Tic Tac de la CCIT (Colombia)

Thank You!

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