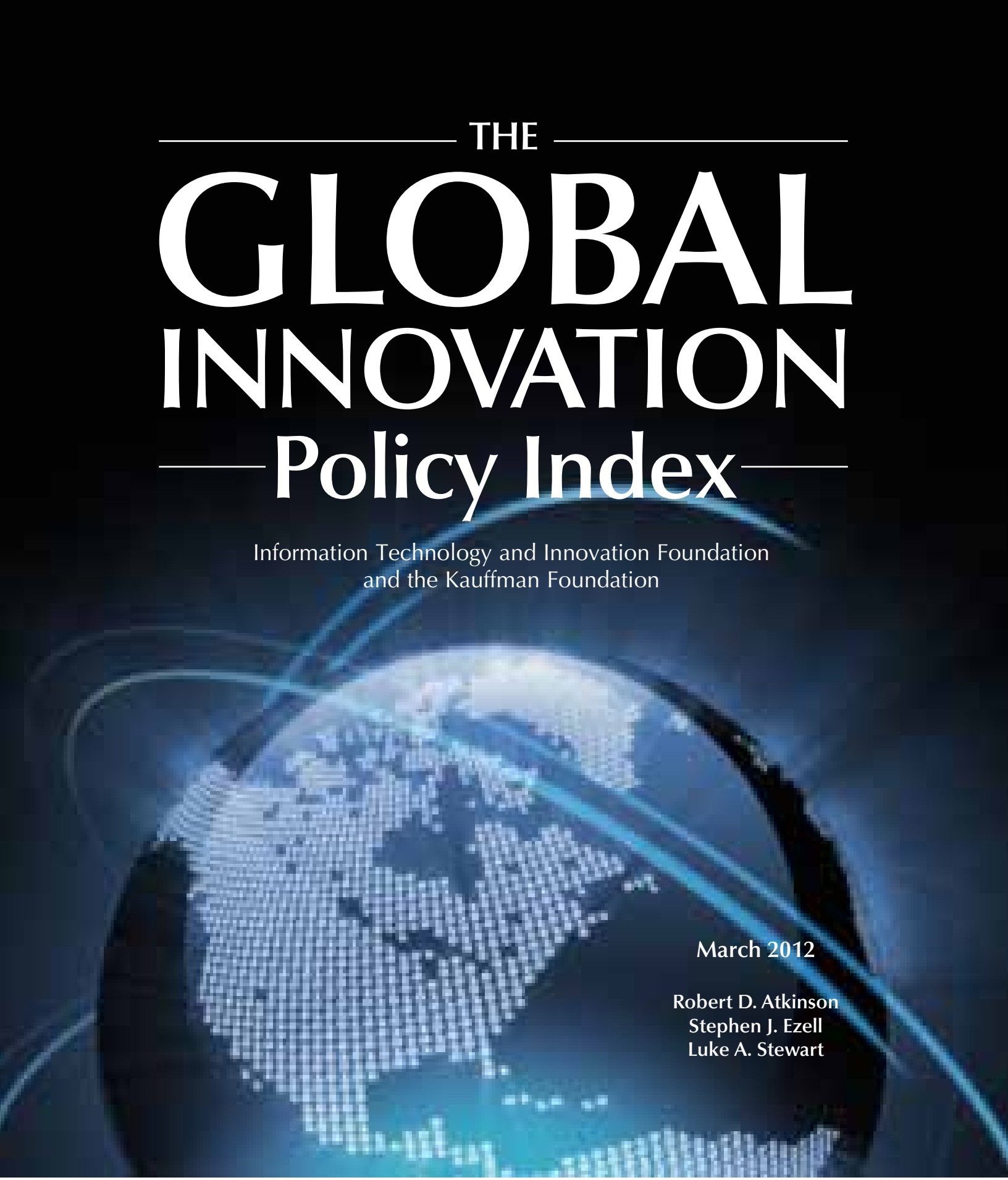
THE GLOBAL INNOVATION Policy Index

Information Technology and Innovation Foundation
and the Kauffman Foundation



March 2012

Robert D. Atkinson
Stephen J. Ezell
Luke A. Stewart

ITIF
The Information Technology & Innovation Foundation

KAUFFMAN
The Foundation of Entrepreneurship

About The Information Technology and Innovation Foundation

The Information Technology and Innovation Foundation (ITIF) is a Washington, D.C.-based think tank at the cutting edge of designing innovation policies and exploring how advances in information technology will create new economic opportunities to improve the quality of life. Non-profit and non-partisan, we offer pragmatic ideas that break free of economic philosophies born in eras long before the first punch card computer and well before the rise of modern China. ITIF, founded in 2006, is dedicated to conceiving and promoting the new ways of thinking about technology-driven productivity, competitiveness, and globalization that the twenty-first century demands.

ITIF publishes policy reports, holds forums and policy debates, advises elected officials and their staffs, and is an active resource for the media. It develops new and creative policy proposals, analyzes existing policy issues through the lens of bolstering innovation and productivity, and opposes policies that hinder digital transformation and innovation.

The Information Technology and Innovation Foundation is a 501(C)3 nonprofit organization. For more information, visit www.itif.org.

About the Kauffman Foundation

The Ewing Marion Kauffman Foundation is a private, nonpartisan foundation that works with partners to advance entrepreneurship in America and improve the education of children and youth. Founded by late entrepreneur and philanthropist Ewing Marion Kauffman, the Foundation is based in Kansas City, Mo. For more information, visit www.kauffman.org, and follow the Foundation on www.twitter.com/kauffmanfdn and www.facebook.com/kauffmanfdn.

KAUFFMAN
The Foundation of Entrepreneurship

www.kauffman.org

4801 Rockhill Road
Kansas City, MO 64110
(816) 932-1000

ITIF
The Information Technology & Innovation Foundation

www.itif.org

1101 K Street, NW • Suite 610
Washington, DC 20005
(202)449-1351
Fax: (202) 638-4922

To download this report, go to www.kauffman.org/globalinnovationpolicy or to www.itif.org/globalinnovationpolicy

ITIF appreciates the financial assistance received from the Ewing Marion Kauffman Foundation and from the U.S. Trade Representative's Office in developing this report. The contents and views of this publication are solely the responsibility of the Information Technology and Innovation Foundation.

The Global Innovation Policy Index

Information Technology and Innovation Foundation
and the Kauffman Foundation

Table of Contents

Tables and Figures

Executive Summary

The last decade has seen an increasing realization among economists and policymakers that innovation has become the central economic growth driver and key to improved standards of living. This awakening to the importance of innovation-based economic growth has spawned a fierce race for global innovation advantage among countries. To advance their competitiveness in this race, many countries are implementing thoughtful and constructive innovation policies aimed at boosting their use of information and communications technologies, helping their companies become more productive and innovative, and facilitating the creation of new companies that produce high-value-added products and services. However, some countries have put in place policies that try to win the race by distorting the global innovation system at the expense of other nations. Hence, a framework is required to identify and promote the deployment of effective innovation policies that drive domestic economic growth while ensuring a sustainable innovation ecosystem that benefits all countries throughout the world.

Effective innovation policy relies on more than just science policy and the promotion of high-tech product development. It also must focus on improving productivity across the board in all economic sectors. Countries with the best innovation strategies coordinate their policies toward skills, scientific research, information and communications technologies (ICTs), tax, trade, intellectual property, government procurement, standards, and regulations in an integrated approach designed to drive economic growth through innovation. Nations are unlikely to achieve sustainably high rates of innovation if their governments have not put in place a broad range of innovation-enabling policies that create the conditions in which organizations throughout a country—whether private enterprises, government agencies, or nonprofit entities—can successfully innovate.

To help them do so, this report provides a structured assessment of policies informing the innovation capacity of fifty-five countries. Moreover, it highlights the most effective policies countries are using to build their innovation capacity, and describes how countries can learn from one another in deploying the best policies. The fifty-five countries analyzed in this report include all members of the Organisation for Economic Co-operation and Development (OECD), all European Union (EU) member states, and nineteen of the twenty-one Asia-Pacific Economic Cooperation (APEC) member economies, as well as the large developing nations of Argentina, Brazil, India, and South Africa. According to the income classification system of the World Bank, thirty-six of the fifty-five countries are "high income," fifteen are "upper-middle income," and four—India, Indonesia, the Philippines, and Vietnam—are "lower-middle income." Due to a lack of available data, no "low-income" countries are included in the analysis.

The report assesses these countries on their strength in seven core policy areas:

1. Open and non-discriminatory market access and foreign direct investment policies;
2. Science and R&D policies that spur innovation;
3. Openness to domestic competition and new firm entry;
4. Effective intellectual property rights protection policies;
5. Digital policies enabling the robust deployment of ICT platforms;
6. Open and transparent government procurement policies; and
7. Openness to high-skill immigration.

Countries are ranked as upper tier, upper-mid tier, lower-mid tier, or lower tier on each of these seven indices, with those ranks calculated by countries' performance on an array of key sub-indicators relevant to each core policy area. In total, the study assesses eighty-four sub-indicators across the seven core innovation policy areas. The seven areas then are weighted as follows: trade, science and R&D, and digital policies at 17.5 percent of the overall weight each; intellectual property protection and domestic competition at 15 percent each; government procurement at 10 percent; and high-skill immigration at 7.5 percent, as Table ES-1 shows. Countries' ranks on the seven weighted core innovation policy areas then are aggregated to produce an overall ranking reflecting the strength of their innovation policy capacity, as Table ES-2 shows.[1] Table ES-3 shows how each country scored with regard to each of the seven core innovation policy areas.

Table ES-1: Weights of Core Innovation Policy Areas in Overall Scoring Methodology

Core Policy Area	Share of Overall Weight
Trade and Foreign Direct Investment	17.5%
Science and R&D	17.5%
Domestic Market Competition	15.0%
Intellectual Property Rights	15.0%
Digital/Information and Communications Technology	17.5%
Government Procurement	10.0%
High-Skill Immigration	7.5%

Countries with the best innovation strategies coordinate their policies toward skills, scientific research, information and communications technologies (ICTs), tax, trade, intellectual property, government procurement, standards, and regulations in an integrated approach designed to drive economic growth through innovation.

Table ES-2: Rank of Countries on Innovation Policy Capacity (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Australia	Belgium	Brazil	Argentina
Austria	Cyprus	Bulgaria	India
Canada	Czech Republic	Chile	Indonesia
Chinese Taipei	Estonia	China	Mexico
Denmark	Hungary	Greece	Peru
Finland	Iceland	Italy	Philippines
France	Ireland	Latvia	Russia
Germany	Israel	Malaysia	Thailand
Hong Kong	Lithuania	Poland	Vietnam
Japan	Luxembourg	Romania	
Netherlands	Malta	Slovak Republic	
New Zealand	Portugal	South Africa	
Norway	Slovenia	Turkey	
Singapore	South Korea		
Sweden	Spain		
Switzerland			
United Kingdom			
United States			

Table ES-3: Country Rank by Core Innovation Policy Area

Country	Aggregate	Trade	Science/ R&D	Domestic Competition	Intellectual Property	ICT	Government Procurement	High-Skill Migration
Argentina	Lower	Lower	Lower-Mid	Lower	Lower	Lower	Lower	Lower-Mid
Australia	Upper	Upper	Upper	Upper	Upper	Upper-Mid	Upper-Mid	Upper-Mid
Austria	Upper	Upper	Upper	Upper-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Belgium	Upper-Mid	Upper	Lower-Mid	Upper-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Brazil	Lower-Mid	Lower	Upper-Mid	Lower	Lower	Lower-Mid	Lower	Lower-Mid
Bulgaria	Lower-Mid	Upper-Mid	Lower	Lower-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Lower
Canada	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper
Chile	Lower-Mid	Upper	Lower-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid
China	Lower-Mid	Lower	Upper-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower	Lower-Mid
Chinese Taipei	Upper	Lower-Mid	Upper	Upper-Mid	Upper-Mid	Upper	Upper	Upper
Cyprus	Upper-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper	Lower-Mid
Czech Republic	Upper-Mid	Upper	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower
Denmark	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Lower-Mid
Estonia	Upper-Mid	Upper	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper	Lower-Mid
Finland	Upper	Upper	Upper	Upper-Mid	Upper	Upper-Mid	Upper	Lower
France	Upper	Upper	Upper	Lower-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Germany	Upper	Upper	Upper-Mid	Upper-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Greece	Lower-Mid	Upper	Lower-Mid	Lower	Lower-Mid	Lower-Mid	Upper-Mid	Lower
Hong Kong	Upper	Upper-Mid	Upper-Mid	Upper	Upper-Mid	Upper	Upper	Upper
Hungary	Upper-Mid	Upper	Lower-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower-Mid
Iceland	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper	Upper	Lower-Mid
India	Lower	Lower	Upper-Mid	Lower	Lower-Mid	Lower-Mid	Lower	Lower-Mid
Indonesia	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower-Mid
Ireland	Upper-Mid	Upper	Lower-Mid	Upper-Mid	Upper	Upper-Mid	Upper-Mid	Lower-Mid
Israel	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper
Italy	Lower-Mid	Upper	Upper-Mid	Lower	Upper-Mid	Lower-Mid	Upper-Mid	Lower
Japan	Upper	Lower-Mid	Upper-Mid	Upper-Mid	Upper	Upper-Mid	Upper	Upper-Mid
Latvia	Lower-Mid	Upper	Lower-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Lower-Mid	Upper-Mid
Lithuania	Upper-Mid	Upper	Upper-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Lower
Luxembourg	Upper-Mid	Upper	Lower	Lower-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Malaysia	Lower-Mid	Lower-Mid	Lower	Upper-Mid	Lower-Mid	Upper-Mid	Lower	Upper-Mid
Malta	Upper-Mid	Upper-Mid	Lower	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower
Mexico	Lower	Upper-Mid	Lower	Lower	Lower-Mid	Lower	Lower	Lower
Netherlands	Upper	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Lower-Mid
New Zealand	Upper	Upper	Lower-Mid	Upper	Upper	Upper-Mid	Upper-Mid	Upper-Mid
Norway	Upper	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Lower-Mid
Peru	Lower	Upper-Mid	Lower	Lower	Lower	Lower-Mid	Lower	Lower-Mid
Philippines	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Upper-Mid
Poland	Lower-Mid	Upper-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid
Portugal	Upper-Mid	Upper	Upper-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper	Lower
Romania	Lower-Mid	Upper	Lower-Mid	Lower	Lower-Mid	Lower-Mid	Lower-Mid	Lower
Russia	Lower	Lower	Upper-Mid	Lower	Lower	Lower	Lower	Lower-Mid
Singapore	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper
Slovak Republic	Lower-Mid	Upper	Lower	Upper-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Lower
Slovenia	Upper-Mid	Upper	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper	Lower
South Africa	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Lower	Lower	Upper-Mid
South Korea	Upper-Mid	Lower-Mid	Upper	Lower-Mid	Upper-Mid	Upper	Upper-Mid	Lower-Mid
Spain	Upper-Mid	Upper	Upper	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower
Sweden	Upper	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Lower-Mid
Switzerland	Upper	Upper-Mid	Upper-Mid	Upper	Upper	Upper	Upper	Lower-Mid
Thailand	Lower	Lower	Lower	Lower-Mid	Lower	Lower-Mid	Lower	Lower-Mid
Turkey	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower
United Kingdom	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Upper	Lower-Mid
United States	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Upper	Upper-Mid
Vietnam	Lower	Lower-Mid	Lower	Lower-Mid	Lower	Lower	Lower	Lower-Mid

Developed nations should focus on implementing science and R&D policies that increase the supply of ideas, knowledge, and technology in an economy and then incentivize their commercialization.

To maximize global innovation, countries need to implement their policies with regard to trade, science and R&D, ICT, intellectual property rights, domestic market competition, government procurement, and high-skill immigration in ways that maximize their innovation capacity but without distorting global trade. To accomplish this, countries' policies will have to be predicated on transparent, non-discriminatory, market-based principles that embrace both global standards and the free flow of talent, capital, information, products, services, and technologies. The following provides a brief summary of the key points in each of the seven core innovation policy areas.

Trade: As innovation and trade policy have become increasingly intertwined, openness to trade characterized by open market access and receptivity to foreign direct investment has become a bedrock pillar of a country's innovation capacity:

- Free trade benefits all countries by allowing each to specialize in producing the products or services in which they have a comparative or competitive advantage.
- Countries should not specialize in all technologies; rather, trade enables them to specialize in what they are good at and then trade for the rest.
- A vital component of free trade is openness to both inward and outward foreign direct investment.
- Another critical component is the use of voluntary, market-led, global standards.

Science and R&D: Science and R&D policies boost countries' innovation potential while enhancing their ability to benefit from technology-based innovation:

- Developed nations should focus on implementing science and R&D policies that increase the supply of ideas, knowledge, and technology in an economy and then incentivize their commercialization.
- Developing nations should focus more on implementing science and R&D policies that enable their organizations to adopt newer and better technologies.
- Countries should utilize a diverse portfolio of science and R&D tools, targeting strategic and broad technologies and industries at all stages of their development.
- Science and R&D policies should be coordinated by a National Innovation Foundation to take advantage of inherent synergies between policies.
- Science and R&D policies should not discriminate against foreign firms operating domestically.

Domestic Competition: Vibrant domestic markets supported by a sound and fair regulatory environment that allows both existing and new firms to compete on a level playing field remain a lynchpin of prosperity:

- One of the strongest drivers of innovation and productivity growth is the existence of competitive marketplaces.
- Countries should remove onerous regulatory restrictions, incumbent protections, cross-border trade restrictions, and labor market restrictions that inhibit competition.
- Leading countries feature regulatory systems that are transparent and non-discriminatory, provide due process, and include opportunities for the meaningful engagement of all stakeholders.
- Countries should create an environment that fosters entrepreneurship throughout all sectors of the economy.

IPR: Recognition of intellectual property rights (IPR) is a vital element if global trade and foreign direct investment are to thrive:

- Effective protection and enforcement of IPR encourages innovators to invest in research, development, and the commercialization of technologies while promoting their dissemination.
- Weak intellectual property rights protections reduce the flow of foreign direct investment and technology transfer.
- Without adequate intellectual property protections, there will be less innovation overall, and this hurts all countries.
- IPR reform tends to deliver positive economic results regardless of a country's level of development.

Digital Policies: Information and communications technology is the global economy's strongest enabler of productivity and innovation:

- Effective digital policies focus first and foremost on spurring ICT use throughout the economy.
- The vast majority of benefits from ICT come

from the widespread use of ICT as opposed to its production.

- Leading countries recognize that the greatest opportunity to improve their economic growth lies in increasing the productivity of their domestic sectors, particularly through the application of ICT.

Government Procurement: Because government procurement accounts for such a large share of economic activity in most countries, government procurement policy is an important and legitimate component of countries' innovation strategies:

- Governments should orient their procurement policies to become strong drivers of innovation.
- Government purchases should be made on the basis of the best value for government, not on the basis of national preferences.
- Government procurement policies should be transparent, non-discriminatory, openly competitive, and performance-based.
- Countries should refrain from adopting measures that make the location of the development or ownership of intellectual property, or any requirement to license intellectual property to a domestic entity, a condition for government procurement eligibility.

High-Skill Immigration: Talent has become the world's most sought-after commodity. Thus, having a highly skilled talent pool to draw from has become vital to countries' economic well-being:

- High-skill immigrants play a unique role in bringing skills, talent, and knowledge to societies while contributing to new firm development, employment, and economic growth.
- Immigration policies play an important part in contributing to a country's knowledge pool and creative ability by bringing in new perspectives and needed skills and knowledge.

Chapter 1: Introduction

Innovation—the improvement of existing or the creation of entirely new products, processes, services, and business or organizational models—is the central driver of economic growth. Innovation doesn't just spring "like manna from heaven" as something over which policymakers have no influence. Rather, nations must put effective innovation policies in place to enable innovative activity to flourish in their economies. Accordingly, this study ranks fifty-five countries on their strength across seven core innovation policy areas:

1. Open and non-discriminatory market access and foreign direct investment policies;
2. Science and R&D policies that spur innovation;
3. Openness to domestic competition and new firm entry;
4. Effective intellectual property rights protection policies;
5. Digital policies enabling the robust deployment of ICT platforms;
6. Open and transparent government procurement policies; and
7. Openness to high-skill immigration.

Countries are ranked as upper tier, upper-mid tier, lower-mid tier, or lower tier in each of the seven policy areas, with their ranks calculated by their performance on an array of key sub-indicators relevant to each core policy area. In total, the study assesses eighty-four sub-indicators across the seven core innovation policy areas. The seven areas then are weighted as follows: trade, science and R&D, and digital policies each at 17.5 percent of the overall weight; intellectual property protection and domestic competition each at 15 percent; government procurement at 10 percent; and high-skill immigration at 7.5 percent, as Table 1-1 shows. Countries' ranks on the seven weighted core innovation policy areas then are aggregated to produce an overall ranking that reflects the strength of their innovation policy capacity, as Table 1-2 shows.[1] Table 1-3 shows how each country scored with regard to each of the seven core innovation policy areas and overall.

The fifty-five countries include all members of the Organization for Economic Co-operation and Development (OECD), all European Union (EU) member states, and nineteen of the twenty-one Asia-Pacific Economic Cooperation (APEC) member economies, as well as the large developing nations of Argentina, Brazil, India, and South Africa. According to the income classification system of the World Bank, thirty-six of the fifty-five countries are "high income" or developed nations. Among the developing nations, fifteen are "upper-middle income," and four—India, Indonesia, the Philippines, and Vietnam—are "lower-middle income." Due to a lack of available data, no "low-income" countries are included in the analysis.[2]

Developed nations dominate the upper tier of innovation policy capacity. However, of the European countries, the upper tier is limited to Northern and Western Europe, with Austria, Denmark, Finland, France, Germany, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom all in the upper tier. The Asian members of the upper tier are Chinese Taipei, Hong Kong, Japan, and Singapore. Canada and the United States both sit in the upper tier, as do Australia and New Zealand.

Table 1-1: Weights of Core Innovation Policy Areas in Overall Scoring Methodology

Core Policy Area	Share of Overall Weight
Trade and Foreign Direct Investment	17.5%
Science and R&D	17.5%
Domestic Market Competition	15.0%
Intellectual Property Rights	15.0%
Digital/Information and Communications Technology	17.5%
Government Procurement	10.0%
High-Skill Immigration	7.5%

Table 1-2: Rank of Countries on Innovation Policy Capacity (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Australia	Belgium	Brazil	Argentina
Austria	Cyprus	Bulgaria	India
Canada	Czech Republic	Chile	Indonesia
Chinese Taipei	Estonia	China	Mexico
Denmark	Hungary	Greece	Peru
Finland	Iceland	Italy	Philippines
France	Ireland	Latvia	Russia
Germany	Israel	Malaysia	Thailand
Hong Kong	Lithuania	Poland	Vietnam
Japan	Luxembourg	Romania	
Netherlands	Malta	Slovak Republic	
New Zealand	Portugal	South Africa	
Norway	Slovenia	Turkey	
Singapore	South Korea		
Sweden	Spain		
Switzerland			
United Kingdom			
United States			

In the first six sections of this report, nearly all of these countries rank in the two upper tiers, the exceptions being Chinese Taipei and Japan, which placed in the lower-mid tier in trade policy; New Zealand in the lower-mid tier in science and R&D policy; and France in the lower-mid tier in domestic competition. In the seventh section, high-skill immigration, several upper-tier countries perform poorly, including Austria, France, Germany, Switzerland, and the United Kingdom in the lower-mid tier, and Finland in the lower tier. Notably, Canada and Singapore achieve upper tier rankings in all sections.

In the two middle tiers are almost all the remaining European nations—including all Southern European nations and all but one Eastern European nation analyzed—as well as the Asian countries of China, India, Malaysia, and South Korea. The two Middle-Eastern nations also reside in the middle tiers, with Israel in the upper-mid tier and Turkey in the lower-mid tier. South America makes its highest appearance in the lower-mid tier with Brazil and Chile. South Africa also sits in the lower-mid tier.

The only European country in the lower tier is Russia, which scores below average on almost all sections, save for science and R&D policy. Several developing Asian countries sit in the lower tier, including Indonesia, the Philippines, Thailand, and Vietnam. In stark contrast to its neighbors to the north, Mexico is also a lower-tier country. And, in South America, Argentina and Peru reside in the lower tier. Nearly all of these countries lie in the two lower tiers in nearly all sections of this report. The exceptions are Mexico and Peru, which are in the upper-mid tier in trade policy, Russia in the upper-mid tier in science and R&D policy, and the Philippines in the upper-mid tier of high-skill immigration policy. Nevertheless, no country resides in the lowest tier for all indicators, although Indonesia comes close, its saving grace being high-skill immigration, where it lies in the lower-mid tier.

These rankings matter because, in a globalized economy, innovation is the fundamental driver of economic growth, and countries are unlikely to achieve sustainably high rates of innovation if their governments have not implemented a broad range of innovation-enabling policies that create the conditions in which organizations throughout an economy—whether private enterprises, government agencies, or nonprofit entities—can successfully innovate. The following section discusses what innovation is (and is not), why innovation is important, and the optimal paths for economies to grow through the application of innovation. The individual chapters discuss countries' performance regarding the seven core innovation policy areas.

Table 1-3: Country Rank by Core Innovation Policy Area

Country	Aggregate	Trade	Science/ R&D	Domestic Competition	Intellectual Property	ICT	Government Procurement	High-Skill Immigration
Argentina	Lower	Lower	Lower-Mid	Lower	Lower	Lower	Lower	Lower-Mid
Australia	Upper	Upper	Upper	Upper	Upper	Upper-Mid	Upper-Mid	Upper-Mid
Austria	Upper	Upper	Upper	Upper-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Belgium	Upper-Mid	Upper	Lower-Mid	Upper-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Brazil	Lower-Mid	Lower	Upper-Mid	Lower	Lower	Lower-Mid	Lower	Lower-Mid
Bulgaria	Lower-Mid	Upper-Mid	Lower	Lower-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Lower
Canada	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper
Chile	Lower-Mid	Upper	Lower-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid
China	Lower-Mid	Lower	Upper-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower	Lower-Mid
Chinese Taipei	Upper	Lower-Mid	Upper	Upper-Mid	Upper-Mid	Upper	Upper	Upper
Cyprus	Upper-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper	Lower-Mid
Czech Republic	Upper-Mid	Upper	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower
Denmark	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Lower-Mid
Estonia	Upper-Mid	Upper	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper	Lower-Mid
Finland	Upper	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Lower
France	Upper	Upper	Upper	Lower-Mid	Upper	Upper-Mid	Upper	Lower-Mid
Germany	Upper	Upper	Upper-Mid	Upper-Mid	Upper	Upper	Upper	Lower-Mid
Greece	Lower-Mid	Upper	Lower-Mid	Lower	Lower-Mid	Lower-Mid	Upper-Mid	Lower
Hong Kong	Upper	Upper-Mid	Upper-Mid	Upper	Upper-Mid	Upper	Upper	Upper
Hungary	Upper-Mid	Upper	Lower-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower-Mid
Iceland	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper	Upper	Lower-Mid
India	Lower-Mid	Lower	Upper-Mid	Lower	Lower-Mid	Lower-Mid	Lower	Lower-Mid
Indonesia	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Lower-Mid
Ireland	Upper-Mid	Upper	Lower-Mid	Upper-Mid	Upper	Upper-Mid	Upper-Mid	Lower-Mid
Israel	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Upper
Italy	Lower-Mid	Upper	Upper-Mid	Lower	Upper-Mid	Lower-Mid	Upper-Mid	Lower
Japan	Upper	Lower-Mid	Upper-Mid	Upper-Mid	Upper	Upper-Mid	Upper	Upper-Mid
Latvia	Lower-Mid	Upper	Lower-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Lower-Mid	Upper-Mid
Lithuania	Upper-Mid	Upper	Upper-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Lower
Luxembourg	Upper-Mid	Upper	Lower	Lower-Mid	Upper	Upper	Upper	Lower-Mid
Malaysia	Lower-Mid	Lower-Mid	Lower	Upper-Mid	Lower-Mid	Upper-Mid	Lower	Upper-Mid
Malta	Upper-Mid	Upper-Mid	Lower	Upper-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower
Mexico	Lower	Upper-Mid	Lower	Lower	Lower-Mid	Lower	Lower	Lower
Netherlands	Upper	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Lower-Mid
New Zealand	Upper	Upper	Lower-Mid	Upper	Upper	Upper	Upper-Mid	Upper-Mid
Norway	Upper	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Lower-Mid
Peru	Lower	Upper-Mid	Lower	Lower	Lower	Lower	Lower	Lower-Mid
Philippines	Lower	Lower	Lower	Lower	Lower	Lower	Lower	Upper-Mid
Poland	Lower-Mid	Upper-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid
Portugal	Upper-Mid	Upper	Upper-Mid	Lower-Mid	Upper-Mid	Upper-Mid	Upper	Lower
Romania	Lower-Mid	Upper	Lower-Mid	Lower	Lower-Mid	Lower-Mid	Lower-Mid	Lower
Russia	Lower	Lower	Upper-Mid	Lower	Lower	Lower	Lower	Lower-Mid
Singapore	Upper	Upper	Upper	Upper	Upper	Upper	Upper	Upper
Slovak Republic	Lower-Mid	Upper	Lower	Upper-Mid	Upper-Mid	Lower-Mid	Upper-Mid	Lower
Slovenia	Upper-Mid	Upper	Upper-Mid	Lower-Mid	Upper-Mid	Lower-Mid	Upper	Lower
South Africa	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Upper-Mid	Lower	Lower	Upper-Mid
South Korea	Upper-Mid	Lower-Mid	Upper	Lower-Mid	Upper-Mid	Upper	Upper-Mid	Lower-Mid
Spain	Upper-Mid	Upper	Upper	Lower-Mid	Upper-Mid	Upper-Mid	Upper-Mid	Lower
Sweden	Upper	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Lower-Mid
Switzerland	Upper	Upper-Mid	Upper-Mid	Upper	Upper	Upper	Upper	Lower-Mid
Thailand	Lower	Lower	Lower	Lower-Mid	Lower	Lower-Mid	Lower	Lower-Mid
Turkey	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower-Mid	Lower
United Kingdom	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Upper	Lower-Mid
United States	Upper	Upper	Upper-Mid	Upper	Upper	Upper	Upper	Upper-Mid
Vietnam	Lower	Lower-Mid	Lower	Lower-Mid	Lower	Lower	Lower	Lower-Mid

In a globalized economy, innovation is the fundamental driver of economic growth, and countries are unlikely to achieve sustainably high rates of innovation if their governments have not implemented a broad range of innovation-enabling policies that create the conditions in which organizations throughout an economy—whether private enterprises, government agencies, or nonprofit entities—can successfully innovate.

What is Innovation?

Innovation has become the central driver of national economic wellbeing and competitiveness—and this is why so many countries are engaged in what might be called "a race for global innovation advantage." But what is innovation? Most believe that innovation is only technological in nature, resulting in shiny new products like Apple's iPad, Sony's PlayStation, or Samsung's 3-D HDTVs, or in enhanced machines or devices, such as lasers and computer-controlled machine tools. Others believe that innovation pertains only to the R&D activities undertaken by universities, national laboratories, or corporations.

While that is part of the answer, it is much too limiting. Innovation is about much more. The OECD defines innovation broadly as, "the implementation of a new or significantly improved product (that is, a physical good or service), process, a new marketing method, or a new organizational method in business practices, workplace organization, or external relations."[3] The key point is that innovation can be both technological and non-technological in nature. In fact, the "non-technological" innovations can be at least as important as the technological ones—although innovations often are best when they combine both technological and non-technological elements. Moreover, innovation is equally, if not more important, in non-traded sectors as in traded.

To elaborate, Larry Keeley and his colleagues at Monitor Company, a consultancy, painstakingly researched the nature of innovation activity in U.S. Fortune 500 corporations between 1989 and 1999, classifying innovative activity into four categories: those dealing with the "offering" itself (that is, the key technical features or attributes of the product or service); those pertaining to the "delivery" of the product or service (principally branding and distribution channels); those related to the firm's internal "processes" (such as use of knowledge or customer relationship management systems); and those relating to the firm's "business model or value chain."[4] What Keeley and his colleagues found was that, though the vast majority of innovation activity in enterprises pertains to the core attributes of a product of service, the overwhelming value arises from innovations focused on the firm's business model or value chain. They found that innovation efforts focused only on the technical features of a product or service could easily be copied or imitated, leading to commoditization pressures, whereas innovations in business models or value chains (think Dell's mass customized build-to-order PC model) were more sustainable and less easily reproducible.[5] In fact, Keeley and his associates found that, between 1989 and 1999, just 2 percent of innovation projects delivered approximately 90 percent of the value created from U.S. Fortune 500 enterprises' innovation efforts.

As the subsequent section on ICT policies explains, many of those innovative efforts leveraged information and communications technologies to create innovative new business models—many of which were previously impossible to execute without ICTs such as the Internet—that have unlocked tremendous value for businesses, customers, and society alike. (In fact, ITIF estimates that the annual global economic benefits of the commercial Internet equal $2 trillion, more than the global sales of medicine, investment in renewable energy, and government investment in R&D combined).[6] Indeed, there is a growing inter-linkage between technological innovation and business model innovation, with new technologies enabling new business models (think inexpensive digital storage and faster broadband enabling the online music store iTunes), and, in turn, new business models being required in order for new technological innovations to fully emerge in the marketplace. Moreover, this trend points to the increasingly important role services play in innovation. With service industries accounting for about three-quarters of GDP (and an even greater level of employment) in OECD nations, countries and enterprises alike need to be at least as focused on innovation in services as in products. And, since many services tend to be non-tradable, countries gain the most value by focusing at least as much attention on their non-traded sectors as on their tradable sectors.

To summarize, innovation comes in a multitude of forms, including products, services, production or business processes (for goods or services, respectively), organizational models, business models, and social innovations (innovation directed toward specific societal gains).[7] Within these dimensions, innovation can arise at different points in the process, including conception, research and development, transfer (the shift of the "technology" to the production organization), production and deployment, or

marketplace usage. Figure 1-1 charts the dimensions of potential innovation opportunity in the "innovation value chain."

To be most effective, countries' innovation activity should be found along all matrices of the innovation value chain—in all types of innovation and along all phases of development. But one of the biggest mistakes countries make with their innovation strategies is that they define innovation too narrowly. In reality, many countries (and companies) focus their innovation activity only on products and, even then, only on a sub-set of products tradable on international markets. And, as Figure 1-2 depicts, many countries only focus on obtaining the intellectual property for an innovative product and then developing, manufacturing, and exporting it.

Indeed, building their economies around high-productivity, high-value-added, export-based sectors, such as high-tech or capital-intensive manufacturing sectors, appears to be the path that nations such as China, Indonesia, Malaysia, Russia, and others are following, in the footsteps of Japan and the Asian tigers—Chinese Taipei, Hong Kong, Korea, and Singapore—before them. These countries place the vast majority of their innovation focus on supporting the manufacturing and export of internationally tradable products, while generally giving short shrift to their domestic services industries. This is unfortunate for countries, because export-led growth strategies leave broad swaths of opportunity to innovate in services, business models, and organizational models untapped, despite the fact that, in most nations, especially large and mid-sized nations, the non-traded sector is substantially larger than the traded sector.[8]

Why Is Innovation Important?

In recent years, a growing number of economists have come to see that it is not so much accumulation of capital but rather innovation that drives countries' long-run economic growth.[9] As the OECD notes, "A driving factor for much of the economic growth and rise in living standards in the post-World War II era is the rapid advances in technology and innovation."[10] The U.S. Department of Commerce estimates that technological innovation has been responsible for as much as 75 percent of the growth in the American economy since World War II.[11] In a seminal study of ninety-eight developed and developing countries, Klenow and Rodríguez-Clare found that up to 90 percent of per-capita income growth stems from innovation.[12]

Indeed, innovation drives economic growth, employment growth, and wage growth by driving the productivity growth that lies at the heart of it all. As the OECD found in a definitive review of studies on productivity and employment:

> Technology both eliminates jobs and creates jobs. Generally, it destroys lower-wage, lower-productivity jobs, while it creates jobs that are more productive, higher-skilled, and better paid. Historically, the income-generating effects of new technologies have proven more powerful than the labor-displacing effects: Technological progress has been accompanied not only by higher output and productivity, but also by higher overall employment.[13]

Moreover, the OECD has shown that technology-using industries have higher-than-average productivity and employment growth than industries that use less technology.[14]

Moreover, innovative activity delivers substantial social returns outside of those reaped by the innovator. Nordhaus estimates that inventors capture just 4 percent of the total social gains from their innovations; the rest spill over to other companies and to society as a whole.[15] And Mansfield finds that the social rate of return from

Figure 1-1: The Innovation Value Chain

		Phase of Development				
Type of Innovation		Conception	Research & Development	Transfer	Production/ Deployment	Usage
	Products					
	Services					
	Production processes					
	Organizational models					
	Business models					

Figure 1-2: Focal Point of Innovation in Export-Led Growth Countries

		Phase of Development				
Type of Innovation		Conception	Research & Development	Transfer	Production/ Deployment	Usage
	Products			*	*	
	Services					
	Production processes					
	Organizational models					
	Business models					

investment in academic research (in terms of its impact on product and process development in U.S. firms) to be at least 40 percent.[16]

Finally, innovation plays a central role in improving citizens' quality of life. Innovation has been and likely will continue to be indispensable to helping societies address difficult challenges, such as developing sustainable sources of food and energy, improving education, combating climate change, meeting the needs of growing and aging populations, raising billions out of poverty, and achieving shared and sustained global prosperity.

Innovation achieves these considerable impacts in large part by enabling the productivity improvements that lie at the core of economic growth, with the current wave of productivity growth throughout the world being driven in large part by ICT innovation. In fact, a number of economists have identified ICT as a "general purpose technology" that plays an inordinate role in innovation and productivity.[17] For example, the *use* (as opposed to the *production*) of ICT was responsible for two-thirds of U.S. total factor productivity growth between 1995 and 2002 and virtually all of the growth in labor productivity.[18] The OECD found that the probability of innovation increases with the intensity of ICT use, and that this held true for both manufacturing and services firms and for different types of innovation.[19] In effect, ICT is "super capital," having an impact on worker productivity three to five times that of non-ICT capital.[20]

ICT is a major growth driver in developed and developing countries alike. ICT use in Canada is associated with higher labor productivity in industries that adopt it.[21] Connolly and Fox analyzed the impacts of ICT capital on total factor productivity (TFP) growth in ten Australian industries from 1966 to 2002 and found that ICT capital is more productive than other types of capital at the aggregate level in all industries of the Australian economy.[22] Likewise, ICT usage in China has played a critical role in growth, accounting for 38 percent of TFP growth and as much as 21 percent of GDP growth.[23] Developing nations such as Chile, Malaysia, and Thailand also have shown significant ICT-induced productivity growth.[24] For example, in a study of approximately 900 Chilean retail firms in 2008, De Vries found that firms with greater ICT use had TFP that was 40 percent higher than the other three groups of retail firms with lower ICT use.[25]

Innovation is Critical for Across-the-Board Productivity Growth

Economies—whether national, state, or regional—have three ways to grow over the medium and longer term: growth in population, shifting to higher productivity industries, or productivity improvements across the board.

In the first path, economies can grow by increasing their populations and, hence, their number of employed workers. But this is an unsustainable strategy for many nations, particularly given threats to the global ecosystem. Moreover, the "get big" strategy does not improve the incomes or quality of life for individuals; it just leads to economies with more individuals and a larger total GDP.

The latter two paths involve boosting productivity. Productivity growth—the increase in the amount of output produced by workers per a given unit of effort—is, in fact, a nation's most important measure and determinant of economic performance.[26] For instance, if U.S. productivity were to grow just 1 percent faster over the next forty years than its rate during the 1980s, the average American would earn approximately $41,000 more per year than he or she would have otherwise (in real 2006 dollars).[27]

Economies can increase their productivity in two ways: either through the "growth effect" or the "shift effect." In the first, all sectors in an economy, all its firms and industries, become more productive, usually by investing

in new technologies or by improving workers' skills. For example, a country's retail, banking, transportation, and automobile manufacturing sectors might all increase their productivity at the same time. The second method, the "shift effect," is more dynamic and disruptive: low-productivity industries lose out in the marketplace to high-productivity industries as the compositional mix of the economy changes.

Both across-the-board productivity growth (the growth effect) and shifts in the mix of industries toward more productive ones (the shift effect) will contribute to an increase in an economy's productivity. But which strategy is best? The answer depends in large part on the size of the economy and, in part, on the type of industry. The larger the economy, the more important the growth effect is, while the smaller the economy, the more important the shift effect is. Moreover, the more local-serving the sector, the more important the growth effect is. To understand why, consider an automobile factory in a small city. If its managers install a new computer-aided manufacturing system and raise the plant's productivity (the growth effect), a large share of the benefits will flow to the factory's customers around the nation and even around the world in the form of lower prices. Because the economy (the city) is small and the factory less local-serving, the city will benefit only to the extent that its residents buy cars from that factory or if some of the increases in productivity go to higher wages instead of only to lower prices.[28] In contrast, if the city attracts another auto plant where the wages average $18 per hour to replace a textile firm with average wages of only $12 per hour that moved overseas to a low-wage economy (the shift effect), most of the benefits will accrue to residents in the form of higher wages for the workers who moved from the textile plant to the car factory (and in the form of more spending at local-serving businesses like restaurants, dry cleaners, furniture stores, etc.). This implies that across-the-board productivity growth, rather than a shift to higher-value-added sectors, will be more important for larger areas, including virtually all economies, because their consumers will capture a greater share of the productivity gains.

Yet, even for small economies, across-the-board productivity gains are still a vitally important way to become richer, especially through productivity gains in local-serving industries. To see why, consider a small nation in which average productivity across the board among existing industries increases 2 percent per year for five years. After five years, the nation's productivity is up by almost 11 percent. To achieve a similar increase in total productivity through an industry mix strategy, the nation would have to replace 20 percent of its existing jobs with new jobs having more than 50 percent higher output—an unlikely transformation.

But to the extent that countries have cared about raising productivity, most have focused on trying to attract higher-wage industries to locate or grow within their borders. However, as Michael Porter found in his analysis of traded clusters in sub-state regions, raising the productivity of all clusters has about the same effect on income as shifting to higher-productivity clusters.[29] In other words, a strategy of raising productivity in existing traded industries is just as effective as attracting or growing higher-productivity industries. Moreover, raising the productivity of non-traded industries (for example, retail, health care, services, or even government) whose output is consumed almost entirely by the economy's residents can have even larger benefits to the economy. Most of the benefits will go to the area's residents in the form of lower prices for consumers and higher wages for workers. For example, if a city encourages its electric utility to install a smart electric grid system that boosts the utility's productivity, most of the benefits, in the form of lower prices (and higher-quality electric services), will flow to local residents.

Thus, the lion's share of productivity growth in most economies—and especially large and medium-sized ones such as China, Indonesia, Japan, Korea, and the United States—comes not from changing the sectoral mix to higher-productivity industries, but from boosting the productivity of all industries and organizations, even the low-productivity ones. Overall, the evidence shows that it is changes within sectors that drive productivity, with around 80 percent of productivity growth coming from industries improving their own productivity and only about 20 percent coming from more productive industries gaining a larger share of output than less productive ones. Often, this occurs through new, more productive firms within those industries gaining market share on less-productive and less-innovative firms within those industries. In other words, the productivity and innovation capacity of a country's sectors matters more than its mix of sectors. And, since the vast majority of economic benefits from technology come from the widespread use of technology, countries with export-led growth strategies miss out on the greatest opportunity to improve their economic growth: increasing the productivity of their domestic sectors, particularly through the application and diffusion of general-purpose technologies such as ICT.

Designing Effective Innovation Policy

As the race for global innovation advantage has intensified, dozens of countries—from Finland to India to Chinese Taipei—have created national innovation strategies designed to boost their countries' potential to benefit from innovation. These countries recognize

that innovation drives growth and that losing the race for innovation advantage can result in a relatively lower standard of living. They know that success in the competition to develop globally competitive domestic companies and industries, while attracting internationally mobile, innovation-based economic activities—and, thus, to achieve high and sustainable levels of economic and employment growth—increasingly depends on the strength of their national innovation ecosystems. The countries with the more sophisticated strategies also realize that innovation-based economic activity is not just about moving up the value chain to higher-value-added activities, but also about boosting the productivity of sectors across the board and developing new capabilities and functionalities in their economies. All of these countries have come to understand that markets relying on price signals alone will not always be as effective as smart public-private partnerships in spurring higher productivity and greater innovation. They understand that government can—and must—play a constructive role in helping its private sector compete. Therefore, they see the promotion of innovation as a focal point of their economic growth and competitiveness strategies. Ultimately, countries' innovation policies aim to explicitly link science, technology, and innovation with economic and employment growth, effectively creating a game plan for how they can compete and win in innovation-based economic activity.

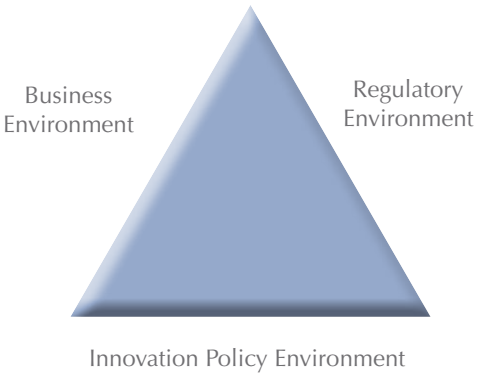
When a country competes to win within the rules of the global trade system, it benefits both the country and the world, because fair competition forces countries to put in place effective innovation policies to promote economic growth. Put in terms of a soccer analogy, the world is better off when competition forces all countries' soccer teams to become great soccer teams. The same dynamic holds with the quality of countries' innovation policies in fostering their global economic competitiveness, and that of the rest of the world. Competition forces all countries to ratchet up their games. In this sense, effective innovation policy leverages the *global* innovation ecosystem to enhance the national innovation ecosystem. Moreover, innovation policies that leverage global knowledge networks and technology transfer compound the return to a country's domestic innovation investments and raise innovation levels across the globe. For example, studies have found that firms that sell in international markets generate more knowledge than counterparts that sell in national markets only.[30] Another study found that the own-country rate of return from R&D investment conducted in the G7 countries was 123 percent, but that the *worldwide* rate of return from R&D investment conducted in the G7 countries was 155 percent.[31]

But, just as innovation is about more than high-tech products, effective innovation policy focuses on more than just science policy or on promoting high-tech product development. Effective innovation policy focuses on fully leveraging the global innovation ecosystem by ensuring the diffusion of innovation to all sectors and organizations and by enabling new business model innovations to emerge and to compete on a global scale. In fact, innovation policy essentially involves the same set of policy issues that countries deal with all the time, but focuses on how countries can address those issues with a view toward maximizing innovation and productivity. For example, countries can operate their procurement practices as they have in the past, or they can reorganize their practices in a manner specifically designed to promote innovation. Likewise, countries can organize their corporate tax systems simply to raise revenues, or to raise revenues while also driving innovation. They can set up their science policies solely to support science, or they can organize their investments in scientific research in ways that strategically consider technology commercialization and innovation needs.

The most sophisticated countries have implemented innovation policies that recognize this. Their innovation strategies constitute a coherent approach that seeks to coordinate disparate policies toward scientific research, technology commercialization, ICT investments, education and skills development, tax, trade, intellectual property, government procurement, and regulatory policies in an integrated fashion that drives economic growth by fostering innovation. Moreover, coherent innovation policies work. Studying the gap between the innovation capacities of twenty-three countries in 1978 and then comparing them to their innovation capacities in 1999, Furman and Hayes found that the initially lagging countries that had subsequently developed innovation-enhancing policies while investing in infrastructure and human capital—notably Chinese Taipei, Denmark, Ireland, Finland, Singapore, and South Korea—dramatically increased their innovative output per capita and, by 1999, had overtaken countries such as the United Kingdom, France, and Italy.[32] Many countries—notably Canada, Japan, and the United Kingdom—have studied these once-follower countries and have started to implement similar approaches.

Getting innovation policy right requires that countries master three components of the innovation ecosystem—the business environment, the regulatory environment, and the innovation policy environment—which sometimes are called "The Innovation Policy Triangle," as Figure 1-3 illustrates. The seven core innovation policy areas that form the basis of this study address all the core elements

Figure 1-3:
The Innovation Policy Triangle



of the innovation policy triangle, whose elements are specified in greater detail below:

Business Environment: The first leg of the innovation triangle is the business environment, which includes finance, private sector institutions, and business capabilities. A strong business environment has several components:

- Ability of capital to flow to innovative and productive investments easily and efficiently;
- A widespread embrace of entrepreneurship and innovation by individuals;
- Strong ICT adoption, especially among businesses;
- Strong managerial skills; and
- A culture that embraces competition and collaboration, as well as an appropriate level of risk-taking.

Regulatory Environment: The second leg is the regulatory environment, which enables the right overall framework for organizations to be innovative. This includes:

- A competitive and open trade system such that domestic firms are spurred to innovate through competition;
- Support for competitive product and labor markets such that new entrants, including new business models, can enter markets;
- A tax system that spurs innovation and enables enterprises to be competitive in global markets;
- Regulatory requirements on businesses that are, to the extent possible, based on consistent, transparent, and performance-based standards;
- Limited regulations on the digital economy that don't impair widespread digital innovation and adoption;
- A legal process that is transparent and based on the rule of law;
- Government procurement based on performance standards as well as open and fair competition; and
- Protection of intellectual property that enables innovators to achieve returns.

Innovation Policy Environment: The third leg of the triangle is a robust innovation policy environment. While markets are key to innovation, absent effective innovation policy, markets will underperform. A strong innovation policy environment supports the key building blocks of innovation. This includes:

- Support for technology research;
- Support for technology commercialization;
- Support for digital technology infrastructures (such as smart grids, broadband, health IT, intelligent transportation systems, e-government, etc.);
- Support for firms, especially small and medium-sized firms, to modernize and boost productivity; and
- Fostering effective education and skills, particularly science, technology, engineering, and math skills (STEM), while welcoming high-skill immigrants.

Ultimately, innovation policy is concerned with enhancing the strength of a nation's innovation ecosystem and recognizes that businesses innovate with the help of many other institutions. Innovation policy recognizes that technological progress depends on certain infrastructure investments and on specific innovations that are too

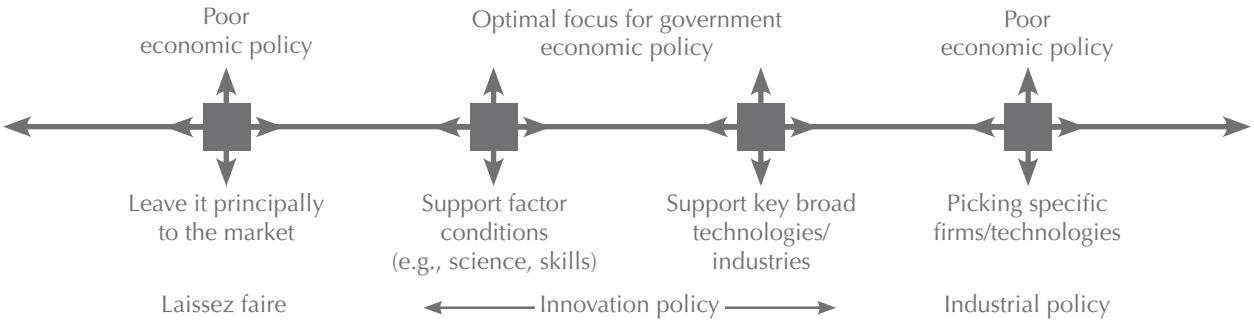
risky, too complex, or too interdependent on other breakthroughs for private firms to always risk alone the substantial investments that are needed.[33] Indeed, the private sector often needs the government's partnership to innovate, and the more collaborative nature of the modern innovation process is reflected by the greater role government agencies, national laboratories, and research universities play in private sector innovation. As ITIF documented in its report, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System*, whereas the lion's share of the R&D 100 Award-winning U.S. innovations in the 1970s came from corporations acting on their own, most of the R&D 100 Award-winning U.S. innovations in the last two decades have come from partnerships involving business and government, including federal labs and federally funded university research. In fact, in 2006, only eleven of the eighty-eight entities that produced award-winning innovations were not beneficiaries of federal funding.[34]

What, then, is the appropriate role of government in innovation policy? In particular, when does a country's *innovation policy* cross the line into an *industrial policy* that seeks to intervene in markets to "pick winners" or "national champions" and which, in the process, distorts the efficient market-based allocation of resources (and sometimes even hinders private firms from developing innovative technologies on their own)? It is useful to envision a continuum of government-market engagement, increasing from left to right in four steps from a "laissez faire, leave-it-to-the-market" approach; to "supporting factor conditions for innovation;" to going further by "supporting key broad technologies/industries;" to, at the most extreme, "picking specific technologies/firms," which would be tantamount to industrial policy, as Figure 1-4 shows.

To provide a specific example in the context of advanced batteries for electric vehicles, it would be *industrial policy* if a government picked a particular company to be its national battery champion—say, if the United States picked Duracell—or a particular technology that government planners think is the best—such as lithium-ion. It is *innovation policy* if governments seek to support private sector efforts to solve key problems, like batteries and electric charge storage. This means supporting a wide range of firms, including startups, and technologies (such as lithium-ion, lithium-air, zinc-air, all electron, metal-molten salt, and magnesium-ion, etc.), recognizing that, while government needs to support the private sector in its efforts to spur battery innovation, neither it nor the private sector can adequately predict which firms and technologies ultimately will win. In short, industrial policy entails a government picking *specific* firms or technologies, whereas innovation policy refers to governments making strategic investments in and supporting key *broad* technologies and/or industries. Governments do play a vital and appropriate role in making investments in strategic and emerging advanced technologies and sectors and helping facilitate the transfer of that technology to the private marketplace with the explicit intent and purpose of driving economic growth. However, governments should not pick specific companies or technologies to be national champions, nor should they exclude local operations of foreign enterprises from eligibility to receive government funding for research grants working on next-generation technologies or otherwise disadvantage foreign competitors competing in their markets.

In summary, innovation policy recognizes that, while the private sector should lead innovation, in an era of globalized innovation and intensely competitive markets, governments can and should play an important

Figure 1-4: The Innovation Policy Continuum



enabling role in supporting private sector innovation efforts. Economist Dani Rodrik paints a helpful picture of the appropriate relationship between government and business with respect to innovation policy when he describes "an interactive process of strategic cooperation between the public and private sectors which, on the one hand, serves to elicit information on business opportunities and constraints and, on the other hand, generates policy initiatives in response."[35] As the U.S. National Economic Council's 2009 report, *A Strategy for American Innovation*, wisely argued, "The true choice in innovation is not between government and no government, but about the right type of government involvement in support of innovation. A modern, practical approach recognizes both the need for fundamental support and the hazards of overzealous government intervention."[36]

Chapter 2: Trade and Foreign Direct Investment

Why Free Trade and FDI Are Important and How They Drive Innovation

Free trade benefits all countries by allowing each country to specialize in producing the products or services for which it has comparative and/or competitive advantage. As countries specialize in the production of traded goods and services at which they are the most efficient, global economic output is maximized and consumers globally benefit by receiving the highest-value, lowest-cost products and services. In a global market-based innovation economy, free trade is a positive-sum game in which everybody wins. Nevertheless, the degree to which nations embrace free trade varies significantly.

Empirical studies suggest that free trade benefits developed and developing countries alike. A World Bank study of seventy-seven developing countries over a twenty-year period finds that a developing country's productivity is larger the more open it is to trade with developed countries and the greater its foreign R&D investment.[1] As much as one-half of U.S. productivity growth derives from foreign technology acquired through trade, licensing, and direct investments (including joint-equity ventures and wholly owned subsidiaries).[2] Moreover, firms that sell in international markets generate more knowledge than counterparts that sell in national markets only.[3] For example, in a study matching patent citation data with trade data, Sjöholm finds that international trade flows encourage knowledge flows.[4]

Trade leads to both static and dynamic gains for countries. Trade can lead to substantial economic benefits through more efficient allocation of resources and deepened specialization, which allows countries to prosper from comparative advantage. These are the so-called "static gains" from trade. "Dynamic gains" come from the increases in competition and the transfer of technology and innovation that trade engenders.

Thus, there is a two-way link between trade and innovation. On the one hand, innovation creates technological advantage, which together with differences in factor endowments is the source of comparative advantage, which in turn drives trade. Indeed, technology gaps have been found to be a key determinant of trade and investment between countries.[5] In other words, countries shouldn't specialize in all technologies; trade enables them to specialize in what they are good at and trade for the rest. Moreover, open markets benefit innovative firms, leading to an increase in the size of the market over which the firm can leverage its innovation (through economies of scale). This is especially important for industries with relatively low marginal costs of production and high fixed costs (for example, semiconductors, software, movies and music, etc.), since larger markets can be served with overall declining average costs. On the other hand, trade and investment also spur innovation through competition effects, technology transfer, and spillover effects (including learning from exporting and learning by investing).

In particular, by exposing domestic firms to international markets and forcing them to compete against sophisticated global competitors, trade is a strong driver of innovation and productivity growth. In fact, data from the OECD Innovation Microdata Project shows that exposure to international markets has either a strong positive effect on firms' incentives to innovate or on their ability to innovate.[6] In part, this occurs because international trade and investment allow for a freer flow of technologies across borders, enhancing competitive pressures and opening new markets. Indeed, a number of studies find that firms that are involved in trade and investment are more productive and innovative than purely domestic firms.[7] For example, a study of Canadian exporters by Baldwin and Gu finds them to use technology more intensively and have higher rates of innovation than non-exporters.[8] Likewise, importers are 7.6 percent more likely to adopt new technology than are firms that do not import.[9]

Moreover, the global shift from a closed, linear innovation model to an open innovation model, which requires closer coordination between network partners, makes a free trade and investment environment that enables relatively free interaction between suppliers, competitors, and customers more important than ever before.[10] While some countries have used restrictive trade and investment policies as part of efforts to develop domestic industries (so-called import substitution industrialization policies), they may lead countries to be excluded from global value chains, ultimately doing more harm than good to their countries. Indeed, global value chains driven by multinational corporations (MNCs) are a key conduit for technology transfer and innovation; thus, a stable trade and investment environment conducive to MNCs is likely to promote further technology transfer and innovation. Likewise, small to medium-sized enterprises that are linked to the global market are more innovative and can make use of global value chains to improve their technology and ability to innovate.

Assessing Country Ranks on Free Trade and Foreign Direct Investment

To assess countries' openness to international trade and investment, this section analyzes fifteen indicators divided into three categories: open market access, trade facilitation, and foreign direct investment. In assessing country ranks, 65 percent of the weight is allocated to measures of open market access, particularly to tariff barriers and their complexity, extent of non-tariff barriers (NTBs), degree of services trade liberalization, and participation in regional free trade agreements. Fifteen percent is allocated to countries' extent of trade facilitation and 20 percent is allocated based on an analysis of countries' foreign direct investment policies. Table 2-1 shows the indicators used and their relative weights. Countries' scores on the market access, trade facilitation, and foreign direct investment indicators account for 17.5 percent of their overall score.

Table 2-2 shows countries' ranks on openness to trade and FDI. In the upper tier are predominantly EU and OECD countries that have been deeply engaged in the process of trade liberalization since World War II. These countries in general have made the most progress in removing tariff and non-tariff barriers. No country in the upper tier engages in currency manipulation. In the upper-mid tier are predominantly Eastern European countries and several Latin American ones that have made significant progress in removing trade barriers but have slightly more progress to make before they reach the level of the leaders. Lower-mid-tier countries retain considerable tariff barriers; have erected more NTBs; and place greater controls on foreign direct investment. Some in this tier, like Chinese Taipei and Japan,

Table 2-1: Trade and Foreign Direct Investment Indicators

Section Weight	Indicator	Data Type	Source	Indicator Weight
65%	**Open Market Access**			
	Simple Mean Tariff Rate, All Products	% Rate	World Bank	5.00%
	Simple Mean Tariff Rate, Manufactured Products	% Rate	World Bank	2.50%
	Tariff Rate, Advanced Technology Products (lithium-ion batteries)	% Rate	WTO	2.50%
	Complexity of Tariffs	Rating	ITC	2.50%
	Share of Duty-Free Imports	% of Total Imports	ITC	2.50%
	Index of Non-Tariff Measures	Rating	ITC	7.50%
	Non-tariff Trade Barriers	Rating	Fraser Institute	7.50%
	GATS Commitments Restrictiveness Index	Rating	World Bank	5.00%
	Currency Manipulation	Y/N	Peterson Institute	20.00%
	Participation in Regional Trade Agreements	#	ITC	10.00%
15%	**Trade Facilitation**			
	Customs Services Index	Rating	WEF	3.75%
	Time to Import Goods	# of Days	World Bank	3.75%
	Documents to Import Goods	# of Documents	World Bank	3.75%
	Irregular Payments in Exports and Imports	Rating	WEF	3.75%
20%	**Openness to Foreign Direct Investment**			
	Foreign Equity Restrictions	Rating	OECD	8.00%
	Screening and Approval Requirements	Rating	OECD	4.00%
	Key Personnel Restrictions	Rating	OECD	4.00%
	Operational Restrictions	Rating	OECD	4.00%

Table 2-2: Country Ranks for Trade and Foreign Direct Investment (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Australia	Bulgaria	Chinese Taipei	Argentina
Austria	Cyprus	Israel	Brazil
Belgium	Hong Kong	Japan	China
Canada	Iceland	Malaysia	India
Chile	Malta	South Africa	Indonesia
Czech Republic	Mexico	South Korea	Philippines
Denmark	Peru	Turkey	Russia
Estonia	Poland	Vietnam	Thailand
Finland	Switzerland		
France			
Germany			
Greece			
Hungary			
Ireland			
Italy			
Latvia			
Lithuania			
Luxembourg			
Netherlands			
New Zealand			
Norway			
Romania			
Portugal			
Singapore			
Slovak Republic			
Slovenia			
Spain			
Sweden			
United Kingdom			
United States			

have otherwise strong trade regimes but have engaged in currency manipulation, which lowers them a tier. Finally, lower-tier countries, such as Argentina, Brazil, China, India, and Russia, engage in a number of trade-distorting activities, especially currency manipulation; impose NTBs such as restrictions on foreign direct investment and conditions on market access; and maintain quite high tariff levels.

Market Access

Tariffs

High tariffs distort innovation in a number of ways. First, they often disadvantage more innovative, productive, and efficient foreign competitors, while protecting domestic enterprises that often are less innovative, productive, and efficient. Further, in the interest of trying to favor domestic sectors on which the tariffs are applied, high tariffs damage other industries in the economy that are consumers of those goods. For example, high tariffs applied on foreign ICT products in the interest of supporting domestic ICT producers have the effect of both raising the cost of ICT goods for other industries in an economy and inhibiting the ability of those sectors to procure best-of-breed information and communications technologies. Hence, placing high tariffs on one sector of an economy often damages all the other sectors of an economy. Ultimately, then, high tariffs distort global markets for innovative products and services and,

by disadvantaging the economic interests of the most efficient and innovative enterprises, leave the world with less innovation than otherwise would be the case.

Table 2-3 displays the simple mean tariff rate on all products applied by the fifty-five countries in our study. Hong Kong, Singapore, and Switzerland have eliminated most of their tariffs and show a simple mean applied tariff rate of 0 percent, followed by Norway at 0.5 percent and Iceland at 1.8 percent. As a whole, EU countries apply simple mean tariffs of 1.9 percent, compared to the United States' 2.9 percent, and China's 8.0 percent. South Korea, Thailand, Argentina, India, and Brazil apply the highest tariffs, all in excess of 10 percent, with Brazil's tariffs as high as 13.4 percent. At 5.1 percent, average tariffs in APEC countries are almost double the OECD country average of 2.6 percent and are 2.7 times higher than tariffs in the EU countries. This shows that, despite the significant progress APEC countries have made in trade liberalization—average applied tariff rates among APEC member countries have declined from 17 percent to 6 percent since APEC's inception—APEC countries still have significant room for progress in trade liberalization.[11] Across all countries in the study, tariffs averaged 3.7 percent.

The high tariffs in Argentina, India, and Brazil show that the legacy of these countries' import substitution industrialization policies, which sought to impose high tariffs on foreign imports with the goal of stimulating

Table 2-3: Simple Mean Tariff Rate Applied, All Products[13]

Country	Simple Mean Tariff Rate, All Products	Country	Simple Mean Tariff Rate, All Products
Hong Kong	0.0	Sweden	1.9
Singapore	0.0	United Kingdom	1.9
Switzerland	0.0	New Zealand	2.5
Norway	0.5	Turkey	2.5
Iceland	1.8	Japan	2.6
Austria	1.9	Australia	2.9
Belgium	1.9	United States	2.9
Bulgaria	1.9	Canada	3.3
Cyprus	1.9	Indonesia	4.8
Czech Republic	1.9	Peru	4.8
Denmark	1.9	Chile	4.9
Estonia	1.9	Philippines	5.3
Finland	1.9	Israel	6.0
France	1.9	Russia	6.0
Germany	1.9	Chinese Taipei	6.1
Greece	1.9	Malaysia	6.8
Hungary	1.9	Vietnam	7.1
Ireland	1.9	South Africa	7.6
Italy	1.9	Mexico	7.8
Latvia	1.9	China	8.0
Lithuania	1.9	South Korea	10.3
Luxembourg	1.9	Thailand	11.2
Malta	1.9	Argentina	11.4
Netherlands	1.9	India	11.5
Poland	1.9	Brazil	13.4
Portugal	1.9	**All Countries**	**3.7**
Romania	1.9	**APEC-19 Countries**	**5.1**
Slovak Republic	1.9	**EU Countries**	**1.9**
Slovenia	1.9	**OECD Countries**	**2.6**
Spain	1.9		

the creation of domestic industries and shielding them from foreign competition, remains alive in these countries. Yet, such import substitution industrialization policies failed because they depended on markets that were too small or too poor to provide economies of scale and on demand conditions that were too isolated to produce globally competitive industries. They typically resulted in inefficient production of bad products by insulated state-owned enterprises.[12]

Table 2-4 shows countries' simple mean applied tariffs on manufactured products. Again, Hong Kong, Singapore, and Switzerland impose virtually no tariffs on manufactured products, followed by Norway at 0.3 percent and Turkey at 1.2 percent. EU countries apply tariffs of 1.9 percent on manufactured products, while the United States imposes simple mean tariffs of 3.0 percent on manufactured products. China, India, Thailand, Argentina, and Brazil impose the highest tariffs on manufactured products, with Brazil's tariffs the highest at 14 percent. China continues to impose high tariffs on manufactured products despite the fact that it accrued a global trade surplus of $297 billion in 2009.[15]

Tariffs on Advanced Technology Products

Unfortunately, steep tariffs persist among many countries across a range of advanced technology products, including for information and communications technology (ICT) products (as discussed in the digital polices section) and renewable energy products. For example, as

Table 2-4: Simple Mean Tariff Rate Applied, Manufactured Products[14]

Country	Simple Mean Tariff Rate, Manufactured Products	Country	Simple Mean Tariff Rate, Manufactured Products
Hong Kong	0.0	Spain	1.9
Singapore	0.0	Sweden	1.9
Switzerland	0.0	United Kingdom	1.9
Norway	0.3	Japan	2.1
Turkey	1.2	New Zealand	2.6
Iceland	1.7	United States	3.0
Austria	1.9	Australia	3.1
Belgium	1.9	Canada	3.6
Bulgaria	1.9	Chile	4.9
Cyprus	1.9	Peru	4.9
Czech Republic	1.9	Indonesia	5.0
Denmark	1.9	Philippines	5.1
Estonia	1.9	Israel	5.6
Finland	1.9	Russia	6.0
France	1.9	Malaysia	6.1
Germany	1.9	Vietnam	6.9
Greece	1.9	South Korea	7.4
Hungary	1.9	Mexico	7.5
Ireland	1.9	South Africa	7.9
Italy	1.9	China	8.0
Latvia	1.9	India	10.3
Lithuania	1.9	Thailand	10.5
Luxembourg	1.9	Argentina	11.9
Malta	1.9	Brazil	14.0
Netherlands	1.9	Chinese Taipei	N/A
Poland	1.9	**All Countries**	**3.5**
Portugal	1.9	**APEC-19 Countries**	**4.8**
Romania	1.9	**EU Countries**	**1.9**
Slovak Republic	1.9	**OECD Countries**	**2.4**
Slovenia	1.9		

Table 2-5: Tariffs on Advanced Technology Products (i.e., Lithium-ion Cells and Batteries)[16]

Country	Tariffs on Lithium-ion Cells and Batteries (%)	Country	Tariffs on Lithium-ion Cells and Batteries (%)
Australia	0.0	Romania	4.7
Estonia	0.0	Spain	4.7
Hong Kong	0.0	Sweden	4.7
Iceland	0.0	Turkey	4.7
Japan	0.0	United Kingdom	4.7
Latvia	0.0	Chile	6.0
Lithuania	0.0	Czech Republic	7.0
Malaysia	0.0	Slovak Republic	7.0
Mexico	0.0	Argentina	8.0
New Zealand	0.0	Brazil	8.0
Norway	0.0	Hungary	8.0
Singapore	0.0	South Korea	8.0
Chinese Taipei	2.5	Malta	9.0
United States	2.7	Peru	9.0
Philippines	3.0	Poland	9.0
Canada	3.5	India	10.0
Israel	4.0	Indonesia	10.0
Austria	4.7	South Africa	10.0
Belgium	4.7	Thailand	10.0
Cyprus	4.7	Bulgaria	12.4
Denmark	4.7	China	14.0
Finland	4.7	Russia	15.0
France	4.7	Slovenia	15.0
Germany	4.7	Vietnam	26.0
Greece	4.7	Switzerland	N/A
Ireland	4.7	**All Countries**	**5.6**
Italy	4.7	**APEC-19 Countries**	**5.8**
Luxembourg	4.7	**EU Countries**	**5.5**
Netherlands	4.7	**OECD Countries**	**4.4**
Portugal	4.7		

Table 2-5 illustrates, Vietnam, Russia, and China place maximum tariffs of 26 percent, 15 percent, and 14 percent, respectively, on lithium-ion cells and batteries, even though the greater use and development of such batteries for electric vehicles can be a critical component in addressing global warming. Other countries, such as Chile, the Czech Republic, Slovak Republic, Peru, India, and Indonesia place rather high tariffs on lithium-ion cells and batteries, with tariffs in those countries ranging from 6 percent to 10 percent. EU countries average tariffs of 4.7 percent, bettered by the United States' 2.7 percent tariff on these products. Laudably, Australia, Estonia, Hong Kong, Iceland, Japan, Latvia, Lithuania, Malaysia, Mexico, New Zealand, Norway, and Singapore impose no tariffs on lithium-ion cells and batteries. But, overall, tariffs imposed on important high-technology products tend to be higher than the average for manufactured products. Indeed, for all countries in the study, average tariffs on lithium-ion cells and batteries are 60 percent higher than for manufactured products.

Complexity of Tariffs and Share of Imports Entering Duty-Free

Beyond countries' sheer tariff levels, another component of open market access is the complexity of those tariff levels.[17] The World Economic Forum's (WEF) *Global Enabling Trade Report 2010* creates a composite index of the nature of countries' tariffs based on four hard-data measures, scoring countries from seven (best) to one (worst), as Table 2-6 illustrates.[18] On this measure,

Chile and Hong Kong lead the world with a perfect 7.0, followed by Singapore, Brazil, Australia, and Indonesia with scores of 6.9, 6.7, 6.4, and 6.4 respectively. Among industrialized countries, Canada has a fairly complex tariff structure resulting from a great degree of variance in its tariff rates. Japan has a highly complex tariff schedule that can be difficult for businesses to navigate due to the variance in and large number of distinct tariffs.[19] Likewise, the United States and the EU countries have room to remove some of the complexity from their tariff systems. When WEF released its *2010 Global Trade Report*, Switzerland ranked last among the 125 countries in its study for the complexity of tariffs. As the *2010 Global Trade Report* noted, "The country applies a staggering 6,662 distinct tariffs, while the count for second-to-last Russia amounts to 1,921. Moreover, over 82 percent of all tariff lines bear a specific tariff. Yet, this complexity seems to apply only to a limited share of trade, since almost 90 percent of all imports to Switzerland are duty-free."[20] However, during 2010, Switzerland introduced dramatic reforms to its tariff schedule, cutting the vast majority of tariffs to zero, explaining why Switzerland scores very well on tariff rates, but last on this indicator.

With regard to duty-free imports, Hong Kong and Singapore lead all countries in the study by allowing 100 percent of imports to enter their countries duty-

Table 2-6: Complexity of Tariffs[21]

Country	Complexity of Tariffs (7=Best; 1=Worst)	Country	Complexity of Tariffs (7=Best; 1=Worst)
Chile	7.0	Denmark	3.2
Hong Kong	7.0	Estonia	3.2
Singapore	6.9	Finland	3.2
Brazil	6.7	France	3.2
Australia	6.4	Germany	3.2
Indonesia	6.4	Greece	3.2
New Zealand	6.3	Hungary	3.2
China	6.2	Ireland	3.2
Mexico	6.1	Italy	3.2
Philippines	5.9	Latvia	3.2
Peru	5.8	Lithuania	3.2
Vietnam	5.7	Luxembourg	3.2
Chinese Taipei	5.2	Netherlands	3.2
South Africa	5.0	Poland	3.2
South Korea	4.9	Portugal	3.2
Turkey	4.8	Romania	3.2
Argentina	4.7	Slovak Republic	3.2
Canada	4.7	Slovenia	3.2
Malaysia	4.5	Spain	3.2
Iceland	4.2	Sweden	3.2
India	4.1	United Kingdom	3.2
Israel	4.1	Norway	2.8
Japan	3.5	Thailand	2.2
United States	3.5	Switzerland	1.9
Russia	3.3	Malta	N/A
Austria	3.2	**All Countries**	**4.1**
Belgium	3.2	**APEC-19 Countries**	**5.3**
Bulgaria	3.2	**EU Countries**	**3.2**
Cyprus	3.2	**OECD Countries**	**3.8**
Czech Republic	3.2		

Table 2-7: Share of Imports Entering Duty-free[22]

Country	Share of Duty-free Imports (%)	Country	Share of Duty-free Imports (%)
Hong Kong	100.0	Italy	63.9
Singapore	100.0	Latvia	63.9
Norway	96.2	Lithuania	63.9
Iceland	91.9	Luxembourg	63.9
Switzerland	88.6	Netherlands	63.9
Mexico	86.2	Poland	63.9
Canada	86.0	Portugal	63.9
Israel	82.0	Romania	63.9
Chile	80.1	Slovak Republic	63.9
Japan	77.2	Slovenia	63.9
Malaysia	76.6	Spain	63.9
United States	76.3	Sweden	63.9
Turkey	76.1	United Kingdom	63.9
Peru	73.2	Indonesia	61.0
New Zealand	67.6	Argentina	57.5
South Africa	66.2	Australia	56.7
Chinese Taipei	65.6	Vietnam	51.3
Austria	63.9	Philippines	49.6
Belgium	63.9	South Korea	48.5
Bulgaria	63.9	China	46.0
Cyprus	63.9	Brazil	35.7
Czech Republic	63.9	Thailand	35.7
Denmark	63.9	Russia	31.2
Estonia	63.9	India	17.4
Finland	63.9	Malta	N/A
France	63.9	**All Countries**	**65.6**
Germany	63.9	**APEC-19 Countries**	**66.8**
Greece	63.9	**EU Countries**	**63.9**
Hungary	63.9	**OECD Countries**	**69.3**
Ireland	63.9		

free, as Table 2-7 shows. They are followed by Norway and Iceland, which allow more than 90 percent of imports to enter their countries duty-free. Switzerland, Mexico, Canada, Israel, and Chile allow more than 80 percent of imports to enter duty-free. In contrast, India only allowed 17.4 percent of products to enter duty-free, followed by Russia at 31.2 percent, and Brazil and Thailand at 35.7 percent

Non-Tariff Barriers and Technical Standards

While countries worldwide have made progress in reducing tariffs, the effect of those decreases has been tempered by a corresponding rise in non-tariff barriers (NTBs). In fact, though they are difficult to measure, it is likely that non-tariff barriers now have a greater detrimental impact on world trade than tariffs do.[23] Non-tariff barriers refer to measures other than tariffs that result in a distortion to trade, including quantitative restrictions, price controls, subsidies, non-tariff charges, unwarranted customs procedures, currency manipulation, and discriminatory application of technical standards. Other non-tariff barriers that seek to restrict trade include controls on foreign direct investment; forced technology or intellectual property transfer as a condition of market access; forced local production as a condition of market access; discriminatory rules and regulations, including those pertaining to health and safety standards; weak

intellectual property protection; and unfair import licensing requirements. As the Global Trade Alert organization's *9th GTA Report* notes about the rising incidence of countries' use of non-tariff barriers, "One of the defining characteristics of contemporary protectionism is the fact that so little of it is effectively regulated by multilateral trade rules."[24] This study employs two measures to assess the extent of countries' use of non-tariff barriers: an index of non-tariff measures developed by the WEF's *2010 Global Trade Report* and the *Economic Freedom of the World Index's* Non-tariff Trade Barriers rating, as Table 2-8 displays.

Technical standards are a particularly important component of non-tariff barriers. The development of voluntary, transparent, and market-led global standards for products and technologies benefits producers and consumers alike, augmenting innovation throughout the global trading system. Internationally compatible standards enable businesses to leverage technologies and manufacture products efficiently at economies of scale by reducing the cost that otherwise would be involved in producing specific variations of products to meet different jurisdictions' standards. Consumers benefit from technology standards every time they are able to use the same USB port across multiple computing or consumer electronics products, to use their cell phone in different economies, or to communicate using data and audio standards.[25] Standards have become increasingly important because they directly affect up to 80 percent of world trade, and because they are ubiquitous in ICT products and services.[26]

In essence, standards form a bridge between markets and technologies, and whoever controls that bridge can greatly influence global trade.[27] Due to this power, standards can be used as a tool to block or limit foreign companies' access to domestic markets, especially in ICT industries.[28] Economies that develop discriminatory national standards typically have two goals. First, they hope to give local companies a competitive advantage by keeping foreign competitors out of the market. Second, they seek to avoid having to pay royalties on foreign intellectual property. For example, economies may enact mandatory standards ("technical regulations") that are incompatible with global standards, thus preventing foreign competitors from entering their markets or forcing them to adopt the domestic standard and then pay royalties to the domestic IP owner.[29] By imposing these unfair standards-related measures, governments ultimately harm local consumers and businesses. These costs can be significant. The OECD estimates that complying with economy-specific technical standards can add as much as 10 percent to the cost of an imported product.[30] Discriminatory standards raise the cost of capital goods, which leads in an economy to less competitive industries and less innovation.

The World Economic Forum's Non-Tariff Measures Index scores countries on two hard data points: the percentage of trade affected by non-tariff measures and the average number of notifications for products affected by NTBs. This data shows that Iceland, Norway, and Canada make the least use of non-tariff measures, with those countries recording scores of 2.6, 3.6, and 7.8 percent, respectively (on a scale where a score of zero is best and a score of 100 worst). On the other hand, Russia and the Philippines lead all countries in the percentage of trade affected by non-tariff measures and the number of products affected by non-tariff barriers, registering scores of 96.0 and 88.0, respectively. Thailand, Argentina, Japan, South Africa, and Brazil make the next-most-extensive use of NTBs. Indeed, this data shows that the use of non-tariff barriers remains extensive across many countries. Therefore, as nations continue to seek greater global integration and trade liberalization, assiduously eliminating NTBs offers perhaps the greatest opportunity for improvement.

The *Economic Freedom of the World Index* reports corporate executive opinion survey answers on countries' use of NTBs that appears to reinforce the quantitative findings to some extent, as Argentina, Russia, and Brazil were judged to make the most extensive use of non-tariff barriers, as the final column of Table 2-8 shows. (However, Norway, which scores second-best on quantitative measures of NTB usage, ranks fourth-lowest in the opinion survey). Executive opinion finds Hong Kong, Chile, Singapore, New Zealand, Luxembourg, and Sweden to rate most highly in eschewing NTB use.

Services Trade Liberalization

One important group of non-tariff barriers pertains to trade in services, where a number of barriers persist, particularly in the financial, engineering, legal, medical, ICT services, transportation, and tourism sectors. Scores of countries jealously guard many of their incumbent firms in non-traded sectors, such as European restrictions on cross-border licensing of legal or medical professionals, and the constrained competition in financial services because of regulatory restrictions.[32] Given these myriad restrictions, services trade liberalization represents the next frontier in global trade integration and liberalization.

Table 2-9 shows countries' scores on the General Agreement on Trade in Services (GATS) Commitments Restrictiveness Index, which measures the extent of GATS commitments for all 155 services sub-sectors as classified by the GATS. Countries are scored from zero (unbound or no commitments) to 100 (completely liberalized). Austria, Latvia, the United States, Iceland, and Lithuania are countries most open to trade in services. As a region,

Table 2-8: Measures of Countries' Non-Tariff Barriers[31]

Country	Non-tariff Measures Index (10=Best; 0=Worst)	Country	EFOTW Index of Non-Tariff Barriers (10=Best; 0=Worst)
Iceland	2.6	Hong Kong	9.2
Norway	3.6	Chile	8.9
Canada	7.8	Singapore	8.9
Switzerland	13.5	New Zealand	8.7
Malaysia	16.9	Luxembourg	8.3
United States	16.9	Sweden	8.3
Australia	18.0	Czech Republic	8.2
Singapore	19.9	Finland	8.1
Vietnam	21.6	Slovak Republic	8.0
New Zealand	22.7	Belgium	7.9
China	23.8	Estonia	7.9
Chinese Taipei	23.9	Ireland	7.8
Chile	24.8	Austria	7.6
Lithuania	27.6	Latvia	7.5
Peru	28.8	Portugal	7.5
India	29.9	Denmark	7.4
Luxembourg	31.2	Israel	7.4
Greece	31.6	Australia	7.4
Bulgaria	32.2	Cyprus	7.3
Portugal	32.8	Hungary	7.3
Italy	34.2	Malta	7.3
Latvia	34.6	Netherlands	7.3
Romania	36.0	United Kingdom	7.2
Mexico	36.9	France	7.1
Estonia	37.1	Slovenia	7.0
Netherlands	40.0	Greece	6.9
Cyprus	40.1	Germany	6.8
Slovenia	40.6	Indonesia	6.7
Finland	40.8	Spain	6.6
United Kingdom	41.1	Canada	6.5
Poland	41.5	Peru	6.5
Austria	41.6	United States	6.5
Denmark	41.9	Lithuania	6.4
Sweden	42.5	Mexico	6.4
France	42.8	Poland	6.4
Indonesia	43.3	Chinese Taipei	6.3
Belgium	43.4	Italy	6.3
Germany	43.8	Romania	6.3
Spain	44.7	South Africa	6.2
Slovak Republic	44.8	Turkey	6.2
Czech Republic	45.3	China	6.0
Hungary	47.8	South Korea	5.9
Ireland	48.6	India	5.7
Brazil	52.4	Thailand	5.7
South Africa	54.6	Malaysia	5.6
Japan	62.0	Bulgaria	5.4
Argentina	62.5	Japan	5.4
Thailand	69.3	Switzerland	5.4
Philippines	88.0	Iceland	5.3
Russia	96.0	Philippines	5.3
Hong Kong	N/A	Vietnam	5.2
Israel	N/A	Norway	5.1
Malta	N/A	Brazil	4.8
South Korea	N/A	Russia	4.3
Turkey	N/A	Argentina	3.8
All Countries	**37.4**	**All Countries**	**6.8**
APEC-19 Countries	**36.5**	**APEC-19 Countries**	**6.6**
EU Countries	**39.6**	**EU Countries**	**7.3**
OECD Countries	**34.4**	**OECD Countries**	**7.1**

Table 2-9: GATS Commitments Restrictiveness Index, 2007[33]

Country	GATS Commitments Restrictiveness Index (High Score Best)	Country	GATS Commitments Restrictiveness Index (High Score Best)
Austria	72.1	South Korea	41.2
Latvia	69.1	Romania	41.1
United States	65.2	Poland	40.1
Iceland	64.4	Ireland	39.0
Lithuania	59.7	Slovak Republic	38.9
Australia	59.0	China	36.2
Hungary	58.5	Bulgaria	36.1
Finland	57.2	Mexico	35.9
Estonia	56.7	Vietnam	30.2
Norway	56.6	Turkey	27.9
Switzerland	53.7	Brazil	26.4
South Africa	53.4	Hong Kong	25.5
New Zealand	52.2	Malaysia	25.4
Slovenia	52.2	Peru	24.6
Canada	51.1	Singapore	22.7
Japan	48.8	Thailand	19.7
Sweden	48.5	Israel	14.8
Denmark	47.1	Philippines	14.1
Luxembourg	47.0	Chile	9.5
Netherlands	47.0	Indonesia	9.5
United Kingdom	46.8	India	6.7
Belgium	46.4	Malta	6.3
Germany	46.4	Cyprus	5.7
Spain	46.3	Chinese Taipei	N/A
France	45.9	Russia	N/A
Italy	45.6	**All Countries**	**40.6**
Greece	45.3	**APEC-19 Countries**	**33.6**
Portugal	44.2	**EU Countries**	**45.7**
Czech Republic	43.4	**OECD Countries**	**46.9**
Argentina	42.1		

Northern Europe (and the Baltic states in particular) features the world's most liberalized service countries. Trade in services is most constrained in Cyprus, Malta, India, Chile, and Indonesia, which all score less than 10.0. Thailand, Israel, and the Philippines, each scoring less than 20.0, also have considerable opportunity to liberalize trade in the service sectors of their countries.

Currency Manipulation

Currency manipulation represents a particularly insidious form of non-tariff trade impediment. The IMF commits member countries to "avoid manipulating exchange rates or the international monetary system in order to prevent effective balance of payments adjustment or to gain an unfair competitive advantage over other members."[34] The IMF bylaws call for "discussion" with any countries that engage in "protracted large-scale intervention in one direction in exchange markets." (In reality, the IMF does virtually nothing to enforce this.) Additionally, the General Agreement on Tariffs and Trade (GATT), which is now an integral part of the WTO, indicates that "contracting parties shall not, by exchange action, frustrate the intent of the provisions of this Agreement."[35] Yet, more than simply violating international trade law, currency manipulation in one nation retards the development of innovation-based jobs in other countries, as well as the development of innovation globally. This is because currency adjustment is the principal way by which open markets adjust to changes in competitive

advantage, particularly when low-wage nations increase their competitiveness. If a low-wage nation has an absolute cost advantage over a high-wage nation, a falling currency in the high-wage nation is the natural adjustment mechanism—it makes imports more expensive and exports cheaper, restoring comparative equilibrium.[36] By disabling the principal adjustment mechanisms of international commerce, countries that manipulate their currencies accrue unsustainable trade surpluses and undermine confidence in trade's ability to bring globally shared prosperity through innovation. If global growth is to be maximized, the flow of goods, services, and capital should be determined on the basis of actual costs and prices, not on subsidies. Moreover, currency manipulation can hurt the manipulating nations themselves, especially since it raises the costs of key capital goods imports that can power productivity growth.

Trade analysts at the Peterson Institute for International Economics have found that a number of countries have intervened in currency markets to prevent their currency from appreciating.[37] Table 2-10 lists countries that the Institute for International Economics has identified as engaged in currency manipulation between May and October 2010. The list includes both developed countries (such as Israel, Japan, and Switzerland) and developing countries from a number of regions, though the list is principally populated by East Asian and Latin American countries.

Table 2-10:
Countries Practicing Currency Manipulation, May–October 2010[38] (in alphabetical order)

Country		
Argentina	Indonesia	South Africa
Brazil	Israel	South Korea
China	Japan	Switzerland
Chinese Taipei	Malaysia	Thailand
Hong Kong	Philippines	Turkey
India	Singapore	

Participation in Regional Free Trade Agreements

The extent to which countries participate in regional trade agreements is another indicator of trade liberalization. As Table 2-11 shows, EU countries participate in twenty-nine regional trade agreements. Outside of the European Union, Switzerland, Iceland, and Norway participate in the most regional free trade agreements. Outside of Europe, Chile, Singapore, Turkey, and Mexico participate in the most regional free trade agreements. The United States and Japan participate in eleven agreements each. Hong Kong (one), Chinese Taipei (two), South Africa (four), and Argentina (four) participate in the fewest regional free trade agreements. Brazil, Indonesia, and Vietnam each only participate in five agreements.

Trade Facilitation

Beyond implementing trade policies that ensure domestic markets are open to foreign products and services, it also is important that countries continue to take measures to reduce transaction costs related to customs procedures and administration. In fact, the losses businesses incur through delays at the border, lack of transparency and predictability, complicated documentation requirements, and similar outdated customs procedures can exceed the cost of tariffs. One survey of companies in the Asia-Pacific region found customs procedures to be the single most serious trade impediment, ahead of restrictive administrative regulations and tariffs.[40]

Efficiency in Customs Clearance

Countries have made significant improvement over the past decade at improving the efficiency of their customs administration. Many countries have aligned their tariff structures with the HS Convention of the World Customs Organization and have set up automated Single Window systems integrating both customs administration and other regulatory functions at the border.[41] These Single Window systems leverage information technologies to enable businesses to electronically submit standardized information and documents at a single entry point to fulfill all customs-related regulatory requirements.

For example, TradeNet, Singapore's Electronic Data Interchange system, launched in 1989, yielded dramatic efficiencies by linking public agencies and trade parties to a single point of transaction for most trade-related activities, ranging from payment of duties and taxes to processing of import and export permits and certificates. This system replaced twenty-one forms, twenty-three agencies, and delays of fifteen to twenty days with two electronic forms that enabled all necessary approvals to be generated in fifteen minutes.[42] Korea recognized in the early 2000s that its complex and inefficient customs procedures negatively impacted its national competitiveness and launched an ambitious modernization program called the uTradeHub facility, which features a single entry point e-customs system with one-time declaration and 100 percent electronic clearance features. The system has generated substantial savings for companies and government agencies alike, with average clearance time from port entry to release from a bonded warehouse reduced from

Table 2-11: Regional Trade Agreements Notified to the WTO[39]

Country	Regional Trade Agreements Notified to the WTO	Country	Regional Trade Agreements Notified to the WTO
Austria	29	Chile	18
Belgium	29	Singapore	16
Bulgaria	29	Turkey	16
Cyprus	29	Mexico	14
Czech Republic	29	Japan	11
Denmark	29	United States	11
Estonia	29	India	10
Finland	29	China	9
France	29	Peru	8
Germany	29	Thailand	8
Greece	29	Australia	7
Hungary	29	Israel	7
Ireland	29	Russia	7
Italy	29	Canada	6
Latvia	29	Malaysia	6
Lithuania	29	New Zealand	6
Luxembourg	29	Philippines	6
Malta	29	South Korea	6
Netherlands	29	Brazil	5
Poland	29	Indonesia	5
Portugal	29	Vietnam	5
Romania	29	Argentina	4
Slovak Republic	29	South Africa	4
Slovenia	29	Chinese Taipei	2
Spain	29	Hong Kong	1
Sweden	29	**All Countries**	**18.9**
United Kingdom	29	**APEC-19 Countries**	**8.0**
Switzerland	20	**EU Countries**	**29.0**
Iceland	19	**OECD Countries**	**22.6**
Norway	19		

9.6 days in 2003 to 3.5 days in 2007. Likewise, clearance time for air cargo fell from 4.6 days in 2003 to 2.78 days in 2007 and from 16.2 days to 5.9 days for sea cargo.[43] Other state-of-the art Single Window models include the United States' International Trade Data System[44] and the Canada Border Services Agency's Single Window Initiative (CWI). Another best practice seen in APEC economies is the use of diagnostic tools for regulatory self-assessment to help identify and deal with bottlenecks. Diagnostic tools (and electronic data interchange) contributed to Japan lowering the time required for sea and air cargo to clear customs by 81 and 74 percent, respectively, from 1991 to 2001. By 2006, import clearance took just 2.7 days for sea cargo and 0.6 days for air cargo.[45] In contrast, some countries are using border clearance procedures to restrict trade. For example, rather than allow the importation of food through any seaport, Indonesia has restricted such imports to a selected number of seaports. This measure will last for all of 2011 and 2012.[46]

The Global Express Associations' (GEA) Customs Services Index rates countries' customs agencies on fifteen measures, such as clearance of shipments via electronic data interchange; separation of physical release of goods from the fiscal control; full-time automated processing; customs working hours adapted to commercial needs; multiple inspections (inspections by agencies other than

customs), and the promptness of those inspections; exemptions from duties and taxes for shipments of minimal value; and appeal of customs decisions to a higher level or an independent tribunal. With a perfect score of 12.0, Singapore and the United Kingdom lead the world in customs administration, as Table 2-12 shows. Sweden, the United States, Austria, Hungary, and Ireland also score very highly with regard to efficient customs operations. Vietnam, Portugal, and Greece have the least-efficient customs operations, followed by Chinese Taipei, Brazil, and Luxembourg.

Another way to evaluate the efficiency of countries' import-export procedures is to consider the amount of time and number of documents required to import goods, as Table 2-13 shows. Singapore leads all countries in time to import at three days, followed by Cyprus, Denmark, Estonia, Hong Kong, and the United Stares at five days each. In contrast, it takes about seven times as much time in Russia and South Africa: thirty-five days and thirteen documents to import into Russia and thirty-six days and nine documents to import into South Africa. Such delays unnecessarily inhibit and distort global trade, yet often are intentionally put in place to discourage imports of foreign goods.

Transparency in Border Administration

Transparency in border administration ensures that products and services sold by enterprises from all countries are treated fairly. As such, the WEF's Executive Opinion

Table 2-12: *Global Express Association* Customs Services Index[47]

Country	Customs Services Index (12=Best; 0=Worst)	Country	Customs Services Index (12=Best; 0=Worst)
Singapore	12.0	Bulgaria	7.8
United Kingdom	12.0	China	7.8
Sweden	11.8	Iceland	7.8
United States	11.8	Belgium	7.7
Austria	11.5	Mexico	7.7
Hungary	11.5	Lithuania	7.6
Ireland	11.5	Poland	7.5
Netherlands	11.5	Russia	7.5
Japan	11.3	Turkey	7.5
Switzerland	11.0	India	7.3
Spain	10.8	Argentina	7.2
Czech Republic	10.5	Indonesia	7.2
Denmark	10.5	Finland	7.1
Estonia	10.5	Peru	6.8
Australia	10.3	Malaysia	6.6
Canada	10.3	Cyprus	6.5
New Zealand	10.0	Italy	6.5
Slovenia	10.0	Norway	6.5
Germany	9.6	Luxembourg	6.2
France	9.5	Brazil	6.1
Israel	9.5	Chinese Taipei	6.0
Slovak Republic	9.5	Greece	4.8
South Africa	9.5	Portugal	4.8
South Korea	9.5	Vietnam	3.3
Romania	9.4	Malta	N/A
Philippines	9.3	**All Countries**	**8.7**
Thailand	9.2	**APEC-19 Countries**	**8.6**
Hong Kong	8.8	**EU Countries**	**9.0**
Chile	8.3	**OECD Countries**	**9.3**
Latvia	8.1		

Table 2-13: Time and Number of Documents Required to Import Goods[48]

Country	Time Required to Import Goods (days)	Country	Documents Required to Import Goods
Singapore	3	France	2
Cyprus	5	Denmark	3
Denmark	5	South Korea	3
Estonia	5	Sweden	3
Hong Kong	5	Thailand	3
United States	5	Canada	4
Luxembourg	6	Estonia	4
Netherlands	6	Hong Kong	4
Sweden	6	Ireland	4
Germany	7	Israel	4
Norway	7	Italy	4
Australia	8	Luxembourg	4
Austria	8	Norway	4
Finland	8	Singapore	4
South Korea	8	United Kingdom	4
United Kingdom	8	Australia	5
Belgium	9	Austria	5
New Zealand	9	Belgium	5
Switzerland	9	China	5
Spain	10	Finland	5
Canada	11	Germany	5
France	11	Iceland	5
Japan	11	Japan	5
Lithuania	11	Mexico	5
Chinese Taipei	12	Netherlands	5
Ireland	12	New Zealand	5
Israel	12	Poland	5
Latvia	12	Portugal	5
Romania	13	Switzerland	5
Thailand	13	United States	5
Iceland	14	Cyprus	6
Malaysia	14	Greece	6
Portugal	15	Indonesia	6
Turkey	15	Latvia	6
Argentina	16	Lithuania	6
Brazil	16	Romania	6
Philippines	16	Argentina	7
Hungary	17	Brazil	7
Mexico	17	Bulgaria	7
Italy	18	Chile	7
Czech Republic	20	Chinese Taipei	7
India	20	Czech Republic	7
Bulgaria	21	Hungary	7
Chile	21	Malaysia	7
Slovenia	21	Peru	8
Vietnam	21	Philippines	8
China	24	Slovak Republic	8
Peru	24	Slovenia	8
Greece	25	Spain	8
Poland	25	Turkey	8
Slovak Republic	25	Vietnam	8
Indonesia	27	India	9
South Africa	35	South Africa	9
Russia	36	Russia	13
Malta	N/A	Malta	N/A
All Countries	**14.0**	**All Countries**	**5.7**
APEC-19 Countries	**15.0**	**APEC-19 Countries**	**5.9**
EU Countries	**12.7**	**EU Countries**	**5.3**
OECD Countries	**12.2**	**OECD Countries**	**5.1**

Survey on irregular payments in exports and imports, which asks how common it is for firms to make undocumented payments or bribes connected with imports and exports, reflects the degree of transparency in countries' border administration. As Table 2-14 illustrates, New Zealand, Denmark, Finland, Iceland, Singapore, and Sweden lead countries on this measure, with survey scores of 6.5 (out of 7) or higher. The Philippines, Vietnam, Russia, Argentina, Indonesia, and Bulgaria evince the greatest degree of irregular payments in exports and imports. As the WEF's *Global Enabling Trade Report 2010* notes, although fairly efficient, border administration remains subject to irregular payments and corruption in China.[49]

Foreign Direct Investment

A vital component of market access is countries' openness to both inward and outward foreign direct investment.[51] Competitive domestic markets let foreign firms compete in their markets and encourage foreign direct investment. Research shows that FDI can contribute significantly to regional innovation capacity and economic growth, in part through the transfer of technology and managerial know-how.[52] For example, Dahlman suggests that higher rates of FDI can explain the relatively higher technological growth rates in East Asian countries.[53] Coe, Helpman, and Hoffmeister find that a developing economy's productivity growth is larger the greater

Table 2-14: Irregular Payments in Exports and Imports[50]

Country	Irregular Payments in Exports and Imports (7=Best; 1=Worst)	Country	Irregular Payments in Exports and Imports (7=Best; 1=Worst)
New Zealand	6.7	South Korea	4.8
Denmark	6.5	Romania	4.7
Finland	6.5	Lithuania	4.6
Iceland	6.5	Czech Republic	4.4
Singapore	6.5	Peru	4.4
Sweden	6.5	Slovak Republic	4.4
Luxembourg	6.3	South Africa	4.4
Ireland	6.2	China	4.3
Norway	6.2	Hungary	4.3
Australia	6.0	Latvia	4.3
Canada	6.0	Malaysia	4.2
Chile	6.0	Italy	3.9
Hong Kong	6.0	Greece	3.8
Japan	6.0	Brazil	3.7
Netherlands	6.0	Mexico	3.6
Switzerland	6.0	Thailand	3.5
Austria	5.8	India	3.4
Israel	5.7	Turkey	3.4
Estonia	5.6	Bulgaria	3.1
Germany	5.6	Indonesia	3.1
Slovenia	5.5	Argentina	2.8
Belgium	5.4	Russia	2.7
Cyprus	5.4	Vietnam	2.7
United Kingdom	5.4	Philippines	2.4
Chinese Taipei	5.3	Malta	N/A
United States	5.3	**All Countries**	**4.9**
Portugal	5.2	**APEC-19 Countries**	**4.7**
France	5.1	**EU Countries**	**5.2**
Spain	5.0	**OECD Countries**	**5.4**
Poland	4.8		

its foreign R&D investment.[54] This is in part because multinationals can better attain both economies of scale and scope that enable them to be more productive than domestic-only firms, particularly in small and mid-sized countries. Eaton and Kortum estimate that one-half of the productivity growth in OECD countries is derived from trade, licensing, and FDI.[55] In other words, FDI builds international linkages and knowledge networks that augment innovation both domestically and around the globe. Foreign R&D investment also has been shown to spur local companies in the receiving country to increase their own share of R&D, leading to regional clusters of innovation-based economic activity. Therefore, it is essential that countries not only open their borders to inward foreign direct investment, but that they allow domestic firms to invest overseas as well.

The OECD provides four measures of FDI controls: Foreign Equity Limits, Screening and Prior Approval, Restrictions on Key Foreign Personnel, and Other Restrictions on the Operation of Foreign Controlled Entities (see Table 2-15).[56] The most direct form of FDI control is the restriction of foreign equity. For example, India prohibits investments in real estate, nuclear energy, railways, and most agricultural activities, among other sectors.[57] The Philippines limits foreign ownership of many firms to 40 percent.[58] Malaysia imposes stringent foreign equity limits in the financial sector. Mexico limits foreign equity ownership in the agriculture, energy, transportation, media, wireless communications, finance, legal services, and education sectors.[59]

The second measure is the presence of screening and approval requirements for FDI. Although screening and approval requirements may serve a legitimate economic purpose, they also may serve as a *de-facto* barrier to FDI through burdensome and time-consuming compliance or approval procedures. For example, New Zealand, with the lowest score in this measure, requires consent for any foreign investment that results in a) 25 percent or more controlling ownership or interest, b) the establishment of a new business with startup costs exceeding NZ $100 million, or c) the acquisition of business property with value exceeding NZ $100 million. New Zealand also places stringent approval requirements on "sensitive" land investments and fishing quota acquisitions.[60]

The third measure, Restrictions on Key Foreign Personnel, includes whether or not foreign personnel are permitted, whether there is an economic means test for the employment of foreign personnel, whether there is a time limit on foreign personnel employment, and the existence of a nationality or residence requirement for boards of directors. Peru, for example, has multiple personnel restrictions. Notably, all employers in Peru—including foreign-owned enterprises—must give preferential treatment to Peruvian nationals when hiring employees, foreign nationals may not comprise more than 20 percent of any enterprise's total number of employees, and their pay may not exceed 30 percent of an enterprise's total payroll.[61]

The final measure includes requirements for local incorporation, reciprocity requirements (whereby the terms of foreign direct investment are required to match those of an investor's country), restrictions on capital repatriation, and restrictions on access to local finance and land acquisition. For example, in China, which scores poorly on this measure, many FDI investments must be conducted as joint ventures with domestic Chinese firms, and often entail requirements to transfer technology.[62]

Table 2-15: Foreign Direct Investment Restrictions[63]

Country	Equity Restrictions (0=Best; 1=Worst)	Country	Screening & Approval (0=Best; 1=Worst)	Country	Key Personnel Restrictions (0=Best; 1=Worst)	Country	Operational Restrictions (0=Best; 1=Worst)
Luxembourg	0.003	Argentina	0.000	Argentina	0.000	Argentina	0.000
Netherlands	0.003	Belgium	0.000	Austria	0.000	India	0.000
Portugal	0.003	Brazil	0.000	Belgium	0.000	Luxembourg	0.000
Bulgaria*	0.003	Chile	0.000	Bulgaria*	0.000	Romania	0.000
Romania	0.008	Czech Republic	0.000	Canada	0.000	Slovakia	0.000
Slovenia	0.011	Denmark	0.000	Czech Republic	0.000	Slovenia	0.000
Belgium	0.014	Estonia	0.000	Denmark	0.000	Spain	0.000
Finland	0.019	Finland	0.000	Estonia	0.000	Denmark	0.001
Spain	0.019	France	0.000	Finland	0.000	Hungary	0.001
Germany	0.020	Germany	0.000	Germany	0.000	Netherlands	0.001
South Africa	0.022	Hungary	0.000	Hungary	0.000	Sweden	0.001
Australia	0.023	Indonesia	0.000	Iceland	0.000	Turkey	0.001
Argentina	0.025	Ireland	0.000	Ireland	0.000	Belgium	0.002
Sweden	0.028	Italy	0.000	Israel	0.000	South Korea	0.002
Greece	0.032	Japan	0.000	Italy	0.000	Australia	0.003
Ireland	0.035	Latvia	0.000	Latvia	0.000	Chile	0.003
Lithuania	0.036	Lithuania	0.000	Lithuania	0.000	Portugal	0.003
United Kingdom	0.036	Luxembourg	0.000	Luxembourg	0.000	Germany	0.004
France	0.038	Netherlands	0.000	Mexico	0.000	Italy	0.004
New Zealand	0.039	Norway	0.000	Netherlands	0.000	Canada	0.005
Czech Republic	0.049	Peru	0.000	New Zealand	0.000	Japan	0.005
Slovakia	0.049	Poland	0.000	Poland	0.000	Norway	0.005
Singapore*	0.051	Portugal	0.000	Portugal	0.000	Czech Republic	0.006
Latvia	0.051	Romania	0.000	Romania	0.000	United States	0.008
Estonia	0.052	Slovakia	0.000	Singapore*	0.000	Austria	0.009
Peru	0.057	Slovenia	0.000	Slovakia	0.000	Switzerland	0.011
Austria	0.058	South Africa	0.000	Slovenia	0.000	France	0.014
Poland	0.058	South Korea	0.000	South Africa	0.000	Indonesia	0.014
Denmark	0.063	Spain	0.000	Spain	0.000	Lithuania	0.014
Norway	0.063	Turkey	0.000	Sweden	0.000	Finland	0.021
Hungary	0.065	United Kingdom	0.000	Switzerland	0.000	United Kingdom	0.022
Canada	0.067	United States	0.000	United Kingdom	0.000	New Zealand	0.023
Chile	0.067	Greece	0.002	France	0.001	Greece	0.024
Italy	0.069	Austria	0.009	South Korea	0.001	Ireland	0.024
Israel	0.070	Switzerland	0.009	Turkey	0.001	Israel	0.032
Switzerland	0.070	Israel	0.018	Greece	0.002	Brazil	0.033
Turkey	0.070	India	0.025	Norway	0.002	Latvia	0.034
Brazil	0.080	Sweden	0.027	Australia	0.003	Mexico	0.037
United States	0.100	Russia	0.040	Brazil	0.005	Peru	0.045
Mexico	0.131	Canada	0.082	India	0.005	Estonia	0.046
South Korea	0.139	Mexico	0.095	Russia	0.005	Poland	0.053
Vietnam*	0.149	Australia	0.108	Japan	0.007	South Africa	0.067
Malaysia*	0.156	China	0.135	United States	0.008	China	0.069
Iceland	0.173	Iceland	0.200	Chile	0.015	Iceland	0.108
India	0.191	New Zealand	0.200	Malaysia*	0.018	Russia	0.122
Philippines*	0.192	Bulgaria	N/A	Thailand*	0.018	Bulgaria	N/A
Russia	0.216	Chinese Taipei	N/A	Philippines*	0.021	Chinese Taipei	N/A
China	0.226	Cyprus	N/A	Vietnam*	0.021	Cyprus	N/A
Japan	0.230	Hong Kong	N/A	China	0.048	Hong Kong	N/A
Thailand*	0.232	Malaysia	N/A	Indonesia	0.048	Malaysia	N/A
Indonesia	0.274	Malta	N/A	Peru	0.050	Malta	N/A
Chinese Taipei	N/A	Philippines	N/A	Chinese Taipei	N/A	Philippines	N/A
Cyprus	N/A	Singapore	N/A	Cyprus	N/A	Singapore	N/A
Hong Kong	N/A	Thailand	N/A	Hong Kong	N/A	Thailand	N/A
Malta	N/A	Vietnam	N/A	Malta	N/A	Vietnam	N/A
All Countries	**0.077**	**All Countries**	**0.021**	**All Countries**	**0.005**	**All Countries**	**0.019**
APEC-19 Countries	**0.138**	**APEC-19 Countries**	**0.055**	**APEC-19 Countries**	**0.016**	**APEC-19 Countries**	**0.028**
EU Countries	**0.033**	**EU Countries**	**0.002**	**EU Countries**	**0.000**	**EU Countries**	**0.012**
OECD Countries	**0.058**	**OECD Countries**	**0.022**	**OECD Countries**	**0.001**	**OECD Countries**	**0.014**

*Estimate

Chapter 3: Science and R&D

Why Science and R&D Polices Are Important

A country's science and R&D policies (sometimes referred to as its technology policies) are crucial determinants of its economic vitality. For more developed nations with higher labor costs and greater skills, this often means implementing science and R&D policies that increase the supply of ideas and knowledge in an economy and then incentivizing their commercialization. For less-developed nations, it often means implementing science and R&D policies that enable the nation's organizations to adopt newer and better technologies than are currently in use (although both these approaches are necessary for developed and developing nations alike). Underlying these policies is the fact that, without them, the level of innovation in an economy almost always is suboptimal from a societal perspective. Indeed, the significant spillover benefits from innovation mean that, even under "perfect" market conditions, the private sector will underinvest in the factors that produce innovation, including R&D. Furthermore, organizations often fail to adequately adopt existing innovations, in part because of "learning failures," but also because spillover effects apply to companies' investments in new capital equipment (for example, companies underinvest because they are unable to capture all of the benefits from their investments).[1]

Two additional problems can arise when relying on market forces alone to dictate innovation investment. The first is that firms will particularly underinvest in basic and early-stage applied research where the positive spillovers are greatest. This is where universities and other research organizations come in: these organizations tend to conduct more of the basic research that the private sector then can draw upon for product and process innovations. The second problem is the so-called "valley of death." The path through the "valley" from early-stage research to commercialization often is long and plagued with setbacks and uncertainty. As such, firms often will shy away from traversing it, instead relying upon less innovative paths to short-term profits.

To alleviate these problems, governments need to step in and support private sector investment through, among other policies, public funding of R&D, tax policies that support R&D and new capital investment, and programs and policies that encourage innovation networks and help organizations adopt best practice technologies. While these policies might focus solely on increasing the output of domestic innovation and modernizing existing industries, perhaps more important in the globalized economy is that they also promote international linkages—or, in other words, not just regional, but global innovation networks. The sharing of ideas, knowledge, and skills across borders benefits not only the domestic economy, but also the world economy as a whole. It is a win-win arrangement; the size of the "innovation pie" increases for all.

As Coe and Helpman explain, "In a world with international trade in goods and services, foreign direct investment, and an international exchange of information and dissemination of knowledge, a country's productivity depends both on its own R&D as well as on the R&D efforts of its trade partners." Indeed, their study found that the own-country rate of return from R&D conducted in the G7 countries was 123 percent, but that the *worldwide* rate of return from R&D investment conducted in the G7 countries was 155 percent.[2] In this vein, science and R&D policies should be open to the participation of foreign-controlled firms that operate domestically. For example, R&D tax incentives should not discriminate against foreign firms.[3] Nor should public research funds be allocated solely to domestically controlled companies. Unfettered participation in the global economy is the key to harnessing the network effects that compound the returns on a country's innovation investments.

Nevertheless, an ad-hoc approach to the implementation of these policies can limit their effectiveness. For example, industry clusters may underperform if they are nothing more than regional collections of isolated firms that do not collaborate in an innovation ecosystem. And policies may be targeting the wrong innovation challenges, especially if countries try to become world innovation leaders before significantly moving up the learning and value chain.[4] Hence, countries should develop and continually refine national innovation and competitiveness strategies such that policies are relevant and take advantage of their potential synergies. Countries should utilize a diverse portfolio of science and R&D tools, targeting strategic and broad technologies and industries at all stages of their development. Indeed, recognizing that neither traditional science support agencies nor large, inflexible economic ministries can adequately coordinate innovation policies, many countries worldwide either have created or expanded national innovation foundations over the last decade. The most effective ones—such as those of Australia, Austria, Chinese Taipei, Denmark, Finland, Japan, the Netherlands, Portugal, Singapore, South Korea, Sweden, and the United Kingdom—have broad authority to shape and coordinate their country's innovation policies.

Table 3-1: Science and R&D Policy Indicators

Indicator	Data Type	Source	Indicator Type
R&D Tax Incentives	Index	OECD	20%
Government R&D Expenditure			
Non-Defense	% of GDP	OECD, UNESCO	30%
Defense	% of GDP	OECD, UNESCO	20%
Higher Education R&D Performance	% of GDP	UNESCO	20%
Industry Cluster Development	Rating	WEF	10%

Assessing Country Ranks on Science and R&D Policy

This section uses five indicators to assess countries' science and R&D policies, as shown in Table 3-1. The indicators include countries' R&D tax incentives; defense[5] and non-defense government R&D expenditures; higher education R&D performance; and industry cluster development activities. Countries' scores on science and R&D policies account for 17.5 percent of the weight used to determine the aggregate rank of countries in this study.

Based on these measures, much of Western Europe and North America, the four Asian Tigers, and the BRIC countries (Brazil, Russia, India, and China) dominate the two upper tiers in science and R&D policy. Australia scores highly on science and R&D policy, primarily due to its first-class R&D tax incentive regime. Japan scores reasonably well on all indicators, reaching the upper-mid tier. Russia makes it into the upper-mid tier mainly due to its high level of defense R&D spending. In the two lower tiers are countries that still need to substantially improve their science and R&D policies. New Zealand and Mexico have

Table 3-2: Country Ranks on Science and R&D Policy (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Australia	Brazil	Argentina	Bulgaria
Austria	China	Belgium	Indonesia
Canada	Czech Republic	Chile	Luxembourg
Chinese Taipei	Estonia	Cyprus	Malaysia
Denmark	Germany	Greece	Malta
Finland	Hong Kong	Hungary	Mexico
France	Iceland	Ireland	Peru
Netherlands	India	Latvia	Philippines
Norway	Israel	New Zealand	Slovak Republic
Singapore	Italy	Poland	Thailand
South Korea	Japan	Romania	Vietnam
Spain	Lithuania	South Africa	
Sweden	Portugal	Turkey	
	Russia		
	Slovenia		
	Switzerland		
	United Kingdom		
	United States		

regressed in this policy area, having recently abolished their R&D tax incentives and continuing to lag behind other countries in government R&D expenditure and university R&D performance. Many East Asian countries, such as Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, have underdeveloped science and R&D polices. Although Turkey has a relatively generous R&D tax incentive regime, the country falls flat in the rest of the indicators, with low scores in government R&D expenditure in particular. On the other hand, Finland, Sweden, and Switzerland do not provide R&D tax incentives but rate highly on the other four indicators.

R&D Tax Incentives

The first sub-indicator rates countries on the strength of their R&D tax incentives. Most R&D tax incentives work by providing an incentive to all firms in all industries that conduct R&D to conduct more of it, in large part as a response to the market failure of firms being unable to appropriate all of the benefits of their own R&D, even with patent and other IP systems. These incentives can be effective tools with which to increase private investment in innovation. Not only do they help firms overcome the "valley of death" problem, whereby firms shy away from investment in innovation due to its inherent uncertainties, but tax incentives also aid in bringing innovation investment up to its socially optimal level. A plethora of studies have found that the economy-wide social rate of return from corporate R&D and innovation activities is at least twice the estimated returns that a company itself receives.[6] For example, Tewksbury, Crandall, and Crane examine the rate of return from twenty prominent innovations and find a median private rate of return of 27 percent but a median social rate of return of a whopping 99 percent, almost four times higher.[7]

Almost all scholarly studies conducted since the early 1990s find R&D tax incentives to be both effective and efficient.[8] A study of the pre-2011 regime of Australian R&D tax incentives finds that it produced about one dollar of R&D for every dollar of tax expenditure.[9] The Canadian tax credit, according to three separate studies, generates between ninety-eight cents and $1.38 in additional R&D for every dollar of credit.[10] Several studies have evaluated the effect of tax incentives for research across a number of nations. In examining R&D tax incentives in seventeen OECD nations, Guellec and van Pottelsberghe find that incentives effectively stimulate business R&D.[11] Falk finds that every dollar of R&D tax expenditure stimulates at least ninety cents in additional business R&D.[12] Another cross-national study by Wolff and Reinthaler concludes that R&D tax subsidies stimulate at least one dollar of R&D for every dollar of tax expenditure.[13] Likewise, in a study of nine OECD nations, Bloom and Griffith find that every dollar of R&D tax expenditure stimulates approximately one dollar of business R&D. They also find that three countries (Australia, Canada, and Spain) that made significant changes in their credits saw increases in private R&D, while decreases had the opposite effect.[14]

To maximize their impact on the innovation ecosystem, R&D tax incentives should conform to the following criteria:

1. R&D tax incentives should be relatively generous.
2. Tax incentives should be permanent and certain to reduce uncertainty and to promote long-term innovation projects. They should not require reauthorization after a set period of time.
3. Tax incentives should not discriminate against foreign firms operating domestically. Countries that discriminate against foreign-controlled firms in their economy do not reap the benefits from the sharing of ideas, knowledge, and skills that enhances the global innovation system as a whole.[15]
4. The definition of eligible R&D should be relatively broad and include both process and product innovations.[16] Eligible R&D also should include software development.
5. Eligibility should be open to all sectors, or open to key sectors or technologies selected in the context of a national innovation strategy.[17]

In Table 3-3, the value of R&D tax incentives is calculated as the average of one minus the B-index for both small and large firms, where "the B-index is defined as the present value of before-tax income necessary to cover the initial cost of R&D investment and to pay corporate income taxes, so that it is profitable to perform research activities."[18] The incentives rated in this section include tax credits, depreciation allowances, and other special allowances on R&D assets. B-index scores are penalized by 25 percent if the tax incentives discriminate against foreign-controlled firms.[19] Due to limitations of the B-index measure, features such as refunding and carry-forward or carry-back mechanisms are not included in this analysis; nor are the taxpayer and asset bases to which the R&D tax incentive is applied.[20]

Australia, France, and Spain have, by far, the most generous tax incentive regimes. Australia's average B-index score of 0.35 has been estimated in order to reflect its new R&D tax incentive system, which took effect in July 2011. Australia now provides one of the most generous R&D tax credits in the world, with large enterprises able to claim a 40 percent refundable credit and small and medium enterprises able to claim a 45 percent credit.[21] France, with an average B-index score of 0.425, offers an R&D tax credit equal to 30 percent of the first €100 million of eligible R&D expenditure and then 5 percent beyond that. Additionally, for new applicants, France offers a

40 percent credit in the first year and a 35 percent credit in the second year.[22] Some nations that have lagged behind in business R&D have turned to a very generous R&D credit to help them catch up. For example, Spain offers a multitude of R&D tax credits, including a flat 25 percent "volume" credit, an additional 42 percent "increment" credit for R&D expenditure that exceeds the average of the prior two years, a 17 percent credit for R&D personnel wages, and an 8 percent credit for investments in both tangible and intangible R&D equipment.[23] This generosity is reflected in Spain's impressive average B-index score of 0.349. Although substantially less generous than the prior three incentive regimes, Brazil, the Czech Republic, India, Norway, Portugal, South Korea, and Turkey form a second tier of incentive generosity that is nevertheless substantially more generous than those of the remaining nations.

Behind these leaders are countries that have some form of R&D tax incentives, but fall behind in their generosity.[24] One exception to this is Canada. Using the B-index methodology, the OECD bestows Canada with an average score of 0.253 due to its generous tax credit with large enterprises eligible for a 20 percent non-refundable credit and SMEs eligible for a 35 percent refundable

Table 3-3: R&D Tax Incentive Scores, 2008[49]

Country	R&D Tax Incentive Scores (B-Index Average), 2008	Country	R&D Tax Incentive Scores (B-Index Average), 2008
France	0.425	Switzerland	-0.008
Australia (2011)*	0.350	Iceland	-0.009
Spain	0.349	Israel	-0.011
Portugal	0.281	Luxembourg	-0.014
Czech Republic	0.271	Sweden	-0.015
India	0.269	Estonia*	-0.02
Brazil	0.254	Germany	-0.02
South Korea (2011)*	0.220	Mexico (2011)*	-0.02
Turkey	0.219	New Zealand	-0.02
Norway	0.219	Peru*	-0.02
Canada**	0.190	Argentina	N/A
South Africa	0.163	Bulgaria	N/A
Hungary	0.162	Chinese Taipei	N/A
China (2011)*	0.160	Cyprus	N/A
Netherlands	0.157	Hong Kong	N/A
Russia (2011)*	0.150	Indonesia	N/A
United Kingdom	0.142	Latvia	N/A
Denmark	0.138	Lithuania	N/A
Japan	0.138	Malaysia	N/A
Italy	0.117	Malta	N/A
Ireland	0.109	Philippines	N/A
Singapore	0.094	Romania	N/A
Belgium	0.089	Slovenia	N/A
Austria	0.088	Thailand	N/A
United States	0.066	Vietnam	N/A
Poland	0.016	**All Countries**	**0.111**
Greece	0.010	**APEC-19 Countries**	**0.089**
Chile	-0.006	**EU Countries**	**0.113**
Finland	-0.008	**OECD Countries**	**0.107**
Slovak Republic	-0.008		

*Estimate
**Canada's (positive) average B-index value (0.253) is penalized 25 percent for discrimination against foreign-controlled firms.

credit. However, ITIF has penalized Canada's average B-index score by 25 percent, because only Canadian-controlled firms are eligible for the 35 percent credit; foreign-controlled firms are eligible for only a 20 percent credit.[25] Canada's adjusted score is thus 0.190. Countries falling behind due primarily to generosity include Japan, the Netherlands, South Africa, the United Kingdom, and the United States. For example, firms in the United States qualify for a credit of 20 percent of eligible R&D expenditure exceeding a complicated base amount, or they can take the Alternative Simplified Credit (ASC) of 14 percent exceeding 50 percent of the average of the three prior years' expenditure. But, according to the professional services firm Deloitte, "The cumulative effect of limited deductions for the ASC and base calculation rules is that the maximum value of the ASC is less than 9.1 percent of current qualified R&D expenditure." Notably, the U.S. credit is not permanent; it must be reauthorized every two years.[26]

Estonia, Finland, Germany, Luxembourg, Mexico, New Zealand, Peru, Sweden, and Switzerland do not provide R&D tax incentives and thus score poorly in Table 3-3.[27] Germany solely provides R&D grants, but is considering implementing a tax incentive system within the next three to four years.[28] New Zealand recently eliminated its R&D tax credit and now provides only research grants.[29] Mexico went so far as to eliminate even its grants along with its tax incentives in its 2010 tax reform legislation, although the grants were extended through 2011 by the legislature.[30] Peru does not provide incentives for R&D, although the newly elected President Ollanta Humala has proposed establishing government grants and coordination for "priority" R&D areas.[31]

Government R&D Expenditure

Due to the private sector's tendency to underinvest in innovation, public R&D funding is needed to bring the rates of economic growth, job creation, and improvement in living standards up to their potential. Furthermore, governments tend to be less averse than the private sector to investments in high-risk, early-stage research that is far from commercialization; thus, publicly funded R&D helps alleviate the private sector's underinvestment due to the "valley of death" problem. While much of this early-stage research does not lead to commercial results in the short term, it is more likely to produce the breakthrough innovations that generate large benefits for the domestic economy and the world in the long run. For example, nanotechnology is a potentially important future technology. Although nanotechnology may very well be to the twenty-first century what steel was to the early twentieth century, commercialization of this new technology is limited. As a result, governments fund the vast majority of nanotechnology research. Yet, despite funding higher-risk projects such as nanotechnology, public R&D has been shown to be efficient: Estimates of the return on investment from publicly funded R&D range from 20 percent to 67 percent.[32] Moreover, multiple studies have found that public R&D serves as a complement, rather than a substitute, for private R&D, with information flow between public researchers and industry augmenting the value of industrial R&D.[33]

This section contains two sub-indicators: defense R&D expenditure and non-defense R&D expenditure. While non-defense R&D expenditure is given a higher weight than defense expenditure because it is more likely to be focused on innovations that drive competitiveness and growth, defense expenditure is still of value to a country's innovation ecosystem due to the spillover benefits of R&D in general and the spinoffs that occur from defense R&D.[34] For example, the Internet is a direct result of the U.S. government's funding of advanced defense R&D, as were early breakthroughs in semiconductor technology. That said, due to military secrecy and the high specificity of some advanced weaponry technologies, the spillover benefits from defense R&D tend to be slightly more limited.

In Table 3-4, the leaders in non-defense government R&D expenditure are Austria, Finland, Iceland, Singapore, and Sweden. Iceland and Austria spend the equivalent of about one percent of their GDP on non-defense R&D. Singapore leads the Asian countries, spending the equivalent of 0.78 percent of its GDP on non-defense R&D. On the other hand, Russia, the United Kingdom, and the United States are far behind in this measure, spending the equivalent of 0.47 percent, 0.43 percent, and 0.31 percent of their GDPs on non-defense R&D, respectively. Instead, as shown in Table 3-5, Russia, the United Kingdom, and the United States reign at or near the top countries in government R&D expenditure on defense. However, several countries, including France, South Korea, and Sweden score highly on both defense and non-defense R&D. One need not come at the expense of the other; Russia, the United Kingdom, and the United States could—and should—increase their civil R&D expenditure without sacrificing national security.

Due to the private sector's tendency to underinvest in innovation, public R&D funding is needed to bring the rates of economic growth, job creation, and improvement in living standards up to their potential.

Iceland and Austria spend the equivalent of about one percent of their GDP on non-defense R&D. Singapore leads the Asian countries, spending the equivalent of 0.78 percent of its GDP on non-defense R&D. On the other hand, Russia, the United Kingdom, and the United States are far behind in this measure, spending the equivalent of 0.47 percent, 0.43 percent, and 0.31 percent of their GDPs on non-defense R&D, respectively.

Table 3-4: Non-Defense Government R&D Expenditure as a Share of GDP, 2008[50]

Country	Non-Defense Government R&D Expenditure, 2008	Country	Non-Defense Government R&D Expenditure, 2008
Iceland	1.02%	Lithuania*	0.43%
Austria	0.99%	United Kingdom	0.43%
Sweden*	0.80%	Hungary	0.41%
Finland	0.79%	Romania	0.40%
Singapore*	0.78%	Argentina	0.35%
Denmark*	0.76%	Poland	0.35%
Australia	0.76%	Hong Kong*	0.35%
Chinese Taipei	0.74%	Chile*	0.35%
Norway*	0.74%	United States	0.31%
Israel*	0.72%	Luxembourg*	0.30%
Germany	0.72%	Greece*	0.30%
South Korea	0.71%	China*	0.30%
Netherlands*	0.69%	Latvia*	0.29%
Switzerland	0.68%	Bulgaria*	0.28%
Portugal	0.66%	Cyprus*	0.27%
Estonia	0.64%	Slovak Republic*	0.24%
France	0.59%	Turkey*	0.22%
Czech Republic	0.59%	Mexico*	0.20%
Brazil	0.58%	Vietnam*	0.16%
Canada	0.58%	Malta*	0.16%
New Zealand*	0.53%	Thailand*	0.08%
Italy	0.52%	Malaysia*	0.07%
Spain	0.52%	Indonesia*	0.04%
India*	0.52%	Philippines*	0.03%
Japan	0.51%	Peru	N/A
Ireland	0.49%	**All Countries**	**0.48%**
Slovenia	0.49%	**APEC-19 Countries**	**0.39%**
Russia	0.47%	**EU Countries**	**0.50%**
South Africa*	0.44%	**OECD Countries**	**0.56%**
Belgium*	0.44%		

*Estimate

Higher Education R&D Performance

The previous section reported that government expenditure on R&D is more likely than private expenditure to support early-stage research that is far from commercialization. One reason this is true is that, in many countries, a significant share of public research funding is performed at universities and other institutions of higher education, which undertake the basic and early-stage research projects without the disincentives that might prevail in the private sector. That said, government is not the only source of university research funds; a significant share of university research budgets can come from the private sector as well as the institutions' own revenues. Hence, it is important to measure the performance of R&D in the higher education sector in order to attain an accurate snapshot of a country's innovation ecosystem.

As shown in Table 3-6, the higher education R&D performance leaders are Austria, Canada, Denmark, Finland, Iceland, the Netherlands, Sweden, and Switzerland. In each country, higher education institutions perform the equivalent of more than 0.60 percent of the countries' GDP on R&D. Of the BRIC nations, Brazil is in the lead by far, with the equivalent of 0.43 percent of its

Table 3-5: Government R&D Expenditure on Defense as a Share of GDP, 2008[51]

Country	Defense Government R&D Expenditure, 2008	Country	Defense Government R&D Expenditure, 2008
United States	0.44%	Turkey*	0.00%
France	0.23%	Denmark*	0.00%
Russia	0.21%	Switzerland	0.00%
South Korea	0.15%	Brazil	0.00%
United Kingdom	0.12%	Vietnam*	0.00%
Sweden*	0.11%	Malta*	0.00%
Spain	0.09%	Hungary	0.00%
Australia	0.06%	Argentina	0.00%
China*	0.05%	Greece*	0.00%
Germany	0.05%	Thailand*	0.00%
Chinese Taipei	0.04%	Malaysia*	0.00%
Norway*	0.04%	Portugal	0.00%
Japan	0.03%	Belgium*	0.00%
Slovenia	0.03%	Indonesia*	0.00%
Finland	0.02%	Philippines*	0.00%
Canada	0.02%	Austria	0.00%
Singapore*	0.02%	Chile*	0.00%
Czech Republic	0.01%	Iceland	0.00%
Netherlands*	0.01%	Ireland	0.00%
Poland	0.01%	Israel*	0.00%
Romania	0.01%	Luxembourg*	0.00%
India*	0.01%	Mexico*	0.00%
Lithuania*	0.01%	New Zealand*	0.00%
Estonia	0.01%	South Africa*	0.00%
Hong Kong*	0.01%	Peru	N/A
Italy	0.01%	**All Countries**	**0.03%**
Latvia*	0.01%	**APEC-19 Countries**	**0.06%**
Bulgaria*	0.01%	**EU Countries**	**0.03%**
Cyprus*	0.01%	**OECD Countries**	**0.04%**
Slovak Republic*	0.01%		

*Estimate

The higher education R&D performance leaders are Austria, Canada, Denmark, Finland, Iceland, the Netherlands, Sweden, and Switzerland. In each country, higher education institutions perform the equivalent of more than 0.60 percent of the countries' GDP on R&D. Of the BRIC nations, Brazil is in the lead by far, with the equivalent of 0.43 percent of its GDP being invested in higher education R&D. Russia, India, and China are near the bottom of the table, with 0.07 percent, 0.04 percent, and 0.12 percent, respectively, of their GDP allocated to university R&D.

Table 3-6: Higher Education R&D Performance as a Share of GDP, 2008[52]

Country	Higher Education R&D Performance, 2008	Country	Higher Education R&D Performance, 2008
Sweden	0.79%	Turkey	0.32%
Denmark	0.78%	Latvia	0.29%
Switzerland	0.72%	Chile*	0.27%
Netherlands	0.67%	Czech Republic	0.25%
Iceland	0.66%	Slovenia	0.22%
Canada	0.64%	Hungary	0.22%
Finland	0.64%	South Africa*	0.22%
Austria	0.64%	Poland	0.20%
Australia	0.57%	Cyprus	0.19%
Israel	0.57%	Malta	0.17%
Estonia	0.56%	Romania	0.17%
Singapore	0.55%	Argentina	0.15%
Portugal	0.52%	China	0.12%
Norway	0.52%	Mexico*	0.12%
United Kingdom	0.47%	Slovak Republic	0.11%
Germany	0.45%	Malaysia	0.10%
Belgium	0.45%	Luxembourg	0.10%
Brazil*	0.43%	Thailand*	0.08%
France	0.43%	Peru*	0.07%
New Zealand*	0.42%	Russia	0.07%
Lithuania	0.42%	Vietnam*	0.05%
Ireland	0.42%	Bulgaria	0.05%
Japan	0.40%	India*	0.04%
Hong Kong	0.40%	Philippines*	0.03%
Italy	0.39%	Indonesia*	0.02%
South Korea	0.37%	**All Countries**	**0.34%**
Spain	0.36%	**APEC-19 Countries**	**0.26%**
United States	0.36%	**EU Countries**	**0.38%**
Greece*	0.35%	**OECD Countries**	**0.44%**
Chinese Taipei	0.34%		

GDP being invested in higher education R&D. Russia, India, and China are near the bottom of the table, with 0.07 percent, 0.04 percent, and 0.12 percent, respectively, of their GDP allocated to university R&D. The United States is substantially below the average of the OECD countries, with the equivalent of only 0.36 percent of GDP being performed by higher education institutions, although this is only slightly below the average rate of the European Union countries.

Nevertheless, government funding of higher education research is of less use to the domestic innovation ecosystem if the resulting knowledge is not transferred out to entrepreneurs and companies. In other words, obtaining the full benefits of university research relies on the effective transfer of knowledge from the university to the private sector so that it can be developed into marketable innovations. In the United States, the main provision of the Bayh-Dole Act of 1980 sought to promote the commercialization of university research by vesting the IP rights of government-funded research with the institution, instead of relying on the disparate policies of the funding government agencies. U.S. institutions now earn royalties through the licensing of their research, providing an incentive for universities and other institutions to pursue opportunities for commercialization.[35] Numerous countries, including Brazil, China, Chinese Taipei, Indonesia, Japan, Malaysia, the Philippines, Russia, Singapore, South Africa, and South Korea, have since followed the United States in establishing policies that grant their universities IP ownership rights, while India is considering implementing a Bayh-Dole-like policy.[36] Nevertheless, countries need to do much more to encourage innovative approaches to technology transfer from universities. For example, Litan, Mitchell, and Reedy suggest several alternative approaches that focus on increasing the number and speed of transferred innovations, as opposed to just "patent-licensing big hits" encouraged by Bayh-Dole-like polices. These alternatives include open source collaborations between the university and industry, non-exclusive licensing of innovations, and the development of social networks for graduate students and university faculty.[37]

Industry Cluster Development

Evidence suggests that geographically concentrated industries experience higher productivity, employment, and wage growth, as well as higher levels of patenting.[38] Industry clustering enables firms to take advantage of common resources, such as a workforce trained in particular skills, technical institutes, or a common supplier base, in order to facilitate better labor-market matching and knowledge sharing. This process is particularly relevant to industries that rely more on the creation or use of new knowledge, as clustering appears to spur knowledge transfers.[39] Just as each additional broadband user makes the Internet more valuable to existing users, each firm in a cluster makes the cluster more valuable to other firms. As such, because the benefits of geographic clustering spill over beyond the boundaries of the firm, market forces produce less geographic clustering than is socially optimal. In addition, the firms in a cluster usually have common needs (for example, worker training or infrastructure) that they cannot meet on their own. Clustered firms therefore usually require external coordination—for example, from a national innovation foundation—to meet these needs. However, the key to successful clusters is not simply enabling the co-location of similar firms and slapping a label on it (for example, "High Tech Valley"). As Saxenian and others have shown, the benefits of geographic clustering depend on the active participation of firms and other organizations in a dynamic, regional learning system.[40] For example, research shows that informal communication between cluster participants leads to more innovation.[41] Thus, for countries seeking to support dynamic clusters, simply putting together real estate deals is not enough. To develop a high-functioning regional innovation ecosystem, countries must work to ensure that active cooperation and learning occurs, as well.

The classic example of industry clustering is California's Silicon Valley, where a large agglomeration of high-tech firms, research universities such as Stanford, technical colleges to train high-tech workers, venture capitalists, and other supporting institutions create the world's most vibrant technology region.[42] In China, some refer to the technology park Zhong Guan Cun in Beijing as "China's Silicon Valley," as it draws talent from several nearby colleges and research universities.[43] Japan has established more than seventeen industrial cluster projects in the biomedical, ICT, manufacturing, semiconductor, and environmental fields.[44] Italy has had a long history of industry clusters, and now boasts more than 100 clusters around the country across a broad range of manufacturing industries.[45] Switzerland has three primary high-tech clusters: an electrical machinery cluster around Zurich, a pharmaceuticals and chemicals cluster in Basel, and a precision instruments and medical devices cluster based in the cantons of Bern and Jura.[46] Chinese Taipei has several well-developed clusters, such as the Taipei Neihu Technology Park, which has more than 3,000 resident firms.[47] And Singapore, which has allocated numerous zones for industry cluster development, now boasts clusters for the biomedical, petrochemical, food, and maritime industries, among others.[48] Table 3-7 shows countries' ratings on industry cluster development.

Table 3-7: Industry Cluster Development Rating[53]

Country	Industry Cluster Development Rating (7=Best; 1=Worst)	Country	Industry Cluster Development Rating (7=Best; 1=Worst)
Italy	5.5	Thailand	4.1
Chinese Taipei	5.4	Cyprus	4.0
Japan	5.4	Czech Republic	4.0
Singapore	5.2	South Africa	4.0
Switzerland	5.2	Mexico	3.8
Finland	5.1	Slovenia	3.8
Hong Kong	5.1	Iceland	3.7
Sweden	5.1	Malta	3.7
United States	5.1	New Zealand	3.7
Canada	5.0	Philippines	3.7
Germany	5.0	Portugal	3.7
United Kingdom	5.0	Argentina	3.6
Vietnam	4.9	Slovak Republic	3.6
Luxembourg	4.8	Turkey	3.6
Malaysia	4.8	Israel	3.5
China	4.7	Peru	3.4
Netherlands	4.7	Russia	3.2
Norway	4.7	Estonia	3.1
Austria	4.6	Greece	2.9
Denmark	4.6	Hungary	2.9
Brazil	4.5	Latvia	2.9
Indonesia	4.5	Lithuania	2.9
South Korea	4.4	Poland	2.9
Belgium	4.3	Bulgaria	2.8
France	4.2	Romania	2.8
India	4.2	**All Countries**	**4.2**
Australia	4.1	**APEC-19 Countries**	**4.5**
Chile	4.1	**EU Countries**	**4.0**
Ireland	4.1	**OECD Countries**	**4.2**
Spain	4.1		

The classic example of industry clustering is California's Silicon Valley, where a large agglomeration of high-tech firms, research universities such as Stanford, technical colleges to train high-tech workers, venture capitalists, and other supporting institutions create the world's most vibrant technology region. In China, some refer to the technology park Zhong Guan Cun in Beijing as "China's Silicon Valley," as it draws talent from several nearby colleges and research universities. Japan has established more than seventeen industrial cluster projects in the biomedical, ICT, manufacturing, semiconductor, and environmental fields.

Chapter 4: Domestic Market Competition and Entrepreneurship

Why Domestic Market Competition and Entrepreneurship Are Important

While it has become increasingly popular for economic planners to focus on export-oriented growth, a vibrant domestic market supported by a sound and fair regulatory environment that allows both existing and new firms to compete on a level playing field remains the lynchpin of economic prosperity. Countries that support competitive domestic markets create the conditions for new entrepreneurial ventures to flourish, while at the same time incentivizing established firms to continue to innovate and to boost productivity. To be sure, countries need to support the expansion of higher-value-added, globally traded industries. However, as a recent report from the McKinsey Global Institute finds, countries that outperform their peers do not have a more favorable sector mix (for example, more jobs in high-tech industries), but instead have firms in all sectors (including less-exciting sectors like retail trade or transportation) that are more productive.[1] In other words, the productivity of all firms in an economy matters more than the mix of sectors that comprise the economy. This holds true for both developed and developing countries alike. As the McKinsey report elaborates:

> Some observers believe that countries can outperform their peers because they have a mix of sectors that have a more favorable growth momentum. But the mix of sectors does not explain differences in the growth performance of countries with similar levels of income at all. The mix of sectors is surprisingly similar across countries at broadly equivalent stages of economic development. It is not the mix of sectors that decides the growth in countries, but rather the actual performance within the sectors compared with their counterparts in peer countries.[2]

McKinsey reached these conclusions by calculating the "growth momentum" of twelve countries (six developed and six developing). The growth momentum calculation takes each country's existing sectoral composition (that is, the actual share of sectors like manufacturing, retail, construction, transportation, and agriculture) and predicts how much the economy would increase its total value-added if its sectors grew at the average growth rate of the same sectors in all six countries. McKinsey first calculated the growth momentum of six leading developed nations: France, Germany, Japan, Korea, the United Kingdom, and the United States. It turns out that the growth rate predicted by a country's initial sectoral mix falls into a small band for highly developed countries, from 1.8 percent to 2.3 percent, but that the actual growth rates exhibited a much wider spread, from 0.4 percent in Japan to 3.3 percent in the United States, indicating that some countries' sectors are substantially outperforming other countries' sectors. In other words, the comparatively greater productivity performance of U.S. sectors contributed to the U.S. compound annual growth rate between 1995 and 2005 being 0.9 percent larger than would have otherwise been expected, while Japan's comparatively lesser productivity performance growth over that time period was 1.7 percent less than would have been expected.

These findings apply not just to the developed world; similar results held when applied to six developing countries: China, India, Mexico, Russia, Brazil, and South Africa. McKinsey found that compound annual growth rates from 1995 to 2005 ranged from 3.6 percent in Russia, to 3.9 percent in Mexico, to 9.1 percent in China. These actual growth rates differ from the growth momentum predicted by these countries' initial sectoral mixes in 1995. That is, if each country's sectors had grown at the average growth rate of the same sectors in the six developing countries, Russia's economy would have been expected to grow by 6.7 percent, Mexico's by 6.0 percent, and China's by 5.7 percent. In other words, from 1995 to 2005, the difference in performance of China's sectors meant that its compound annual growth was 3.4 percent better than expected; India's performance was 0.3 percent better than expected; while Mexico performed 2.1 percent worse than expected, along with Brazil, India, and Russia, which

A vibrant domestic market supported by a sound and fair regulatory environment that allows both existing and new firms to compete on a level playing field remains the lynchpin of economic prosperity.

William Lewis, the former head of the McKinsey Global Institute, argues that there is perhaps no factor more important to driving economic growth than the presence of competitive markets. As Lewis explains, "Differences in competition in product markets are much more important [than differences in labor and capital markets]."

performed 2.5, 3.1, and 4.1 points worse than expected, respectively. As McKinsey concludes, "this demonstrates the fact that, even if they started with a less-favorable sector mix, the fastest-growing countries outperformed their peers in terms of their sector competitiveness."[3]

What drives sector performance? It turns out that one of the strongest drivers of productivity growth in countries is the existence of competitive marketplaces. William Lewis, the former head of the McKinsey Global Institute, argues that there is perhaps no factor more important to driving economic growth than the presence of competitive markets. As Lewis explains, "Differences in competition in product markets are much more important [than differences in labor and capital markets]. Policies governing competition in product markets are as important as macroeconomic policies."[4] This means that micro-economic factors—such as product- and labor-market regulations, competition policies, and technology policies—are as important to growth as macro-economic ones (if not more so). It also means that the productivity of a country's firms is deeply connected to a country's regulatory environment. Put simply, countries that create a climate of competition force their firms to become more productive and innovative. This includes removing regulatory restrictions, incumbent protections, and cross-border trade restrictions that limit competition.

Unfortunately, the restrictive regulatory regimes that many countries have in place can severely inhibit growth.[5] For example, the McKinsey Global Institute report observes that, in some sectors, such as retail, regulations alone largely explain the wide variations in productivity and employment among countries. And, because such sectors are so large, policy choices can have a significant impact on a country's overall GDP. A regulatory environment that allows the expansion of more productive modern supermarkets and convenience stores raises productivity because larger chains can profit from scale benefits in purchasing, merchandising, and store operations. Yet, many countries have chosen to protect small-scale mom and pop stores through barriers to foreign direct investment and competitive entry, zoning laws, and restrictions on the size of stores.[6]

Gabriel Sanchez finds that Argentina's grocery retail sector is one of the few in the world to have experienced large declines in productivity growth over the past two decades, primarily because its large, productive firms have lost market share due to the extreme regulatory restrictions placed on them.[7] In this case, rather than creative destruction leading to the exit of less-productive firms, discriminatory policies against larger, more efficient firms, coupled with lack of enforcement of regulations on smaller and informal firms has meant that less-efficient firms (and, in many cases, firms selling lower-quality groceries) actually gained market share. For example, small stores can sell products whose void date has expired, while larger firms are forced to give such food away. Small grocery stores pay much less in taxes. It can take four years to get a permit for a large grocery store, and regulations limit the size of stores and the maximum number of stores any one firm can operate in an area. Further, the government imposes price controls on food, but only in larger stores, and Argentina's government limits imports of certain items by larger stores.

Of course, Argentina is by no means alone in restricting competition in its domestic retail sectors. In Japan, laws limiting the entry of large supermarkets and providing incentives for small retailers to stay in business explain the country's high share of family retailers—and their low productivity.[8] Japan's government subsidizes small stores with generous loans, while its high capital gains tax rate provides little incentive for owners to sell some of the most valuable real estate in the world. Consequently, Japan's retail sector is comprised of 50 percent small stores, compared to 12 percent in the United States. Nevertheless, many U.S. communities have passed zoning regulations specifically to thwart "big box" retailers. The state of Maryland passed legislation essentially forcing only Wal-Mart, but not smaller retailers, to provide health insurance to its workers. And these are just examples from the retail sector. Similar examples can be found across scores of industries in all countries. For example, every U.S. state has regulations that prohibit consumers from purchasing vehicles online in an attempt to protect automobile dealer jobs.[9] And, as the advent of the Internet has enabled online business models, dozens of industries and professions have sought, often successfully, government protection from often more-efficient and lower-cost e-commerce entrants in an effort to thwart competition.

In stark contrast to countries that have attempted to protect their sectors, countries that have liberalized their retail sectors have seen dramatic improvements in

sector productivity, with consequent strong contributions to economic growth. Russian retail productivity has more than doubled in the past ten years, from 15 percent to 31 percent of U.S. levels, because of the increasing market share won by more modern retailers.[10] In Mexico, opening up the food retail sector to international competition has led to increasing competition and lowered prices, as Mexico saw an explosion in the number of convenience stores from a little more than 1,000 to more than 6,000 in five years. The Mexican consumer has been an outright beneficiary of this increased competitive intensity, as food prices have grown significantly less rapidly than other prices.[11] And, in Sweden, the liberalization of opening hours and zoning regulations for retail stores unleashed competition, contributing to retail sector productivity growth of 4.6 percent per year for ten years after 1995.[12]

Thus, raising the productivity of domestic non-traded sectors such as retail is not trivial; it can have profound economic impacts. For example, even despite some extremely productive and innovative multinational firms, overall Japanese productivity is just 70 percent of U.S. rates. Korea's productivity is just 50 percent of U.S. rates. The gap is even greater in developing nations. Overall productivity in India is but 8 percent of U.S. rates, while Chinese productivity is just 14 percent of U.S. rates.[13] For developed and developing countries alike, the message is clear: Attracting more high-value-added export firms is not likely to be the major path to economic growth in the long run, boosting productivity in the vast swaths of the economy that are not traded internationally is.[14] And, to boost productivity in these domestic, non-traded sectors—as well as to create the conditions in which new, entrepreneurial firms can flourish—policies that ensure domestic competition are vital. It also is important for countries to consider the effect regulations have on innovation. While classical economic theory holds that regulation inevitably imposes cost burdens on firms, causing them to reallocate their spending away from investments in innovation, there can be circumstances under which thoughtful regulations can spur innovation and productivity improvements in an economy.[15] In particular, flexible regulations, including incentive-based regulation and performance standards, tend to aid innovation by maximizing the implementation leeway available to firms, allowing the market to dictate cost-efficient and commercially viable solutions.

Assessing Countries on Openness to Domestic Market Competition

In this section, twenty-one indicators are organized into three categories—the regulatory environment, the competitive environment, and the entrepreneurial environment—to assess countries' degrees of openness to domestic market competition, as Table 4-1 shows. Sixty percent of the weight is assigned to fifteen indicators that evaluate how effectively a country's regulatory environment contributes to fostering a high degree of domestic market competition. The four indicators in the competitive environment category, weighted at 25 percent, comprise aggregated measures of domestic market competition; they reflect the effectiveness of the measures in the regulatory environment category at creating a competitive domestic marketplace. Encouraging the entrance of new firms is important to fostering a competitive domestic market, and accounts for 15 percent of a country's score.

Table 4-2 shows countries' ranks on these measures. Australia, Canada, Denmark, Hong Kong, Singapore, Switzerland, the United Kingdom, and the United States occupy the upper tier. Upper-tier countries have found the sweet spot between regulatory regimes that are not overburdening and that make doing business domestically flexible and competitive while at the same time providing new firms access to capital, training, and growth opportunities. These countries make it easy for firms to start, to access capital, to acquire property, to attract talented workers, to enforce contracts, to close or reorient operations when necessary, and to operate in a generally corruption-free environment. Though they certainly are not perfect, they generally have enacted policies that encourage domestic market competition (including that introduced by the domestic operations of foreign enterprises) and that encourage new firm entry. These governments also have promoted advanced G2B (government-to-business) e-government platforms that make it easier for firms to register, to submit required information, to comply with regulations, and to pay taxes.

Argentina, Brazil, Greece, Italy, Indonesia, India, Mexico, Peru, the Philippines, Romania, and Russia foster the least domestic market competition. These lower-mid-tier countries largely are corruption free and have clear rules of the road for doing business. However, despite some being pioneers of digital marketplaces, policymakers

For developed and developing countries alike, the message is clear: Attracting more high-value-added export firms is not likely to be the major path to economic growth in the long run, boosting productivity in the vast swaths of the economy that are not traded internationally is.

Upper-tier countries make it easy for firms to start, to access capital, to acquire property, to attract talented workers, to enforce contracts, to close or reorient operations when necessary, and to operate in a generally corruption-free environment.

Table 4-1: Domestic Market Competition and Entrepreneurship Indicators

Section Weight	Indicator	Data Type	Source	Indicator Weight
60%	**Regulatory Environment**			
	Starting a Business			
	Number of procedures to start a business	# of Procedures	World Bank	3.33%
	Time to start a business	# of Days	World Bank	3.33%
	Cost to start a business	% of Income per Capita	World Bank	3.33%
	Acquiring Property			
	Number of procedures involved in buying/ renting property	# of Procedures	World Bank	2.50%
	Time involved in buying/renting property	# of Days	World Bank	2.50%
	Enforcing Contracts			
	Number of procedures to enforce a contract	# of Procedures	World Bank	3.33%
	Time involved in enforcing contracts	# of Days	World Bank	3.33%
	Cost involved in enforcing contracts	% of Claim	World Bank	3.33%
	Acquiring Talent			
	Rigidity of employment	Rating	WEF	15.00%
	Impact of pay on productivity	Rating	WEF	5.00%
	Closing a Business			
	Recovery rate when closing a business	Cents/$	World Bank	3.33%
	Time needed to close a business	# Years	World Bank	3.33%
	Cost involved in closing a business	% of Estate	World Bank	3.33%
	Operating in a Corruption-Free Environment			
	Irregular payments and bribes	Rating	WEF	2.50%
	Regulatory and administrative opacity	Rating	OECD	2.50%
25%	**Competitive Environment**			
	Intensity of local competition	Rating	WEF	10.00%
	Extent of market dominance	Rating	WEF	5.00%
	Efficiency of legal framework in challenging regulations	Rating	WEF	5.00%
	Barriers to competition	Rating	OECD	5.00%
15%	**Entrepreneurial Environment**			
	Number of new firms	New Firms per 1,000 Workers	World Bank, Kauffman Foundation	10.00%
	Administrative burdens on startups	Rating	OECD	5.00%

in these countries have not gone far enough in fostering an entrepreneurial society. The countries in the lower-tier, including Indonesia, Mexico, Peru, the Philippines, and Russia, also struggle with arbitrary regional bureaucracies and have large informal sectors where entrepreneurs have little access to reliable capital or government assistance. They generally provide a more difficult environment for businesses to operate in, do not do as strong a job in ensuring competitive domestic markets, and are not characterized by rates of labor and capital market mobility as high as those found in the upper- and mid-tier countries.

Regulatory Environment for Business

From starting a business to acquiring property and talent, and from enforcing contracts to closing down a business, public sector regulations on private enterprise constitute "the rules of the road" for domestic firms, impacting every stage in the lifecycle of a business. In other words, public regulatory policies set the framework in which enterprises compete. Therefore, much can be learned about how effectively public policies and regulations engender competition by examining how easy countries make it for enterprises to start, acquire property, enforce contracts, attract talent, close, and operate free of corruption.

Starting a Business

Table 4-3 assesses countries on the number of procedures that are required to start a business, the time involved in starting a business, and the cost to start a business. Countries that make these processes easier are oriented toward fostering domestic market competition and spurring new firm growth. Indeed, academic evidence clearly shows that delays caused by entry regulations are associated with lower rates of firm entry.[16] Yet, what stands out is the variability in these processes across countries. Only one procedure is required to start a business in Canada and New Zealand and two in Australia and Slovenia, whereas India requires twelve, Argentina and China fourteen, and Brazil, Greece, and the Philippines fifteen. It's easiest to start a business in OECD and EU

Upper-tier countries have found the sweet spot between regulatory regimes that are not overburdening and that make doing business domestically flexible and competitive while at the same time providing new firms access to capital, training, and growth opportunities.

Table 4-2: Country Ranks on Domestic Market Competition and Entrepreneurship

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Australia	Austria	Bulgaria	Argentina
Canada	Belgium	Chile	Brazil
Denmark	Chinese Taipei	China	Greece
Hong Kong	Cyprus	France	Italy
Singapore	Czech Republic	Hungary	Indonesia
Switzerland	Estonia	Israel	India
United Kingdom	Finland	Latvia	Mexico
United States	Germany	Lithuania	Peru
	Iceland	Luxembourg	Philippines
	Ireland	Poland	Romania
	Japan	Portugal	Russia
	Malaysia	Slovenia	
	Malta	South Africa	
	Netherlands	South Korea	
	New Zealand	Spain	
	Norway	Thailand	
	Slovak Republic	Turkey	
	Sweden	Vietnam	

Table 4-3: Number of Procedures, Time, and Cost Involved in Starting a New Business[19]

Country	No. of Procedures to Start a Business	Country	Time to Start a Business (days)	Country	Cost to Start a Business (As % of Income per Capita)
Canada	1	New Zealand	1	Denmark	0.0
New Zealand	1	Australia	2	Slovenia	0.0
Australia	2	Singapore	3	Canada	0.4
Slovenia	2	Belgium	4	Ireland	0.4
Belgium	3	Hungary	4	New Zealand	0.4
Finland	3	Canada	5	Sweden	0.6
Hong Kong	3	Iceland	5	Australia	0.7
Singapore	3	Denmark	6	Singapore	0.7
Sweden	3	Hong Kong	6	United Kingdom	0.7
Bulgaria	4	Italy	6	France	0.9
Denmark	4	Portugal	6	Finland	1.1
Hungary	4	Slovenia	6	United States	1.4
Ireland	4	Turkey	6	Latvia	1.5
Estonia	5	United States	6	Bulgaria	1.6
France	5	Estonia	7	Norway	1.8
Iceland	5	France	7	Estonia	1.9
Israel	5	Norway	7	Slovak Republic	1.9
Latvia	5	Cyprus	8	Hong Kong	2.0
Norway	5	Netherlands	8	Luxembourg	2.1
Chinese Taipei	6	Mexico	9	Switzerland	2.1
Cyprus	6	Romania	10	Iceland	2.3
Italy	6	Ireland	13	Romania	2.6
Lithuania	6	United Kingdom	13	Lithuania	2.8
Luxembourg	6	Finland	14	Russia	3.6
Mexico	6	South Korea	14	Chinese Taipei	4.1
Netherlands	6	Chinese Taipei	15	Israel	4.3
Peru	6	Germany	15	China	4.5
Poland	6	Sweden	15	Germany	4.8
Portugal	6	Latvia	16	Austria	5.2
Romania	6	Slovak Republic	16	Belgium	5.4
Slovak Republic	6	Malaysia	17	Thailand	5.6
South Africa	6	Bulgaria	18	Netherlands	5.7
Switzerland	6	Greece	19	South Africa	6.0
Turkey	6	Luxembourg	19	Portugal	6.5
United Kingdom	6	Czech Republic	20	Chile	6.8
United States	6	Switzerland	20	Brazil	7.3
Thailand	7	Chile	22	Japan	7.5
Austria	8	Lithuania	22	Hungary	8.2
Chile	8	South Africa	22	Czech Republic	9.3
Japan	8	Japan	23	Vietnam	12.1
South Korea	8	Argentina	26	Mexico	12.3
Czech Republic	9	Peru	27	Cyprus	12.6
Germany	9	Austria	28	Peru	13.6
Indonesia	9	India	29	Argentina	14.2
Malaysia	9	Russia	30	South Korea	14.7
Russia	9	Poland	32	Spain	15.1
Vietnam	9	Thailand	32	Turkey	17.2
Spain	10	Israel	34	Malaysia	17.5
India	12	China	38	Poland	17.5
Argentina	14	Philippines	38	Italy	18.5
China	14	Vietnam	44	Greece	20.7
Brazil	15	Indonesia	47	Indonesia	22.3
Greece	15	Spain	47	Philippines	30.3
Philippines	15	Brazil	120	India	56.5
Malta	N/A	Malta	N/A	Malta	N/A
All Countries	**6.6**	**All Countries**	**19**	**All Countries**	**7.8**
APEC-19 Countries	**6.8**	**APEC-19 Countries**	**20**	**APEC-19 Countries**	**8.5**
EU Countries	**5.9**	**EU Countries**	**14.6**	**EU Countries**	**5.7**
OECD Countries	**5.7**	**OECD Countries**	**13.5**	**OECD Countries**	**5.8**

countries, requiring less than six procedures on average, while 6.8 procedures are required to start a business in APEC countries. The variability in number of procedures to start a business largely explains the differences in the amount of time it takes to start a business. While it takes only one day to start a business in New Zealand, two in Australia, and three in Singapore, it takes 120 days to start a business in Brazil, forty-seven in Indonesia and Spain, and forty-four in Vietnam. And, while it still takes almost three weeks to start a business in Korea, this number actually represents a dramatic improvement over the seventeen months it once took.[17] The cost to start a business (measured as the percent of income per capita) also varies dramatically, from virtually nothing in Denmark and Slovenia and just 0.4 percent in Canada, Ireland, and New Zealand to a near-prohibitive cost of 56.5 percent of average per-capita income in India. Starting a business in Italy, Greece, Indonesia, and the Philippines also demands a quite significant share of per-capita income, which no doubt inhibits entrepreneurship in these countries.

Fortunately, however, a number of countries have made progress in streamlining the time and expense it takes to start a new business. For example, Chinese Taipei has reduced the time it takes enterprises to check company names, to register retirement plans, and to apply for health insurance. Countries such as Portugal that have streamlined and quickened their new business registration procedures have seen dramatic results. Portugal's "On the Spot Firm" initiative enables new businesses to register with the government online in just forty-five minutes, and has been so successful that 60,000 new firms have formed using this method in just two years.[18]

Acquiring Property

The effective assignment, acquisition, and transfer of property rights constitute another fundamental condition for competitive markets to flourish. Several studies have found that countries that have weak property rights, ambiguous or arbitrary regulatory enforcement, or cumbersome requirements are less likely to have more productive firms.[20] Table 4-4 examines the number of procedures and time involved in buying or renting property across countries. Norway, Portugal, and Sweden require only one procedure to buy or rent property, and New Zealand, Thailand, and the United Kingdom require only two. In contrast, Brazil requires fourteen procedures and Greece eleven. In line with the number of procedures, Portugal boasts the shortest time to buy or rent property, taking only one day, and it takes just two days in New Zealand and Thailand, three days in Lithuania and Norway, and four days in Iceland. In contrast, buying or renting property takes 152 days in Poland, 144 days in Israel, and 113 days in Slovenia. Such long timeframes slow the wheels of commerce and impede economic growth, placing these countries at a disadvantage to their peers.

Enforcing Contracts

Another hallmark of an effective, competition-enhancing regulatory environment is that it enables the timely and cost-efficient enforcement of private contracts. Table 4-5 presents data on the number of procedures, time, and cost involved in enforcing contracts, again revealing wide disparity across countries. Ireland, Singapore, Hong Kong, and Austria require the fewest procedures to enforce a contract, between twenty and twenty-five, whereas more than forty procedures are necessary in Italy, Peru, Cyprus, Brazil, India, and Chinese Taipei. It takes by far the least time to enforce a contract in Singapore, just 150 days, though the process is also relatively quick in New Zealand (216 days) and South Korea (230 days). Leading countries have introduced a number of reforms to make the process of enforcing contracts smoother. For example, New Zealand created new district court rules that streamline the process of enforcing contracts.[21] The civil justice system in Hong Kong enacted reforms in 2010 aimed at increasing the efficiency and cost-effectiveness of settling commercial disputes. But the contract enforcement process is particularly time consuming in Italy, Slovenia, and India, where it takes 1,210 days, 1,290 days, and 1,420 days, respectively. The cost to enforce a contract, defined as a percentage of the claim, is least in Iceland, Luxembourg, and Norway, requiring less than 10 percent of the claim value, but costs a prohibitive amount in Indonesia, where it often exceeds the value of the claim. Such expenses also are high in South Africa, Peru, and India.

The effective assignment, acquisition, and transfer of property rights constitute another fundamental condition for competitive markets to flourish. Several studies have found that countries that have weak property rights, ambiguous or arbitrary regulatory enforcement, or cumbersome requirements are less likely to have more productive firms.

Table 4-4: Number of Procedures and Time Required in Buying or Renting Property[22]

Country	No. Procedures to Buy or Rent Property	Country	Time to Buy or Rent Property (days)
Norway	1	Portugal	1
Portugal	1	New Zealand	2
Sweden	1	Thailand	2
New Zealand	2	Lithuania	3
Thailand	2	Norway	3
United Kingdom	2	Iceland	4
Austria	3	Australia	5
Chinese Taipei	3	Chinese Taipei	5
Cyprus	3	Singapore	5
Denmark	3	Turkey	6
Estonia	3	Netherlands	7
Finland	3	Peru	7
Iceland	3	Sweden	7
Lithuania	3	United Kingdom	8
Singapore	3	South Korea	11
Slovak Republic	3	United States	12
China	4	Finland	14
Czech Republic	4	Japan	14
Hungary	4	Bulgaria	15
Peru	4	Switzerland	16
Spain	4	Canada	17
Switzerland	4	Hungary	17
United States	4	Slovak Republic	17
Vietnam	4	Estonia	18
Australia	5	Spain	18
Germany	5	Austria	21
Hong Kong	5	Greece	22
India	5	Indonesia	22
Ireland	5	South Africa	24
Malaysia	5	Italy	27
Mexico	5	China	29
Netherlands	5	Luxembourg	29
Argentina	6	Chile	31
Canada	6	Philippines	33
Chile	6	Cyprus	34
Indonesia	6	Hong Kong	36
Japan	6	Ireland	38
Latvia	6	Germany	40
Poland	6	Brazil	42
Russia	6	Denmark	42
Slovenia	6	Latvia	42
South Africa	6	Czech Republic	43
Turkey	6	Russia	43
Israel	7	India	44
South Korea	7	Romania	48
Belgium	8	Argentina	52
Bulgaria	8	Malaysia	56
France	8	Vietnam	57
Italy	8	France	59
Luxembourg	8	Mexico	74
Philippines	8	Belgium	79
Romania	8	Slovenia	113
Greece	11	Israel	144
Brazil	14	Poland	152
Malta	N/A	Malta	N/A
All Countries	**5.0**	**All Countries**	**31.7**
APEC-19 Countries	**4.8**	**APEC-19 Countries**	**24.3**
EU Countries	**5.0**	**EU Countries**	**35.2**
OECD Countries	**4.8**	**OECD Countries**	**32.7**

Table 4-5: Number of Procedures, Time, and Cost Involved in Enforcing Contracts[23]

Country	No. Procedures to Enforce a Contract	Country	Time to Enforce a Contract (Days)	Country	Cost to Enforce a Contract (% of Claim)
Ireland	20	Singapore	150	Iceland	8.2
Singapore	21	New Zealand	216	Luxembourg	9.7
Hong Kong	24	South Korea	230	Norway	9.9
Austria	25	Lithuania	275	South Korea	10.3
Belgium	26	Hong Kong	280	China	11.1
Luxembourg	26	Norway	280	Poland	12.0
Netherlands	26	Russia	281	Thailand	12.3
Czech Republic	27	Vietnam	295	Slovenia	12.7
Iceland	27	United States	300	Portugal	13.0
Latvia	27	Latvia	309	Finland	13.3
Australia	28	Luxembourg	321	Russia	13.4
United Kingdom	28	France	331	Germany	14.4
France	29	Japan	360	Greece	14.4
Germany	30	Finland	375	United States	14.4
Japan	30	Germany	394	Hungary	15.0
Lithuania	30	Australia	395	Cyprus	16.4
Malaysia	30	Hungary	395	Argentina	16.5
New Zealand	30	Austria	397	Brazil	16.5
South Africa	30	United Kingdom	399	Belgium	16.6
Sweden	30	China	406	Spain	17.2
Portugal	31	Denmark	410	France	17.4
Romania	31	Mexico	415	Chinese Taipei	17.7
Slovak Republic	31	Iceland	417	Austria	18.0
Switzerland	31	Switzerland	417	Turkey	18.8
Finland	32	Turkey	420	Hong Kong	19.5
Slovenia	32	Estonia	425	Australia	20.7
United States	32	Peru	428	Canada	22.3
Norway	33	Thailand	479	New Zealand	22.4
China	34	Chile	480	Japan	22.7
Vietnam	34	Belgium	505	Latvia	23.1
Denmark	35	Sweden	508	Denmark	23.3
Hungary	35	Chinese Taipei	510	United Kingdom	23.4
Israel	35	Romania	512	Lithuania	23.6
South Korea	35	Netherlands	514	Bulgaria	23.8
Turkey	35	Ireland	515	Switzerland	24.0
Argentina	36	Spain	515	Netherlands	24.4
Canada	36	Portugal	547	Israel	25.3
Chile	36	Bulgaria	564	Singapore	25.8
Estonia	36	Slovak Republic	565	Philippines	26.0
Thailand	36	Canada	570	Estonia	26.3
Philippines	37	Indonesia	570	Ireland	26.9
Russia	37	Malaysia	585	Malaysia	27.5
Mexico	38	Argentina	590	Vietnam	28.5
Poland	38	South Africa	600	Chile	28.6
Bulgaria	39	Czech Republic	611	Romania	28.9
Greece	39	Brazil	616	Italy	29.9
Spain	39	Cyprus	735	Slovak Republic	30.0
Indonesia	40	Greece	819	Sweden	31.2
Italy	41	Poland	830	Mexico	32.0
Peru	41	Philippines	842	Czech Republic	33.0
Cyprus	43	Israel	890	South Africa	33.2
Brazil	45	Italy	1,210	Peru	35.7
India	46	Slovenia	1,290	India	39.6
Chinese Taipei	47	India	1,420	Indonesia	122.7
Malta	N/A	Malta	N/A	Malta	N/A
All Countries	**33.2**	**All Countries**	**513.2**	**All Countries**	**23.0**
APEC-19 Countries	**34.0**	**APEC-19 Countries**	**410.1**	**APEC-19 Countries**	**27.0**
EU Countries	**31.8**	**EU Countries**	**548.9**	**EU Countries**	**20.7**
OECD Countries	**31.8**	**OECD Countries**	**507.8**	**OECD Countries**	**20.1**

Acquiring Talent/Flexible Labor Markets

Just as an economy needs to put in place mechanisms to enable failing or unsuccessful businesses to close such that capital can be reallocated to other opportunities, an economy also needs labor flexibility such that talent can be deployed and redeployed to the most productive pursuits. Indeed, labor market flexibility is a vital component of the adaptive capacity of an economy and its ability to innovate. In fact, in a 2004 report for the OECD, Eric Bartlesman of Amsterdam's Free University found that the "rates of innovation" between U.S. and EU businesses were actually the same. But Bartelsman also found that the United States did a better job of more quickly allocating capital and labor to the most promising startup businesses with innovative new business models, and thus the United States was spawning more high-tech "winners," even though the underlying rates of innovation were the same.[24]

Table 4-6 displays data from the World Bank's Rigidity of Employment Index (scored from zero to 100, best to worst). The index measures the regulation of employment, specifically the hiring and firing of workers and the rigidity of working hours. The index includes six quantitative measures of labor market flexibility: ratio of minimum wage to the average value-added per worker; hindrances to hiring additional workers; rigidity of hours;

Table 4-6: Rigidity of Employment[26]

Country	Rigidity of Employment (0=Best;100=Worst)	Country	Rigidity of Employment (0=Best;100=Worst)
Australia	0	Turkey	35
Hong Kong	0	Italy	38
Singapore	0	Lithuania	38
United States	0	Russia	38
Canada	4	South Korea	38
Denmark	7	Sweden	38
New Zealand	7	Peru	39
Switzerland	7	Indonesia	40
Ireland	10	Finland	41
Malaysia	10	Mexico	41
United Kingdom	10	Germany	42
Czech Republic	11	Latvia	42
Thailand	11	Netherlands	42
Japan	16	Portugal	43
Belgium	17	Norway	44
Israel	17	Brazil	46
Chile	18	Chinese Taipei	46
Bulgaria	19	Romania	46
Argentina	21	Spain	49
Iceland	21	Greece	50
Vietnam	21	Estonia	51
Hungary	22	France	52
Slovak Republic	22	Slovenia	54
Austria	24	Luxembourg	56
Cyprus	24	Malta	N/A
Poland	25	**All Countries**	**28.1**
Philippines	29	**APEC-19 Countries**	**20.5**
India	30	**EU Countries**	**33.6**
China	31	**OECD Countries**	**28.0**
South Africa	35		

difficulty of firing redundant employees; legally mandated notice period; and mandatory severance pay. By this measure, several APEC countries, specifically Australia, Hong Kong, Singapore, and the United States, have the world's most flexible labor markets. Canada, Denmark, New Zealand, and Switzerland also exemplify highly flexible labor markets. In contrast, Spain, Greece, Estonia, France, Slovenia, and Luxembourg show the least labor market flexibility. It's not surprising that some of the countries with the highest rates of youth unemployment (for example, the rate exceeds 45 percent in Spain) have highly inflexible labor markets.

Another way to assess the productivity of a country's workforce is to look at the extent to which pay is related to productivity. If there is not a strong relationship between pay and productivity, this suggests that government policies may be forcing businesses to retain non-productive employees, whether by making it difficult to release redundant or non-productive employees, imposing overly generous minimum wages that are in excess of the value-added by certain workers, or requiring that businesses provide other benefits to employees in excess of the value they are adding. Table 4-7 shows World Economic Forum survey data on the relationship

Table 4-7: Relationship Between Pay and Productivity[27]

Country	Pay and Productivity (7=Best; 1=Worst)	Country	Pay and Productivity (7=Best; 1=Worst)
Singapore	5.6	Poland	4.2
Hong Kong	5.5	Russia	4.2
Chinese Taipei	5.4	Bulgaria	4.1
Malaysia	5.1	Ireland	4.1
Switzerland	5.1	Cyprus	4.0
Vietnam	5.1	India	4.0
Estonia	5.0	Malta	4.0
Slovak Republic	4.9	Norway	4.0
United States	4.9	Austria	3.9
Japan	4.8	Finland	3.9
China	4.7	Netherlands	3.9
Lithuania	4.7	Slovenia	3.9
Czech Republic	4.6	Turkey	3.9
Indonesia	4.6	Philippines	3.8
Israel	4.6	Sweden	3.8
Denmark	4.5	Belgium	3.7
Iceland	4.5	Brazil	3.7
South Korea	4.5	Peru	3.7
Thailand	4.5	Mexico	3.5
United Kingdom	4.5	Portugal	3.3
Canada	4.4	Spain	3.3
New Zealand	4.4	South Africa	3.2
Romania	4.4	Greece	3.1
Chile	4.3	Italy	3.1
Germany	4.3	Argentina	2.8
Latvia	4.3	**All Countries**	**4.2**
Luxembourg	4.3	**APEC-19 Countries**	**4.6**
Australia	4.2	**EU Countries**	**4.1**
France	4.2	**OECD Countries**	**4.2**
Hungary	4.2		

between pay and productivity. Pay is most closely related to productivity in Singapore, Hong Kong, Chinese Taipei, Malaysia, Switzerland, and Vietnam and least closely related in Portugal, Spain, South Africa, Greece, Italy, and Argentina, placing in stark relief the costs borne by countries with inflexible labor markets. Enterprises in the countries that scored highest on this measure have the greatest ability to reward employees based on their performance, equipping them with a powerful tool to attract the best talent to their firms. Countries that score at the bottom often shackle the productivity of their businesses by compelling them to retain employees whose output in many cases does not equal their compensation. Notably, there is a strong negative correlation between weak regulatory regimes (as defined by the World Bank) and the pervasiveness of merit-based pay.[25]

Closing a Business

In addition to enabling productivity improvements within existing firms, innovation empowers the creation of new, often more productive and competitive firms, and this turbulent, dynamic process of firm churn and turnover is a vital source of renewal and growth in economies. Innovation's demand for constant renewal holds true at both the firm level and the economy level. At the firm level, research by Franklin and Keeley suggests that firms that do not replace at least 10 percent of their revenue streams annually with new products or services are likely to be out of business within five years.[28] The emergence of ICT has only accelerated this dynamic across both ICT-producing and ICT-consuming industries. As MIT economist Eric Brynjolfsson writes, "We see much greater turbulence and volatility in the information industries, reflecting the gale of creative destruction that inevitably accompanies disruptive innovation."[29] In fact, since the mid-1990s, this has contributed to a dramatic widening in the disparity in profits between the leading firms in industries that use technology intensively and those firms and industries that are less technology intensive. Today, the leaders truly benefit from innovation while the innovation laggards pay a stiff price.

Just as businesses must constantly renew themselves, so must countries. For example, within U.S. manufacturing, the reallocation of production from less-productive firms to more productive ones accounted for significantly more than half the growth in manufacturing productivity between 1976 and 1996.[30] Firms either innovated and became more productive, or they lost market share and jobs. Innovation likewise accelerates the pace of turnover of firms in an economy. Whereas at the beginning of the last century the average lifespan of an S&P 500 company was greater than sixty years, today the average lifespan is just twenty years. Ninety-eight percent of American companies disappear within eleven years.[31] The average lifespan of a company in Japan and Europe is twelve and a half years. Despite sounding regressive, this process of churn is actually vitally important to a nation's economic health. In fact, every year more than 750,000 new establishments open in the United States, 500,000 of which are startup companies. These companies create more than seven million new jobs. At the same time, nearly 700,000 establishments close each year in the United States, destroying more than six million jobs in the process.[32] Countries in which firm creation and dissolution are impaired constrain the dynamic effects that innovation brings to an economy.

Therefore, countries that make it more difficult for businesses to close impede the reallocation of capital and talent toward more promising ventures. Table 4-8 assesses the time and costs involved in closing a business, along with the recovery rate from closing a business. These metrics can help identify weaknesses in countries' bankruptcy laws and the main procedural and administrative bottlenecks in the bankruptcy process.[33] The regulatory cost of closing a business (defined as a percentage of the value of the estate) is an astounding 38 percent of a firm's value in the Philippines and 36 percent in Thailand, compared to only 1 percent in Norway and Singapore. Ireland, Japan, Canada, Singapore, Belgium, Finland, and Norway allow the most expeditious closing of businesses (taking less than one year), while it takes an astounding seven years to close a business in India, 5.7 years in the Philippines, 5.5 in Indonesia, and 5.0 in Vietnam. Such egregiously long timeframes discourage the redeployment of labor and capital in an economy to more productive uses and ultimately are significantly counterproductive.

Recovery rates (defined as cents recovered on the dollar) calculate how much value claimants (creditors, tax authorities, and employees) can recover from an insolvent firm. Recovery rates are highest in Japan, Singapore, Canada, and Norway, where claimants can recover as much as 90 percent or more in a bankruptcy proceeding. Recovery rates are lowest in the Philippines, Indonesia, India, Brazil, and Vietnam, where claimants can recover only a fraction of assets in a bankruptcy proceeding. Taking these three measures together, Belgium, Canada, Denmark, Chinese Taipei, Finland, Iceland, Norway, and Singapore make it easiest to close and recover the assets from a firm, while this process is most time- and cost-consuming in Brazil, Chile, India, Indonesia, the Philippines, Slovak Republic, and Turkey.

Table 4-8: Cost, Time, and Recovery Rate in Closing a Business[34]

Country	Cost of Closing Business (% estate)	Country	Time to Close Business (years)	Country	Recovery Rate (cents/$)
Norway	1	Ireland	0.4	Japan	92.7
Singapore	1	Japan	0.6	Singapore	91.3
Belgium	4	Canada	0.8	Canada	91.2
Canada	4	Singapore	0.8	Norway	90.9
Chinese Taipei	4	Belgium	0.9	Denmark	89.4
Denmark	4	Finland	0.9	Finland	89.4
Finland	4	Norway	0.9	United Kingdom	88.6
Iceland	4	Australia	1.0	Belgium	87.6
Japan	4	Iceland	1.0	Ireland	87.4
Netherlands	4	Spain	1.0	Chinese Taipei	82.2
New Zealand	4	United Kingdom	1.0	Netherlands	81.9
Slovenia	4	Austria	1.1	Australia	81.8
South Korea	4	Denmark	1.1	South Korea	81.7
Switzerland	4	Hong Kong	1.1	United States	81.5
United Kingdom	6	Netherlands	1.1	Hong Kong	81.2
Lithuania	7	Germany	1.2	New Zealand	79.1
Peru	7	New Zealand	1.3	Iceland	78.5
United States	7	Cyprus	1.5	Sweden	77.3
Australia	8	Lithuania	1.5	Spain	76.3
Germany	8	South Korea	1.5	Austria	73.1
Bulgaria	9	United States	1.5	Portugal	72.6
Estonia	9	China	1.7	Cyprus	70.4
France	9	Italy	1.8	Mexico	66.7
Greece	9	Mexico	1.8	Italy	58.0
Hong Kong	9	Chinese Taipei	1.9	Czech Republic	55.9
India	9	France	1.9	Slovak Republic	55.3
Ireland	9	Greece	2.0	Germany	53.1
Portugal	9	Hungary	2.0	Slovenia	50.9
Russia	9	Luxembourg	2.0	Lithuania	49.6
Sweden	9	Portugal	2.0	Israel	49.1
Romania	11	Slovenia	2.0	Switzerland	47.5
Spain	11	South Africa	2.0	France	45.2
Argentina	12	Sweden	2.0	Luxembourg	43.7
Brazil	12	Malaysia	2.3	Thailand	43.5
Latvia	13	Thailand	2.7	Greece	43.2
Chile	15	Argentina	2.8	Malaysia	39.8
Cyprus	15	Estonia	3.0	Hungary	37.9
Hungary	15	Latvia	3.0	China	36.4
Luxembourg	15	Poland	3.0	Estonia	35.5
Malaysia	15	Switzerland	3.0	South Africa	34.4
Turkey	15	Peru	3.1	Argentina	32.8
Vietnam	15	Czech Republic	3.2	Latvia	31.9
Czech Republic	17	Bulgaria	3.3	Poland	31.3
Austria	18	Romania	3.3	Bulgaria	31.0
Indonesia	18	Turkey	3.3	Chile	28.2
Mexico	18	Russia	3.8	Peru	27.2
Slovak Republic	18	Brazil	4.0	Romania	25.7
South Africa	18	Israel	4.0	Russia	25.3
Poland	20	Slovak Republic	4v	Turkey	21.1
China	22	Chile	4.5	Vietnam	18.6
Italy	22	Vietnam	5.0	Brazil	17.1
Israel	23	Indonesia	5.5	India	16.3
Thailand	36	Philippines	5.7	Indonesia	13.2
Philippines	38	India	7.0	Philippines	4.5
Malta	N/A	Malta	N/A	Malta	N/A
All Countries	**11.4**	**All Countries**	**2.3**	**All Countries**	**55.5**
APEC-19 Countries	**12.5**	**APEC-19 Countries**	**2.5**	**APEC-19 Countries**	**56.1**
EU Countries	**10.7**	**EU Countries**	**1.9**	**EU Countries**	**59.3**
OECD Countries	**9.9**	**OECD Countries**	**1.9**	**OECD Countries**	**65.4**

Corruption-Free Regulatory Environment

The extent of corruption in an economy also significantly affects the regulatory environment for the firm. Corruption includes both bribes paid to local bureaucrats for services or favors as well as the misuse of political power by government officials to interfere with economic decisions. The economic literature is clear: Corruption is a significant deterrent to long-run economic growth. Mauro finds that corruption lowers FDI and domestic investment rates, which, in turn, dampens economic performance.[35] And Tanzi and Davodi find that, while corruption actually increases public sector spending (likely crowding out private sector investments), it reduces the productivity of public expenditures considerably.[36] In the mid- to long-term, corruption and bribery eat away at the competitive elements of an economy as firms are rewarded for "playing the game" instead of producing the highest quality at the lowest costs.

Table 4-9 shows the extent of irregular payments and bribes in the fifty-five countries in this study. New Zealand, Singapore, Sweden, Denmark, and Finland, with scores ranging from 6.7 to 6.5 (where 7 is the highest possible score), have the lowest incidences of irregular payments and bribes according to survey data provided by the World Economic Forum. In contrast, the Philippines, Argentina, Vietnam, Russia, Indonesia, and Bulgaria score lowest on

Table 4-9: Irregular Payments and Bribes[39]

Country	Irregular Payments and Bribes (7=Best; 1=Worst)	Country	Irregular Payments and Bribes (7=Best; 1=Worst)
New Zealand	6.7	Malta	4.8
Singapore	6.6	Lithuania	4.6
Sweden	6.6	South Africa	4.6
Denmark	6.5	South Korea	4.6
Finland	6.5	Malaysia	4.5
Iceland	6.4	Romania	4.4
Norway	6.4	Hungary	4.2
Hong Kong	6.3	China	4.1
Luxembourg	6.3	Peru	4.1
Switzerland	6.3	Brazil	4.0
Canada	6.2	Czech Republic	4.0
Japan	6.2	Thailand	4.0
Ireland	6.1	Italy	3.9
Netherlands	6.1	Latvia	3.9
Australia	6.0	Slovak Republic	3.9
Austria	6.0	Turkey	3.9
Israel	6.0	India	3.7
Germany	5.9	Greece	3.6
United Kingdom	5.9	Mexico	3.6
Belgium	5.7	Bulgaria	3.5
Chile	5.7	Indonesia	3.4
Cyprus	5.5	Russia	3.2
Estonia	5.5	Vietnam	3.2
France	5.5	Argentina	3.1
Portugal	5.3	Philippines	2.8
Slovenia	5.2	**All Countries**	**5.0**
Chinese Taipei	5.1	**APEC-19 Countries**	**4.8**
Spain	5.0	**EU Countries**	**5.2**
United States	5.0	**OECD Countries**	**5.5**
Poland	4.9		

this indicator, with scores of 2.8 to 3.5, falling considerably below the all-country average of 5.0. Importantly, one of the easiest ways that these low-scoring countries can reduce corruption is by introducing "disintermediation" between services and citizens.[37] By automating procedures that traditionally would require interaction with a local bureaucrat, information technology helps reduce the power asymmetries between officials and citizens, thereby reducing the likelihood of forced bribes and corruption.

The OECD provides a rating of countries' regulatory and administrative opacity, reflecting the degree to which a country's regulations and administrative procedures are clearly and transparently communicated to its businesses.[38] As Table 4-10 shows, Austria, Italy, Mexico, Portugal, South Korea, and Spain have the highest degree of regulatory and administrative capacity. In contrast, Israel, Iceland, New Zealand, Turkey, and South Africa have the most opaque regulatory and administrative procedures out of countries assessed by the OECD on this measure.

Competitive Environment for Business

The preceding fifteen indicators have provided various snapshots of how effectively countries foster competitive domestic marketplaces. Yet, while they are important on a micro level, they do not tell a holistic story. The

Table 4-10: Regulatory and Administrative Opacity[40]

Country	Regulatory and Administrative Opacity (0=Best)	Country	Regulatory and Administrative Opacity (0=Best)
Austria	0	Poland	0.66
Italy	0	India	0.66
Mexico	0	Germany	0.67
Portugal	0	Ireland	0.69
South Korea	0	Israel	0.73
Spain	0	Iceland	0.78
Netherlands	0.04	New Zealand	1.03
Slovenia	0.05	Turkey	1.07
United States	0.06	South Africa	1.12
China	0.08	Argentina	N/A
Chile	0.10	Bulgaria	N/A
Canada	0.16	Chinese Taipei	N/A
Hungary	0.18	Cyprus	N/A
Denmark	0.33	Hong Kong	N/A
France	0.33	Indonesia	N/A
Luxembourg	0.33	Latvia	N/A
Russia	0.33	Lithuania	N/A
Sweden	0.33	Malaysia	N/A
Switzerland	0.33	Malta	N/A
Norway	0.35	Peru	N/A
Australia	0.35	Philippines	N/A
United Kingdom	0.37	Romania	N/A
Japan	0.37	Singapore	N/A
Finland	0.38	Thailand	N/A
Belgium	0.38	Vietnam	N/A
Estonia	0.38	**All Countries**	**0.38**
Czech Republic	0.41	**APEC-19 Countries**	**0.25**
Greece	0.45	**EU Countries**	**0.31**
Slovak Republic	0.52	**OECD Countries**	**0.35**
Brazil	0.64		

following four indicators "bubble up" the effectiveness of the preceding policies into a broader, higher-level view of how effectively countries' regulatory policies engender competitive markets.

Intensity of Local Competition

The World Economic Forum offers a measure of the intensity of competition in an economy by asking executives how they would "assess the intensity of competition in the local markets in your country."[41] On this measure, Chinese Taipei, Germany, Austria, Belgium, and Sweden rate the highest, as Table 4-11 shows. Russia, Argentina, Mexico, Bulgaria, and Latvia have the least competitive domestic markets. Vietnam, Greece, Italy, Lithuania, and Romania also have markets where local domestic competition is well below the world average. These data show that Eastern European countries, Baltic nations, and many APEC countries have considerable opportunity to remove impediments to competition in their countries. However, in general, markets appear more competitive in developed countries, suggesting that boosting the competitiveness of domestic markets should be an important policy priority in countries wishing to close development gaps with upper-tier countries.

Table 4-11: Intensity of Local Competition[43]

Country	Intensity of Local Competition (7=Best;1=Worst)	Country	Intensity of Local Competition (7=Best;1=Worst)
Chinese Taipei	6.1	Hungary	5.3
Germany	6.1	Malaysia	5.3
Austria	5.9	Thailand	5.3
Belgium	5.9	Luxembourg	5.2
Sweden	5.9	Portugal	5.2
Japan	5.8	Slovenia	5.2
Malta	5.8	Brazil	5.1
Netherlands	5.8	Finland	5.1
United Kingdom	5.8	Indonesia	5.1
Australia	5.7	Ireland	5.1
Czech Republic	5.7	New Zealand	5.0
South Korea	5.7	South Africa	5.0
Turkey	5.7	Iceland	4.9
Canada	5.6	Peru	4.9
China	5.6	Philippines	4.9
Cyprus	5.6	Vietnam	4.8
Denmark	5.6	Greece	4.7
France	5.6	Italy	4.7
Israel	5.6	Lithuania	4.7
United States	5.6	Romania	4.7
Chile	5.5	Latvia	4.6
Norway	5.5	Bulgaria	4.5
Singapore	5.5	Mexico	4.5
Spain	5.5	Argentina	4.3
Estonia	5.4	Russia	4.1
Hong Kong	5.4	**All Countries**	**5.3**
India	5.4	**APEC-19 Countries**	**5.3**
Poland	5.4	**EU Countries**	**5.4**
Slovak Republic	5.4	**OECD Countries**	**5.4**
Switzerland	5.4		

Extent of Market Dominance

A related indicator of the degree of competition in domestic markets is the extent of market dominance, which measures the degree to which corporate activity in an economy is dominated by a few business groups or spread among many firms. As Table 4-12 shows, on this measure, Germany, Japan, Chinese Taipei, Switzerland, and Belgium rate the highest. Mexico, Israel, South Korea, the Philippines, and Iceland score the lowest on this measure. While it is surprising that executive opinion would regard Japan as having business activity not dominated by a few business groups (given the history of the *keiretsu*—business groups with tight relationships—in Japan), Japan's strong score on this indicator may reflect the strength of its small- and medium-sized enterprises (the so-called *chuken kigyo*) which dominate specialized global markets in many industries. In fact, Japanese companies serve more than 70 percent of the worldwide market in at least thirty industrial technology sectors worth more than $1 billion apiece.[42] However, competition in Japan's domestic serving sectors (for example, health care, retail, etc.) appears to be much less robust. In contrast, Korea's position, with its history of business conglomerates (known as *chaebol*), as well as Mexico's strong orientation toward business conglomerates, appears more in line with expectations.

Table 4-12: Extent of Business Market Dominance[44]

Country	Intensity of Local Competition (7=Best; 1=Worst)	Country	Intensity of Local Competition (7=Best; 1=Worst)
Germany	5.9	New Zealand	4.2
Japan	5.9	Poland	4.2
Chinese Taipei	5.7	South Africa	4.2
Switzerland	5.7	Turkey	4.2
Belgium	5.5	Malta	4.1
Netherlands	5.4	Vietnam	4.0
Austria	5.3	Slovenia	3.9
United States	5.3	Romania	3.8
United Kingdom	5.2	Greece	3.7
Australia	5.1	Hong Kong	3.7
Denmark	5.1	Hungary	3.7
Canada	5.0	Latvia	3.7
Czech Republic	5.0	Thailand	3.7
Singapore	5.0	Chile	3.5
Italy	4.9	Bulgaria	3.4
Norway	4.9	Peru	3.4
Sweden	4.9	Russia	3.4
China	4.8	Argentina	3.3
France	4.8	Lithuania	3.3
Finland	4.7	Portugal	3.3
India	4.7	Iceland	3.2
Cyprus	4.6	Philippines	3.2
Luxembourg	4.6	South Korea	3.2
Malaysia	4.6	Israel	3.1
Slovak Republic	4.5	Mexico	2.9
Spain	4.5	**All Countries**	**4.3**
Ireland	4.4	**APEC-19 Countries**	**4.3**
Brazil	4.2	**EU Countries**	**4.5**
Estonia	4.2	**OECD Countries**	**4.5**
Indonesia	4.2		

Related to governments' ability to foster a domestic market in which competition flourishes is the extent to which governments afford enterprises the ability to contest and seek redress for government actions or regulations that may hamper competition. The World Economic Forum surveys business executives regarding countries' efficiency in enabling private businesses to challenge the legality of government actions and/or regulations, as Table 4-13 shows. Hong Kong and Sweden record the highest scores on this indicator, followed by Luxembourg, Finland, and Switzerland. In contrast, Argentina registers the lowest score, followed by Slovak Republic and Italy. Bulgaria, Hungary, Latvia, the Philippines, and Russia also score low on this measure. Low scores on this indicator signal that regulators may be subject to capture by entrenched interests (whether businesses, unions, parties, etc.) and therefore more susceptible to issuing decisions or regulations that protect incumbent players. Government actions and regulations always should be made in a transparent fashion, and mechanisms should exist to enable businesses to contest governments' growth- or competition-hampering regulatory decisions.

The OECD provides a measure of barriers to competition in many countries, as Table 4-14 shows.

Table 4-13: Efficiency of Legal Framework in Challenging Regulations[45]

Country	Efficiency of Legal Framework in Challenging Regulations (7=Best;1=Worst)	Country	Efficiency of Legal Framework in Challenging Regulations (7=Best;1=Worst)
Hong Kong	5.8	Malta	4.0
Sweden	5.8	Thailand	4.0
Luxembourg	5.6	Indonesia	3.9
Finland	5.5	Vietnam	3.8
Switzerland	5.4	Spain	3.7
Germany	5.3	Brazil	3.5
New Zealand	5.3	Mexico	3.4
Norway	5.3	Slovenia	3.4
Singapore	5.3	Turkey	3.4
Austria	5.2	Czech Republic	3.3
Denmark	5.2	Lithuania	3.2
Netherlands	5.1	South Korea	3.2
Australia	5.0	Greece	3.1
Iceland	5.0	Peru	3.1
Canada	4.9	Poland	3.1
France	4.9	Portugal	3.0
United Kingdom	4.9	Romania	2.9
Cyprus	4.7	Bulgaria	2.8
South Africa	4.7	Hungary	2.8
Chile	4.6	Latvia	2.8
Ireland	4.5	Philippines	2.8
Malaysia	4.4	Russia	2.8
Japan	4.3	Italy	2.7
United States	4.3	Slovak Republic	2.4
Estonia	4.2	Argentina	2.3
India	4.2	**All Countries**	**4.1**
Belgium	4.1	**APEC-19 Countries**	**4.2**
Chinese Taipei	4.1	**EU Countries**	**4.0**
Israel	4.1	**OECD Countries**	**4.3**
China	4.0		

According to the OECD's data, the United Kingdom, Ireland, Sweden, Slovak Republic, and the Netherlands have the lowest barriers to competition in their countries. They are followed by Spain, New Zealand, the Czech Republic, Chile, and Austria. In contrast, OECD data suggests that Iceland, the United States, Israel, China, and Mexico have the highest barriers to competition out of the thirty-nine countries they assess.

Entrepreneurial Environment

As noted, in achieving economic growth in both developed and developing countries, raising productivity and innovation across the board in all sectors is essential. This can be done, in part, by implementing innovation policies that spur productivity growth in existing firms. But this is only part of the answer. Crucially, policymakers also need to employ innovation policies that foster entrepreneurship throughout all sectors of the economy. New firms, especially "gazelle" firms—fast-growing new firms—promote economic dynamism by injecting fresh ideas and new technologies into the economy. They are essential to the process of "creative destruction," whereby innovative new firms replace less innovative incumbents, raising productivity in their sectors or even creating new sectors, and growing the economy as a whole. The primary mechanism through which entrepreneurs boost productivity and innovation is by transferring new ideas and inventions into the marketplace—in the

Table 4-14: Barriers to Competition[46]

Country	Barriers to Competition (0=Best)	Country	Barriers to Competition (0=Best)
United Kingdom	0.25	Russia	0.66
Ireland	0.32	Canada	0.69
Sweden	0.33	Japan	0.74
Slovak Republic	0.37	South Africa	0.79
Netherlands	0.41	Iceland	0.82
Spain	0.42	United States	0.83
New Zealand	0.42	Israel	0.92
Czech Republic	0.43	China	0.93
Chile	0.45	Mexico	1.02
Austria	0.46	Argentina	N/A
Switzerland	0.47	Bulgaria	N/A
Germany	0.47	Chinese Taipei	N/A
Slovenia	0.48	Cyprus	N/A
Turkey	0.48	Hong Kong	N/A
Finland	0.49	Indonesia	N/A
Estonia	0.49	Latvia	N/A
France	0.51	Lithuania	N/A
Brazil	0.52	Malaysia	N/A
Italy	0.52	Malta	N/A
Australia	0.54	Peru	N/A
Belgium	0.55	Philippines	N/A
Hungary	0.56	Romania	N/A
Poland	0.57	Singapore	N/A
India	0.58	Thailand	N/A
Luxembourg	0.58	Vietnam	N/A
Norway	0.58	**All Countries**	**0.57**
Portugal	0.59	**APEC-19 Countries**	**0.69**
Denmark	0.60	**EU Countries**	**0.48**
South Korea	0.61	**OECD Countries**	**0.55**
Greece	0.61		

words of Schumpeter, "The inventor produces ideas, the entrepreneur 'gets things done.'" The key point is that, as Christensen documented in *The Innovator's Dilemma*, existing firms all too often resist innovation; instead, entrepreneurial startups often are the drivers.[48] Thus, entrepreneurship facilitates innovation by both directly bringing ideas to the marketplace and by keeping incumbent firms from growing complacent, and then productivity is boosted among new firms and existing firms alike. In a study of twenty-three OECD countries, Audretsch et al. found that a sustained entrepreneurship rate is essential for economic growth.[49] Holtz-Eakin and Kao found that increases in the birth rate of firms, after some lag, leads to higher productivity.[50] This is partially reflected in the fact that, in Canada, for example, SMEs account for 82 percent of new technologies created in the economy.[51] In addition, a small share of new, "gazelle" firms is responsible for the lion's share of new job creation in many countries. Indeed, in the United States and Korea, young firms (those under five years of age) have been responsible for virtually all new jobs created over the past several years.[52] In the United States, new and small businesses accounted for roughly 70 percent of all new jobs created in the past decade.[53]

Table 4-15 shows the number of new firms created per 1,000 workers employed in 2009. On this measure, Cyprus leads all countries with 20.3 new firms founded per every 1,000 workers employed. Cyprus is followed by

Table 4-15: New Firms Per 1,000 Workers Employed[55]

Country	New Firms Per 1,000 Workers Employed	Country	New Firms Per 1,000 Workers Employed
Cyprus	20.30	Czech Republic	3.00
Hong Kong	19.19	Spain	2.92
New Zealand	17.08	Peru	2.65
Iceland	12.84	Russia	2.61
Malta	9.52	Malaysia	2.55
Estonia	8.10	Chinese Taipei	2.42
United Kingdom	8.05	Brazil	2.38
Canada	7.56	Lithuania	2.18
Singapore	7.40	Chile	2.12
Luxembourg	7.38	Italy	1.78
Bulgaria	7.20	South Korea	1.72
Australia	6.38	Japan	1.28
China	6.30	Germany	1.19
Hungary	6.26	Greece	1.18
Switzerland	4.88	Turkey	0.87
Ireland	4.67	South Africa	0.77
Latvia	4.62	Mexico	0.61
Denmark	4.57	Thailand	0.59
Norway	4.49	Austria	0.58
Israel	4.46	Poland	0.52
United States	4.30	Argentina	0.46
Belgium	4.28	Philippines	0.19
Slovenia	4.16	Indonesia	0.18
Sweden	4.09	India	0.12
Slovak Republic	4.04	Vietnam	N/A
Portugal	3.92	**All Countries**	**4.52**
Romania	3.66	**APEC-19 Countries**	**4.73**
Finland	3.37	**EU Countries**	**4.73**
Netherlands	3.10	**OECD Countries**	**4.38**
France	3.08		

Hong Kong, New Zealand, and Iceland. India, Indonesia, the Philippines, Argentina, and Poland have the lowest rates of entrepreneurship, with India, Indonesia, and the Philippines, respectively, creating just 0.12, 0.18, and 0.19 firms for every 1,000 workers employed. The United States' underwhelming performance on this indicator—4.30 new firms created per every 1,000 workers employed—likely reflects in part the economic downturn of the late 2000s. As a group, the EU countries and APEC countries tie for the most new firms, 4.73, created per 1,000 workers employed, followed by the OECD at 4.38 firms.

The quality of a country's regulatory environment is critical for fostering new firm creation. In a study of eighty-four countries, Klapper, Amit, and Guillen find there is a strong relationship between entrepreneurial activity and the indicators that impact domestic market competition (financial markets, economic growth, and the quality of the legal, regulatory, and governing environment).[54] The OECD provides a measure of the administrative burden that countries impose on their startup businesses, as Table 4-16 shows. Ireland, Germany, New Zealand, the United Kingdom, and Denmark impose the fewest administrative burdens on their startups, according to OECD data. In contrast, China, India, Mexico, Chile, and Poland impose the greatest burden. China imposes the most administrative burdens in startups by an order of magnitude, more than three times greater than the all-country average.

Table 4-16: Administrative Burden on Startups[56]

Country	Administrative Burden on Startups (0=Best)	Country	Administrative Burden on Startups (0=Best)
Ireland	0.15	Israel	0.81
Germany	0.16	Turkey	0.86
New Zealand	0.18	Greece	0.87
United Kingdom	0.19	Hungary	0.94
Denmark	0.21	Poland	1.07
South Africa	0.24	Chile	1.08
Norway	0.24	Mexico	1.27
Japan	0.24	India	1.47
Australia	0.25	China	1.84
Canada	0.28	Argentina	N/A
Sweden	0.28	Bulgaria	N/A
United States	0.33	Chinese Taipei	N/A
Switzerland	0.36	Cyprus	N/A
Iceland	0.38	Hong Kong	N/A
Netherlands	0.41	Indonesia	N/A
France	0.43	Latvia	N/A
Finland	0.48	Lithuania	N/A
Belgium	0.49	Malaysia	N/A
Estonia	0.52	Malta	N/A
South Korea	0.52	Peru	N/A
Slovenia	0.54	Philippines	N/A
Italy	0.55	Romania	N/A
Portugal	0.57	Singapore	N/A
Slovak Republic	0.64	Thailand	N/A
Czech Republic	0.69	Vietnam	N/A
Austria	0.70	**All Countries**	**0.60**
Russia	0.77	**APEC-19 Countries**	**0.68**
Luxembourg	0.77	**EU Countries**	**0.54**
Spain	0.77	**OECD Countries**	**0.54**
Brazil	0.79		

Chapter 5: Intellectual Property Rights

What Are Intellectual Property Rights?

In considering what constitutes innovation policy, intellectual property rights (IPR), as the "use of property-like rights to induce innovations of various kinds," are considered one of the most central and oldest institutions in the policy domain. Intellectual property refers to creations of the mind, such as inventions, literary and artistic works, and symbols, names, images, and designs used in commerce.[1] Intellectual property rights as an institutional arrangement consist of various types of rights, including patents for inventions, trade secrets, copyrights, trademarks, and even design and database rights.

Intellectual property represents the creative thought that is embodied in inventions, books, music, and works of art. It is in the design of a car engine, the wings of a plane, the software that runs a computer, the devices and processes that run efficient manufacturing shop floors, the words that form a story, and the notes of a song. Patent, copyright, and trademark laws give the creators of intellectual property the right, for a limited time, to prevent others from using their works. A patent gives an inventor of a type of circuit design the right to keep someone else from producing a circuit using the same process.[2] Copyrights allow a software company to prevent anyone from copying the software without permission. Trademarks protect brand names, designs, and other symbols (like the apple design on the Apple computer) that companies use to sell their products.

The Importance of Intellectual Property Rights

From the Middle Ages to today, IPR arrangements are well recognized as providing effective protections that enable innovators to achieve the returns necessary to continue to innovate and to promote the availability of leading-edge technologies. Economist Douglass North, one of the foremost scholars of economic history, argues that the introduction of intellectual property rights had one of the most profound impacts on spurring economic growth in human history. North points out that average global economic growth rates for about one and a half millennia prior to the Industrial Revolution are estimated to have been almost zero. Eighteenth-century elites in England had practically the same per-capita income as their counterparts in third-century Rome.[3] North has shown that the inflection point toward greater economic growth was the widespread development of patent systems in the nineteenth century.[4]

Clearly delineated intellectual property rights are a *sine qua non* for an innovative economy. Effective protection and enforcement of IPR encourages innovators to invest in research, development, and commercialization of technologies while promoting their dissemination. But weak intellectual property rights protections reduce the flow of foreign direct investment and technology transfer. Without adequate intellectual property protections, there will be less innovation overall.

Intellectual property rights produce at least five principal benefits for developed and developing countries alike. First, stronger intellectual property rights spur innovative activity by increasing the appropriability of the returns to innovation, enabling innovators to capture more of the benefits of their own innovative activity. By raising the private rate of return closer to the social rate of return, intellectual property addresses the knowledge-asset incentive problem, allowing inventors to realize economic gain from their inventions, thereby catalyzing economic growth. In addition, as they capture a larger portion of the benefits of their innovative activity, innovators obtain the resources to pursue the next generation of innovative activities, engendering a virtuous cycle of innovation for countries.

Second, as a condition of receiving certain intellectual property rights, such as patents, innovators are required to disclose their knowledge, as opposed to keeping it secret, which creates knowledge spillovers that help others innovate.[5] Indeed, the spillover effects from innovative activity are tremendous. A number of studies have found that the rate of return to society from corporate R&D and innovation activities is at least twice the estimated returns that the company itself receives.[6]

Third, IPRs can help countries operate more efficiently and productively by reducing transaction costs. For example, trademarks signal information about the quality of products, which reduce consumer search costs.[7] A fourth benefit of intellectual property rights pertains to the international diffusion of innovations, which refers to the introduction of foreign products, processes, and technologies into a destination economy.[8] Such diffusion can occur through several mechanisms, including trade, international licensing, foreign direct investment, or joint ventures. When countries extend intellectual property rights protections to not only their own enterprises but also to enterprises from foreign countries that seek to introduce new products, processes, or technologies into their markets, knowledge and technology diffuse across borders, producing benefits for consumers and enterprises in the foreign economy. As Maskus explains, trade and

foreign direct investment are key factors in this process as they are two of the main market-mediated channels by which ideas and intangible assets are disseminated internationally.[9] Thus, trade and FDI facilitate the gradual accumulation of knowledge capital in firms, sectors, and countries.[10] Such open trade in enabling general-purpose technologies, such as information and communications technology, is vitally important for countries, for such enabling technologies impact the competitiveness of all sectors of an economy. For example, if a country's weak IPR protections deter foreign enterprises from introducing and thus inhibit its domestic industries from accessing best-of-breed information and communications technologies, its domestic sectors, such as banking, insurance, retail, and transportation, are likely to suffer from missing out on these productivity-boosting products and technologies. Finally, a sixth benefit for countries, as explained subsequently, is that increased IPR protections have been shown to boost exports in developing countries.

Putting these benefits together, it's clear that effective intellectual property rights are vital to a country's competitiveness. As the OECD finds, "Enhancement of IPR systems and complementary policies help to improve competitiveness—at both the macro and the micro economic levels—via improved access to, and accumulation of, knowledge capital."[11] Thus, as Park and Lippoldt find, "Reform of IPR protection is often cited as one part of a general strategy for promoting economic development." At the same time, effective IPR protections produce positive spillovers for the entire world.[12] By being able to earn profits from a larger global marketplace, innovative enterprises are able to reinvest those revenues in future generations of products, processes, and technologies that continue to push forward the global technology frontier, producing benefits for citizens in all countries.

Despite the benefits that strong IPR protections bring to countries, some have expressed concerns about IPR in a development context, in particular with regard to technology access, firms' ability to "learn by doing," and the costs of implementing IPR systems. Others worry that either through competition or strategic behavior by firms, "patent thickets" may arise, blocking others' ability to exploit new technologies or limiting innovation in related areas.[13] Still others have argued that, while strong intellectual property rights regimes make sense in developed countries, they are less useful for developing countries, whose industries in some cases may rely on imitative catch-up strategies designed to build off technologies created elsewhere.

In response to such criticisms, the central point is that the patent system always has been about finding the right balance between creating the incentives for innovation while promoting the diffusion of knowledge. Striking the right balance is why many countries (and agreements such as TRIPS) award patents with twenty-year coverage periods and not 100-year coverage periods. And, while problems have sometimes arisen with patent thickets, these often arise from poor-quality patent issuance more than anything else. Ultimately, policymakers must recognize that the goal is to achieve a balanced, high-quality patent system that issues strong patents for truly innovative activity and that balances incentives to innovate with the goal of diffusing knowledge.

The evidence shows that strong intellectual property rights protections are vitally important for both developed and developing countries. As a definitive 2010 OECD review of the effects of intellectual property rights protections on developing countries found, "the results point to a tendency for IPR reform to deliver positive economic results."[14] The study found that developing country IPR reforms concerning patent protection have tended to deliver the most substantial results, but the results for copyright reform and trademark reform also are positive and significant. But to have the greatest impact on economic growth, IPR reforms must occur concomitantly with other positive complements, particularly those regarding inputs for innovative and productive processes and the ability to conduct business. These include policies that influence the macro-environment for firms, as well as the availability of resources (for example, those related to education), the legal and institutional conditions, and the fiscal incentives.[15]

The Relationship of IPR Reform to Trade, FDI, and Technology Transfer

A wealth of academic research has documented the relationship between the strength of a country's intellectual property protections and the extent of trade and foreign direct investment. For example, a 1986 United Nations Conference on Trade and Development study found that direct investment in new technology areas such as computer software, semiconductors, and biotechnology was supported by stronger intellectual property rights policy regimes.[16] A 1989 study by the United Nations Commission on Transnational Corporations (UNCTC) found that weak IPR reduced computer software direct investment, and a 1990 study by UNCTC found that weak IPR reduced pharmaceutical investment.[17] Mansfield has conducted firm-level surveys which find that perceptions of strong IPR abroad have a positive effect on incentives to transfer technologies abroad. Likewise, survey research by the World Bank's International Finance Corporation has found that, with variations by sector, country, and technology, at least 25 percent of American and Japanese high-tech firms refused to direct invest or joint venture in developing countries with weak intellectual property rights; and a later study confirmed those survey findings

with actual foreign direct investment data.[18] And, an Institute for International Economics study of World Bank data concluded that weak intellectual property rights reduce flows of all these commercial activities, regardless of the level of national economic development.[19] By the same token, strengthening of IPR protection also has been connected with increased inflows of FDI. Cavazos Cepeda, Lippoldt and Senft find that a 1 percent increase in the protection of IPRs as measured by the Patent Rights Index (a measure of the strength of countries' IPR regimes) is associated with a 2.8 percent increase in the inflow of FDI.[20]

Likewise, an increase in trademark protection level by 1 percent is associated with a 3.8 percent increase in FDI. Further, a 1 percent increase in copyright protection yielded a 6.8 percent increase in FDI.[21] Moreover, they found a virtuous cycle between FDI and IP protection, whereby improvements in the IPR environment are associated with improved economic performance—in particular with respect to FDI—and, in turn, further improvements in the IPR environment. Park and Lippoldt also show that stronger IPRs in developing countries are associated with an increase of technology-intensive FDI. Awokuse and Yin provide a concrete example concerning the relationship of IPR protection in China to FDI inflows. They conclude that IPR reforms in China have had a positive and significant effect on inward FDI.[22] Strengthening of IPR protection also has been shown to correlate with increased trade.[23] Fink and Primo Braga found that IPR protection is positively associated with international trade flows, in particular manufactured nonfuel imports.[24]

Academic research also shows a strong correlation between IPR and technology transfer. Lippoldt shows that IPR strengthening in countries—particularly with respect to patents—is associated with increased technology transfer via trade and investment.[25] Diwan and Rodrik have demonstrated that stronger patent rights in developing countries give enterprises from developed countries a greater incentive to research and introduce technologies appropriate to developing countries.[26] Similarly, Taylor shows that weak patent rights in developing countries lead enterprises from developed countries to introduce less-than-best practice technologies to developing countries.[27] Interestingly, the relationship goes in both directions. Branstetter and Saggi show that strengthened IPR protection not only improves the investment climate in the implementing countries, but also leads to increased FDI in the country producing the original innovation.[28] They conclude that IPR reform in the "global South" (developing countries) may be associated with FDI increases in the "global North" (developed countries). As northern firms shift their production to southern affiliates, this FDI accelerates southern industrial development, creating a cyclical feedback mechanism that also benefits the North. Another study by Liao and Wong, focusing on firm-level analysis, highlights the inter-relationship of IPR reform in developed and developing countries. Their study concludes that developing countries can entice technology transfer from the North by providing IPR protection for incoming products (although they note that there is a need for redoubled R&D efforts in developed countries to spur needed innovation).[29]

The Relationship between IPR Reform and Innovation/R&D

IPR reforms introduce strong incentives for domestic innovation. Sherwood, using case studies from eighteen developing countries, concluded that poor provision of intellectual property rights deters local innovation and risk-taking.[30] In contrast, IPR reform also has been associated with increased innovative activity as measured by domestic patent filings, albeit with some variation across countries and sectors.[31] For example, Ryan, in a study of bio-medical innovations and patent reform in Brazil, finds that patents provided incentives for innovation investments and facilitated the functioning of technology markets.[32] Park and Lippoldt also observe that the provision of adequate protection for IPRs can help to stimulate local innovation, in some cases building on the transfer of technologies that provide inputs and spillovers.[33] In other words, local innovators are introduced to technologies first through the technology transfer that takes place in an environment where protection of IPRs is assured; then, they may build upon those ideas to create an evolved product or develop alternate approaches. But, Maskus notes that, without protection from potential abuse of their newly developed technologies, foreign enterprises may be less willing to reveal technical information associated with their innovations.[34] The protection of patents and trade secrets provides necessary legal assurances for firms wishing to reveal proprietary characteristics of technologies to subsidiaries and licensees via contracts.

The relationship between IPR rights and innovation also can be seen in studies of how the introduction of stronger IPR laws, with regard to patents, copyrights, and trademarks, affect R&D activity in an economy. Studies by Varsakelis and Kanwar and Evenson find that R&D/GDP ratios are positively related to the strength of patent rights, conditional on other factors.[35] Cavazos Cepeda, Lippoldt and Senft find a positive influence of IPRs on the level of R&D in an economy, finding that, for every 1 percent increase in the level of protection of IPRs in an economy (as measured by improvements to a country's score in the Patent Rights Index), there was on average a 0.7 percent increase in the domestic level of R&D.[36] Likewise, a 1 percent increase in copyright protection was associated with a 3.3 percent increase in domestic R&D. Similarly,

when trademark protection increased by one percent, it was associated with an R&D increase of 1.4 percent. As they conclude, "Increases in the protection of the IPRs carried economic benefits in the form of higher inflows of FDI, increases in the levels of domestically conducted R&D, and increases in the level of service imports as measured by licensing fees."[37] As Jackson summarizes the relationship between IPR reform and both innovation/R&D and FDI, "In addition to spurring domestic innovation, strong intellectual property rights can increase incentives for foreign direct investment, which in turn also leads to economic growth."[38]

The Relationship between IPR Reform and Exports/Growth

Academic research draws a correlation between stronger IPR protections and exports from developing countries, and between stronger IPR protections and the faster growth rates of certain industries. Yang and Kuo argue that stronger IPR protection can improve the export performance of firms benefitting from technology transfer. And, in their 2010 research, Cavazos Cepeda, Lippoldt and Senft find that trademark protection has a statistically significant association in relation to the export turnover, sales, and total assets of firms studied. They also find a significant association between copyrights and export turnover. And they find "a positive influence of patent right protection on export turnover (sales) under certain specifications with respect to complementary policies."[39]

In cross-country studies, researchers also have found that stronger patent rights are associated with faster company growth in IP-intensive industries like pharmaceuticals. In fact, during the early 1990s, a one-standard-deviation increase in patent rights was associated with an increase in firm growth of 0.69 percent (an advantage amounting to nearly one-fifth of the average industry growth rate of 3.7 percent).[40]

Consequences of Not Implementing Strong IPR Protections

Nations that have not implemented or do not enforce robust intellectual property rights protections hurt their economic development in at least three principal ways. First, they deter future innovative activity by their innovators. Second, they discourage trade and foreign direct investment, hurting their own consumers and businesses, both by limiting their choices and by inhibiting their enterprises' ability to access best-of-breed technologies that are vital to boosting domestic productivity. Third, in countries with weak IPR protections, firms are forced to invest undue amounts of resources in protection rather than invention.

Ironically, developing countries' own economic development opportunities and intellectual property development potential are inhibited by their weak intellectual property protections. For instance, the lack of effective protection for intellectual property rights has limited the introduction of advanced technology and innovation investments by foreign companies in China, reducing potential benefits to local innovation capacity.[41] As Cavazos Cepeda, Lippoldt and Senft find in a case study of IPR protections in that economy: "China has made progress in strengthening the protection of intellectual property over the past two decades, as attested to by indicators such as the Patent Rights Index…However, uncertainty around the protection of intellectual property [remains] an important deterrent for foreign as well as domestic firms engaging in R&D-related activities."[42]

Some countries not on the global technological frontier have used a strategy of intellectual property theft in an attempt to catch up with the global technology frontier. But, as a study by Grossman and Helpman found, while intellectual property theft may help countries in the short-run, IP theft stifles incentives to embark on home-grown technology development, thus retarding countries' abilities to develop their long-term capability to compete by cultivating real skills at innovating new products, services, processes, and technologies.[43]

Ultimately, as Cavazos Cepeda, Lippoldt and Senft find, countries in which "uncertainties in the IP environment persist" are "likely to fall short of their innovation potential," as some firms may withdraw from innovative activities or divert energy into alternative approaches for IP protection.[44] Thus, if countries are to realize their vision of fostering regional trade and foreign direct investment while at the same time maximizing their full innovation and economic growth potential, it is imperative that they both implement and enforce strong IPR protections.

Assessing Countries' Intellectual Property Rights Protections

This chapter assesses countries on their extent of IP protection, their effectiveness at enforcing IP rights, and the extent of IP theft in their countries, using six indicators outlined in Table 5-1. Countries' scores on IPR policy account for 15 percent of their aggregate scores. Table 5-2 shows countries' ranks in IPR policy.

As Table 5-2 shows, there is a relationship between countries' level of development and their rank in IP policies. Leading nations tend to be developed ones, such as Australia, the Netherlands, and the United Kingdom. A number of Baltic and Eastern European countries, as well as other nations seeking to be innovation leaders, like Chinese Taipei, Israel, and South Korea, are in the upper-mid tier. China is in the lower-mid tier, in part because it has

Table 5-1: Intellectual Property Rights Indicators

Section Weight	Indicator	Data Type	Source	Indicator Weight
40%	**Protection**			
	2005 Park Index	Rating	Walter G. Park	25%
	IP Protection Rating	Rating	WEF	15%
30%	**Enforcement**			
	Legal and Political Environment	Rating	Property Rights Alliance	15%
	Integrity of the Legal System	Rating	PRS Group	15%
30%	**IP Theft**			
	Software Piracy Rate	Unlicensed Software % of Total Installed	Business Software Alliance/IDC Corporation	15%
	USTR 301 Watch List	Priority Watch List/ Watch List/ Not Listed	United States Trade Representative	15%

Table 5-2: Country Ranks for Intellectual Property Rights Protections (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Australia	Chile	Bulgaria	Argentina
Austria	Chinese Taipei	China	Brazil
Belgium	Cyprus	Greece	Indonesia
Canada	Czech Republic	India	Peru
Denmark	Estonia	Lithuania	Philippines
France	Hong Kong	Malaysia	Russia
Finland	Hungary	Mexico	Thailand
Germany	Iceland	Romania	Vietnam
Japan	Israel	Turkey	
Ireland	Italy		
Luxembourg	Latvia		
Netherlands	Malta		
New Zealand	Poland		
Norway	Portugal		
Singapore	Slovak Republic		
Sweden	Slovenia		
Switzerland	Spain		
United Kingdom	South Africa		
United States	South Korea		

made some recent improvement in its IPR regime. The Latin American nations—Argentina, Brazil, and Peru—along with some emerging Asian nations, are in the lower tier.

IP Protection

Perhaps the best measure of countries' IP protections is the "Park Index," which provides an index of patent rights for 110 countries. It presents the sum of five separate scores for: coverage (inventions that are patentable); membership in international treaties; duration of protection; enforcement mechanisms; and restrictions (for example, compulsory licensing in the event that a patented invention is not sufficiently exploited).[45] The index was designed to provide an indicator of the strength

Table 5-3: Park Index Rating of Intellectual Property Protection[47]

Country	Park Index (2005)	Country	Park Index (2000)	Country	% Change (2000–2005)
United States	4.88	United States	4.88	India	65.6
Belgium	4.67	Belgium	4.67	Slovak Republic	42.2
Canada	4.67	Canada	4.67	Czech Republic	34.9
Denmark	4.67	Denmark	4.67	China	32.0
Finland	4.67	France	4.67	Lithuania	14.9
France	4.67	Ireland	4.67	Malaysia	14.9
Ireland	4.67	Italy	4.67	Chinese Taipei	13.7
Italy	4.67	Japan	4.67	Indonesia	12.1
Japan	4.67	Netherlands	4.67	Romania	12.1
Netherlands	4.67	Finland	4.54	Hungary	11.4
Bulgaria	4.54	Sweden	4.54	Malta	9.4
Sweden	4.54	United Kingdom	4.54	Portugal	9.0
United Kingdom	4.54	Germany	4.50	Greece	8.3
Germany	4.50	Bulgaria	4.42	Poland	7.4
Hungary	4.50	Austria	4.33	Mexico	5.4
Portugal	4.50	Spain	4.33	Thailand	5.1
Austria	4.33	Switzerland	4.33	Philippines	5.0
Czech Republic	4.33	Chile	4.28	Singapore	5.0
South Korea	4.33	South Africa	4.25	South Korea	4.8
Spain	4.33	Australia	4.17	Vietnam	4.5
Switzerland	4.33	Luxembourg	4.14	Norway	3.9
Greece	4.30	Israel	4.13	Iceland	3.8
Norway	4.29	Norway	4.13	Finland	2.9
Chile	4.28	Portugal	4.13	Bulgaria	2.7
South Africa	4.25	South Korea	4.13	Argentina	0
Poland	4.21	Hungary	4.04	Australia	0
Singapore	4.21	New Zealand	4.01	Austria	0
Slovak Republic	4.21	Singapore	4.01	Belgium	0
Philippines	4.18	Turkey	4.01	Brazil	0
Australia	4.17	Argentina	3.98	Canada	0
Romania	4.17	Philippines	3.98	Chile	0
Luxembourg	4.14	Greece	3.97	Cyprus	0
Israel	4.13	Poland	3.92	Denmark	0
China	4.08	Hong Kong	3.81	France	0
New Zealand	4.01	Romania	3.72	Germany	0
Turkey	4.01	Mexico	3.68	Hong Kong	0
Lithuania	4.00	Russia	3.68	Ireland	0
Argentina	3.98	Brazil	3.59	Israel	0
Mexico	3.88	Cyprus	3.48	Italy	0
Hong Kong	3.81	Lithuania	3.48	Japan	0
India	3.76	Iceland	3.38	Luxembourg	0
Chinese Taipei	3.74	Peru	3.32	Netherlands	0
Russia	3.68	Chinese Taipei	3.29	New Zealand	0
Brazil	3.59	Czech Republic	3.21	Peru	0
Iceland	3.51	Malta	3.18	Russia	0
Cyprus	3.48	China	3.09	South Africa	0
Malaysia	3.48	Malaysia	3.03	Spain	0
Malta	3.48	Slovak Republic	2.96	Sweden	0
Peru	3.32	Vietnam	2.90	Switzerland	0
Vietnam	3.03	Thailand	2.53	Turkey	0
Indonesia	2.77	Indonesia	2.47	United Kingdom	0
Thailand	2.66	India	2.27	United States	0
Estonia	N/A	Estonia	N/A	Estonia	N/A
Latvia	N/A	Latvia	N/A	Latvia	N/A
Slovenia	N/A	Slovenia	N/A	Slovenia	N/A
All Countries	**4.12**	**All Countries**	**3.93**	**All Countries**	**6.37%**
APEC-19 Countries	**3.89**	**APEC-19 Countries**	**3.72**	**APEC-19 Countries**	**5.39%**
EU Countries	**4.37**	**EU Countries**	**4.14**	**EU Countries**	**6.47%**
OECD Countries	**4.38**	**OECD Countries**	**4.24**	**OECD Countries**	**4.19%**

of patent protection in countries (though not the overall quality of countries' patent systems).[46]

According to the latest Park Index (which uses data as of 2005), the United States offers the world's strongest patent protection regime, as Table 5-3 shows. The United States is followed by Denmark, Finland, France, Ireland, Italy, Japan, and the Netherlands. Thailand, Indonesia, Vietnam, and Peru offer the weakest patent regimes. In terms of improving their scores on the Park Index between 2000 and 2005, India, Slovak Republic, the Czech Republic, China, and Lithuania demonstrated the greatest improvement. No countries regressed in terms of the strength of their patent protections.

In another measure, the World Economic Forum surveys executives on how they rate intellectual property protection, including anti-counterfeiting measures in countries, as shown in Table 5-4. Finland, Sweden, Singapore, Luxembourg, and Switzerland rate the highest. Argentina rates the lowest, followed by Bulgaria, Peru, Russia, and Turkey. The Philippines and Vietnam have scores less than half that of the leaders.

Table 5-4: Rating of Intellectual Property Protection by the *World Economic Forum*[48]

Country	WEF Intellectual PropertyProtection Rating (7=Best;1=Worst)	Country	WEF Intellectual PropertyProtection Rating (7=Best;1=Worst)
Finland	6.2	Israel	4.2
Sweden	6.2	South Korea	4.1
Singapore	6.1	China	4.0
Luxembourg	6.0	Greece	4.0
Switzerland	6.0	Hungary	4.0
France	5.9	Czech Republic	3.9
New Zealand	5.8	Indonesia	3.8
Austria	5.7	Slovak Republic	3.8
Denmark	5.7	Chile	3.7
Germany	5.7	Italy	3.7
Netherlands	5.7	Poland	3.7
Australia	5.6	India	3.6
Canada	5.6	Latvia	3.6
Ireland	5.6	Lithuania	3.5
Norway	5.6	Romania	3.2
United Kingdom	5.5	Brazil	3.1
Hong Kong	5.4	Mexico	3.1
Japan	5.2	Thailand	3.1
Belgium	5.1	Philippines	2.8
Iceland	5.1	Vietnam	2.7
United States	5.1	Bulgaria	2.6
Chinese Taipei	4.9	Peru	2.6
South Africa	4.9	Russia	2.6
Cyprus	4.7	Turkey	2.6
Malaysia	4.7	Argentina	2.5
Estonia	4.6	**All Countries**	**4.5**
Malta	4.6	**APEC-19 Countries**	**4.3**
Portugal	4.4	**EU Countries**	**4.7**
Slovenia	4.4	**OECD Countries**	**4.9**
Spain	4.3		

IP Enforcement

While it is important to have IPR protections in place, they are of little benefit if they are not enforced. Enforcement is contingent upon a number of factors pertaining to the quality of the country's political and legal environment, including its adherence to the rule of law, its degree of judicial independence, the resources available for intellectual property rights enforcement, and the overall desire to enforce those rights. Two indicators provide insight into the quality of countries' efforts at IP enforcement.

First, the Property Rights Alliance uses four sub-measures to create a composite score of countries' legal and political environment in support of IPR: the degree of judicial independence, the rule of law, political stability, and the control of corruption. According to Table 5-5, Finland, New Zealand, Sweden, Denmark, Luxembourg, Norway, and Switzerland feature the best legal and political environment in support of IPR. Russia and the Philippines, followed by Peru, Argentina, Mexico, Indonesia, and China offer the weakest legal environments in support of IPR.

Table 5-5: *Property Rights Alliance* Rating of Legal and Political Environment[50]

Country	Legal and Political Environment Rating (10=Best; 0=Worst)	Country	Legal and Political Environment Rating (10=Best; 0=Worst)
Finland	8.8	Hungary	6.1
New Zealand	8.8	Israel	6.1
Sweden	8.8	Spain	6.1
Denmark	8.7	South Korea	6.0
Luxembourg	8.5	Latvia	5.9
Norway	8.5	Lithuania	5.8
Switzerland	8.5	Slovak Republic	5.7
Canada	8.4	Malaysia	5.6
Netherlands	8.4	Italy	5.5
Australia	8.3	South Africa	5.5
Iceland	8.3	Greece	5.4
Singapore	8.3	Romania	5.2
Ireland	8.2	Brazil	5.0
Austria	8.1	Bulgaria	5.0
Germany	8.1	Vietnam	4.8
Hong Kong	8.1	India	4.7
United Kingdom	7.8	Thailand	4.6
Japan	7.6	Turkey	4.6
Belgium	7.4	China	4.5
Chile	7.3	Indonesia	4.2
Malta	7.3	Mexico	4.2
France	7.2	Argentina	4.1
Estonia	7.1	Peru	3.7
United States	7.1	Philippines	3.5
Cyprus	7.0	Russia	3.5
Portugal	6.8	**All Countries**	**6.5**
Slovenia	6.8	**APEC-19 Countries**	**6.1**
Chinese Taipei	6.4	**EU Countries**	**7.0**
Poland	6.4	**OECD Countries**	**7.2**
Czech Republic	6.3		

As Table 5-6 shows, the PRS Group provides a legal system integrity rating that contains two measures comprising one risk component. The 'law' sub-component assesses the strength and impartiality of the legal system, while the 'order' sub-component assesses popular observance of the law.[49] Austria, Canada, Denmark, Finland, Iceland, Ireland, Luxembourg, the Netherlands, Norway, and Sweden have a perfect score on the indicator, showing strong overlap with the countries at the top of the Property Rights Alliance's ratings—indeed, Canada, Denmark, the Netherlands, and Norway score among the top ten on both indicators. On the other hand, Brazil scores lowest, followed by Argentina, Bulgaria, the Philippines, South Africa, and Thailand. Here again, overlap between the two indicators is strong, with six countries—Argentina, Indonesia, Mexico, Peru, the Philippines, and Thailand—scoring in the bottom ten on both indicators.

IP Theft

While it is instructive to assess ratings of how countries enforce IPR, there is no substitute for evaluating the effectiveness of enforcement. To examine this, this report assesses the extent of unlicensed software usage and reviews which countries are on the U.S. Trade

Table 5-6: *PRS Group* Rating of Legal System Integrity[51]

Country	Legal System Integrity Rating (10=Best; 0=Worst)	Country	Legal System Integrity Rating (10=Best; 0=Worst)
Austria	10.0	United States	8.33
Canada	10.0	China	7.50
Denmark	10.0	Greece	7.50
Finland	10.0	Poland	7.50
Iceland	10.0	Slovenia	7.50
Ireland	10.0	Turkey	7.50
Luxembourg	10.0	Estonia	6.67
Netherlands	10.0	Hungary	6.67
Norway	10.0	India	6.67
Sweden	10.0	Italy	6.67
Australia	9.17	Lithuania	6.67
New Zealand	9.17	Malaysia	6.67
United Kingdom	9.17	Romania	6.67
Belgium	8.33	Russia	6.67
Chile	8.33	Slovak Republic	6.67
Chinese Taipei	8.33	Vietnam	6.67
Cyprus	8.33	Mexico	5.83
Czech Republic	8.33	Indonesia	5.00
France	8.33	Peru	5.00
Germany	8.33	Argentina	4.17
Hong Kong	8.33	Bulgaria	4.17
Israel	8.33	Philippines	4.17
Japan	8.33	South Africa	4.17
Latvia	8.33	Thailand	4.17
Malta	8.33	Brazil	3.33
Portugal	8.33	**All Countries**	**7.67**
Singapore	8.33	**APEC-19 Countries**	**7.28**
South Korea	8.33	**EU Countries**	**8.18**
Spain	8.33	**OECD Countries**	**8.53**
Switzerland	8.33		

Representative Office's Special 301 Watch List for offering inadequate protections to foreign intellectual property rights holders.

The Business Software Alliance, in conjunction with the International Data Corporation, provides data on unlicensed software units as a percentage of total software units installed for dozens of countries. In 2010, global PC software theft reached a record total of $59 billion.[52] Sixty percent of PC software piracy occurred in Asia-Pacific countries. Indeed, as Table 5-7 shows, Indonesia, Vietnam, China, and Thailand have the highest incidences of software piracy, with 86 percent of software units on PCs in Indonesia unlicensed and Vietnam, China, and Thailand showing software piracy rates of 85 percent, 79 percent, and 75 percent respectively. The United States, Japan, Luxembourg, and New Zealand have the lowest rates of unlicensed software units as a percentage of total software units installed, each under 22 percent. Software piracy rates in China are four times greater than in the United States.

The U.S. Trade Representative Office's Special 301 Watch List identifies countries that do not provide

Table 5-7: Software Piracy Rates[53]

Country	Unlicensed Software Units as Percentage of Total Software Units Installed	Country	Unlicensed Software Units as Percentage of Total Software Units Installed
United States	20	Hong Kong	47
Japan	21	Cyprus	48
Luxembourg	21	Iceland	49
New Zealand	22	Italy	49
Australia	25	Estonia	50
Austria	25	Lithuania	54
Belgium	25	Poland	54
Finland	25	Brazil	56
Sweden	25	Latvia	56
Switzerland	25	Greece	58
Denmark	26	Malaysia	58
United Kingdom	27	Mexico	60
Germany	28	Turkey	63
Netherlands	28	Chile	64
Canada	29	India	65
Norway	29	Romania	65
Israel	33	Bulgaria	67
Ireland	35	Russia	67
Singapore	35	Philippines	69
South Africa	35	Peru	70
Czech Republic	37	Argentina	71
Chinese Taipei	38	Thailand	75
France	40	China	79
Portugal	40	Vietnam	85
Hungary	41	Indonesia	86
South Korea	41	**All Countries**	**45.8**
Spain	42	**APEC-19 Countries**	**52.2**
Slovak Republic	43	**EU Countries**	**40.7**
Malta	45	**OECD Countries**	**36.7**
Slovenia	46		

"adequate and effective" protection for U.S. IPR holders.[54] Countries not adopting adequate and effective protections are either placed on a Watch List or a Priority Watch List, depending upon the severity of infractions, as Table 5-8 shows.

Nine nations are on the "Priority Watch" list. China is one, and its theft of U.S. intellectual property costs almost one million U.S. jobs and caused $48 billion in U.S. economic losses in 2009 alone.[55] Chile was placed on the Priority Watch List because it has yet to adequately implement "an effective system to address patent issues expeditiously in connection with applications to market pharmaceutical products, to implement protections against the circumvention of technological protection measures, to implement protection for encrypted satellite signals, and to ensure that administrative and judicial procedures and deterrent remedies are made available to rights holders."[56] The United States has placed Israel on the Priority Watch List in part because of "ineffective enforcement remedies against infringement that occurs over the Internet."[57] Canada is on the list in part because Canadian efforts in 2010 to enact long-awaited copyright legislation were unsuccessful and in part because it has not effectively stopped the transit of counterfeit and pirated products through its territory.[58]

Brazil, Greece, Italy, Malaysia, Mexico, Norway, Peru, the Philippines, Romania, Spain, Turkey, and Vietnam are on the "Watch" list. Malaysia "has remained on the Special 301 Watch List since 2001 because of continuing concerns including its failure to substantially reduce pirated optical disc production and exports."[59] Vietnam is on the Watch List because of "high levels of copyright piracy, increasing levels of piracy over the Internet, satellite and cable signal piracy, and the general availability of counterfeit goods in the marketplace."[60]

Table 5-8: Country Status on USTR 301 Watch List*[61]

Priority Watch List	Watch List
Argentina	Brazil
Canada	Greece
Chile	Italy
China	Malaysia
India	Mexico
Indonesia	Norway
Israel	Peru
Russia	Philippines
Thailand	Romania
	Spain
	Turkey
	Vietnam

*Not rated: United States

Chapter 6: Digital and Information and Communications Technology

ICT's Role in the Innovation Ecosystem

As a "general purpose technology" (GPT) that drives innovation and productivity across all sectors of the economy, information and communications technology plays a vital role in the global innovation ecosystem.[1] For example, the *use*—not the production—of ICT was responsible for two-thirds of U.S. total factor productivity growth between 1995 and 2002 and virtually all of the growth in labor productivity.[2] An analysis of several OECD nations by Colecchia and Schreyer found that, throughout the 1980s and 1990s, ICT contributed between 0.2 and 0.5 percentage points per year to economic growth.[3] During the second half of the 1990s, this contribution rose to 0.3 to 0.9 percentage points per year. Also, in a study of twenty-seven developed and sixty-six developing countries, Clarke and Wallsten found that a 1 percentage point increase in the number of Internet users correlates with a boost in exports of 4.3 percentage points.[4] According to a recent World Bank analysis of 120 countries, for every 10-percentage-point increase in the penetration of broadband services, there is an increase in economic growth of 1.3 percentage points. Furthermore, this growth effect from broadband is significant and stronger in developing countries than in developed countries.[5] In effect, ICT is "super capital," having an impact on worker productivity three to five times that of non-ICT capital, and is driving innovation and growth throughout the developed and developing world.[6] Hence, market-based digital and ICT policy is less concerned with the development of the ICT industry and more focused on facilitating the widespread use of ICT throughout all areas of an economy. In other words, it is focused on building an *ICT-enabled* innovation ecosystem.

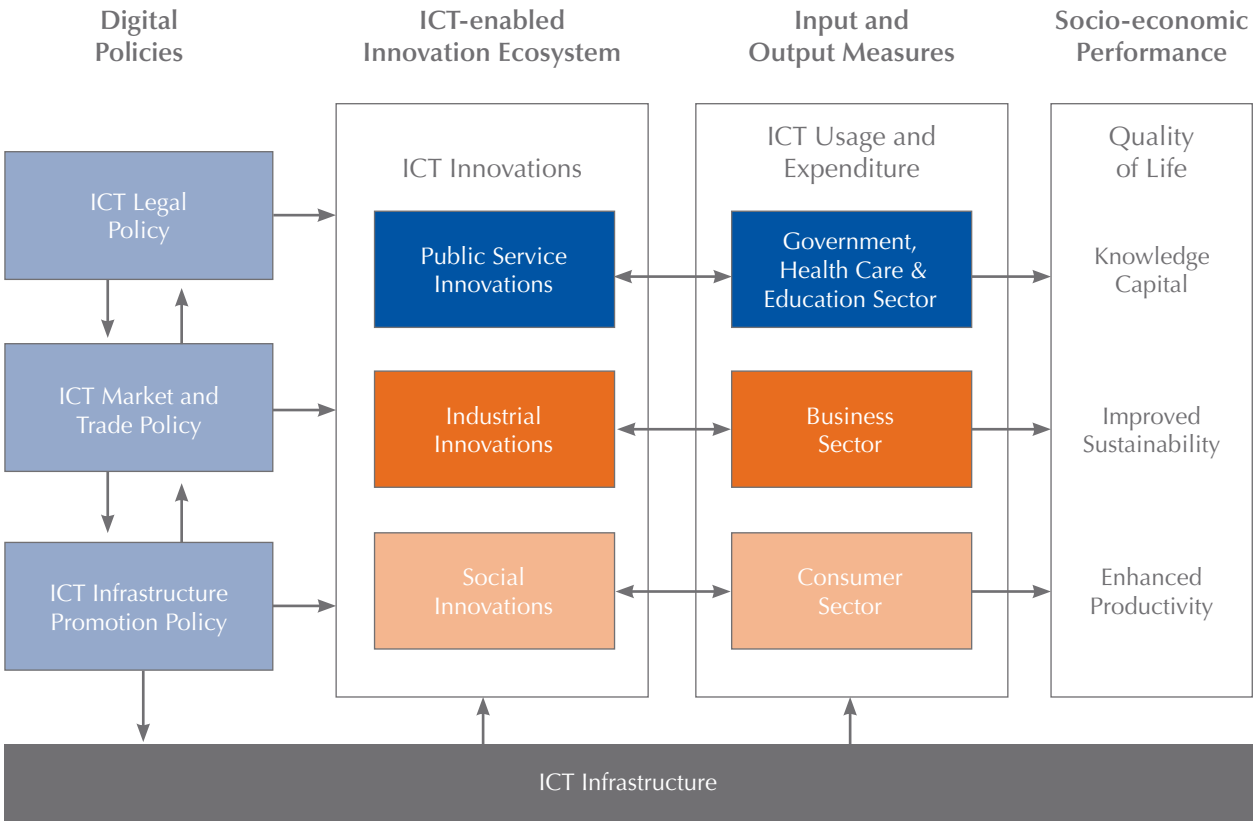
There are two perspectives on ICT's contribution to economic growth. The first is the *output perspective*, where ICT as an output provides users with opportunities for higher levels of achievement, personal development, and quality of life. At the economy level, ICT also helps construct an expansive knowledge capital base and broaden knowledge networks. The second, more important view is the *input perspective*, in which ICT is viewed as "super capital," delivering powerful inputs to the production process, thereby augmenting productivity on the firm and national levels.[7] Many complex processes are involved here. For example, one such process is a dynamic feedback loop, whereby ICT innovation leads to new applications, which, in turn, leads to new ICT innovations, and so on. Another process involves dynamic externalities and network effects, such as when the incentive to adopt ICT or an ICT application increases as the number of total adopters increases. A good example of this is broadband: Each new broadband user increases the value of broadband for all users. One further process is the diffusion of ICT among business models, along vertical value chains—such as customer relationship management, supply chain management, and procurement systems—and across more general application areas—such as mobile banking, e-commerce, smart grids, and smart offices.

Figure 6-1 depicts how digital and ICT policies stimulate market-led innovation. Digital policy is integral to policies related to infrastructure, industry promotion, market competition, and the political and legal environment. These policy components altogether govern the key pillars of the ICT-enabled innovation ecosystem: infrastructure investment, applications and content, markets and competition, policies and regulation, government budgets, and ICT skills and education.[8] These pillars, interacting with each other in an ICT-enabled innovation ecosystem, characterize the nature of ICT innovations. The following section assesses countries' adoption of effective digital policies toward an ICT-enabled innovation ecosystem, ranking countries in four tiers.

Assessing Countries' Digital and ICT Policies

To assess countries' digital policies, key measures were selected and regrouped to fit the ICT-enabled innovation ecosystem structure depicted in Table 6-1. The indicators are divided into four overall categories: competitiveness of ICT infrastructure and policy, international openness to ICT and market competition, the legal environment, and ICT usage. The competitiveness of ICT infrastructure and policy element accounts for 25 percent of a country's digital policy score, and contains three sub-indicators relating to infrastructure access, three relating to infrastructure affordability, and four relating to ICT policy governance. The international openness to ICT and market competition element accounts for 40 percent of a country's digital policy score, and includes six sub-indicators relating to international openness to ICT and three relating to market competition level. The quality of a country's legal environment as it relates to ICT policy accounts for 10 percent of the country's scores, and includes sub-indicators such as laws relating to ICT, spam legislation, and policies regarding transparency, privacy, and cybercrime. Finally, 25 percent of a country's digital policy score pertains to ICT usage by the public sector,

Figure 6-1: Digital Policies and ICT-enabled National Innovation System



In effect, ICT is "super capital," having an impact on worker productivity three to five times that of non-ICT capital, and is driving innovation and growth throughout the developed and developing world.

by businesses, and by individuals. More than thirty sub-indicators are assessed in calculating countries' scores on digital policy, which together account for 17.5 percent of countries' aggregate scores.

Evaluating countries' overall performance on digital polices, as shown in Table 6-2, the European countries of Denmark, Finland, Germany, Iceland, Luxembourg, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom take the lead, along with Chinese Taipei, Hong Kong, Singapore, and South Korea in Asia; Canada and the United States in North America; and New Zealand in Oceania. Of the BRIC countries, Brazil, China, and India occupy the lower-mid tier, while Russia lags behind in the lower tier.

Competitiveness of ICT Infrastructure and Policy

The effectiveness of market-led digital policies in ICT infrastructure can be evaluated in view of access, affordability, and policy governance. These three pillars, when put together in a well-coordinated manner, contribute to the global competitiveness of ICT infrastructure.

Infrastructure Access and Affordability

Access usually refers to the quality, coverage, and penetration of an ICT service. In this case, access measures broadband penetration, mobile network coverage, and Internet access in schools. Table 6-3 shows the actual values of the access indicators for each country.

Table 6-1: Digital Policy Indicators

	Section Weight	Indicator	Data Type	Source	Indicator Weight
COMPETITIVENESS OF ICT INFRASTRUCTURE AND POLICY	25%	**Infrastructure Access**			
		Broadband Penetration	Subscriptions per 100 inhabitants	ITU	5.00%
		Mobile Network Coverage Rate	% of Population	WEF	2.50%
		Internet Access in Schools	Rating	WEF	2.50%
		Infrastructure Affordability			
		Price Basket for Residential Fixed Line	PPP$/month	World Bank	1.67%
		Price Basket for Mobile Call	PPP$/month	World Bank	1.67%
		Price Basket for Internet	PPP$/month	World Bank	1.67%
		ICT Policy Governance			
		National Broadband Plan	Y/N	Economy analysis	5.00%
		Separate Regulatory Body	Y/N	World Bank	2.00%
		Government Prioritization of ICT	Rating	WEF	2.00%
		Importance of ICT to Government Vision of the Future	Rating	WEF	1.00%
INTERNATIONAL OPENNESS TO ICT AND MARKET COMPETITION	40%	**International Openness to ICT**			
		Tariffs on ICT Products	% Rate	WTO	7.50%
		WTO/ITA	Y/N	Economy analysis	7.50%
		Foreign Participation/Ownership in Telecom Sector	% Allowed	ITU	5.00%
		Long-Distance Termination Charges	US$	US FCC	5.00%
		Open Interconnection Agreement	Multiple Y/N	ITU	5.00%
		Unregulated VoIP	Multiple Y/N	ITU	5.00%
		ICT Market Competition Level			
		International Long-Distance Market Competition	C/PC/M*	World Bank	1.67%
		Mobile telephone market competition	C/PC/M	World Bank	1.67%
		Fixed-Line Telephone Market Competition	PB/MX/PV**	World Bank	1.67%
LEGAL	10%	**Legal Environment**			
		IP, Transparency, Privacy, and Cybercrime	Rating	EIU	3.33%
		Laws Relating to ICT	Rating	WEF	3.33%
		Spam Legislation	Y/N	ITU	3.33%
USAGE	25%	**Public Sector Usage**			
		Government Success in ICT Promotion	Rating	WEF	3.00%
		ICT Use and Government Efficiency	Rating	WEF	3.00%
		Online Service Index	Rating	UN	3.00%
		e-Participation Index	Rating	WEF	3.00%
		Public Service Sector Expenditure	% of GDP	WITSA	3.00%
		Business Usage			
		Extent of Business Internet Use	Rating	WEF	1.33%
		ICT Impact on New Services and Products	Rating	WEF	1.33%
		ICT Impact on New Organizational Models	Rating	WEF	1.33%
		Business Sector Expenditure	% of GDP	WITSA	3.00%
		Individual Usage			
		Internet Use	Subscribers per 100 Inhabitants	WEF	1.00%
		Mobile Cellular Use	Subscriptions per 100 Inhabitants	WEF	1.00%
		Use of Virtual Social Networks	Rating	WEF	1.00%

* C: Competition, PC: Partial Competition, M: Monopoly ** PB: Public, MX: Mixed, PV: Private

Table 6-2: Country Ranks on Digital Policy (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Canada	Australia	Brazil	Argentina
Chinese Taipei	Austria	Bulgaria	Indonesia
Denmark	Belgium	Chile	Mexico
Finland	Cyprus	China	Peru
Germany	Czech Republic	Greece	Philippines
Hong Kong	Estonia	India	Russia
Iceland	France	Italy	South Africa
Luxembourg	Hungary	Latvia	Vietnam
Netherlands	Ireland	Poland	
New Zealand	Israel	Romania	
Norway	Japan	Slovak Republic	
Singapore	Lithuania	Slovenia	
South Korea	Malaysia	Thailand	
Sweden	Malta	Turkey	
Switzerland	Portugal		
United Kingdom	Spain		
United States			

Broadband penetration seemingly is dependent on the income level, showing a significant difference between the high-income group and the other middle- and lower-income group. Figure 6-2 shows an empirical evidence of this observation. However, broadband penetration is not necessarily a function of income levels. For example, South Korea shows high broadband penetration of 36.6 subscribers per 100 inhabitants despite having a low GDP per capita of $20,757 relative to other high-income countries. This is indicative of an effective broadband policy. In contrast, Ireland, Luxembourg, and Norway have low broadband penetration rates relative to their high income levels.

The other access components provide some supplementary views on ICT trends and requirements. According to Sundberg, the mobile market is reaching saturation levels; on average, there were 116 subscriptions per 100

Figure 6-2:
Broadband Penetration and
GDP Per Capita

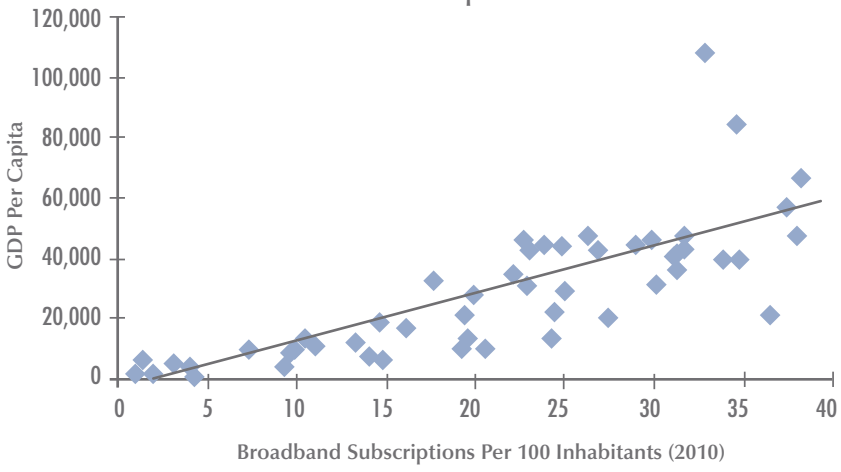


Table 6-3: Infrastructure Access[33]

Country	Broadband Penetration (Subscriptions per 100 inhabitants)	Country	Mobile Network Coverage (% of Population)	Country	Internet Access in Schools (7=Best; 1=Worst)
Switzerland	38.2	Bulgaria	100.0	Iceland	6.8
Netherlands	38.0	Chile	100.0	Estonia	6.4
Denmark	37.4	Chinese Taipei	100.0	Sweden	6.4
South Korea	36.6	Cyprus	100.0	Netherlands	6.2
Iceland	34.7	Estonia	100.0	Singapore	6.2
Norway	34.6	Hong Kong	100.0	Switzerland	6.2
France	33.9	Israel	100.0	Chinese Taipei	6.1
Luxembourg	32.8	Lithuania	100.0	Denmark	6.1
Sweden	31.6	Malta	100.0	Finland	6.1
Belgium	31.5	Singapore	100.0	Hong Kong	6.1
United Kingdom	31.4	Switzerland	100.0	Canada	6.0
Germany	31.2	Turkey	100.0	South Korea	6.0
Hong Kong	30.2	Belgium	99.9	Norway	5.9
Canada	29.8	Greece	99.9	United States	5.9
Finland	29.1	Japan	99.9	Austria	5.8
Malta	27.5	Luxembourg	99.9	Belgium	5.8
Japan	26.9	Mexico	99.9	Luxembourg	5.8
United States	26.3	Romania	99.9	Malta	5.8
Israel	25.1	South Korea	99.9	New Zealand	5.8
New Zealand	24.9	Czech Republic	99.8	United Kingdom	5.8
Singapore	24.7	Italy	99.8	China	5.7
Slovenia	24.4	Poland	99.8	Czech Republic	5.7
Estonia	24.3	Slovak Republic	99.8	Slovenia	5.7
Austria	23.9	South Africa	99.8	Portugal	5.6
Australia	23.2	Spain	99.8	Australia	5.5
Spain	23.0	United Kingdom	99.8	Lithuania	5.5
Ireland	22.8	Slovenia	99.7	Hungary	5.4
Chinese Taipei	22.7	United States	99.6	Latvia	5.4
Italy	22.1	China	99.5	Israel	5.2
Lithuania	20.6	Finland	99.5	Cyprus	5.0
Greece	19.8	Australia	99.0	Malaysia	5.0
Hungary	19.6	Austria	99.0	Slovak Republic	5.0
Portugal	19.4	Canada	99.0	Germany	4.9
Latvia	19.3	France	99.0	Japan	4.9
Cyprus	17.6	Germany	99.0	France	4.8
Slovak Republic	16.1	Hungary	99.0	Chile	4.7
Bulgaria	14.7	Iceland	99.0	Thailand	4.7
Czech Republic	14.7	Ireland	99.0	Bulgaria	4.6
Romania	14.0	Philippines	99.0	Indonesia	4.5
Poland	13.2	Portugal	99.0	Poland	4.5
Russia	11.0	Sweden	99.0	Vietnam	4.5
Chile	10.5	Latvia	98.8	Romania	4.4
Mexico	10.0	Netherlands	98.0	Spain	4.4
Turkey	9.8	New Zealand	97.0	Turkey	4.3
Argentina	9.6	Brazil	96.6	Ireland	4.2
China	9.4	Peru	95.6	Russia	4.1
Malaysia	7.3	Malaysia	95.0	Peru	3.9
Brazil	7.2	Russia	95.0	Brazil	3.8
Vietnam	4.1	Argentina	94.1	India	3.8
Thailand	3.9	Indonesia	90.0	Greece	3.7
Peru	3.1	India	83.0	Philippines	3.7
Philippines	1.8	Vietnam	70.0	Italy	3.6
South Africa	1.5	Thailand	37.8	Mexico	3.5
India	0.9	Denmark	N/A	South Africa	3.2
Indonesia	0.8	Norway	N/A	Argentina	3.0
All Countries	**20.4**	**All Countries**	**96.9**	**All Countries**	**5.1**
APEC-19 Countries	**16.2**	**APEC-19 Countries**	**93.5**	**APEC-19 Countries**	**5.1**
EU Countries	**24.2**	**EU Countries**	**99.5**	**EU Countries**	**5.3**
OECD Countries	**25.6**	**OECD Countries**	**99.4**	**OECD Countries**	**5.4**

Leadership in infrastructure policy is not solely a result of good broadband policy, but of a collaborative set of diverse public policies, including articulating a national broadband plan, governance of the regulatory body, government's leadership, and regulatory certainty.

inhabitants at the end of 2010 and a marginal growth of 1.6 percent from 2009–2010. At the same time, the developing world is increasing its share of mobile subscriptions and reached an estimated 68 percent of global total mobile subscriptions at the end of 2010.[9] This high saturation is apparent in Table 6-3, with every developing country except Thailand showing a coverage level of 70 percent or higher.

Affordability reflects the cost of ICT services, which is affected by the level of competition in a market, its maturity, user uptake, and prices. Three markets of residential fixed-line, mobile cellular prepaid, and fixed broadband Internet access service were evaluated to measure the overall affordability of ICT infrastructure, as Table 6-4 shows. In the evaluation, the effect of varying price levels was excluded by adjusting for purchasing power.[10] Based on Sundberg's analysis, citizens in developed countries spend relatively less of their income (1.5 percent) on ICT services compared to citizens in developing countries (17.5 percent), which means ICT services tend to be more affordable in developed countries and less affordable in developing countries.[11] The income effect is definitely clear, but, still, the impact of other factors like market competition is not negligible. In Mexico, after competition in fixed broadband services began in 2006, the price of a fixed broadband monthly subscription dropped by almost 60 percent between 2008 and 2009, from $40.19 to $18.47, representing, at the end of 2009, 2 percent of the average GDP per capita. Over that same period, the number of fixed broadband subscriptions increased by 29 percent to reach 9.7 million.[12]

Policy Governance

Leadership in infrastructure policy is not solely a result of good broadband policy, but of a collaborative set of diverse public policies, including articulating a national broadband plan, governance of the regulatory body, government's leadership, and regulatory certainty. Table 6-5 shows the ICT policy governance of countries in terms of the availability of a national broadband plan, separate regulatory body, and government's prioritization and vision on ICT.

Among the policy governance measures, the most important are articulating and implementing a national broadband plan concomitant with making the requisite investments to R&D in ICT, network upgrades, and universal service. Many countries have been implementing or preparing national broadband plans, with different scopes and policy targets.[13]

To achieve these targets, most countries recognize the necessity of policy coordination between the national broadband plan and the other related policy areas, such as universal service, competition and regulation, research and development, and national informatization plan. Even with higher broadband access rates, for example, high broadband adoption gaps remain in many countries, including a 20 percent gap in Australia and a 31 percent gap in the United States.[14] But, even in the United States, universal broadband access is still not available. The United States' National Broadband Plan dealt with this issue in a most comprehensive manner by specifying detailed measures for ensuring universal access to broadband network services.

Even with aggressive national broadband plans, the challenges many countries face in coming years remain complex.[15] One of the most important challenges relates to spectrum reform. Most countries have seen exponential growth in both the number of mobile cellular subscriptions and the availability of mobile broadband services. The ongoing deployment of higher-speed 4G mobile broadband networks such as WIMAX, HSPA+, and LTE systems certainly will contribute to greater levels of mobile broadband services, as well as mobile content and applications delivered over smart phones.[16] Some countries have taken or are planning to take measures to free up more spectrum for wireless broadband. For example, regulatory measures taken in the United States and South Korea, including spectrum repurposing and the licensing of 4G LTE services, also will contribute to accelerating the growth of mobile broadband penetration.

Lower-tier countries should participate in discussion forums for continuous assessing and monitoring of the cutting-edge innovative regulatory tools and best practices that leader countries have explored in the hope of surmounting the challenges. In this regard, the latest institutional and regulatory trends indicated by Sundberg are worth noting for all regulators and policymakers.[17] They include establishing a separate telecom/ICT regulator; setting clear dispute resolution mechanisms in a regulatory framework; and aggressively reforming the spectrum allocation process more toward market-based allocation.

Table 6-4: Infrastructure Affordability[34]

Country	Price Basket for Residential Fixed-Line Phone (PPP$/month)	Country	Price Basket for Mobile Service (PPP$/month)	Country	Price Basket for Internet Service (PPP$/month)
China	6.1	Hong Kong	3.7	Philippines	4.6
Vietnam	8.4	Singapore	5.1	Denmark	6.0
India	8.9	United States	6.7	New Zealand	6.3
South Korea	9.6	India	6.7	France	11.0
Singapore	9.6	China	6.9	Lithuania	11.4
Indonesia	9.9	Denmark	7.1	China	12.2
Romania	10.5	Sweden	7.1	South Korea	13.1
Hong Kong	11.9	Canada	8.4	Hungary	14.4
Argentina	13.6	Finland	8.7	Turkey	15.0
Chile	13.6	Thailand	9.1	Canada	15.6
Denmark	14.0	Russia	9.6	Thailand	15.6
Russia	15.5	Netherlands	10.0	Bulgaria	16.2
Malaysia	16.4	Norway	10.0	United Kingdom	16.5
Israel	17.3	Malaysia	10.6	Sweden	16.9
Thailand	17.6	Philippines	11.0	Greece	17.1
Latvia	18.4	Poland	11.2	Poland	17.2
Turkey	18.5	New Zealand	11.3	Latvia	17.4
Sweden	19.8	Israel	11.8	Germany	17.5
Switzerland	20.6	Italy	12.0	India	17.8
Italy	21.2	Slovenia	12.0	Finland	17.9
United Kingdom	21.7	Latvia	12.9	Malaysia	18.0
Finland	21.8	Lithuania	13.9	United States	20.0
Greece	21.9	Ireland	14.0	Australia	20.9
Canada	22.2	Indonesia	14.0	Italy	21.2
Germany	22.7	Belgium	15.0	Russia	21.5
Slovenia	23.2	Romania	15.2	Norway	21.9
Mexico	23.3	Argentina	15.6	Slovenia	22.4
France	23.3	Chile	16.6	Ireland	22.7
Bulgaria	23.5	Hungary	16.6	Austria	23.2
Australia	23.6	Turkey	17.4	Singapore	24.3
Norway	24.0	Czech Republic	18.3	Romania	24.7
Spain	24.2	Germany	18.7	Netherlands	25.9
Austria	24.8	France	18.7	Argentina	27.2
New Zealand	24.8	Vietnam	19.7	Israel	27.7
Brazil	24.8	Australia	20.1	Japan	28.1
Netherlands	25.3	Mexico	20.1	Czech Republic	28.5
United States	25.5	Austria	21.4	Switzerland	28.6
Japan	25.6	Switzerland	21.9	Mexico	28.9
Belgium	27.3	Spain	22.2	Spain	30.1
Lithuania	27.7	South Korea	22.5	Belgium	31.0
Philippines	27.7	South Africa	23.3	Vietnam	32.5
Ireland	30.0	Portugal	23.9	Hong Kong	36.1
Poland	30.8	Greece	24.0	Chile	37.5
Hungary	32.5	United Kingdom	24.8	Brazil	39.4
Portugal	32.9	Japan	29.1	Portugal	39.4
South Africa	34.9	Bulgaria	35.6	Indonesia	42.6
Czech Republic	36.5	Brazil	35.6	South Africa	47.3
Peru	38.5	Peru	47.1	Peru	47.5
Chinese Taipei	N/A	Chinese Taipei	N/A	Chinese Taipei	N/A
Cyprus	N/A	Cyprus	N/A	Cyprus	N/A
Estonia	N/A	Estonia	N/A	Estonia	N/A
Iceland	N/A	Iceland	N/A	Iceland	N/A
Luxembourg	N/A	Luxembourg	N/A	Luxembourg	N/A
Malta	N/A	Malta	N/A	Malta	N/A
Slovak Republic	N/A	Slovak Republic	N/A	Slovak Republic	N/A
All Countries	**21.39**	**All Countries**	**16.19**	**All Countries**	**22.90**
APEC-19 Countries	**18.32**	**APEC-19 Countries**	**15.08**	**APEC-19 Countries**	**23.63**
EU Countries	**24.27**	**EU Countries**	**16.52**	**EU Countries**	**20.40**
OECD Countries	**23.42**	**OECD Countries**	**16.05**	**OECD Countries**	**21.43**

Table 6-5: ICT Policy Governance and Vision[35]

Country	National Broadband Plan (Y=1/N=0)	Country	Separate Regulatory Body (Y=1/N=0)	Country	Government Prioritization on ICT (7=Best; 1=Worst)	Country	Importance of ICT to Gov't Vision (7=Best; 1=Worst)
Argentina	1	Argentina	1	Singapore	6.4	Singapore	6.2
Australia	1	Australia	1	Malta	6.2	Malta	5.6
Austria	1	Austria	1	Finland	6.1	Chinese Taipei	5.4
Brazil	1	Belgium	1	Sweden	6.1	Portugal	5.4
Bulgaria	1	Brazil	1	Chinese Taipei	6.0	Sweden	5.4
Canada	1	Bulgaria	1	Portugal	6.0	China	5.1
Chile	1	Canada	1	Luxembourg	5.9	Hong Kong	5.1
China	1	Chile	1	Malaysia	5.8	Luxembourg	5.1
Chinese Taipei	1	Chinese Taipei	1	Estonia	5.7	Malaysia	5.1
Czech Republic	1	Cyprus	1	New Zealand	5.7	Australia	5.0
Denmark	1	Czech Republic	1	China	5.6	Denmark	5.0
Estonia	1	Denmark	1	South Korea	5.6	Estonia	5.0
Finland	1	Estonia	1	Switzerland	5.6	New Zealand	5.0
France	1	Finland	1	Denmark	5.5	South Korea	5.0
Germany	1	France	1	Germany	5.5	Finland	4.9
Greece	1	Germany	1	United States	5.5	Iceland	4.8
Hong Kong	1	Greece	1	Vietnam	5.5	Norway	4.8
Hungary	1	Hong Kong	1	Canada	5.4	United States	4.8
Iceland	1	Hungary	1	Hong Kong	5.4	Canada	4.7
India	1	Iceland	1	Iceland	5.4	Vietnam	4.7
Ireland	1	India	1	Norway	5.4	Austria	4.6
Italy	1	Indonesia	1	Australia	5.3	Chile	4.6
Japan	1	Ireland	1	India	5.3	France	4.6
Lithuania	1	Israel	1	United Kingdom	5.3	Germany	4.6
Luxembourg	1	Italy	1	Austria	5.2	India	4.6
Malaysia	1	Japan	1	France	5.2	Japan	4.5
Malta	1	Latvia	1	Japan	5.2	Switzerland	4.5
Netherlands	1	Lithuania	1	Israel	5.1	United Kingdom	4.5
New Zealand	1	Luxembourg	1	Netherlands	5.1	Netherlands	4.4
Norway	1	Malaysia	1	Chile	5.0	Cyprus	4.3
Peru	1	Malta	1	Turkey	4.9	Brazil	4.2
Philippines	1	Mexico	1	Belgium	4.8	Indonesia	4.1
Poland	1	Netherlands	1	Slovenia	4.8	Ireland	4.1
Portugal	1	New Zealand	1	Cyprus	4.7	Israel	4.1
Singapore	1	Norway	1	Indonesia	4.7	Slovenia	4.0
Slovak Republic	1	Peru	1	Ireland	4.7	Thailand	4.0
South Korea	1	Philippines	1	Brazil	4.6	Belgium	3.9
Spain	1	Poland	1	Czech Republic	4.6	Lithuania	3.9
Sweden	1	Portugal	1	Lithuania	4.5	Czech Republic	3.8
Switzerland	1	Romania	1	Russia	4.5	Turkey	3.8
Thailand	1	Russia	1	Thailand	4.5	Mexico	3.7
Turkey	1	Singapore	1	Hungary	4.3	South Africa	3.7
United Kingdom	1	Slovak Republic	1	South Africa	4.2	Bulgaria	3.6
United States	1	Slovenia	1	Spain	4.2	Hungary	3.6
Belgium	0	South Africa	1	Greece	4.1	Spain	3.6
Cyprus	0	South Korea	1	Peru	4.1	Peru	3.5
Indonesia	0	Spain	1	Philippines	4.1	Russia	3.5
Israel	0	Sweden	1	Bulgaria	4.0	Greece	3.4
Latvia	0	Switzerland	1	Italy	4.0	Italy	3.4
Mexico	0	Thailand	1	Latvia	4.0	Philippines	3.4
Romania	0	Turkey	1	Mexico	4.0	Latvia	3.3
Russia	0	United Kingdom	1	Poland	3.8	Romania	3.3
Slovenia	0	United States	1	Romania	3.7	Poland	3.2
South Africa	0	China	0	Slovak Republic	3.6	Slovak Republic	3.2
Vietnam	0	Vietnam	0	Argentina	3.0	Argentina	2.6
All Countries	**0.8**	**All Countries**	**1.0**	**All Countries**	**5.0**	**All Countries**	**4.3**
APEC-19 Countries	**0.8**	**APEC-19 Countries**	**0.9**	**APEC-19 Countries**	**5.2**	**APEC-19 Countries**	**4.6**
EU Countries	**0.8**	**EU Countries**	**1.0**	**EU Countries**	**4.9**	**EU Countries**	**4.2**
OECD Countries	**0.9**	**OECD Countries**	**1.0**	**OECD Countries**	**5.1**	**OECD Countries**	**4.4**

International Openness to ICT Market and Competition

Market policy is a core component of a market-based national innovation ecosystem. Given that digital content and ICT services markets already are integrated into a single global market, local or national markets need to be equipped with diverse resources, a large pool of suppliers and buyers (not necessarily local), and strategic partners all over the world collaborating within a value chain. In this sense, international openness to ICT in terms of visible or invisible barriers, tariffs, and trade communities like the WTO's Information Technology Agreement is becoming more and more important as a market policy tool. These market environments, along with the size of the ICT market structure, determine an economy's global market competitiveness. Two core policy indicators—international openness to ICT and market competition levels—are measured and discussed.

International Openness to ICT

Market-based innovation performance is closely related with international openness to ICT, especially in a global ICT and ICT application market. If some core technologies and ICT resources are constrained or barred from flowing freely over national borders, the inputs for the production system cannot be optimized, degrading the overall performance of the national innovation ecosystem. In essence, ICT loses its "super capital" status. Two categories of goods—the tangible ICT products and the intangible ICT services and digital products, like digital content and software—should be differentiated. In this context, tariffs on tangible ICT products are discussed first and invisible barriers in the form of ownership, price, and interconnection regulations are dealt with next.

A number of countries continue to place high tariffs on information and communications technology products. For instance, despite the fact that China has agreed to enter the WTO's Information Technology Agreement (ITA; see Table 6-6), it places 30 percent tariffs on magnetic tape-type video recording or reproducing apparatus and 24.5 percent on monitors.[18] Malaysia imposes duties of 25 percent on all monitors not incorporating television reception apparatus. The Philippines places duties of 15 percent on monitors and 40 percent on printers, copiers, and fax machines. Vietnam places maximum ad valorem duties of 27 percent on video recording or reproducing apparatus, 14 percent on television cameras, digital cameras, and video recorders, and 13 percent on monitors. Argentina and Brazil impose an average 10 percent tariff across a wide range of ICT products. Russia's average is nine percent. And the European Union applies a 14 percent duty on monitors and a 5.4 percent duty on video recording devices.[19] Table 6-7 shows countries' tariffs on a basket of imported ICT products—including tariffs on printed circuit boards; mobile telephones; monitors (excluding television apparatus); printers, copiers, and fax machines; and television cameras, digital cameras, and video camera recorders—as well as an average ICT tariff calculated as the simple average tariff on those five categories of ICT products. Hong Kong, Israel, Japan, Norway, Singapore, and Switzerland impose no tariffs on this basket of ICT products, while New Zealand, Australia, and the United States impose nominal tariffs of less than 1 percent.

Such high tariffs on advanced technology products only serve to damage these countries, causing other sectors to suffer. For example, for every one dollar of tariffs India imposed on imported ICT products, it suffered an economic loss of $1.30 due to spillover effects.[20] As Kaushik and Singh found with regard to their study of ICT adoption in India, "High tariffs did not create a competitive domestic [hardware] industry, and [they] limited adoption [of ICT by users in India] by keeping prices high."[21] Argentina encountered a similar experience when it imposed tariffs on assembled computers, though not on computer parts, with the goal of creating a domestic computer assembly industry. The result was actually to create an inefficient computer industry, where up to one-third of computers sold in Argentina are hand-assembled in small shops. Such policies have served only to raise the price of computing technology in Argentina, hurting all sectors of its economy. Thus, tariffs are particularly pernicious when applied to ICTs, hurting the nations that impose them by raising the cost of ICT goods and services, thus causing businesses (and individuals) to invest less in ICT and lowering their productivity. The economic price to such countries can be steep. For instance, Mann finds that the globalization of ICT hardware resulted in ICT prices some 10 percent to 30 percent lower than they would have been based on domestic production and domestic technological advances alone in the United States in the 1990s, which could have made U.S. GDP some $250 billion higher over the 1995 to 2000 period than it would have been had there been no globalization of IT hardware.[22]

As for the invisible barriers on ICT, this report uses four measures. The first is related to the market accessibility of the telecom sector, which can be measured by restrictions on foreign participation or ownership. The second and the third are associated with bilateral agreements in interconnection between two countries. High long-distance termination charges play the same role in international settlement markets as high tariffs do in ICT commodity markets. Meanwhile, interconnection agreements can be regulated to drive toward open interconnections. The highest openness is achieved when the agreement and price themselves are made public

Table 6-6: Information Technology Agreement (ITA) Signatories[36]

Country	ITA Signatory? (Y=1/N=0)	Country	ITA Signatory? (Y=1/N=0)
Australia	1	New Zealand	1
Austria	1	Norway	1
Belgium	1	Philippines	1
Bulgaria	1	Poland	1
Canada	1	Portugal	1
China	1	Romania	1
Chinese Taipei	1	Singapore	1
Cyprus	1	Slovak Republic	1
Czech Republic	1	Slovenia	1
Denmark	1	South Korea	1
Estonia	1	Spain	1
Finland	1	Sweden	1
France	1	Switzerland	1
Germany	1	Thailand	1
Greece	1	Turkey	1
Hong Kong	1	United Kingdom	1
Hungary	1	United States	1
Iceland	1	Argentina	0
India	1	Brazil	0
Indonesia	1	Chile	0
Ireland	1	Mexico	0
Israel	1	Peru	0
Italy	1	Russia	0
Japan	1	South Africa	0
Latvia	1	Vietnam	0
Lithuania	1	**All Countries**	**0.9**
Luxembourg	1	**APEC-19 Countries**	**0.7**
Malaysia	1	**EU Countries**	**1.0**
Malta	1	**OECD Countries**	**0.9**
Netherlands	1		

and a Reference Interconnection Offer (RIP) is required. In Table 6-8, the number three is assigned when all three conditions are met, while lower numbers indicate that conditions are only partially or never met. The last measure, unregulated VoIP, specifies the scope of services for which VoIP is allowed. Since VoIP is in nature a global service, a larger scope corresponds to a higher openness. Five categories of services, PC-to-PC, PC-to-phone, phone-to-phone, VoIP over private network, and voice-over-broadband, were investigated as to whether VoIP is allowed or not. The greater the scope of VoIP allowed, the larger the indicator for measuring the unregulated VoIP. According to Table 6-8, the telecom sector is fully opened to foreign participation or ownership in all countries (with available data) except Canada, China, India, Israel, Malaysia, Mexico, the Philippines, South Africa, and South Korea.

ICT Market Competition Level

The most common types of telecommunications reform include privatizing the national telecommunications

Table 6-7: Tariffs on ICT Products[37]

Country	Average	Printed Circuit Boards	Mobile Telephones	Monitors	Printers, Copiers, and Fax Machines	Television/ Digital Cameras, & Video Recorders
Hong Kong	0.0	0.0	0.0	0.0	0.0	0.0
Israel	0.0	0.0	0.0	0.0	0.0	0.0
Japan	0.0	0.0	0.0	0.0	0.0	0.0
Norway	0.0	0.0	0.0	0.0	0.0	0.0
Singapore	0.0	0.0	0.0	0.0	0.0	0.0
Switzerland	0.0	0.0	0.0	0.0	0.0	0.0
New Zealand	0.3	0.0	0.0	0.0	1.7	0.0
Australia	0.7	0.0	0.0	0.0	0.0	3.3
United States	0.8	0.0	0.0	2.1	0.0	1.7
Canada	1.0	0.0	0.0	5.0	0.0	0.0
Iceland	1.5	0.0	0.0	7.5	0.0	0.0
Peru	1.8	0.0	0.0	9.0	0.0	0.0
Chinese Taipei	2.4	0.0	0.0	8.8	0.0	3.3
South Africa	2.5	0.0	0.0	12.5	0.0	0.0
South Korea	2.8	0.0	0.0	8.0	1.8	4.0
Mexico	2.8	0.0	0.0	14.0	0.0	0.0
Austria	3.9	0.0	0.0	14.0	0.0	5.4
Belgium	3.9	0.0	0.0	14.0	0.0	5.4
Bulgaria	3.9	0.0	0.0	14.0	0.0	5.4
Cyprus	3.9	0.0	0.0	14.0	0.0	5.4
Czech Republic	3.9	0.0	0.0	14.0	0.0	5.4
Denmark	3.9	0.0	0.0	14.0	0.0	5.4
Estonia	3.9	0.0	0.0	14.0	0.0	5.4
Finland	3.9	0.0	0.0	14.0	0.0	5.4
France	3.9	0.0	0.0	14.0	0.0	5.4
Germany	3.9	0.0	0.0	14.0	0.0	5.4
Greece	3.9	0.0	0.0	14.0	0.0	5.4
Hungary	3.9	0.0	0.0	14.0	0.0	5.4
Ireland	3.9	0.0	0.0	14.0	0.0	5.4
Italy	3.9	0.0	0.0	14.0	0.0	5.4
Latvia	3.9	0.0	0.0	14.0	0.0	5.4
Lithuania	3.9	0.0	0.0	14.0	0.0	5.4
Luxembourg	3.9	0.0	0.0	14.0	0.0	5.4
Malta	3.9	0.0	0.0	14.0	0.0	5.4
Netherlands	3.9	0.0	0.0	14.0	0.0	5.4
Poland	3.9	0.0	0.0	14.0	0.0	5.4
Portugal	3.9	0.0	0.0	14.0	0.0	5.4
Romania	3.9	0.0	0.0	14.0	0.0	5.4
Slovak Republic	3.9	0.0	0.0	14.0	0.0	5.4
Slovenia	3.9	0.0	0.0	14.0	0.0	5.4
Spain	3.9	0.0	0.0	14.0	0.0	5.4
Sweden	3.9	0.0	0.0	14.0	0.0	5.4
United Kingdom	3.9	0.0	0.0	14.0	0.0	5.4
Indonesia	4.2	0.0	0.0	15.0	0.0	6.0
India	4.3	0.0	0.0	10.0	1.7	10.0
Turkey	4.4	0.0	0.0	14.0	2.8	5.1
Malaysia	5.0	0.0	0.0	25.0	0.0	0.0
Thailand	5.7	0.0	0.0	20.0	6.0	2.3
Chile	6.0	6.0	6.0	6.0	6.0	6.0
Vietnam	7.1	0.0	6.0	13.0	2.5	14.0
China	7.2	0.0	0.0	24.5	6.0	5.7
Russia	9.0	15.0	10.0	10.0	5.0	5.0
Argentina	10.1	10.0	10.7	20.0	4.0	5.7
Brazil	10.4	10.0	10.7	20.0	5.5	5.7
Philippines	11.5	0.0	0.0	15.0	40.0	2.3
All Countries	**3.8**	**0.8**	**0.8**	**11.6**	**1.5**	**4.1**
APEC-19 Countries	**3.6**	**1.1**	**1.2**	**9.2**	**3.6**	**2.8**
EU Countries	**3.9**	**0.0**	**0.0**	**14.0**	**0.0**	**5.4**
OECD Countries	**3.0**	**0.2**	**0.2**	**10.3**	**0.4**	**3.9**

Table 6-8: Market Access Policy for Telecom Market[38]

Country	Foreign Participation in Telecom Sector (%)	Country	Long Distance Termination Charges (US$)	Country	Open Inter-connection Agreement (Multiple Y/N)	Country	Unregulated VoIP (Multiple Y/N)
Argentina	100	Canada	0.01	Brazil	3	Austria	5
Australia	100	Hong Kong	0.01	Canada	3	Belgium	5
Austria	100	Singapore	0.01	Czech Republic	3	Brazil	5
Belgium	100	United States	0.01	Denmark	3	Bulgaria	5
Brazil	100	Argentina	0.02	Germany	3	Canada	5
Chile	100	China	0.02	Iceland	3	Chile	5
Cyprus	100	India	0.02	Japan	3	Cyprus	5
Czech Republic	100	Peru	0.02	Lithuania	3	Czech Republic	5
Denmark	100	Thailand	0.02	Malaysia	3	Denmark	5
Estonia	100	Australia	0.03	Norway	3	Estonia	5
Finland	100	Cyprus	0.03	Peru	3	Finland	5
France	100	Denmark	0.03	Poland	3	France	5
Germany	100	Greece	0.03	Romania	3	Germany	5
Greece	100	Luxembourg	0.03	Singapore	3	Greece	5
Hungary	100	Malaysia	0.03	Slovak Republic	3	Hungary	5
Iceland	100	Netherlands	0.03	Switzerland	3	Iceland	5
Ireland	100	Poland	0.03	Thailand	3	Ireland	5
Italy	100	Portugal	0.03	United Kingdom	3	Italy	5
Japan	100	Romania	0.03	United States	3	Lithuania	5
Latvia	100	Sweden	0.03	Argentina	2	Luxembourg	5
Lithuania	100	Turkey	0.03	Austria	2	Malta	5
Luxembourg	100	United Kingdom	0.03	Belgium	2	Netherlands	5
Malta	100	France	0.04	Bulgaria	2	Poland	5
New Zealand	100	Germany	0.04	Chile	2	Portugal	5
Norway	100	Iceland	0.04	China	2	Romania	5
Peru	100	Ireland	0.04	Cyprus	2	Singapore	5
Portugal	100	Italy	0.04	Estonia	2	Slovenia	5
Romania	100	Mexico	0.04	Finland	2	South Korea	5
Singapore	100	Russia	0.04	France	2	Spain	5
Slovak Republic	100	South Korea	0.04	Greece	2	Switzerland	5
Slovenia	100	Belgium	0.05	Hungary	2	United States	5
Spain	100	Chinese Taipei	0.05	India	2	Argentina	4
Sweden	100	Finland	0.05	Ireland	2	India	4
Switzerland	100	Hungary	0.05	Italy	2	Japan	4
Turkey	100	Indonesia	0.05	Latvia	2	Slovak Republic	4
South Africa	85.0	Israel	0.05	Luxembourg	2	Turkey	4
Canada	84.6	Vietnam	0.05	Malta	2	United Kingdom	4
Israel	72.3	Brazil	0.06	Netherlands	2	Latvia	3
India	63.3	Chile	0.06	Portugal	2	Malaysia	3
South Korea	61.8	New Zealand	0.06	Slovenia	2	New Zealand	3
China	49.2	Spain	0.06	South Africa	2	Norway	3
Mexico	49.0	Japan	0.07	South Korea	2	Sweden	3
Philippines	40.0	Norway	0.07	Spain	2	Australia	2
Malaysia	30.0	Slovak Republic	0.07	Sweden	2	Mexico	2
Bulgaria	N/A	South Africa	0.07	Turkey	2	China	1
Chinese Taipei	N/A	Austria	0.09	Vietnam	2	Israel	1
Hong Kong	N/A	Czech Republic	0.09	Australia	1	Vietnam	1
Indonesia	N/A	Switzerland	0.09	Indonesia	1	Indonesia	0
Netherlands	N/A	Latvia	0.10	Israel	1	Peru	0
Poland	N/A	Malta	0.10	Philippines	1	South Africa	0
Russia	N/A	Philippines	0.12	Mexico	0	Thailand	0
Thailand	N/A	Estonia	0.19	Chinese Taipei	N/A	Chinese Taipei	N/A
United Kingdom	N/A	Bulgaria	0.20	Hong Kong	N/A	Hong Kong	N/A
United States	N/A	Slovenia	0.20	New Zealand	N/A	Philippines	N/A
Vietnam	N/A	Lithuania	0.37	Russia	N/A	Russia	N/A
All Countries	**91.71**	**All Countries**	**0.06**	**All Countries**	**2.3**	**All Countries**	**3.9**
APEC-19 Countries	**76.21**	**APEC-19 Countries**	**0.04**	**APEC-19 Countries**	**2.1**	**APEC-19 Countries**	**2.7**
EU Countries	**100.0**	**EU Countries**	**0.08**	**EU Countries**	**2.3**	**EU Countries**	**4.8**
OECD Countries	**95.59**	**OECD Countries**	**0.05**	**OECD Countries**	**2.2**	**OECD Countries**	**4.4**

providers and liberalizing the markets. As shown in Table 6-9, the main fixed-line telephone operator was at least partially or fully privatized in all the countries analyzed except for Thailand. Regarding market liberalization, nearly all countries analyzed have either fully competitive or partially competitive markets in international long-distance communication, mobile telephones, and Internet service. (Internet service was not included as an indicator in this analysis, because all countries analyzed had fully competitive markets.) The only exception is Poland, which retains a single international long-distance services provider. As briefly noted, market liberalization is a direct policy tool to foster competition, which, in turn, contributes to better affordability and wider penetration of ICT services. But, relating market structure to ICT affordability directly, market competition level serves as a necessary condition for good ICT service affordability. In other words, market competition alone cannot guarantee affordability of ICT services.

Regarding the impact of telecom reform on technology adoption, Howard and Mazaheri found that privatizing, when combined with implementing an independent telecom regulator, forms the most constructive policy for encouraging technology adoption.[23] The implication on the global ICT market is clear. Market liberalization and market openness policy will foster global market competition in ICTs and will increase the efficiency of the market, stimulating the diffusion of innovations throughout the world via strategic alliances or mergers and acquisitions among international players. This will contribute to the affordability of various ICT services across national borders.

Legal Environment

The legal environment for ICT can have important effects on ICT usage in countries. Three sub-measures are considered, as Table 6-10 shows: EIU's legal environment (comprehensiveness, transparency, and enforcement of IP legislation, data privacy, anti-spam, and cybercrime laws),[24] WEF's measures of the effectiveness and efficiency of ICT-related legal systems,[25] and the existence of spam legislation. The importance of getting these policies right is expressed by Marcus et al.:

> Understanding arrangements that seek to protect the privacy of individuals is exceedingly complex. Privacy protection often develops in a piecemeal fashion, not necessarily as part of a considered plan to provide for privacy and enhanced trust. Arrangements within a given economy have to be understood in a holistic fashion. Legal arrangements often interact with self-regulatory and co-regulatory schemes in complex ways. Individual rights might be enforced by a government Data Protection Authority or equivalent, by the individual, or by industry self-regulatory and co-regulatory arrangements. The effectiveness of privacy and trust arrangements can only be viewed in the context of what works best for each economy, based on specific economic, social, and cultural conditions.[26]

ICT Usage

As outlined in Figure 6-1, usage is a concrete measure for evaluating the performance of digital policies. A country that outperforms on this measure will have a far higher innovation capacity and stronger competitive position relative to other nations. Indeed, usage is the method by which digital policies contribute to the national economy and the well-being of its—and the world's—citizens. Thus, usage is one of the most direct and powerful measures for assessing a country's digital policies performance. Usage by three demand sectors—public sector, business, and individual—are investigated in view of adoption and expenditure.

Public Sector Usage

The public sector usage measures reflect survey data on governments' success in ICT promotion, ICT use, government online services, and e-participation (the provision of online government services). Additionally, there is a quantitative measure of government spending on ICT as a share of GDP. The survey results are summarized in Table 6-11, which shows that Singapore performs best on the first two measures, while South Korea shows an outstanding performance in both the online service index and e-Participation Index. In view of the government ICT expenditure in Table 6-12, the United States outperforms all countries. This reflects the size of the budget in government services and the ICT investment relative to the amount of public services.

Market liberalization and market openness policy will foster global market competition in ICTs and will increase the efficiency of the market, stimulating the diffusion of innovations throughout the world via strategic alliances or mergers and acquisitions among international players. This will contribute to the affordability of various ICT services across national borders.

Table 6-9: Market Competition Level[39]

Country	International Long-Distance Market*	Country	Mobile Telephone Market*	Country	Main Fixed-Line Telephone Operator**
Argentina	C	Argentina	C	Argentina	PV
Australia	C	Australia	C	Brazil	PV
Austria	C	Brazil	C	Canada	PV
Belgium	C	Canada	C	Chile	PV
Brazil	C	Chile	C	Czech Republic	PV
Canada	C	Finland	C	Denmark	PV
Chile	C	France	C	Hungary	PV
Czech Republic	C	Germany	C	Ireland	PV
Denmark	C	India	C	Italy	PV
Estonia	C	Indonesia	C	Japan	PV
Finland	C	Ireland	C	Lithuania	PV
France	C	Israel	C	Mexico	PV
Germany	C	Italy	C	Netherlands	PV
Greece	C	Japan	C	New Zealand	PV
Hungary	C	Latvia	C	Peru	PV
India	C	Malaysia	C	Philippines	PV
Ireland	C	Mexico	C	Portugal	PV
Israel	C	Netherlands	C	South Korea	PV
Italy	C	New Zealand	C	Spain	PV
Japan	C	Norway	C	United Kingdom	PV
Latvia	C	Peru	C	United States	PV
Lithuania	C	Philippines	C	Australia	MX
Malaysia	C	Poland	C	Austria	MX
Mexico	C	Portugal	C	Belgium	MX
Netherlands	C	Romania	C	Bulgaria	MX
New Zealand	C	Russia	C	China	MX
Norway	C	Singapore	C	Estonia	MX
Peru	C	Slovak Republic	C	Finland	MX
Philippines	C	Slovenia	C	France	MX
Portugal	C	South Korea	C	Germany	MX
Romania	C	Spain	C	Greece	MX
Singapore	C	Sweden	C	India	MX
Slovak Republic	C	Switzerland	C	Indonesia	MX
Slovenia	C	Thailand	C	Israel	MX
South Africa	C	United Kingdom	C	Latvia	MX
South Korea	C	United States	C	Malaysia	MX
Spain	C	Vietnam	C	Norway	MX
Sweden	C	Austria	PC	Poland	MX
Switzerland	C	Belgium	PC	Romania	MX
Thailand	C	Bulgaria	PC	Russia	MX
Turkey	C	China	PC	Singapore	MX
United Kingdom	C	Czech Republic	PC	Slovak Republic	MX
United States	C	Denmark	PC	Slovenia	MX
Vietnam	C	Estonia	PC	South Africa	MX
Bulgaria	PC	Greece	PC	Sweden	MX
China	PC	Hungary	PC	Switzerland	MX
Indonesia	PC	Lithuania	PC	Turkey	MX
Russia	PC	South Africa	PC	Vietnam	MX
Poland	M	Turkey	PC	Thailand	PB
Chinese Taipei	N/A	Chinese Taipei	N/A	Chinese Taipei	N/A
Cyprus	N/A	Cyprus	N/A	Cyprus	N/A
Hong Kong	N/A	Hong Kong	N/A	Hong Kong	N/A
Iceland	N/A	Iceland	N/A	Iceland	N/A
Luxembourg	N/A	Luxembourg	N/A	Luxembourg	N/A
Malta	N/A	Malta	N/A	Malta	N/A

* C: Competition, PC: Partial competition, M: Monopoly
** PB: Public, MX: Mixed, PV: Private

ICT usage in government is closely related to national e-government initiatives. Many leading countries recognize ICT as a useful tool that can enable public agencies to change from routine-based, command-and-control organizations that are inwardly focused on administration to knowledge-based, networked, learning organizations that are externally focused on service. The Korean government's KONEPS (e-procurement), UNI-PASS (online customs service), Home Tax Service, and e-People are good examples of creative e-government services.[27] This shift requires changes not only in front-end transactions and delivery of services to clients, but also in integration and reengineering of back-end and core business processes in and across government agencies.[28] According to the UN's e-Government Survey 2010, Korea, the United States, Canada, the United Kingdom, the Netherlands, Norway, Denmark, Australia, Spain, France, Singapore, Sweden, New Zealand, Germany, Belgium, Japan, Switzerland, Finland, and Estonia are listed among the world's top twenty countries in e-government development.[29]

Business Usage

Business sector usage reflects firm-level use of Internet and IT-enabled innovations in business. The use of Internet includes Internet access, broadband use, Web presence and Internet commerce. Likewise, ICT-enabled innovations include development of new services and products, establishment of new operational processes and organizational changes. They are measured using the indicators shown in Table 6-13, where, notably, Sweden dominates in all three measures. Table 6-14 shows business sector expenditure as a share of GDP. Hungary, Hong Kong, the Czech Republic, Malaysia, South Africa, South Korea, and Singapore lead the way, allocating 5 percent of GDP to business ICT expenditure.

There has been strong progress in business ICT usage in developed countries. Australian businesses, for instance, took $143 billion worth of Internet orders in 2009–2010, up 15 percent on the previous year, according to figures released in June 2011 by the Australian Bureau of Statistics.[30] Nearly all (94 percent) of Australia's large businesses had a Web presence, and broadband dominated as the Internet access method (97 percent), with little variation between industries. Regarding ICT-enabled innovation, development or introduction of new or significantly improved goods, services, processes, or methods was reported by 44 percent of Australian businesses in 2009–2010. Large businesses were more than twice as likely to undertake innovation as smaller businesses were (74 percent compared to 36 percent). Wholesale trade was the most innovative, with almost 60 percent of businesses in the industry reporting some form of innovation.[31]

Individual Usage

The usage measures for the individual sector include Internet users per 100 inhabitants, mobile cellular subscriptions, and use of virtual social networks (SNS). The first two are hard data, while the use of SNS is survey data. As shown in Table 6-15, individual usage is relatively higher in developed countries. The European Union and OECD countries show above-average individual usage numbers, while the APEC-19 countries and BRIC countries show below-average usage.

Associated with individual ICT usage, SNS has attracted significant attention from industry and government during the last five years. Given the wide diffusion of SNS services in developed and developing countries alike, however, the social and economic impact of SNS is not yet well understood. Only recently have policy institutes such as the OECD and the European Union begun to study the use and impact of SNS services.[32] Their major concern is that the protection of user rights and regulation of abuse should remain a priority. However, considering that SNS is opening new opportunities as it continuously evolves, retaining a balance between liberalizing and regulating SNS services still remains a challenge that policymakers in many countries need to meet in coming years.

Table 6-10: Legal Environment Relating to ICT[40]

Country	IP, Transparency, Privacy, and Cyber-Crime (100=Best; 1=Worst)	Country	Laws Relating to ICT (7=Best; 1=Worst)	Country	Spam Legislation (Y=1/N=0)
United States	92.0	Singapore	5.9	Argentina	1
Australia	90.5	Sweden	5.9	Australia	1
Belgium	88.5	Estonia	5.8	Belgium	1
Switzerland	88.5	Denmark	5.7	Brazil	1
Denmark	87.0	Norway	5.6	Bulgaria	1
Netherlands	87.0	Australia	5.5	Chile	1
Austria	85.0	Austria	5.5	China	1
Finland	85.0	Canada	5.5	Cyprus	1
Germany	85.0	Finland	5.5	Czech Republic	1
Norway	85.0	Hong Kong	5.5	Denmark	1
United Kingdom	85.0	Iceland	5.5	Germany	1
France	83.5	New Zealand	5.5	Greece	1
Canada	82.0	Netherlands	5.4	Hungary	1
Ireland	81.5	Portugal	5.4	Iceland	1
Singapore	81.5	Switzerland	5.4	Ireland	1
Sweden	81.5	United Kingdom	5.4	Italy	1
Hong Kong	80.0	United States	5.4	Japan	1
New Zealand	80.0	Chinese Taipei	5.3	Latvia	1
Japan	79.0	Germany	5.3	Lithuania	1
Chinese Taipei	73.5	Luxembourg	5.3	Malta	1
Italy	73.0	France	5.2	Netherlands	1
Slovenia	73.0	Malta	5.2	Peru	1
Israel	72.0	Malaysia	5.1	Poland	1
Portugal	71.0	Slovenia	5.1	Portugal	1
Spain	71.0	South Korea	5.1	Romania	1
Estonia	69.5	Chile	5.0	Singapore	1
Slovak Republic	69.5	Belgium	4.9	Slovak Republic	1
Chile	69.0	Japan	4.8	South Korea	1
Czech Republic	67.5	South Africa	4.8	Spain	1
Greece	67.5	Ireland	4.7	Sweden	1
Hungary	67.5	Czech Republic	4.6	Switzerland	1
Lithuania	67.5	India	4.6	Turkey	1
South Korea	67.0	Brazil	4.5	United Kingdom	1
Poland	66.5	Cyprus	4.5	United States	1
Latvia	65.5	Israel	4.5	Canada	0
South Africa	63.5	Lithuania	4.5	Finland	0
Argentina	63.0	Spain	4.5	France	0
Turkey	61.0	China	4.4	India	0
China	59.5	Bulgaria	4.3	Indonesia	0
Mexico	58.0	Turkey	4.3	Mexico	0
Bulgaria	56.0	Hungary	4.1	South Africa	0
Romania	56.0	Italy	4.0	Vietnam	0
Malaysia	54.0	Vietnam	4.0	Austria	N/A
Philippines	50.5	Indonesia	3.9	Chinese Taipei	N/A
Brazil	49.5	Mexico	3.9	Estonia	N/A
Peru	48.5	Slovak Republic	3.9	Hong Kong	N/A
India	48.0	Thailand	3.9	Israel	N/A
Indonesia	47.0	Latvia	3.8	Luxembourg	N/A
Vietnam	47.0	Peru	3.8	Malaysia	N/A
Thailand	43.5	Poland	3.8	New Zealand	N/A
Russia	42.0	Greece	3.6	Norway	N/A
Cyprus	N/A	Philippines	3.6	Philippines	N/A
Iceland	N/A	Romania	3.5	Russia	N/A
Luxembourg	N/A	Russia	3.5	Slovenia	N/A
Malta	N/A	Argentina	3.1	Thailand	N/A
All Countries	**69.9**	**All Countries**	**4.8**	**All Countries**	**0.8**
APEC-19 Countries	**65.5**	**APEC-19 Countries**	**4.7**	**APEC-19 Countries**	**0.7**
EU Countries	**74.6**	**EU Countries**	**4.8**	**EU Countries**	**0.9**
OECD Countries	**77.2**	**OECD Countries**	**5.0**	**OECD Countries**	**0.9**

Table 6-11: Public Sector ICT Usage[41]

Country	Gov't Success in ICT Promotion (7=Best; 1=Worst)	Country	ICT Use and Government Efficiency (7=Best; 1=Worst)	Country	Online Service Index (1=Best; 0=Worst)	Country	e-Participation Index (1=Best; 0=Worst)
Singapore	6.2	Singapore	6.2	South Korea	1.000	South Korea	1.00
Malta	5.9	Sweden	6.0	United States	0.937	Australia	0.91
Chinese Taipei	5.8	Chinese Taipei	5.7	Canada	0.883	Spain	0.83
Sweden	5.6	Estonia	5.7	United Kingdom	0.775	New Zealand	0.77
Denmark	5.5	Portugal	5.7	Australia	0.765	United Kingdom	0.77
Luxembourg	5.5	South Korea	5.7	Spain	0.765	Japan	0.76
Portugal	5.5	Austria	5.6	Norway	0.737	United States	0.76
Estonia	5.4	Hong Kong	5.6	Singapore	0.686	Canada	0.73
Iceland	5.4	Malta	5.6	France	0.683	Estonia	0.69
China	5.3	Chile	5.5	Netherlands	0.679	Singapore	0.69
Malaysia	5.3	Iceland	5.4	Denmark	0.673	Malaysia	0.66
South Korea	5.3	Malaysia	5.4	Japan	0.673	Denmark	0.64
Finland	5.2	Canada	5.3	New Zealand	0.639	Germany	0.61
Hong Kong	5.2	Finland	5.3	Malaysia	0.631	France	0.60
India	5.2	Norway	5.3	Belgium	0.625	Netherlands	0.60
Norway	5.2	Switzerland	5.3	Chile	0.610	Belgium	0.59
United States	5.2	Denmark	5.2	Israel	0.584	Lithuania	0.53
Canada	5.0	France	5.2	Germany	0.549	Slovenia	0.51
Australia	4.9	Luxembourg	5.2	Sweden	0.527	Austria	0.50
Switzerland	4.9	New Zealand	5.2	Hungary	0.505	Norway	0.50
Cyprus	4.8	United States	5.1	Estonia	0.502	Cyprus	0.49
France	4.8	Australia	5.0	Ireland	0.498	Sweden	0.49
Germany	4.8	China	5.0	Lithuania	0.482	Ireland	0.44
Austria	4.7	Netherlands	5.0	Finland	0.479	Finland	0.41
Netherlands	4.7	Brazil	4.9	Austria	0.476	Israel	0.41
Slovenia	4.7	Germany	4.9	Malta	0.470	China	0.37
Israel	4.6	Israel	4.8	Czech Republic	0.454	Mexico	0.37
Thailand	4.6	Lithuania	4.8	Switzerland	0.444	Chile	0.34
United Kingdom	4.6	Turkey	4.8	Mexico	0.441	Malta	0.34
Chile	4.5	India	4.7	Latvia	0.416	Hungary	0.31
Japan	4.5	Ireland	4.7	Romania	0.416	Bulgaria	0.30
Vietnam	4.5	Slovenia	4.7	Argentina	0.413	Brazil	0.29
Belgium	4.4	United Kingdom	4.7	Bulgaria	0.410	Latvia	0.27
Brazil	4.4	Cyprus	4.6	Peru	0.410	Portugal	0.27
New Zealand	4.4	Vietnam	4.6	Slovenia	0.400	Greece	0.26
Indonesia	4.3	Thailand	4.5	Iceland	0.397	Poland	0.24
Ireland	4.3	Czech Republic	4.4	Philippines	0.394	Italy	0.21
Lithuania	4.3	Spain	4.4	Poland	0.387	Turkey	0.21
Greece	4.1	Belgium	4.3	Portugal	0.387	Argentina	0.2
Romania	4.1	Japan	4.3	Luxembourg	0.381	India	0.20
Czech Republic	4.0	Peru	4.3	Cyprus	0.371	Switzerland	0.20
Turkey	4.0	Indonesia	4.2	Brazil	0.368	Philippines	0.19
South Africa	3.9	Mexico	4.2	China	0.368	Romania	0.19
Latvia	3.8	Italy	4.1	India	0.368	South Africa	0.19
Mexico	3.8	South Africa	4.1	Greece	0.356	Luxembourg	0.17
Philippines	3.8	Bulgaria	4.0	Slovak Republic	0.346	Peru	0.17
Russia	3.8	Greece	4.0	Turkey	0.346	Czech Republic	0.13
Spain	3.8	Hungary	4.0	Thailand	0.333	Indonesia	0.13
Bulgaria	3.7	Latvia	3.7	Russia	0.330	Russia	0.13
Italy	3.7	Russia	3.7	South Africa	0.308	Thailand	0.09
Peru	3.7	Philippines	3.6	Vietnam	0.305	Vietnam	0.09
Hungary	3.6	Slovak Republic	3.5	Italy	0.289	Slovak Republic	0.07
Slovak Republic	3.4	Poland	3.4	Indonesia	0.244	Iceland	0.04
Poland	3.2	Romania	3.3	Chinese Taipei	N/A	Chinese Taipei	N/A
Argentina	2.9	Argentina	3.2	Hong Kong	N/A	Hong Kong	N/A
All Countries	**4.6**	**All Countries**	**4.8**	**All Countries**	**0.508**	**All Countries**	**0.41**
APEC-19 Countries	**4.7**	**APEC-19 Countries**	**4.9**	**APEC-19 Countries**	**0.568**	**APEC-19 Countries**	**0.48**
EU Countries	**4.5**	**EU Countries**	**4.7**	**EU Countries**	**0.493**	**EU Countries**	**0.42**
OECD Countries	**4.6**	**OECD Countries**	**4.9**	**OECD Countries**	**0.564**	**OECD Countries**	**0.48**

Table 6-12: Public Sector Expenditure on ICT as a Share of GDP[42]

Country	Public Sector Expenditure on ICT (% of GDP)	Country	Public Sector Expenditure on ICT (% of GDP)
United States	1.05	Australia	0.29
Malaysia	0.95	Spain	0.28
Switzerland	0.76	Poland	0.28
Chinese Taipei	0.71	Argentina	0.27
Hungary	0.69	India	0.27
Canada	0.67	Norway	0.27
South Africa	0.54	Russia	0.26
Netherlands	0.54	Italy	0.26
Sweden	0.52	Romania	0.24
Hong Kong	0.50	Ireland	0.23
Brazil	0.50	Bulgaria	0.23
United Kingdom	0.50	Slovenia	0.22
Finland	0.45	Chile	0.21
South Korea	0.45	Peru	0.20
France	0.43	Indonesia	0.19
Israel	0.42	Vietnam	0.17
Slovak Republic	0.42	Turkey	0.16
Portugal	0.37	Mexico	0.14
Czech Republic	0.36	Cyprus	N/A
Japan	0.36	Estonia	N/A
Denmark	0.36	Iceland	N/A
Belgium	0.34	Latvia	N/A
Singapore	0.32	Lithuania	N/A
China	0.32	Luxembourg	N/A
Philippines	0.32	Malta	N/A
Germany	0.32	**All Countries**	**0.39**
Thailand	0.31	**APEC-19 Countries**	**0.41**
Austria	0.31	**EU Countries**	**0.36**
Greece	0.29	**OECD Countries**	**0.39**
New Zealand	0.29		

Table 6-13: Business Sector ICT Usage[43]

Country	Extent of Business Internet Use (7=Best; 1=Worst)	Country	ICT Impact on New Services and Products (7=Best; 1=Worst)	Country	ICT Impact on New Organizational Models (7=Best; 1=Worst)
Sweden	6.6	Sweden	6.3	Sweden	6.0
Estonia	6.3	Chinese Taipei	6.0	United States	5.6
Iceland	6.3	South Korea	5.9	Canada	5.5
Lithuania	6.3	France	5.8	Chinese Taipei	5.5
South Korea	6.3	Norway	5.8	Norway	5.5
Canada	6.2	Singapore	5.8	Singapore	5.5
United Kingdom	6.2	United Kingdom	5.8	United Kingdom	5.5
United States	6.2	Canada	5.7	Finland	5.4
Chinese Taipei	6.1	Germany	5.7	Israel	5.4
Israel	6.1	Iceland	5.7	Iceland	5.3
Denmark	6.0	Switzerland	5.7	Malaysia	5.3
Hong Kong	6.0	United States	5.7	Netherlands	5.3
Japan	6.0	Estonia	5.6	Estonia	5.2
Netherlands	6.0	Netherlands	5.5	France	5.2
New Zealand	6.0	Austria	5.4	Germany	5.2
Norway	6.0	Finland	5.4	Hong Kong	5.2
Singapore	6.0	Hong Kong	5.4	Switzerland	5.2
Switzerland	6.0	Israel	5.4	Australia	5.1
Australia	5.9	Malaysia	5.4	South Korea	5.1
Finland	5.9	Portugal	5.4	Denmark	5.0
France	5.9	Brazil	5.3	Malta	5.0
Austria	5.8	Chile	5.3	Belgium	4.9
Czech Republic	5.8	Japan	5.3	Brazil	4.9
Germany	5.8	Malta	5.3	Lithuania	4.9
Belgium	5.7	Australia	5.2	Portugal	4.9
Brazil	5.7	Lithuania	5.2	Chile	4.8
Malta	5.7	China	5.1	New Zealand	4.8
Ireland	5.6	Denmark	5.1	Austria	4.7
Luxembourg	5.6	India	5.1	China	4.7
Portugal	5.6	Luxembourg	5.1	India	4.7
Chile	5.5	New Zealand	5.1	Ireland	4.7
Malaysia	5.5	Belgium	5.0	Luxembourg	4.7
Bulgaria	5.4	Ireland	5.0	Japan	4.6
Latvia	5.4	Spain	4.9	Spain	4.5
Slovak Republic	5.4	Vietnam	4.9	Thailand	4.5
Slovenia	5.4	Peru	4.8	Indonesia	4.4
Vietnam	5.3	Thailand	4.8	Peru	4.4
Cyprus	5.2	Turkey	4.8	South Africa	4.3
Poland	5.2	Cyprus	4.7	Turkey	4.2
China	5.1	Czech Republic	4.7	Argentina	4.1
India	5.1	Indonesia	4.6	Bulgaria	4.1
South Africa	5.1	Slovenia	4.6	Czech Republic	4.1
Thailand	5.1	South Africa	4.6	Mexico	4.1
Turkey	5.1	Mexico	4.5	Slovenia	4.1
Indonesia	5.0	Argentina	4.3	Cyprus	4.0
Hungary	4.9	Bulgaria	4.3	Philippines	4.0
Romania	4.9	Hungary	4.3	Poland	3.9
Spain	4.9	Philippines	4.3	Vietnam	3.9
Italy	4.8	Italy	4.2	Italy	3.8
Russia	4.8	Poland	4.2	Latvia	3.8
Mexico	4.7	Romania	4.2	Russia	3.8
Argentina	4.6	Slovak Republic	4.2	Hungary	3.7
Peru	4.5	Greece	4.1	Slovak Republic	3.7
Philippines	4.5	Latvia	4.1	Romania	3.6
Greece	4.4	Russia	4.0	Greece	3.3
All Countries	**5.6**	**All Countries**	**5.1**	**All Countries**	**4.7**
APEC-19 Countries	**5.5**	**APEC-19 Countries**	**5.1**	**APEC-19 Countries**	**4.8**
EU Countries	**5.6**	**EU Countries**	**5.0**	**EU Countries**	**4.6**
OECD Countries	**5.7**	**OECD Countries**	**5.2**	**OECD Countries**	**4.8**

Table 6-14: Business Sector Expenditure on ICT as a Share of GDP[44]

Country	Business Sector Expenditure on ICT (% of GDP)	Country	Business Sector Expenditure on ICT (% of GDP)
Hungary	6.4	Thailand	2.8
Hong Kong	5.8	Brazil	2.8
Czech Republic	5.4	Italy	2.7
Malaysia	5.3	Spain	2.7
South Africa	5.2	Chile	2.7
South Korea	5.1	Israel	2.6
Singapore	5.0	Slovenia	2.6
United Kingdom	4.9	Norway	2.6
Slovak Republic	4.9	Philippines	2.5
China	4.8	India	2.4
Finland	4.8	Romania	2.4
United States	4.5	Argentina	2.3
Switzerland	4.4	Mexico	2.2
Sweden	4.3	Russia	2.2
Canada	4.1	Greece	2.1
Japan	3.8	Turkey	1.7
Netherlands	3.8	Peru	1.7
Austria	3.5	Indonesia	1.4
Germany	3.5	Cyprus	N/A
New Zealand	3.4	Estonia	N/A
Poland	3.3	Iceland	N/A
Portugal	3.3	Latvia	N/A
France	3.2	Lithuania	N/A
Ireland	3.2	Luxembourg	N/A
Australia	3.1	Malta	N/A
Vietnam	3.1	**All Countries**	**3.5**
Belgium	3.1	**APEC-19 Countries**	**3.5**
Chinese Taipei	3.1	**EU Countries**	**3.6**
Denmark	3.1	**OECD Countries**	**3.6**
Bulgaria	2.9		

Table 6-15: Individual ICT Usage[45]

Country	Internet Users per 100 Inhabitants	Country	Mobile Cellular Subscriptions per 100 Inhabitants	Country	Use of Virtual Social Networks (7=Worst; 1=Best)
Iceland	93.5	Estonia	203.0	Iceland	6.8
Norway	92.1	Hong Kong	179.4	Sweden	6.5
Sweden	90.8	Russia	163.6	United Kingdom	6.4
Netherlands	89.6	Lithuania	151.0	Denmark	6.3
Luxembourg	87.3	Portugal	148.8	Norway	6.3
Denmark	86.8	Luxembourg	148.1	Canada	6.2
United Kingdom	83.6	Italy	147.0	Finland	6.2
Finland	82.5	Singapore	145.2	Switzerland	6.2
South Korea	81.5	Finland	144.6	Australia	6.1
Switzerland	81.3	Bulgaria	140.2	Austria	6.1
Canada	80.3	Czech Republic	137.5	Hong Kong	6.1
New Zealand	79.7	Austria	136.7	Luxembourg	6.1
Germany	79.3	United Kingdom	130.6	Netherlands	6.1
Japan	78.0	Argentina	130.3	United States	6.1
United States	78.0	Germany	127.8	New Zealand	6.0
Belgium	76.2	Netherlands	127.7	Singapore	6.0
Slovak Republic	75.2	Sweden	125.9	Chinese Taipei	5.9
Australia	74.3	Israel	125.8	Germany	5.9
Austria	73.5	Denmark	125.0	Belgium	5.8
Estonia	72.5	Switzerland	122.3	Chile	5.8
France	71.6	Cyprus	122.0	Malaysia	5.8
Chinese Taipei	69.9	Romania	119.4	Malta	5.8
Hong Kong	69.4	Greece	119.1	Estonia	5.7
Singapore	68.3	Hungary	118.0	France	5.7
Ireland	67.4	Poland	117.7	Indonesia	5.7
Latvia	66.8	Belgium	117.5	Israel	5.7
Czech Republic	64.4	Chinese Taipei	116.7	Portugal	5.7
Slovenia	64.3	Australia	113.8	Slovak Republic	5.6
Israel	63.1	Spain	113.8	South Korea	5.6
Spain	62.6	Vietnam	111.5	Ireland	5.5
Hungary	61.8	Norway	111.4	Lithuania	5.5
Lithuania	59.8	New Zealand	110.2	Philippines	5.5
Poland	59.0	Malaysia	109.7	Bulgaria	5.4
Malta	58.9	Ireland	107.9	Czech Republic	5.4
Malaysia	55.9	Latvia	105.4	Italy	5.4
Cyprus	49.8	Iceland	105.3	Brazil	5.3
Italy	48.8	Slovenia	104.0	Spain	5.3
Portugal	48.3	Malta	103.3	Argentina	5.2
Bulgaria	45.0	Slovak Republic	101.7	Japan	5.2
Greece	44.5	South Korea	100.7	Latvia	5.2
Chile	41.3	Philippines	100.3	Romania	5.2
Brazil	39.2	Thailand	97.3	Slovenia	5.2
Romania	36.6	Chile	96.9	China	5.0
Turkey	36.4	France	95.5	Cyprus	5.0
Argentina	34.0	South Africa	92.7	Greece	5.0
Peru	31.4	Japan	91.5	Peru	5.0
Russia	29.0	United States	90.8	Thailand	5.0
China	28.9	Brazil	89.8	Turkey	5.0
Mexico	28.3	Peru	84.7	India	4.8
Vietnam	26.6	Turkey	83.9	Mexico	4.8
Thailand	25.8	Mexico	76.2	South Africa	4.8
Philippines	9.0	Canada	70.9	Hungary	4.6
South Africa	8.8	Indonesia	69.2	Vietnam	4.6
Indonesia	8.7	China	55.5	Russia	4.4
India	5.1	India	43.8	Poland	4.2
All Countries	**58.6**	**All Countries**	**115.1**	**All Countries**	**5.6**
APEC-19 Countries	**50.8**	**APEC-19 Countries**	**104.4**	**APEC-19 Countries**	**5.5**
EU Countries	**66.9**	**EU Countries**	**127.4**	**EU Countries**	**5.6**
OECD Countries	**70.5**	**OECD Countries**	**117.6**	**OECD Countries**	**5.7**

Chapter 7: Government Procurement

Why Government Procurement Can Be a Driver of Innovation

Governments can orient their procurement policies to become strong drivers of innovation and, as such, procurement policy is an important component of countries' innovation strategies. Smart public procurement policies can stimulate private innovation and innovative solutions.[1] They position governments to boost demand for innovative technologies, products, and services, in part by acting as lead users, or "early adopters," that help prove technologies or foster the development of new markets. Extensive research documents the role of demand in spurring innovation, with one study of more than 1,000 firms finding that, in more than half, innovation stems from new requirements and demand.[2] Governments can play an important and legitimate role in spurring that demand. For example, one study found that, between 1984 and 1998, 48 percent of projects leading to successful innovation in Finland were triggered by public procurement or regulation.[3] And, a study by Rothwell finds that over longer time periods, countries' procurement policies triggered greater innovation impulses in more areas than did R&D subsidies, and they did so without having to include any "buy domestic" requirements.[4]

Globally, new interest has emerged in the value of demand-side approaches to innovation and, more specifically, in the use of public demand as an engine for innovation.[5] Governments in many countries have begun to use the power of the purse to promote innovation, in part by making innovation an explicit metric when awarding public sector contracts. The first step countries have taken is to acknowledge that doing so requires explicit policies and strategies to incentivize innovation. For example, Japan's Ministry of Economic Trade and Industry developed an integrated procurement process aimed at expanding technology procurement horizontally across government, which promoted the rapid adoption of ubiquitous 3G networks.[6] In 2006, the Swedish government commissioned VINNOVA, the agency responsible for R&D and innovation, and NOU (the Swedish National Board for Public Procurement) to "examine how public procurement can contribute to developing innovation and creative renewal."[7] The Australian Government has affirmed that it "will drive innovation in the private sector by being a demanding and discerning customer."[8] Australian agencies are encouraged to single out innovative ideas by evaluating extra-unique features of proposals as a separate criterion.

Some nations have designed procurement policies to spur developments of technology platforms that the private sector may have a difficult time developing on its own. For example, to stimulate the development of near-field communications (NFC), NFC-enabled mobile payments, and the use of mobile phones as electronic wallets, Singapore's Infocomm Development Authority (IDA) formed a roundtable group of banks, mobile network operators, and transit companies with the intent of developing a national plan for the introduction of NFC-enabled commerce. Recognizing that developing a fully interoperable NFC environment would generate a market size eight times larger than a non-interoperable environment, IDA created a national, trusted third party to ensure full interoperability between the NFC services of all mobile operators and service providers. The United Kingdom also has recognized that government must become explicitly involved in advocating for and helping to foster mobile payments capability. The UK Department of Transport's 2009 Smart and Integrated Ticketing Strategy envisions universal coverage of a smart ticketing infrastructure for all UK public transport, finding that using contactless ticketing technologies such as NFC could save the country up to £2 billion annually.[9]

It is important to recognize that strategic public procurement policies need not be tantamount to an industrial policy that picks winners or selects national champion firms in key technologies or industries. While strategic public procurement should identify key broad emerging technologies that appear ripe for innovation, making specifications as to which firms or even to which solutions should be favored or selected is likely to be counterproductive. Moreover, while governments should view innovation as an explicit goal of the public

Globally, new interest has emerged in the value of demand-side approaches to innovation and, more specifically, in the use of public demand as an engine for innovation. Governments in many countries have begun to use the power of the purse to promote innovation, in part by making innovation an explicit metric when awarding public sector contracts.

procurement process, there are legitimate ways to do so, and there are illegitimate ways that distort global trade by giving unfair preferences to domestic firms.[10] Foremost, when including innovation as a consideration in awarding government procurements, the criteria considered—as with all criteria used in making government contract awards—should be transparent and publicly disseminated, and should apply equally and consistently to foreign and domestic enterprises alike. Furthermore, the source of an enterprise's intellectual property or technology used in submitting the bid should not be a consideration in the government's evaluation, as this risks locking in inferior technology.

Nevertheless, many governments' procurement policies long have favored domestic players, effectively blocking foreign competitors from successfully bidding for public procurement contracts.[11] Such practices are economically harmful for several reasons. First, businesses and citizens suffer by receiving inferior technology, products, or services, while often paying more for the privilege. Further, by not selecting superior bids, countries miss out on opportunities for learning and technological improvements, which tend to spill over within the market in which the procurement takes places.[12] Second, such practices undermine the principles of global free trade. They also may contravene countries' legal obligations under the World Trade Organization's Government Procurement Agreement (GPA), which prohibits restrictions on government purchases between member countries. However, whether countries are members of the GPA or not, national treatment is the fundamental commitment upon which the world trading system relies, and countries that fail to accord national treatment to foreign competitors in government procurement undermine both the cause and the realization of liberalized trade. Therefore, while government procurement policies have a legitimate role to play in spurring innovation, it is imperative that they are not used to distort free trade by giving unfair preferences to domestic competitors.

Assessing Countries' Government Procurement Policies

As Table 7-1 shows, this section assesses countries' adoption of the above government procurement principles based on their accession to the World Trade Organization's Government Procurement Agreement, the degree of procurement accounted for by state-owned-enterprises, countries' scores in Transparency International's Corruption Perceptions Index, and their effectiveness in procuring advanced technology products. The number and extent of trade-distorting implementations of local content and other public procurement policies as cataloged in the Global Trade Alert database also is assessed (though not used as a scored measure). Countries' scores on these government procurement indicators account for 10 percent of their aggregate score.

On these measures, the majority of countries reside in the two upper tiers, having adopted government procurement policies that are transparent, non-discriminatory, openly competitive, and performance-based. Of the European Union countries, only Romania remains outside of the two upper tiers. Most developing countries reside in the lower tier, including the BRIC countries of Brazil, Russia, India, and China, as Table 7-2 shows.

National treatment is the fundamental commitment upon which the world trading system relies, and countries that fail to accord national treatment to foreign competitors in government procurement undermine both the cause and the realization of liberalized trade.

Table 7-1: Government Procurement Policy Indicators

Indicator	Data Type	Source	Indicator Weight
Participation in WTO Government Procurement Agreement	Signatory/ Observer/ Non-Member	WTO	40%
Government Enterprise and Investment Indicator	Rating	Fraser Institute	20%
Corruption Perceptions Index	Rating	Transparency International	20%
Government Procurement of Advanced Technology Products	Rating	WEF	20%

Table 7-2: Country Ranks on Government Procurement (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Austria	Australia	Latvia	Argentina
Belgium	Bulgaria	Romania	Brazil
Canada	Chile	Turkey	China
Chinese Taipei	Czech Republic		India
Cyprus	Greece		Indonesia
Denmark	Hungary		Malaysia
Estonia	Ireland		Mexico
Finland	Israel		Peru
France	Italy		Philippines
Germany	Lithuania		Russia
Hong Kong	Malta		South Africa
Iceland	New Zealand		Thailand
Japan	Poland		Vietnam
Luxembourg	Slovak Republic		
Netherlands	Spain		
Norway	South Korea		
Portugal			
Slovenia			
Singapore			
Sweden			
Switzerland			
United Kingdom			
United States			

Membership in the WTO's Government Procurement Agreement

The WTO's Government Procurement Agreement prohibits restrictions on government purchases between member countries, stating that companies in other signatory countries will be treated no less favorably than domestic companies in accordance with the principles of national treatment and non-discrimination. Of the countries in this analysis, the majority are parties to the GPA, as Table 7-3 shows. Argentina, Australia, Chile, China, India, New Zealand, and Turkey are observers of the GPA, meaning that they participate in the discussions at the meetings and follow the proceedings of the WTO Committee on Government Procurement, but are not obliged to fulfill commitments related to the Agreement. Australia is the world's only major industrialized country that is not a GPA signatory.[13] China, which promised to accede to the GPA as part of its entrance to the WTO in 2001, continues to tarry in its negotiations to accede to the Agreement. In January 2011, China agreed to submit a revised offer to the WTO Government Procurement Committee before the Committee's final meeting of 2011.[14]

However, countries that are GPA members can go even further toward liberalizing their government procurement policies. This is because when countries accede to the GPA, they provide a list of which government entities or which types of procurements are subject to the GPA requirements, exempting the rest of their government procurement activities from GPA coverage. For example, in Canada, federal government procurements are subject to Canada's GPA commitments, but provincial-level

Table 7-3: Membership in World Trade Organization's Government Procurement Agreement[15]

Status	Country	Status	Country
Signatories	Austria	Signatories	Romania
	Belgium		Slovak Republic
	Bulgaria		Slovenia
	Canada		Singapore
	Chinese Taipei		South Korea
	Cyprus		Spain
	Czech Republic		Sweden
	Denmark		Switzerland
	Estonia		United States
	Finland		United Kingdom
	France	Observers	Argentina
	Germany		Australia
	Greece		Chile
	Hong Kong		China
	Hungary		India
	Iceland		New Zealand
	Ireland		Turkey
	Israel	Non-Members	Brazil
	Italy		Indonesia
	Japan		Malaysia
	Latvia		Mexico
	Lithuania		Peru
	Luxembourg		Philippines
	Malta		Russia
	Netherlands		South Africa
	Norway		Thailand
	Poland		Vietnam
	Portugal		

procurement activity is not. At Canada's provincial and municipal levels, various procurement regimes apply domestic preferences, such as price preferences and domestic content requirements, in favor of goods or services produced or sold within the territory.[16] Likewise, while Japan's GPA coverage does include all central government entities, all forty-seven prefectures, and twelve designated cities, it has excluded many of the lower layers of its local administration (such as cities and villages), markets estimated to be worth as much as $74 billion, from its GPA commitments.[17] Likewise, the quality of China's anticipated accession to the GPA will be contingent upon the extent of government procurement activity it makes subject to the agreement. China has argued in the past that goods and services purchased by its state-owned enterprises should be seen as exempted from the national treatment obligations of WTO/GATT and WTO/GATS.[18]

Trade-Restricting Public Procurement Policies

The Center for Economic Policy Research's Global Trade Alert (GTA) database extensively catalogs instances of trade-distorting public procurement policies that governments around the world have implemented,[19] disadvantaging foreign commercial interests. Based on this data, China and Russia have the most documented

instances of procurement preferences that favor domestic businesses. However, these practices were seen in developed and developing countries alike, with Australia, Brazil, Chinese Taipei, France, India, Indonesia, Japan, Malaysia, Spain, Turkey, the United States, and Vietnam also excluding or disadvantaging foreign contestants in some government procurement contracts. This suggests that many countries have room to improve in implementing impartial government procurement practices; however, some have much more room for improvement than others.

For example, revisions to Russia's Government Procurement Law, which took effect in March 2009, gave preferences to certain national producers "on placement of orders for goods and services delivery for state and municipal needs."[20] In 2010, Russia introduced 10 billion rubles ($358 million) in subsidies to states within the Russian Federation to buy cars from domestic producers.[21] Brazil implemented the "Bigger Brazil Plan" in 2011, which established a preferential margin of up to 25 percent in the bidding process for manufacturing products or services. According to Global Trade Alert, "The preferential margin implies that Brazilian products can be up to 25 percent more expensive than the rest and still have preference over the products of other countries on government purchases."[22] In another discriminatory measure, in 2009 Brazil banned public procurement of wind turbines with nominal power less than 1,500 kW, negatively affecting its trading partners of Denmark, Germany, Japan, and Spain.[23] However, neither Japan nor Spain is unoffending in government procurement. Spain's "State Fund for a Dynamic Economy and Employment" obscures relevant application and tendering procedures in government bidding from foreign firms, and thus "the potential for discrimination against foreign commercial interests is very high."[24] In January 2010, local governments in Japan implemented policies to encourage purchases of local products such as cars, televisions, and other electronic equipment.[25] Nor is the United States immune from local content requirement pressures. The Consolidated Appropriations Act of 2010 provides explicit local content requirements for Amtrak, stating that, "funds provided in this Act for the National Railroad Passenger Corporation shall immediately cease to be available to said Corporation in the event that the Corporation contracts to have services provided at or from any location outside the United States."[26]

Several Southeast Asian countries employ preferential government procurement practices. In Indonesia, potential contractors are required to source at least 35 percent of their offering domestically.[27] Likewise, Malaysia's official policy is to use government procurement to support national public policy objectives, such as achieving the transfer of technology from foreign to domestic industries, reducing the outflow of foreign exchange, providing advantages to local companies in the service sector, and boosting Malaysia's export capabilities.[28] Vietnam's government has introduced specific preferences for open source software in government procurement in an effort to minimize purchases of foreign software.[29] China has introduced "buy local" policies at both the provincial and national levels. In fact, China has gone far beyond nearly all other countries in introducing local content requirements by conceiving an overarching indigenous innovation strategy that seeks to use government procurement policies specifically to advance the innovation capabilities of domestic enterprises and industries, in part by favoring domestic intellectual property by requiring the use of domestically developed intellectual property or technology in many government procurement contracts.[30] In 2011, a United States-China Joint Statement declared that "it will not link its innovation policies to the provision of government procurement preferences."[31] Although this is a positive development, the statement did not apply by its terms to purchases made by China's state-owned enterprises, to the National Development Reform Commission (NDRC) concession projects, including the acquisition of turbines for large wind farms, nor to any of the sixteen major priority projects contained in China's Medium and Long Term Plan for Scientific Development.[32]

Trade-Promoting Public Procurement Policies

In contrast with the above, a number of trade-promoting government procurement policies among the countries were analyzed. Although a frequent offender in other areas of procurement, Russia has, in fact, created a single consolidated website to announce the government procurement tenders (and auctions) from state and municipal bodies.[33] The application process, as well as bidding, is done electronically, and all documents are available on the website. Foreign producers are able to participate in government procurement bids on this website. Similarly, the Philippines has implemented a clearer and more coherent system of government procurement, with a uniform procurement system and prescribed competitive bidding, and has specified clearly the methods and stages of purchasing to be followed, including the roles, responsibilities, accountability, and manner of appointment of procurement officials and committees.[34]

Though the Korean government invested $1 billion between 2003 and 2007 in e-procurement systems, it estimates that, taking account of both the ability to repurpose government personnel and time-saving measures across the government, e-government saves far more than its costs. Korean officials estimate that e-government has produced $16 billion worth of indirect economic benefits from more efficient government

procurement, trade, and construction. Overall, Korea's government estimates that, for every dollar it has invested in e-government since 2003, it has saved $17. In fact, one study finds that countries—including Hong Kong, Italy, Singapore, South Korea, Sweden, the United Kingdom, and the United States—that implement e-procurement systems realize savings of 13 percent in the form of lowered transaction costs, reduced paper work, rapid ordering processes, wider vendor choices, and more bidders.[35] This is particularly important because research on public procurement finds that increasing the number of bidders for a government procurement contract substantially reduces the price paid by the state.[36] And, given their sheer size, even small improvements in procurement efficiency can have substantial economic effects. For example, in a study of thirty-nine developing countries, twenty-one reported that just a 10 percent increase in procurement efficiency would yield as much value as a 50 percent increase in the foreign aid they received in a given year.[37]

Extent of State-Owned Enterprise (SOE) Activity

An important component of procurement policy is the extent to which countries use private rather than government enterprises to produce goods and services. As the Fraser Institute notes, "Government firms play by rules that are different from those to which private enterprises are subject. They are not dependent on consumers for their revenue or on investors for capital. They often operate in protected markets. Thus, economic freedom is reduced as government enterprises produce a larger share of total output."[38] State-owned enterprises often enjoy other advantages, including monopoly access to markets through sharply constrained (foreign and domestic) competition; public subsidies, including preferential access to free or discounted land, capital, and even labor; or exemptions from certain laws and regulations. In other words, in countries in which state-owned enterprises account for a disproportionate share of economic activity, private market-based economic activity is substantially distorted. To measure this, the Fraser Institute uses an index of government enterprise and investment based on the number, composition, and share of output supplied by state-operated enterprises and government investment as a share of total investment. Countries are ranked from ten to zero, with those where there are few SOEs and where government investment is generally less than 15 percent of total investment receiving a ten and those where the economy is dominated by SOEs and government investment exceeds 50 percent of total investment receiving a zero.[39] Table 7-4 shows countries' scores on the extent of the SOE activity.

On this measure, eight countries score below a six, as Table 7-4 illustrates. India's score of four reflects the fact that SOEs generated 13.2 percent of the country's GDP in 2006–2007.[41] According to the OECD, in Israel, with a score of four, the total assets of SOEs "amounted to $37.5 billion and the staff employed by them to over 50,511" in 2007, concentrated primarily in public utilities and manufacturing.[42] Likewise, in 2009, Latvian SOEs had $10.2 billion in assets and employed more than 52,000 people, explaining the country's score of four.[43] In 2004, South Africa, also with a score of four, had a range of SOEs that employed 136,000 people.[44] Vietnam's score of four reflects a substantial number of state-owned enterprises operating in many sectors, including manufacturing, with government investment accounting for 30 percent to 40 percent of total investment in the economy, while Malaysia's score of two reflects an even greater presence of SOEs and government investment that accounts for 40 percent to 50 percent of the country's total investment.[45] Although Romania has privatized many enterprises since 1990, SOEs continue to play a large role in its economy, with the government retaining a majority stake in thirty-five commercial companies and a minority stake in 376 companies.[46] China's score reflects the fact that state-owned enterprises still account for about 40 percent of GDP, and an even greater share on other measures.[47] For example, the explicit state share of employment was 57 percent as of October 2010, and the state-owned Assets Supervision and Administration Commission indicates that the assets of its firms have grown from the equivalent of 60 percent of GDP in mid-2003 to 62 percent of GDP in mid-2010.[48] Countries where state-owned enterprises constitute a large share of GDP miss out on the economic efficiencies that private sector competition engenders, which, over time, can lead to stagnating productivity growth.

Transparency and Accountability

Transparency and accountability are vital for effective governance. Corruption—the abuse of entrusted power for private gain—can bring staggering financial and social costs to countries, adding 15 percent to 25 percent—and, in some cases, as much as 40 percent to 50 percent—to the cost of government procurement.[49] Corruption robs citizens of the ability to enjoy best-value and best-quality products and services, while forcing society to pay more for inferior products and services. Corruption erodes economic freedom by introducing insecurity and uncertainty into economic relationships.[50] Transparency International measures 178 countries according to the perception of corruption in the private sector. The 2010 CPI finds that nearly three-quarters of the 178 countries in the index score below five on a scale from ten (highly clean) to zero (highly corrupt). The CPI asks survey questions relating to bribery of public officials, kickbacks in public procurement, embezzlement of public funds,

Table 7-4: *Economic Freedom of the World* Government Enterprise and Investment Rating[40]

Country	Government Enterprise and Investment Rating (10=Best; 0=Worst)	Government Investment as a Share of Total Investment in Economy (%)
Australia	10	11.2
Austria	10	4.9
Belgium	10	7.3
Bulgaria	10	14.2
Canada	10	14.7
Chile	10	10.4
Cyprus	10	3.1
Denmark	10	8.8
Estonia	10	N/A
Finland	10	11.6
France	10	14.9
Germany	10	7.9
Greece	10	14.2
Hong Kong	10	N/A
Hungary	10	13.8
Italy	10	10.7
Japan	10	13.3
Lithuania	10	4.6
Norway	10	14.6
Portugal	10	10.5
Russia	10	14.6
Slovak Republic	10	7.9
Slovenia	10	N/A
Spain	10	13.3
Switzerland	10	8.9
United Kingdom	10	13.5
Brazil	8	N/A
Iceland	8	18.4
Luxembourg	8	16.7
Netherlands	8	17.0
New Zealand	8	16.9
Peru	8	16.6
South Korea	8	17.0
Sweden	8	16.9
Turkey	8	19.4
United States	8	18.9
Chinese Taipei	7	23.0
Czech Republic	7	20.7
Indonesia	7	N/A
Ireland	7	23.4
Mexico	7	24.9
Philippines	7	22.5
Poland	7	20.8
Singapore	7	N/A
Thailand	7	24.1
Argentina	6	N/A
Malta	6	N/A
India	4	N/A
Israel	4	N/A
Latvia	4	N/A
South Africa	4	32.0
Vietnam	4	N/A
Malaysia	2	46.5
China	0	53.2
Romania	0	N/A
All Countries	**8.0**	**16.6**
APEC-19 Countries	**7.4**	**21.9**
EU Countries	**8.7**	**12.6**
OECD Countries	**9.0**	**14.3**

and questions that probe the strength and effectiveness of public sector anti-corruption efforts.[51]

Denmark, New Zealand, and Singapore lead the world as having the least corruption in their public and private sectors with a score of 9.3 in the 2010 Corruption Perceptions Index.[52] Among the countries analyzed, they are joined in the top five by Finland and Sweden, with scores of 9.2, as Table 7-5 shows. Argentina, Indonesia, Vietnam, the Philippines, and Russia all perform poorly in this index, each with scores of less than three.

Government Procurement of Advanced Technology Products

When practical, governments should be early adopters of advanced technologies, rather than solely relying on industry to lead the way. Through technological leadership in its purchases, governments can play an important role in spurring markets and proving concepts. For example, government agencies can pursue green ICT initiatives by establishing telework policies and by creating telework best practices. Governments can

Table 7-5: *Transparency International* Corruption Perceptions Index[55]

Country	Corruption Perceptions Index (10=Best; 0=Worst)	Country	Corruption Perceptions Index (10=Best; 0=Worst)
Denmark	9.3	South Korea	5.4
New Zealand	9.3	Poland	5.3
Singapore	9.3	Lithuania	5.0
Finland	9.2	Hungary	4.7
Sweden	9.2	Czech Republic	4.6
Canada	8.9	South Africa	4.5
Netherlands	8.8	Malaysia	4.4
Australia	8.7	Turkey	4.4
Switzerland	8.7	Latvia	4.3
Norway	8.6	Slovak Republic	4.3
Iceland	8.5	Italy	3.9
Luxembourg	8.5	Brazil	3.7
Hong Kong	8.4	Romania	3.7
Ireland	8.0	Bulgaria	3.6
Austria	7.9	China	3.5
Germany	7.9	Greece	3.5
Japan	7.8	Peru	3.5
United Kingdom	7.6	Thailand	3.5
Chile	7.2	India	3.3
Belgium	7.1	Mexico	3.1
United States	7.1	Argentina	2.9
France	6.8	Indonesia	2.8
Estonia	6.5	Vietnam	2.7
Slovenia	6.4	Philippines	2.4
Cyprus	6.3	Russia	2.1
Israel	6.1	**All Countries**	**5.9**
Spain	6.1	**APEC-19 Countries**	**5.6**
Portugal	6.0	**EU Countries**	**6.3**
Chinese Taipei	5.8	**OECD Countries**	**6.9**
Malta	5.6		

lead on promoting adoption of digital signatures for e-government applications.[53] Governments can purchase leading-edge vehicles (like plug-in hybrids) for their vehicle fleets and take the lead in adopting energy-efficient, green building practices. As Bob Peck, commissioner of public buildings for the U.S. General Services Administration, observes, "We're so huge, we make markets. We'll be the proving ground for innovation in the building industry."[54] In the measure of government procurement of advanced technology products, Chinese Taipei, Finland, Luxembourg, Malaysia, Singapore, and the United States score the highest, as Table 7-6 shows. At the end of the list are Argentina, the Philippines, and Slovak Republic, reflecting that government procurement policies in those countries could much more effectively foster technological innovation.

Table 7-6: Government Procurement of Advanced Technology Products[56]

Country	Government Procurement of Advanced Technology Products (7=Best; 1=Worst)	Country	Government Procurement of Advanced Technology Products (7=Best; 1=Worst)
Singapore	5.4	France	4.0
Luxembourg	4.9	Brazil	3.9
Chinese Taipei	4.7	United Kingdom	3.8
Finland	4.7	Poland	3.7
Malaysia	4.7	Slovenia	3.7
United States	4.7	Thailand	3.7
Denmark	4.6	Turkey	3.7
China	4.5	Ireland	3.6
Sweden	4.5	New Zealand	3.6
Israel	4.4	India	3.5
Malta	4.4	Russia	3.5
Portugal	4.4	Bulgaria	3.4
Switzerland	4.4	Spain	3.4
Vietnam	4.4	Mexico	3.3
Canada	4.3	Peru	3.3
Hong Kong	4.3	Greece	3.2
Iceland	4.3	Hungary	3.2
Netherlands	4.3	Lithuania	3.2
Cyprus	4.2	Romania	3.2
Czech Republic	4.2	South Africa	3.2
Germany	4.2	Latvia	3.1
Indonesia	4.2	Italy	3.0
Norway	4.2	Argentina	2.7
Australia	4.1	Philippines	2.7
Austria	4.1	Slovak Republic	2.7
Chile	4.1	**All Countries**	**3.9**
Estonia	4.1	**APEC-19 Countries**	**4.1**
Japan	4.1	**EU Countries**	**3.8**
South Korea	4.1	**OECD Countries**	**4.0**
Belgium	4.0		

Chapter 8: High-Skill Immigration

Why High-Skill Immigration is Important

In the increasingly globalized knowledge economy, ensuring that there is a large, highly skilled talent pool to draw from has become vital to countries' innovation ecosystems and economic growth. In fact, some have argued that talent has become "the world's most sought-after commodity." Immigration plays an important role in contributing to a country's knowledge pool and creative potential by bringing in new perspectives and needed skills from afar. This "brain circulation" allows countries to dig deeply into the ever-expanding pools of knowledge and skills that exist beyond their borders, resulting in more innovation and prosperity both in-country and throughout the world at large.

Countries like the United States have benefitted enormously from attracting highly skilled foreign talent, particularly through the companies and jobs that many high-skilled immigrants have created. For example, at least seven studies have examined the role of immigrants in launching new companies in the United States, and all conclude that immigrants are key actors in this process, creating from 15 percent to 26 percent of new companies in the U.S. high-tech sector over the past two decades.[1] Some U.S. states have been even greater beneficiaries: Nearly 40 percent of the engineering and technology firms founded in the U.S. states of California and New Jersey between 1995 and 2005 were founded by foreign born-immigrants.[2] And, while some contend that foreign high-skilled workers drive down domestic workers' wages, according to a 2010 study, foreign workers entering the United States on H-1B visas earn, on average, 6.8 percent more than domestic workers, essentially dispelling the myth that H-1B-visa holders create a race to the bottom among high-skilled firms.[3] Further, a study by Davies finds that immigration has no apparent impact on the unemployment rate or on the distribution of income in the U.S. economy.[4]

Given the important roles high-skill immigrants can play in bringing skills, talent, and knowledge to societies and contributing to new firm development and thus employment and economic growth, some countries that have been less open to high-skilled immigrants have suffered as a result. For example, Arora, Branstetter, and Dev found that the rise of software-based innovation had differential effects on the performance of Japanese and American ICT industries, leading to the decline of Japan's ICT industry and to the resurgence of Silicon Valley.[5] They show that U.S. ICT firms were better positioned than Japanese ones as ICT innovation became more software intensive, with Japanese firms unable to overcome national labor resource constraints to acquire the requisite software engineering skills. Arora, Branstetter, and Dev suggest that one reason for this was that, "Japan's relatively restrictive immigration laws and its long history as an ethnically homogeneous society mitigate against large-scale importation of skilled labor from foreign countries, creating barriers to bringing foreign expertise to Japan." They note that America's ability to tap into an increasingly abundant (and increasingly foreign) supply of software engineers may explain how American firms out-produced their rivals, and observe that if institutional reforms in Japan fail to open Japanese labor markets to highly skilled immigrants, it could leave Japanese firms at a disadvantage even in the longer run.[6] Indeed, as *The Economist* notes in an article entitled "People Protectionism," policies that seek to protect domestic workers' jobs above all else will prove to be short-sighted when it comes to the talent and competitiveness game.[7]

Open immigration policies for high-skilled workers fill the need for talent, expand the demand for talent, and create knowledge flows in both directions.[8] Moreover, foreign countries' open immigration policies can create demand for high-skilled jobs in the home economy, as individuals realize that they are indeed able to secure quality jobs with their skills. Thus, governments should welcome legitimate competition among countries to appeal to internationally mobile highly skilled workers, especially in science, technology, engineering, and math (STEM) fields.[9] In fact, dozens of countries have implemented explicit strategies to attract internationally mobile, skilled workers, particularly in STEM fields.[10] As Papademetriou argues, "A key rationale behind countries' immigration policies has been to use migration explicitly as a key instrument of economic growth and competitiveness."[11]

At least seven studies have examined the role of immigrants in launching new companies in the United States, and all conclude that immigrants are key actors in this process, creating from 15 percent to 26 percent of new companies in the U.S. high-tech sector over the past two decades.

Properly governed, expanding global flows of STEM talent can and should be a win-win proposition for the countries analyzed here and, indeed, the entire world. A global talent pool that expands rapidly and circulates widely will spread prosperity in the context of greater openness and interdependence.

Assessing Countries' High-Skill Immigration Policies

To assess the effectiveness of countries' immigration policies in attracting high-skill foreign immigrants, countries were measured on three key indicators: high-skill immigrants as a share of population; "selection rates" of high-skill immigrants; and the ratio of selection rates of high-skilled immigrants to that of low-skilled immigrants—as Table 8-1 shows. Countries' scores on high-skill immigration policies account for 7.5 percent of their aggregate score.

Table 8-2 shows the ranks of countries based on their high-skill immigration policies. Only Canada, Chinese Taipei, Hong Kong, Israel, and Singapore represent the upper-tier countries in having immigration policies that most successfully attract high percentages of high-skill foreign-born talent. Following behind in the upper-mid tier are Australia, Japan, Latvia, Malaysia, New Zealand, the Philippines, South Africa, and the United States. The remaining countries reside in the two lower tiers.

Countries looking to attract and select high-skill immigrants generally use either points-based or employer-led selection systems (although some use neither). Employer-driven systems, such as those used in the United States and European countries, including Norway, Spain, and Sweden, allow employers to directly select the workers they need, subject to government regulations.[12] In contrast, many countries have implemented points-based immigration systems, by which applicants for immigration receive points for characteristics such as education level, work experience, and language ability.[13] Some countries, such as New Zealand, prioritize the applications of prospective workers in "future growth" occupations. Canada was the first economy to introduce, in the 1960s, a points-based immigration system.[14] Many of the countries analyzed in this study, including Australia, Denmark, Canada, Hong Kong, Korea, Malaysia, New Zealand, Singapore, and the United Kingdom, employ points-based immigration systems, through which they seek to achieve greater "selection" of highly skilled immigrants to supplement their workforces.[15]

Both points-based and employer-led selection systems have their strengths and weaknesses. The primary advantage of points-based systems is that they enable governments to set clear and transparent standards regarding their selection process for incoming immigrants. At the same time, they retain flexibility so that such systems can be adjusted easily to meet evolving economic and broad labor market needs, thus "making adaptability the hallmark of the most successful points-based systems."[16] However, the greatest disadvantage of the points-based selection formula is that immigrants often arrive without job offers and there is no guarantee that they will find work easily and at their skill levels. In fact, some research from Canada and Australia points to substantial underemployment and unemployment among points-selected foreign workers, giving credence to the concern that points systems may lead to "brain waste" by not adequately identifying workers possessing skills that local employers value.[17]

In contrast, employer-led selection systems solve this problem by allowing employers to directly find workers who meet their specific needs from out of the enormous global talent pool. Employer sponsorship is a strong signal that the labor market values an immigrant's skills and credentials. However, employer-led systems have their own weaknesses, particularly in that, by tying workers to specific employers, it is difficult for workers to stand

Table 8-1: High-Skill Immigration Policy Indicators

Indicator	Data Type	Source	Indicator Weight
Selection Rate for High-skill Immigrants	% of Immigrant Population	Frédéric Docquier et al.	25%
Ratio of Selection Rate of High-skill Immigrants to Low-Skill Immigrants	Ratio of % of Immigrant Population	Frédéric Docquier et al.	25%
High-skill immigrants as a Share of Total Population	% of Population	UN, Frédéric Docquier et al.	50%

Table 8-2: Country Ranks on High-Skill Immigration (in alphabetical order)

Upper Tier	Upper-Mid Tier	Lower-Mid Tier	Lower Tier
Canada	Australia	Argentina	Bulgaria
Chinese Taipei	Japan	Austria	Czech Republic
Hong Kong	Latvia	Belgium	Finland
Israel	Malaysia	Brazil	Greece
Singapore	New Zealand	Chile	Italy
	Philippines	China	Lithuania
	South Africa	Cyprus	Malta
	United States	Denmark	Mexico
		Estonia	Portugal
		France	Romania
		Germany	Slovak Republic
		Hungary	Slovenia
		Iceland	Spain
		Ireland	Turkey
		India	
		Indonesia	
		Luxembourg	
		Netherlands	
		Norway	
		Peru	
		Poland	
		Russia	
		South Korea	
		Sweden	
		Switzerland	
		Thailand	
		United Kingdom	
		Vietnam	

up to exploitative employers and to respond to changing labor demand by switching jobs.[18] There is also a fear that temporary employer-driven immigration may spill over into illegal immigration if workers lose their jobs.

Recognizing that neither approach is flawless, a number of countries—led by Australia—have begun to move toward more of a hybrid high-skill immigration system that combines the best of both approaches. Such hybrid systems prioritize employer demand while still using a points test or other set of criteria to distinguish between applicants of differing quality.[19] Often, such systems award points to applicants who have received an employment offer; make greater use of temporary-to-permanent pathways; provide visa portability for employer-selected immigrants; and base permanent residence decisions on workers' track record of employment.[20] Whichever approach is used, good selection systems have clear and transparent rules designed to ensure that the outcomes are mostly predictable for all concerned.

Regardless of approach, many countries' immigration systems have enabled them to achieve high "selection rates" in their intake of highly educated foreign workers, whereby the selection rate is defined as the share of high-skill immigrants in the total immigrant population. Docquier et al. provide detailed data sets on international migration.[21] In 2000, Chinese Taipei had the highest rate of selection for high-skill immigrants, at 78 percent, followed by the Philippines, Japan, South Africa, Hong Kong, India,

and Canada, as Table 8-3 shows.[22] At 8.8 percent, Turkey has the lowest selection rate for high-skilled immigrants, followed by Portugal, Mexico, Bulgaria, and Italy, with selection rates less than 20 percent.

Table 8-4 shows the ratio of high-skill to low-skill immigrant selection for countries in 2000. Chinese Taipei accepted the highest ratio of high-skill to low-skill immigrants, followed by Canada, Japan, South Africa, and the Philippines. Many countries in this study recorded a higher selection rate for low-skill than high-skill immigrants, including Bulgaria, the Czech Republic, Finland, Ireland, Italy, Greece, Lithuania, Luxembourg, Malta, Mexico, Portugal, Romania, Slovak Republic, Slovenia, Spain, and Turkey.

Selection rates decrease for applicants at lower skill levels, and countries that have higher selection rates for low- and medium-skill talent may be losing out in the competition for high-skill talent. For instance, it is revealing that Turkey has the lowest selection rate for high-skill immigrants (8.8 percent) but also the highest selection rate for low-skill immigrants (79.1 percent). Likewise, the country with the greatest high-skill selection rate, Chinese

Table 8-3: Selection Rate for High-Skill Immigrants[23]

Country	Selection Rate for High-Skill Immigrants (%)	Country	Selection Rate for High-Skill Immigrants (%)
Chinese Taipei	78.0	Vietnam	40.0
Philippines	67.1	Germany	39.5
Japan	63.8	Poland	39.5
South Africa	62.6	Hungary	39.1
Hong Kong	61.9	Belgium	39.0
India	60.5	France	38.6
Canada	60.1	Iceland	38.6
Malaysia	59.2	Cyprus	37.2
Israel	57.6	Austria	34.9
Singapore	57.1	Czech Republic	33.1
United States	55.4	Romania	31.3
Australia	54.6	Ireland	30.7
South Korea	54.1	Lithuania	29.1
Latvia	51.2	Luxembourg	28.1
Russia	51.1	Finland	27.4
Argentina	48.2	Slovenia	26.1
United Kingdom	48.2	Malta	23.6
China	48.0	Greece	22.3
Chile	47.4	Spain	21.6
Peru	46.9	Slovak Republic	20.0
Indonesia	46.3	Italy	17.3
Sweden	46.2	Bulgaria	16.4
New Zealand	45.9	Mexico	14.4
Thailand	44.6	Portugal	12.0
Brazil	43.4	Turkey	8.8
Switzerland	43.3	**All Countries**	**41.3**
Netherlands	41.4	**APEC-19 Countries**	**52.4**
Denmark	40.8	**EU Countries**	**32.4**
Norway	40.2	**OECD Countries**	**37.4**
Estonia	40.1		

Taipei (78.0 percent), has the least low-skill selection rate (7.0 percent). Yet, while this data can offer useful insights, it offers only a single snapshot into the effectiveness of a country's immigration policy. For example, while Japan's immigration policies do succeed at selecting high-skill immigrants, overall it admits comparatively few foreign-born immigrants and, generally, has failed to adopt an open stance toward high-skill immigration.

Because it is important to understand the percentage of high-skill immigrants per capita, Table 8-5 displays the percentage of high-skill immigrants as a share of population in each country. Hong Kong, Israel, and Singapore have by far the highest shares of high-skill immigrants as a percentage of their population. Australia, Canada, New Zealand, and Switzerland also have high levels, and these countries are reaping the benefits of an open posture toward the influx of highly skilled talent. Vietnam, Peru, Indonesia, and China have the lowest share of high-skill immigrants as a percentage of their populations. These countries risk missing out on the dynamic brain circulation that can bring new ideas, knowledge, talents, and even technologies into a society.

Table 8-4: Ratio of Selection Rate of High-Skill Immigrants to Low-Skill Immigrants[24]

Country	Ratio of Selection Rate of High-Skill Immigrants to Low-Skill Immigrants	Country	Ratio of Selection Rate of High-Skill Immigrants to Low-Skill Immigrants
Chinese Taipei	11.1	Vietnam	1.4
Canada	7.7	Estonia	1.3
Japan	6.3	Netherlands	1.3
South Africa	5.8	Poland	1.3
Philippines	5.2	France	1.2
New Zealand	4.2	Hungary	1.2
Israel	3.9	Austria	1.1
Australia	3.6	Belgium	1.1
Hong Kong	3.6	Cyprus	1.0
Malaysia	3.4	Romania	0.9
Peru	3.3	Czech Republic	0.8
Singapore	3.1	Finland	0.8
Argentina	3.0	Ireland	0.8
South Korea	3.0	Lithuania	0.7
Chile	2.8	Luxembourg	0.6
India	2.8	Slovenia	0.6
United Kingdom	2.8	Malta	0.5
United States	2.4	Slovak Republic	0.5
Latvia	2.3	Greece	0.4
Sweden	2.3	Spain	0.4
Russia	2.0	Bulgaria	0.3
Brazil	1.9	Italy	0.3
Denmark	1.7	Mexico	0.3
Germany	1.7	Portugal	0.2
Iceland	1.7	Turkey	0.1
China	1.6	**All Countries**	**2.2**
Indonesia	1.6	**APEC-19 Countries**	**3.6**
Norway	1.6	**EU Countries**	**1.0**
Switzerland	1.5	**OECD Countries**	**1.8**
Thailand	1.5		

Table 8-5: High-Skill Immigrants as a Share of Population[25]

Country	High-Skill Immigrants as a Share of Population	Country	High-Skill Immigrants as a Share of Population
Hong Kong	24.02	Czech Republic	1.46
Israel	23.27	Hungary	1.45
Singapore	23.24	Chinese Taipei	1.33
Canada	12.80	Italy	1.28
Australia	11.96	Lithuania	1.16
New Zealand	10.28	Finland	1.15
Switzerland	10.05	Japan	1.08
Luxembourg	9.89	Portugal	1.03
Latvia	7.68	Chile	0.90
United States	7.48	Malta	0.90
Cyprus	6.51	Poland	0.87
Sweden	6.51	Thailand	0.76
Ireland	6.02	South Korea	0.60
Estonia	5.45	Slovak Republic	0.48
Austria	5.44	Philippines	0.34
Germany	5.17	India	0.24
United Kingdom	5.01	Bulgaria	0.23
Malaysia	4.97	Romania	0.19
Russia	4.45	Brazil	0.17
Iceland	4.36	Turkey	0.17
Netherlands	4.35	Mexico	0.10
France	4.13	China	0.05
Norway	4.02	Indonesia	0.05
Denmark	3.59	Peru	0.05
Belgium	3.55	Vietnam	0.04
Spain	3.05	**All Countries**	**4.4**
South Africa	2.32	**APEC-19 Countries**	**5.5**
Greece	2.25	**EU Countries**	**3.4**
Slovenia	2.11	**OECD Countries**	**4.7**
Argentina	1.74		

Regardless of whether a points-based or an employer-led selection approach is used, good high-skill immigrant selection systems have clear and transparent rules designed to ensure that the outcomes are mostly predictable for all concerned.

Conclusion

To maximize global innovation, countries need to implement their policies with regard to trade, science and R&D, ICT, intellectual property rights, domestic market competition, government procurement, and high-skill immigration in ways that maximize their innovation capacity without distorting global trade. To accomplish this, countries' policies will have to be predicated on transparent, non-discriminatory, market-based principles that embrace both global standards and the free flow of talent, capital, information, products, services, and technologies.

As innovation and trade policy have become increasingly intertwined, openness to trade characterized by open market access and receptivity to foreign direct investment (FDI) has become a bedrock pillar of a country's innovation capacity. Free trade benefits all countries by allowing each to specialize in producing the products or services for which it has comparative or competitive advantage. This also suggests that countries should not specialize in all technologies; rather, trade enables them to specialize in what they are good at and then trade for the rest. A vital component of free trade is countries' openness to both inward and outward foreign direct investment. Research shows that FDI contributes significantly to regional innovation capacity and economic growth, in part through the transfer of technology and managerial know-how. Another important component of countries' trade policies is their use of voluntary, market-led, and global standards that promote innovation and competition while creating global markets for products and services. In the upper tier of trade policy are predominantly EU and OECD countries that have been deeply engaged in the process of trade liberalization since World War II. These countries in general have made the most progress in removing tariff and non-tariff barriers and in openness to FDI. Lower-tier countries, such as Argentina, Brazil, China, India, and Russia, engage in a number of trade-distorting activities, especially currency manipulation; impose NTBs such as conditions on market access; restrict FDI; and maintain high tariff levels.

Science and R&D policies—including those regarding R&D tax incentives, government R&D expenditures, and university ownership of intellectual property—boost countries' innovation potential while enhancing their ability to benefit from technology-based innovation. Countries should utilize a diverse portfolio of science and R&D tools, targeting strategic and broad technologies and industries at all stages of their development, and coordinate them with a National Innovation Foundation to take advantage of inherent synergies among policies. But science and R&D policies, such as the ability to partake in R&D tax incentives or receive R&D grants, should not discriminate against foreign firms operating domestically, for countries that do so limit their own ability to reap benefits from the sharing of ideas, knowledge, and skills that enhance the entire global innovation system. Much of Western Europe and North America, the four Asian Tigers, and the BRIC countries dominate the two upper tiers in science and R&D policy. On the other hand, many East Asian countries such as Indonesia, Malaysia, the Philippines, Thailand and Vietnam have underdeveloped science and R&D policies.

Vibrant domestic markets supported by a sound and fair regulatory environment that allows both existing and new firms to compete on a level playing field remain a lynchpin of prosperity. Indeed, one of the strongest drivers of innovation and productivity growth is the existence of competitive marketplaces. This includes removing regulatory restrictions, incumbent protections, cross-border trade restrictions, and labor market restrictions that inhibit competition. Leading countries feature regulatory systems that are transparent and non-discriminatory, provide due process, and include opportunities for meaningful engagement on the part of all stakeholders. In the upper tier, eight developed nations—Australia, Canada, Denmark, Hong Kong, Singapore, Switzerland, the United Kingdom, and the United States—lead all countries on measures of domestic market competition and entrepreneurship. Argentina, Brazil, Greece, Italy, Indonesia, India, Mexico, Peru, the Philippines, Romania, and Russia foster the least domestic market competition and entrepreneurship.

Recognition of intellectual property rights is a vital element if global trade and foreign direct investment are to thrive. Effective protection and enforcement of IPR encourages innovators to invest in research, development, and commercialization of technologies while promoting their dissemination. But weak intellectual property rights protections reduce the flow of foreign direct investment and technology transfer. Without adequate intellectual property protections, there will be less innovation overall, and this hurts all countries. Moreover, IPR reform tends to deliver positive economic results, regardless of a country's level of development. Leading nations in IPR policy tend to be developed ones, such as Australia, the Netherlands, and the United Kingdom. The Latin American nations—Argentina, Brazil, and Peru—along with Indonesia, the Philippines, Thailand, and Vietnam, are in the lower tier.

Information and communications technology is one of the global economy's strongest enablers of productivity and innovation. Effective digital policies focus first and foremost on spurring the use of ICT throughout the economy as opposed to its production. Leading countries recognize that the greatest opportunity to improve their

economic growth lies in increasing the productivity of their domestic sectors, particularly through the application of ICT. In digital policy, Denmark, Iceland, the Netherlands, Norway, Sweden, Switzerland, and the United Kingdom take the lead, along with Chinese Taipei, Hong Kong, Singapore, and South Korea in Asia, and Canada and the United States in North America. Argentina, Indonesia, Mexico, Peru, the Philippines, Russia, South Africa, and Vietnam lag behind in the lower tier.

Because government procurement accounts for such a large share of most economies, ensuring fair and open government procurement practices has become a vital aspect of realizing liberalized global trade. A core principle of market-based trade is that government purchases should be made on the basis of the best value for government, not on the basis of national preferences. This does not mean that governments should not orient their procurement policies to become strong drivers of innovation. Indeed, government procurement policy is an important and legitimate component of countries' innovation strategies. But countries' government procurement policies should be transparent, non-discriminatory, openly competitive, and performance-based. In particular, countries should refrain from adopting or maintaining measures that make the location of the development or ownership of intellectual property, or any requirement to license intellectual property to a domestic entity, a condition for eligibility for government preferences. The majority of countries reside in the two upper tiers of government procurement policy, having adopted policies that are transparent, non-discriminatory, openly competitive, and performance-based. Argentina, Brazil, China, India, Indonesia, Malaysia, Mexico, Peru, the Philippines, Russia, South Africa, Thailand, and Vietnam reside in the lower tier.

Talent has become the world's most sought-after commodity. Thus, having a highly skilled talent pool to draw from has become vital to countries' well-being. High-skill immigrants play a unique role in bringing skills, talent, and knowledge to societies while contributing to new firm development and, thus, employment and economic growth. Thus, immigration policies play an important part in contributing to a country's knowledge pool and creative ability by bringing new perspectives and needed skills and knowledge from other places. Only Canada, Chinese Taipei, Hong Kong, Israel, and Singapore represent the upper-tier countries in having immigration policies that most successfully attract high percentages of high-skill, foreign-born talent. Following behind in the upper-mid tier are Australia, Japan, Latvia, Malaysia, New Zealand, the Philippines, South Africa, and the United States. Both developed and developing nations occupy the two lower tiers.

These seven policy areas outline a framework that identifies the effective innovation policies that can drive domestic economic growth while ensuring a sustainable innovation ecosystem that benefits all countries around the globe. Countries that lead in these areas are well-positioned to experience robust economic health and increasing living standards for their citizens over the long run. Countries that lag behind—either due to underdeveloped policies or due to polices that distort the global innovation system—need to rethink their approach, devoting additional resources and attention toward innovation policies that maximize their nation's innovation potential and promote shared prosperity around the globe.

Executive Summary Endnotes

1. To calculate countries' final overall ranks, raw scores for each of the eighty-four indicators were first standardized. Using these standardized scores, a weighted average score was calculated for each country for each section and overall. The tiers then are calculated as four equidistant partitions between the resulting maximum and minimum scores in each section and overall. The number of countries in each tier can vary widely within section rankings; for example, a country whose average score is a relative outlier may be the sole member of a tier. Country scores are calculated with available data only; missing values are ignored and do not affect a country's position in the tiered rankings.

Chapter 1 Endnotes

1. Methodology: Raw scores for each sub-indicator were standardized. Using these standardized sub-indicator scores, a weighted average score was calculated for each country in each section and overall. The tiers then are calculated as four equidistant partitions between the resulting maximum and minimum scores in each section and overall. The number of countries in each tier can vary widely within section rankings; for example, a country whose average score is a relative outlier may be the sole member of a tier. Country scores are calculated with available data only; missing values are ignored and do not affect a country's position in the tiered rankings.
2. The effective policies discussed in the report remain broadly applicable to both developed and developing countries alike. However, low-income countries may emphasize the adoption of existing technologies as opposed to internal innovation. Furthermore, due to limited resources, developing countries may need to be more specific in their innovation strategies by allocating resources to a more limited set of competitive sectors.
3. OECD, *The OECD Innovation Strategy: Getting a Head Start on Tomorrow* (Paris: OECD, 2010), 20, http://www.oecd.org/document/15/0,3343,en_2649_34273_45154895_1_1_1_1,00.html.
4. Larry Keeley, "Taming of the New Workshop," (presentation, Puget Sound SIGCHI, Seattle, September 18, 2007). A slide deck containing similar slides is available at http://www.slideshare.net/whatidiscover/invention-vs-innovation.
5. For a further exploration of Keeley's "The Ten Types of Innovation," see Tekes, "Seizing the White Space: Innovative Service Concepts in the United States," *Technology Review* 205 (2007): 72–74, http://www.tekes.fi/en/document/43000/innovative_service_pdf.
6. Robert D. Atkinson et al., *The Internet Economy 25 Years After.com: Transforming Life and Commerce,* (Washington, D.C.: ITIF, 2010), http://www.itif.org/files/2010-25-years.pdf.
7. For more on "social innovation," see Luke A. Stewart, "The Impact of Regulation on Innovation in the United States: A Cross-Industry Literature Review" (technical report, Institute of Medicine Committee on Patient Safety and Health IT, June 2010), http://www.iom.edu/~/media/Files/Report%20Files/2011/Health-IT/Commissioned-paper-Impact-of-Regulation-on-Innovation.pdf.
8. To be sure, the innovation strategies for truly lagging developing countries, notably in Africa, should be distinct from those for more developed nations. And exports are certainly part of any nations' economic growth strategy. But an exports-only strategy must be revised to reflect today's world. Innovation-based growth in severely lagging nations will be much more about adopting and leveraging information technologies, such as by improving access to broadband Internet and improving education, health care, and public infrastructure.
9. Elhanan Helpman, *The Mystery of Economic Growth* (Cambridge, MA: Belknap Press, 2004).
10. Osamu Onodera, "Trade and Innovation Project: A Synthesis Paper" (working paper, OECD, Paris, August 7, 2008), http://www.oecd.org/dataoecd/60/22/41105505.pdf.
11. Arti Rai, Stuart Graham, and Mark Doms, "Patent Reform: Unleashing Innovation, Promoting Economic Growth, and Producing High-Paying Jobs" (white paper, U.S. Department of Commerce, April 13, 2010), 1, http://2001-2009.commerce.gov/s/groups/public/@doc/@os/@opa/documents/content/prod01_009147.pdf.
12. Peter J. Klenow and Andrés Rodríguez-Clare, "The Neoclassical Revival in Growth Economics: Has It Gone Too Far?," *NBER Macroeconomics Annual 1997* 12 (1997): 73–103.
13. OECD, *The OECD Jobs Study: Fact, Analysis, Strategies* (Paris: OECD, 1994), http://www.oecd.org/dataoecd/42/51/1941679.pdf.
14. OECD, *The OECD Jobs Strategy: Technology, Production and Job Creation: Best Policy Practices: Highlights* (Paris: OECD, 1996), http://www.oecd.org/dataoecd/39/28/2759012.pdf.
15. William Nordhaus, "Schumpetarian Profits and the Alchemist Fallacy" (working paper, Department of Economics, Yale University, 2005), http://www.econ.yale.edu/ddp/ddp00/ddp0006.pdf.
16. Edwin Mansfield, "Academic Research and Industrial Innovation: An Update of Empirical Findings," *Research Policy* 26, no. 7-8 (1998): 773–776.
17. Elhanan Helpman, *General Purpose Technologies and Economic Growth* (Cambridge, MA: MIT Press, 1998).
18. Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh, *Productivity Volume 3: Information Technology and the American Growth Resurgence* (Cambridge, MA: MIT Press, 2005); Robert D. Atkinson and Andrew S. McKay, *Digital Prosperity: Understanding the Economic Benefits of the Information Technology Revolution* (Washington, D.C.: ITIF, 2007), http://www.itif.org/files/digital_prosperity.pdf.
19. OECD, *Measuring Innovation: A New Perspective* (Paris: OECD, 2010), 84–85, http://www.oecd.org/dataoecd/29/29/45188243.pdf.
20. Atkinson and McKay, *Digital Prosperity*.

21. John R. Baldwin, David Sabourin, and David Smith, "Firm Performance in the Canadian Food Processing Sector: The Interaction between ICT, Advanced Technology Use and Human Resource Competencies" in *The Economic Impact of ICT: Measurement, Evidence and Implications* (Paris: OECD, 2004): 153–181.
22. Ellis Connolly and Kevin Fox, "The Impact of High-Tech Capital on Productivity: Evidence From Australia," *Economic Inquiry* 44, no. 1 (2006): 50–68.
23. Atkinson and McKay, *Digital Prosperity*; Almas Heshmati and Wanshan Yang, "Contribution of ICT to the Chinese Economic Growth" (working paper, RATIO Institute and Techno-Economics and Policy Program, College of Engineering, Seoul National University, February 2006).
24. Atkinson and McKay, *Digital Prosperity*, 17.
25. Gaaitzen J. de Vries and Michael Koetter, "How Does ICT Enhance Productivity? Evidence from Latent Retail Technologies in Chile" (working paper, University of Groningen, Netherlands, March 2008), ftp://ftp.zew.de/pub/zew-docs/veranstaltungen/ICT2008/papers/Vries.pdf.
26. Robert D. Atkinson and Daniel K. Correa, *The 2007 State New Economy Index: Benchmarking Economic Transformation in the States* (Washington, D.C.: ITIF, 2007), 6, http://www.itif.org/files/2007_State_New_Economy_Index.pdf.
27. Ibid.
28. When firms are in competitive markets (including competitive labor and product markets), the benefits of productivity increases flow to consumers in the form of lower real prices.
29. Michael E. Porter, "The Economic Performance of Regions," *Regional Studies* 37, no. 6-7 (2003): 545–546.
30. See Rosanna Pittliglio, Edgardo Sica, and Stefania Villa, "Innovation and Internationalization: The Case of Italy," *Journal of Technology Transfer* 34, no. 6 (2009): 588–602; Fredrik Sjöholm, "International Transfer of Knowledge: The Role of International Trade and Geographic Proximity," *Review of World Economics* 132, no. 1 (1996): 97–115.
31. David T. Coe and Elhanan Helpman, "International R&D Spillovers," *European Economic Review* 39, no. 5 (1995): 859–887. The G7 countries are Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.
32. Jeffrey Furman and Richard Hayes, "Catching Up or Standing Still? National Innovative Productivity among 'Follower' Countries, 1978–1999," Research Policy 33, no. 9 (2004): 1329–1354
33. Gregory Tassey, *The Technology Imperative* (Northampton, MA: Edward Elgar, 2007).
34. Fred Block and Matthew Keller, "Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970–2006" (technical report, ITIF, Washington, D.C., 2008), http://www.itif.org/files/Where_do_innovations_come_from.pdf.
35. Dani Rodrik, "Industrial Policy for the Twenty-First Century" (working paper, Kennedy School of Government, Harvard University, 2004), 38.
36. National Economic Council, *A Strategy for American Innovation: Driving Towards Sustainable Growth and Quality Jobs* (Washington, D.C.: Executive Office of the President, 2009), http://www.whitehouse.gov/administration/eop/nec/StrategyforAmericanInnovation/.

Chapter 2 Endnotes

1. David T. Coe, Elhanan Helpman, and Alexander Hoffmeister, "North-South R&D Spillovers" (working paper, National Bureau of Economic Research, Cambridge, MA, 1995), 134.
2. Jonathan Eaton and Samuel Kortum, "Trade in Ideas: Patenting and Productivity in the OECD," *Journal of International Economics* 40, no. 3-4 (1997): 251–278.
3. Rosanna Pittliglio, Edgardo Sica, and Stefania Villa, "Innovation and Internationalization: The Case of Italy," *Journal of Technology Transfer* 34, no. 6 (2009): 588–602.
4. Sjöholm, "International Transfer of Knowledge."
5. Osamu Onodera, "Trade and Innovation Project: A Synthesis Paper" (working paper, OECD, Paris, August 7, 2008), 12, http://www.oecd.org/dataoecd/60/22/41105505.pdf.
6. Ibid., 15.
7. Ibid., 4.
8. John R. Baldwin and Wulong Gu, "Trade Liberalization: Export-Market Participation, Productivity Growth, and Innovation," *Oxford Review of Economic Policy* 20, no. 3 (2004): 372–392.
9. Rita Almeida and Ann Margarida Fernandes, "Openness and Technological Innovations in Developing Countries," *Journal of Development Studies*, 44, no. 5 (2008): 701–727.
10. Onodera, "Trade and Innovation Project," 4.
11. APEC, "A Mid-Term Stocktake of Progress Towards the Bogor Goals: Busan Roadmap to the Bogor Goals," 2005, http://www.apec.org/About-Us/About-APEC/Fact-Sheets/Mid-Term-Stocktake-of-Progress-Towards-the-Bogor-Goals-and-the%20Busan-Roadmap-to-the-Bogor-Goals.aspx.
12. Rudiger Dornbusch and F. Leslie, C.H. Helmers, eds., *The Open Economy: Tools for Policymakers in Developing Countries* (New York: Oxford University Press, 1988).
13. World Bank, World Development Indicators (tariff rate, applied, simple mean, all products; accessed October 3, 2011).
14. World Bank, World Development Indicators (tariff rate, applied, simple mean, manufactured products; accessed October 3, 2011).

15. APEC, StatsAPEC, Key Indicators Database (current account balance in current USD millions; accessed August 12, 2011), http://statistics.apec.org/.
16. World Trade Organization, Tariff Download Facility (accessed July 20, 2011).
17. Tariff complexity is measured in terms of the variance in tariff rates at the six-digit level of the Harmonized Tariff Schedule, the share of tariff lines with domestic peaks (defined as where the tariff value is three times or more greater than the simple average tariff), the share of tariff lines with at least one specific tariff, and the number of distinct tariff rates that a country applies to its imports.
18. Robert Z. Lawrence et al., *The Global Enabling Trade Report 2010* (Geneva: World Economic Forum, 2010), 291, http://www3.weforum.org/docs/WEF_GlobalEnablingTrade_Report_2010.pdf.
19. Ibid., 22.
20. Ibid., 21.
21. Ibid., 291. Data collected from individual country profiles throughout report.
22. Ibid.
23. Michael J. Ferrantino, "Analytical Approaches to Quantifying Economic Effects of Non-Tariff Measures" (technical report, Farm Foundation, Washington, D.C., September 17, 2003), http://www.farmfoundation.org/news/articlefiles/219-Ferrantinopaper9-11-03.pdf.
24. Simon J. Evenett, ed., *Resolve Falters as Global Prospects Worsen: The 9th GTA Report* (London: Center for Economic Policy Research, 2011), 37, http://www.globaltradealert.org/sites/default/files/GTA9.pdf.
25. Julie A. Hedlund and Robert D. Atkinson, "The Rise of the New Mercantilist: Unfair Trade Practices in the Innovation Economy" (technical report, ITIF, Washington, D.C., June 2007), 10, http://www.itif.org/files/ITMercantilism.pdf.
26. OECD, *Regulatory Reform and International Standardisation* (Paris: OECD, 1999), http://www.oecd.org/dataoecd/33/19/1955309.pdf; Donald E. Purcell, "Globalization and Technology Standards: The Case for Expanded U.S. Leadership" (presentation, ITIF, Washington, D.C., January 13, 2009), http://www.itif.org/events/globalization-and-technology-standards-case-expanded-us-leadership.
27. Donald E. Purcell, "Strategic Standardization Overview" (presentation, Catholic University School of Engineering, Washington, D.C., May 18, 2011).
28. Hedlund and Atkinson, "The Rise of the New Mercantilists," 23.
29. José-Daniel Reyes, "International Harmonization of Product Standards and Firm Heterogeneity in International Trade" (working paper, World Bank, Washington, D.C., June 2011), http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/06/06/000158349_20110606163024/Rendered/PDF/WPS5677.pdf.
30. Keith E. Maskus, Tsunehiro Otsuki, and John S. Wilson, "The Costs of Complying with Foreign Product Standards for Firms in Developing Countries: An Econometric Study" (working paper, Institute of Behavioral Science, University of Colorado at Boulder, May 19, 2004), 7, http://www.colorado.edu/ibs/pubs/pec/pec2004-0004.pdf.
31. James Gwartney, Joshua Hall, and Robert Lawson, *Economic Freedom of the World: 2010 Annual Report* (Vancouver: Fraser Institute, 2010), 224, http://www.freetheworld.com/2010/reports/world/EFW2010_BOOK.pdf. Scores for each country are compiled from individual economy profiles throughout the EFOTW report. Lawrence, *Global Enabling Trade*. Data collected from individual country profiles throughout report.
32. Stephen J. Ezell and Robert D. Atkinson, *The Good, The Bad, and The Ugly (and The Self-Destructive) of Innovation Policy: A Policymakers Guide to Crafting Effective Innovation Policy* (Washington, D.C.: ITIF, 2010), http://www.itif.org/files/2010-good-bad-ugly.pdf.
33. World Bank, World Trade Indicators (GATS commitments restrictiveness index; accessed September 3, 2011).
34. Fred Bergsten, "Beijing Is Key to Creating More US Jobs," Foreign Policy, April 14, 2010, http://www.iie.com/publications/opeds/oped.cfm?ResearchID=1545.
35. Ibid.
36. Robert D. Atkinson, "Globalisation, New Technology and Economic Transformation," in Social Justice in the Global Age, eds. Olaf Cramme and Patrick Diamond (Cambridge, UK: Polity Press, 2009).
37. William R. Cline and John Williamson, "Currency Wars" (policy brief, Peterson Institute for International Economics, Washington, D.C., November 2010), 4, http://www.iie.com/publications/pb/pb10-26.pdf.
38. Ibid.
39. Lawrence, *Global Enabling Trade*.
40. OECD, *Overcoming Border Bottlenecks: The Costs and Benefits of Trade Facilitation* (Paris: OECD, 2009), 90.
41. OECD, "Progress Towards Trade and Investment Liberalization by Industrialised APEC Economies (technical report, OECD, Paris, 2010), 19.
42. United Nations, *Trade Facilitation Handbook For the Greater Mekong Region* (New York: UN, 2002), http://www.unescap.org/tid/publication/t&ipub2224.pdf; Singapore Customs, "Evolution of Singapore's Single Window" (presentation, Single Window Working Group Capacity, APEC 2009, Singapore, April 2009), http://www.wcoomd.org/files/6.SW_Files/SW%20Initiatives/APEC/APEC%20-%20Singapore%20Evolution%20of%20Single%20Window%20-%20April%202009.pdf.
43. OECD, "Korea – Progress in Implementing Regulatory Reform" (policy brief, OECD, Paris, March 2007), http://www.oecd.org/dataoecd/34/62/38238965.pdf.
44. International Trade Data System, "Report to Congress on the International Trade Data System" (technical report, ITDS, December 2010), http://www.itds.gov/linkhandler/itds/toolbox/library/resource_documents/itds_report.ctt/itds_report.pdf.

45. OECD, "Progress Towards Trade," 19.
46. Evenett, *Resolve Falters*, 3.
47. Lawrence, *Global Enabling Trade*.
48. World Bank, World Development Indicators (time to import (days); documents to import (number); accessed October 9, 2011).
49. Lawrence, *Global Enabling Trade*, 23.
50. Ibid., 292.
51. Ezell and Atkinson, *Good, Bad, and Ugly*, 76.
52. Michael P. Ryan, "Intellectual Property and Economic Growth" (working paper, George Washington University, Washington, D.C., 2008), http://www.law.gwu.edu/Academics/research_centers/ciec/Documents/Notes%20on%20Creativity/IPANDECONOMICGROWTH.pdf.
53. Carl Dahlman, "Technology Strategy in East Asian Developing Economies" (working paper, World Bank, Washington, D.C., 1994).
54. Coe, Helpman, and Hoffmeister, "North-South R&D Spillovers."
55. Eaton and Kortum, "Trade in Ideas."
56. Blanka Kalinova, Angel Palerm, and Stephen Thomsen, "OECD's FDI Restrictiveness Index" (working paper, OECD, Paris, March 2010), http://dx.doi.org/10.1787/5km91p02zj7g-en.
57. World Trade Organization, *Trade Policy Review: India* (Geneva: WTO, 2011), http://www.wto.org/english/tratop_e/tpr_e/tp349_e.htm. India recently opened its retail sector to 51 percent foreign ownership. See Vikas Bajaj, "India to Ease Retail Rules for Foreign Companies," *New York Times*, November 24, 2011, http://www.nytimes.com/2011/11/25/business/global/india-to-allow-foreign-retailers-to-own-stores.html.
58. World Trade Organization, *Trade Policy Review: The Philippines* (Geneva: WTO, 2005), http://www.wto.org/english/tratop_e/tpr_e/tp249_e.htm; Ezell and Atkinson, *Good, Bad, and Ugly*.
59. International Monetary Fund, Annual Report on Exchange Arrangements and Exchange Restrictions database (country reports; accessed July 15, 2011), http://elibrary.imf.org/page/AREAER/.
60. Ibid.
61. OECD, *OECD Investment Policy Reviews: Peru* (Paris: OECD, 2008).
62. International Monetary Fund, Annual Report on Exchange Arrangements and Exchange Restrictions database (country reports; accessed July 15, 2011), http://elibrary.imf.org/page/AREAER/.
63. Kalinova, Palerm, and Thomsen, "OECD's FDI Restrictiveness Index," World Bank, Investing Across Borders (investing across sectors; starting a foreign business; accessed September 29, 2011), http://iab.worldbank.org/.

Chapter 3 Endnotes

1. See literature review in Robert D. Atkinson, "Effective Corporate Tax Reform in the Global Innovation Economy" (technical report, Information Technology and Innovation Foundation, Washington, D.C., 2009), http://www.itif.org/files/090723_CorpTax.pdf.
2. Coe and Helpman, "International R&D Spillovers." The G7 countries are Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.
3. Aside from stipulating that the R&D must be performed domestically.
4. Justin Yifu Lin and Célestin Monga, "Growth Identification and Facilitation: The Role of the State in the Dynamics of Structural Change" (working paper, World Bank, Washington, D.C., May 2010).
5. Due to wide disparities between high defense spenders and low defense spenders, the natural logarithm of defense R&D as a share of GDP was used in computing countries' tier ranks.
6. See Charles I. Jones and John C. Williams, "Measuring the Social Return to R&D," *Quarterly Journal of Economics* 113, no. 4 (1998): 1119–1135; Edwin Mansfield, "Social Returns from R&D: Findings, Methods, and Limitations," *Research Technology Management* 34, no. 6 (1991): 24–27; Eric Brynjolfsson, Lauren Hitt, and Shinkyu Yang, "Intangible Assets: How the Interaction of Information Technology and Organizational Structure Affects Stock Market Valuations."
7. J. G. Tewksbury, M. S. Crandall, and W. E. Crane, "Measuring the Societal Benefits of Innovation," *Science* 209, no. 4457 (1980): 658–662.
8. The U.S. tax credit, in particular, has been heavily studied. For example, the former U.S. Congressional Office of Technology Assessment concluded that, "For every dollar lost in tax revenue, the R&D tax credit produces a dollar increase in reported R&D spending, on the margin." See Bronwyn Hall, "The Effectiveness of Research and Experimental Tax Credits: Critical Literature Review and Research Design" (technical report, Office of Technology Assessment, Washington, D.C., 1995), http://emlab.berkeley.edu/~bhhall/papers/BHH95%20OTArtax.pdf. Other studies of the U.S. credit find even greater benefits, with the research investment to tax-cost ratio between 1.3 and 2.9. See Coopers & Lybrand, *Economic Benefits of the R&D Tax Credit* (New York: Coopers & Lybrand, 1998).
9. Australian Bureau of Industry Economics, *R&D, Innovation and Competitiveness: An Evaluation of the R&D Tax Concession* (Canberra: Australian Government Publishing Service, 1993). In 2011, Australia replaced its system of R&D super deductions with a system of R&D tax credits.
10. Marcel Dagenais, Pierre Mohnen, and Pierre Therrien, "Do Canadian Firms Respond to Fiscal Incentives to Research and Development?" (working paper, CIRANO, Québec, 1997).

11. Dominique Guellec and Bruno van Pottelsberghe de la Potterie, "The Impact of Public R&D Expenditure on Business R&D," *Economics of Innovation and New Technology* 12, no. 3 (2003): 225–243.
12. Martin Falk, "What Drives Business R&D across OECD Countries?" (working paper, Austrian Institute of Economic Research, Vienna, 2004).
13. Guntram B. Wolff and Volker Reinthaler, "The Effectiveness of Subsidies Revisited: Accounting for Wage and Employment Effects in Business R&D," *Research Policy* 37, no. 8 (2008): 1403–1412.
14. Nicholas Bloom and Rachel Griffith, "The Internationalisation of UK R&D," Fiscal Studies 22, no. 3 (2001): 337–355.
15. Requiring that the R&D be performed domestically is an acceptable practice, however.
16. The "Frascati" definition of R&D expenditure provides a baseline for grading individual countries' definitions of eligible expenditure, although there are several acceptable exemptions from the Frascati definition, including social science R&D, marketing expenses, and indirectly related expenditures. (For example, some economies, such as Norway, deem services expenditures such as ethnographic social research and concept piloting and prototyping as eligible for tax incentives. See SkatteFun, http://www.forskningsradet.no.) Likewise, while including capital expenditure related to R&D is a good practice, economies are not graded on capital expenditure eligibility in this study, due to the difficulty in parsing the effects of incentives for R&D capital expenditure from other, more general capital expenditure incentives present in many tax codes. See Organization for Economic Co-operation and Development, *Frascati Manual: Proposed Standard Practice for Surveys on Research and Experimental Development* (Paris: OECD, 2002).
17. Ezell and Atkinson, *Good, Bad, and Ugly*.
18. OECD, *Science, Technology and Industry Scoreboard 2009* (Paris: OECD, 2009). According to the OECD: "The B index is a unique tool for comparing the generosity of the tax treatment of R&D in different countries. However, its computation requires some simplifying assumptions. It should therefore be examined together with a set of other relevant policy indicators. Furthermore, its 'synthetic' nature does not allow for distinguishing the relative importance of the various policy tools it takes into account (such as depreciation allowances, special R&D allowances, tax credit, CITR [corporate income tax rate]). B indexes have been calculated under the assumption that the 'representative firm' is taxable and may enjoy the full benefit of the tax allowance or credit. For incremental tax credits, calculation of the B index implicitly assumes that R&D investment is fully eligible for the credit and does not exceed the ceiling if there is one. Some detailed features of R&D tax schemes (such as refunding, carry-back and carry-forward of unused tax credit, or flow-through mechanisms) are therefore not taken into account. The effective impact of the R&D tax allowance or credit on the after-tax cost of R&D is affected by the level of the CITR. An increase in the CITR reduces the B index only in those countries with the most generous R&D tax treatment. If tax credits are taxable, the effect of the CITR on the B index depends only on the level of the depreciation allowance. If the latter is more than 100 percent for the total R&D expenditure, an increase in the CITR will reduce the B index. For countries with less generous R&D tax treatment, the B index is positively related to the CITR."
19. B-index scores are penalized by 25 percent of their positive value.
20. OECD, *Science, Technology and Industry Scoreboard 2009*.
21. "R&D Tax Credit: Frequently Asked Questions," AusIndustry, June 21, 2011, http://www.ausindustry.gov.au/InnovationandRandD/RandDTaxCredit/Documents/RDTaxCreditFAQs.pdf.
22. 2011 rates.
23. Deloitte, *Global Survey of R&D Tax Incentives* (New York: Deloitte, 2011), http://www.investinamericasfuture.org/PDFs/Global%20RD%20Survey%20Final%20-%202011.pdf.
24. Another way a country may fall behind in the B index measure is if certain features of its R&D tax incentive regime are not captured in the B Index calculation.
25. Deloitte, *Global Survey of R&D Tax Incentives*.
26. Ibid. The fact that the United States R&D tax credit is not permanent is not captured in the B index calculation.
27. OECD, *Science, Technology and Industry Scoreboard 2011* (Paris: OECD, 2011).
28. Ernst & Young, *Research Incentives in the New Tax Landscape* (London: Ernst & Young, 2010), http://www.ey.com/Publication/vwLUAssets/Research_incentives_in_the_new_tax_landscape/$File/Research_incentives_in_the_new_tax_landscape.pdf.
29. Ibid.
30. Deloitte, *Global Survey of R&D Tax Incentives*.
31. United Nations Conference on Trade and Development, Economic Commission for Latin America and the Caribbean, *Science, Technology and Innovation Policy Review: Peru* (New York: United Nations, 2011), http://www.unctad.org/en/docs/dtlstict20102_en.pdf; Patricia Guerra, "New ICT Ministry Proposed under Humala's Platform," *Business News Americas*, June 10, 2011, http://www.bnamericas.com/news/technology/new-ict-ministry-proposed-under-humalas-platform.
32. U.S. Committee on Prospering in the Global Economy of the 21st Century and U.S. Committee on Science, Engineering, and Public Policy, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington, D.C.: National Academies Press, 2007).
33. Wesley M. Cohen, Richard R. Nelson, and John P. Walsh, "Links and Impacts: The Influence of Public Research on Industrial R&D," *Management Science* 48, no. 1 (2002): 1–23; For a review of the econometric evidence, see Paul A. David, Bronwyn H. Hall, and Andrew A. Toole, "Is Public R&D a Complement or Substitute for Private R&D? A Review of the Econometric Evidence," *Research Policy* 29, no. 4 (2000): 497–529.
34. See John A. Alic et al., eds., *Beyond Spinoff, Military and Commercial Technologies in a Changing World* (Cambridge, MA: Harvard University Press, 1992).

35. Wendy H. Schacht, "Patent Ownership and Federal Research and Development (R&D): A Discussion of the Bayh-Dole Act and the Stevenson-Wydler Act" (technical report, Congressional Research Service, Washington, D.C., 2000), http://ncseonline.org/nle/crsreports/science/st-66.cfm.
36. Bhaven N. Sampat, "Lessons from Bayh-Dole," *Nature* 468, no. 7325 (2010): 755–756; Brad Sherman, "The Patenting of University-based Research in Australia," video, 2:01:43, from Bayh-Dole @ 30: Mapping the Future of University Patenting, University of California, Davis, April 30, 2011, http://mediasite.ucdavis.edu/Mediasite/Viewer/?peid=17f3390d85c1479ba88ad672c03fd3f21d; Alan Collier and Brendan Gray, "The Commercialisation of University Innovations: A Qualitative Analysis of the New Zealand Situation" (technical report, University of Otago, 2010), http://www.otago.ac.nz/entrepreneurship/docs/Qual%20report_31%20August%202010.pdf; Universiti Brunei Darussalem, "Intellectual Property Policy," March 15, 2010, http://www.wipo.int/clea/docs_new/pdf/en/bn/bn022en.pdf; Amit Shovon Ray and Sabyasachi Saha, "Patenting Public-Funded Research for Technology Transfer: A Conceptual Synthesis of US Evidence and Lessons for India" (working paper, Indian Council for Research on International Economic Relations, January 2010), http://www.icrier.org/pdf/WorkingPaper244.pdf; Scott Valentine, "IP in Canada," *Canadian Broadcasting Corporation*, December 11, 2007, http://www.cbc.ca/news/background/tech/hightech/ip.html; Gregory D. Graff, "Echoes of Bayh-Dole? A Survey of IP and Technology Transfer Policies in Emerging and Developing Economies," in *Intellectual Property Management in Health and Agricultural Innovation: A Handbook of Best Practices*, eds. Anatole Krattiger et al. (Oxford: MIHR; Davis, CA: PIPRA, 2007), http://www.iphandbook.org/handbook/ch03/p03/; Hepeng Jia, "China Allows Academics to Own Patents," *Chemistry World*, news release, January 4, 2008, http://www.rsc.org/chemistryworld/News/2008/January/04010802.asp; Risaburo Nezu et al., *Technology Transfer, Intellectual Property and Effective University-Industry Partnerships: The Experience of China, India, Japan, Philippines, the Republic of Korea, Singapore and Thailand* (Geneva: World Intellectual Property Organization, 2007), http://www.wipo.int/freepublications/en/intproperty/928/wipo_pub_928.pdf; David Mowery, "University-Industry Collaboration and Technology Transfer in Hong Kong and Knowledge-based Economic Growth" (working paper, University of California, Berkeley, 2009), http://www.savantas.org/cmsimg/files/Research/HKIP/Report/1_mowery.pdf; M. V. Ramani, "Technology Commercialization by Academic Institutions of Far East Countries: A Review," *Society for Technology Management*, newsletter, July 2009, http://www.fenwick.com/docstore/publications/ip/technology_transfer_considerations.pdf; Ryoichi Namikawa, "Intellectual Property in R&D Project under Japanese Bayh-Dole System," *International Journal of Technology Transfer and Commercialisation* 9, no. 1 (2010): 9–24; Anil Narayan and Keith Hooper, "The Role of Government towards Encouraging the Development of Academic Research Commercialisation in New Zealand Universities: A Historical Overview of Policy Directions" (working paper, Auckland University of Technology, 2010), http://www.victoria.ac.nz/sacl/6ahic/Publications/6AHIC-34_FINAL_paper.pdf; L. Stanley, "Country Report: Papua New Guinea" (presentation, WIPO Regional Workshop on Effective Management of Intellectual Property Academies: Challenges and Responses, Jakarta, February 2, 2010), http://www.wipo.int/edocs/mdocs/aspac/en/wipo_ip_jkt_10/wipo_ip_jkt_10_topic09_papua_new_guinea.pdf; "Patents," Intellectual Property Office of Papua New Guinea, 2011, http://www.ipopng.gov.pg/patents.htm; United Nations Conference on Trade and Development, Economic Commission for Latin America and the Caribbean, *Science, Technology and Innovation Policy Review: Peru* (New York: United Nations, 2011), http://www.unctad.org/en/docs/dtlstict20102_en.pdf; W. Lesser, "The Role of Intellectual Property Rights in Biotechnology Transfer under the Convention on Biological Diversity," ISAAA Briefs, no. 3 (1997): 22; Erica Poon, "Bayh-Dole Comes to the Philippines," *Managing Intellectual Property*, April 14, 2011, http://www.managingip.com/Article/2807576/Bayh-Dole-comes-to-the-Philippines.html; Jae-hwan Park and James Moultrie, "Understanding University Academics' Internal and External Knowledge Interactions in Different Disciplines: Evidence from Universities in South Korea" (conference paper, Imperial College London Business School, June 16, 2010), http://www2.druid.dk/conferences/viewpaper.php?id=502087&cf=43; David Cyranoski, "Taiwan's Hopes for a Biotech Revolution," *Nature,* July 10, 2009, http://www.nature.com/news/2009/090710/full/news.2009.643.html; Orakanoke Phanraksa, "Uniformity of the Patent Policy in Technology Transfer in Thailand: To What Extent Can the Bayh-Dole Act Concept be Adapted for the Thai Technology Transfer System?" (dissertation, University of Washington, 2005); Wendy H. Schacht, "Patent Ownership and Federal Research and Development (R&D): A Discussion of the Bayh-Dole Act and the Stevenson-Wydler Act" (technical report, Congressional Research Service, Washington, D.C., 2000), http://ncseonline.org/nle/crsreports/science/st-66.cfm.
37. Robert E. Litan, Lesa Mitchell, and E.J. Reedy, "Commercializing University Innovations: Alternative Approaches" (working paper, National Bureau of Economic Research, Cambridge, MA, May 2007).
38. Mercedes Delgado, Michael E. Porter, and Scott Stern, "Clusters, Convergence, and Economic Performance" (working paper, Harvard Business School, Cambridge, MA, 2011), http://www.isc.hbs.edu/pdf/DPS_Clusters_Performance_2011-0311.pdf.
39. Joseph Cortright, *Making Sense of Clusters: Regional Competitiveness and Economic Development* (Washington: Brookings Institution, 2006); Andrew Reamer, Larry Icerman, and Jan Youtie, *Technology Transfer and Commercialization: Their Role in Economic Development* (Washington, D.C.: Department of Commerce, Economic Development Administration, 2003), 57–110, http://www.eda.gov/ImageCache/EDAPublic/documents/pdfdocs/eda_5fttc_2epdf/v1/eda_5fttc.pdf.
40. Timothy Bresnahan, Alfonso Gambardella, and Annalee Saxenian, "'Old Economy' Inputs for 'New Economy' Outcomes: Cluster Formation in the New Silicon Valleys," *Industrial and Corporate Change* 10, no. 4 (2001): 835–860.
41. Michale S. Dahl and Christian Ø. R. Pedersen, "Knowledge Flows through Informal Contacts in Industrial Clusters: Myths or Realities?" (working paper, Danish Research Unit for Industrial Dynamics, Aalborg Oe, Denmark, 2003), http://www.druid.dk/wp/pdf_files/03-01.pdf.
42. Robert D. Atkinson and Stephen J. Ezell, *The Race for Global Innovation Advantage: And Why the United States is Falling Behind* (New Haven, CT: Yale University Press, forthcoming).
43. "Zongguancun, China's Silicon Valley," China Internet Information Center, accessed August 10, 2011, http://www.china.org.cn/english/travel/51023.htm.
44. Shinya Okuda, "The Industrial Cluster Policy of Japan" (presentation, EU-Japan Forum on Research, Technology, and Innovation, Kobe University, April 22, 2006), http://www.deljpn.ec.europa.eu/data/current/dataobj-480-data.pdf.
45. "Clusters Flustered," *Economist,* April 14, 2011, http://www.economist.com/node/18560669.

46. Patrick Dümmler and Alain Thierstein, "Identifying and Managing Clusters – Evidence from Switzerland" (conference paper, Uddevalla Symposium 2003, Trollhättan, Sweden, 2003), http://e-collection.library.ethz.ch/eserv/eth:26802/eth-26802-01.pdf.
47. Tian-jy Chen, "Taiwan's Industrial Development Strategies" (presentation, 1st Global Monte Jade Summit and Taiwan MJ Annual Conference, Taipei, July 30, 2008), www.cepd.gov.tw/dn.aspx?uid=5712.
48. "Selecting Premises," EnterpriseOne, Government of Singapore, last modified February 18, 2011, http://www.business.gov.sg/EN/BusinessTopic/SelectingPremises/OtherEssentialInformation/prem_essen_zones.htm.
49. OECD, *Science, Technology and Industry Scoreboard 2009*; OECD, *Science, Technology and Industry Scoreboard 2011* (Paris: OECD, 2011); Deloitte, *Global Survey of R&D Tax Incentives* (New York: Deloitte, 2011), http://www.investinamericasfuture.org/PDFs/Global%20RD%20Survey%20Final%20-%202011.pdf.
50. UNESCO Institute for Statistics, Reports, Science and Technology (GERD financed by government; accessed June 2, 2011), http://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx; World Bank, World Development Indicators (gross domestic product; accessed June 2, 2011), http://data.worldbank.org/data-catalog/world-development-indicators; OECD, Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds; accessed June 2, 2011); OECD, Science, Technology and R&D Statistics (government budget appropriations or outlays for R-D; accessed October 3, 2011); Taiwan Directorate General of Budget, Accounting and Statistics, National Accounts, Statistical Tables (principle figures; accessed June 2, 2011); Carlos Henrique de Brito Cruz and Herman Chaimovich, "Brazil," in *UNESCO Science Report 2010*, ed. Susan Schneegans (Paris: UNESCO, 2010), http://unesdoc.unesco.org/images/0018/001899/189958e.pdf; Center for Strategic and International Studies, Defense-Industrial Initiatives Group, "India's Defense Spending and Military Modernization" (technical report, March 29, 2011), http://casi.ssc.upenn.edu/system/files/RR+-+CSIS.pdf; Richard A. Bitzinger, "China's Defense Budget: If Not More Transparent, At Least More Credible?," *Asian Military Review*, June 2008, http://www.asianmilitaryreview.com/upload/200806252205141.pdf; Hepeng Jia, "China Slows R&D Funding Growth," *Chemistry World*, March 10, 2010, http://www.rsc.org/chemistryworld/News/2010/March/10031002.asp; S. Rajaratnam School of International Studies, "Indonesia's New Offset Policy: Time for Broader Defence Industrial Strategy – Analysis," *Eurasia Review,* August 8, 2011, http://www.eurasiareview.com/08082011-indonesia%E2%80%99s-new-offset-policy-time-for-broader-defence-industrial-strategy-analysis/; Business Monitor International, *Malaysia Defense and Security Report Q3 2011* (London: Business Monitor International, 2011); South Africa Human Sciences Research Council, Centre for Science, Technology and Innovation Indicators, *National Survey of Research & Experimental Development: Main Results 2008/09* (Cape Town: Human Sciences Research Council, 2011); 2008 data estimated for Belgium, Bulgaria, Chile, China, Cyprus, Denmark, Greece, Hong Kong, India, Indonesia, Israel, Latvia, Lithuania, Luxembourg, Malaysia, Malta, Mexico, Netherlands, New Zealand, Norway, the Philippines, Singapore, Slovak Republic, South Africa, Sweden, Thailand, Turkey, and Vietnam; no data available Peru.
51. Ibid. (Same sources as for Table 3-4).
52. UNESCO Institute for Statistics, Reports, Science and Technology (GERD performed by Higher Education; accessed June 2, 2011), http://stats.uis.unesco.org/unesco/ReportFolders/ReportFolders.aspx; World Bank, World Development Indicators (gross domestic product; accessed June 2, 2011), http://data.worldbank.org/data-catalog/world-development-indicators; OECD, Science, Technology and R&D Statistics (gross domestic expenditure on R-D by sector of performance and source of funds; accessed June 2, 2011); Taiwan Directorate General of Budget, Accounting and Statistics, National Accounts, Statistical Tables (principle figures; accessed June 2, 2011); 2008 data estimated for Brazil, Chile, Greece, India, Indonesia, Mexico, New Zealand, Peru, the Philippines, South Africa, Thailand, and Vietnam.
53. Klaus Schwab et al., *The Global Competitiveness Report 2010-2011* (Geneva: World Economic Forum, 2010), http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2010-11.pdf.

Chapter 4 Endnotes

1. McKinsey Global Institute, *How to Compete and Grow: A Sector Guide to Policy*, (New York: McKinsey, 2010), http://www.mckinsey.com/mgi/reports/freepass_pdfs/competitiveness/Full_Report_Competitiveness.pdf.
2. Ibid, 26.
3. Ibid, 27.
4. William Lewis, *The Power of Productivity* (Chicago: University of Chicago Press, 2005), http://www.press.uchicago.edu/Misc/Chicago/476766.html.
5. Lewis, *The Power of Productivity*.
6. McKinsey Global Institute, *How to Compete and Grow*, 35.
7. Gabriel Sanchez, "Understanding Productivity Levels, Growth and Dispersion in Argentina: the Case of Supermarkets" (working paper, IERAL, Buenos Aires, February 13, 2008), http://www.merit.unu.edu/MEIDE/papers/2009/1236010806_GS.pdf.
8. McKinsey Global Institute, *Why the Japanese Economy is Not Growing: Micro Barriers to Productivity Growth* (New York: McKinsey, 2000).
9. Robert D. Atkinson and Mark Cooper, "A Cure by Way of the Consumer," *Washington Times*, December 17, 2008, http://www.washingtontimes.com/news/2008/dec/17/ailing-auto-industry/.
10. McKinsey Global Institute, *How to Compete and Grow*, 36.
11. Ibid, 37.

12. Ibid., 36.
13. Robert D. Atkinson, "Time to End Rampant Mercantilism" *G8/G20 Magazine*, June 2010, http://www.itif.org/files/G8G20_RAtkinson.pdf.
14. Atkinson, "Globalisation, New Technology and Economic Transformation."
15. Luke A. Stewart, "The Impact of Regulation on Innovation in the United States: A Cross-Industry Literature Review" (technical report, Institute of Medicine Committee on Patient Safety and Health IT, June 2010), http://www.iom.edu/~/media/Files/Report%20Files/2011/Health-IT/Commissioned-paper-Impact-of-Regulation-on-Innovation.pdf.
16. Antonio Ciccone and Elias Papaioannou, "Red Tape and Delayed Entry," *Journal of the European Economic Association* 5, no. 2-3 (2007): 444–458.
17. Kim Jong-Nyun, "Korean Firms Come Out Winners from Global Crisis," *SERI Quarterly* 3, no. 3 (2010), 39.
18. Portuguese Ministry of Justice, "On the Spot Firm" (presentation, Finland, September 2006), http://www.4qconference.org/liitetiedostot/bp_esitykset/Portugal_C.pdf.
19. World Bank, "Doing Business: Measuring Business Regulations," http://www.doingbusiness.org/.
20. Hossein Jalilian, Colin Kirkpatrick, and David Parker, "The Impact of Regulation on Economic Growth in Developing Countries: A Cross-Country Analysis," *World Development* 35, Issue 1 (2007): 87–103, http://www.sciencedirect.com/science/article/pii/S0305750X06001823.
21. International Finance Corporation and The World Bank, "Doing Business: Business Reforms in New Zealand," http://www.doingbusiness.org/reforms/overview/economy/new-zealand.
22. World Bank, Doing Business (starting a business: accessed September 21, 2011).
23. Ibid.
24. Eric Bartelsman, Stefano Scarpetta, and Fabiano Schivardi, "Comparative Analysis of Firm Demographics and Survival: Evidence from Micro-level Sources in OECD Countries," *Industrial and Corporate Change* 14, no. 3 (2005): 365–391.
25. Author's calculations, data for regulatory systems from World Bank, data for payment systems and productive based on surveys from the World Economic Forum.
26. Schwab et al., *Global Competitiveness Report*, 446.
27. Schwab et al., *Global Competitiveness Report*, 449.
28. Larry Keeley, "The Taming of the New: Larry Keeley Workshop on Innovation" (presentation, Puget Sound SIGCHI, Seattle, September 18, 2007); Carl Franklin, *Why Innovation Fails* (London: Spiro, 2003).
29. Erik Brynjolfsson and Adam Saunders, *Wired for Innovation: How Information Technology is Reshaping the Economy* (Cambridge, MA: MIT Press, 2010), *x*.
30. Amil Petrin, T. Kirk White, and Jerome Reiter, "The Impact of Plant-level Resource Allocations and Technical Progress on U.S. Macroeconomic Growth" (discussion paper, Center for Economic Studies, Census Bureau, December 2009).
31. Curtis Carlson and William Wilmot, *Innovation: The Five Disciplines for Creating What Customers Want* (New York: Crown Business, 2006), 34–35.
32. Census Bureau, Business Dynamics Statistics, Database List (economy wide; accessed January 6, 2011), http://www.ces.census.gov/index.php/bds/bds_database_list/.
33. International Finance Corporation and The World Bank, "Doing Business: Closing a Business," http://www.doingbusiness.org/data/exploretopics/closing-a-business.
34. World Bank, Doing Business (resolving insolvency; accessed September 23, 2011).
35. Hiren Sarkar and M. Aynul Hasan, "Impact of Corruption on the Efficiency of Investment: Evidence from A Cross-Country Analysis," *Asia-Pacific Development Journal* 8, no. 2 (2001): 112.
36. Ibid.
37. Robert D. Atkinson and Daniel Castro, *Digital Quality of Life: Understanding the Benefits of the IT Revolution, Information Technology and Innovation Foundation*, (Washington, D.C.: ITIF, 2008), http://www.itif.org/files/DQOL-16.pdf.
38. OECD, *OECD Science, Technology and Industry Scoreboard 2011: Innovation and Growth in Knowledge Economies* (Paris: OECD, 2011), http://www.oecd.org/document/10/0,3746,en_2649_33703_39493962_1_1_1_1,00.html. Product market regulations indicators are quantitative indicators derived from qualitative information on laws and regulations that may affect competition.
39. Schwab et al., *Global Competitiveness Report*, 370.
40. OECD, *Science, Technology and Industry Scoreboard 2011*.
41. Schwab et al., *Global Competitiveness Report*, 428.
42. "Invisible but Indispensable," *Economist,* November 5, 2009, http://www.economist.com/node/14793432.
43. Schwab et al., *Global Competitiveness Report*, 428.
44. Ibid., 429.
45. Ibid., 376.
46. OECD, *Science, Technology and Industry Scoreboard 2011*.
47. Joseph A. Schumpeter, "The Creative Response to Economic History," *Journal of Economic History* 7, no. 2 (1947): 149–159; Hugo Erken, "Productivity, R&D and Entrepreneurship" (doctoral thesis, Erasmus Research Institute of Management, Rotterdam, November 27, 2011), http://repub.eur.nl/res/pub/14004/EPS2008147ORG9058921796Erken.pdf.

48. See Clayton M. Christensen, *The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail* (Boston: Harvard Business School Press, 1997).
49. David B. Audretsch et al., "Impeded Industrial Restructuring: The Growth Penalty," *Kyklos* 55, no. 1 (2002): 81–97.
50. Douglas Holtz-Eakin and Chihwa Kao, "Entrepreneurship and Economic Growth" (working paper, Center for Policy Research, Syracuse University, NY, February 2003), https://www.maxwell.syr.edu/uploadedFiles/cpr/publications/working_papers/wp50.pdf.
51. Kashmir Gill, "NRC-IRAP Program and Tips for Commercial Success," NSERC I2I Workshop, May 16, 2007, www.rso.ualberta.ca/pdfs/NRC-IRAP.ppt.
52. David Stanler and Paul Kedrosky, *Neutralism and Entrepreneurship: The Structural Dynamics of Startups, Young Firms, and Job Creation* (Kansas City, MO: Ewing Marion Kauffman Foundation, 2010), http://www.kauffman.org/uploadedFiles/firm-formation-neutralism.pdf; Haltiwanger, Jarmin, and Miranda, *Jobs Created from Business Startups in the United States* (Kansas City, MO: Ewing Marion Kauffman Foundation, 2009), http://www.kauffman.org/uploadedFiles/BDS_Jobs_Created_011209b.pdf .
53. Zoltan J. Acs, William Parsons, and Spencer Tracy, "High-Impact Firms: Gazelles Revisited" (technical report, Small Business Administration, Washington, D.C., June 2008), http://archive.sba.gov/advo/research/rs328tot.pdf.
54. Leora Klapper et al., "Entrepreneurship and Firm Formation Across Countries" (working paper, World Bank, Washington, D.C., 2008), http://knowledge.wharton.upenn.edu/papers/1345.pdf.
55. World Bank Group Entrepreneurship Snapshots (accessed September 6, 2011); For China and Taiwan, new firm information was derived from Donna Kelley, Niels Bosma, and José Ernesto Amorós, *Global Entrepreneurship Monitor: 2010 Global Report* (London: Global Entrepreneurship Monitor, 2010), http://www.gemconsortium.org/download/1322865922331/GEM%20GLOBAL%20REPORT%202010rev.pdf.
56. OECD, *Science, Technology and Industry Scoreboard 2011*, 155.

Chapter 5 Endnotes

1. "What is Intellectual Property?," World Intellectual Property Organization, n.d., http://www.wipo.int/about-ip/en/.
2. Julie A. Hedlund, "Patents Pending: Patent Reform for the Innovation Economy" (technical report, ITIF, Washington, D.C., 2007), 3, http://www.itif.org/files/PatentsPending.pdf.
3. Michael P. Ryan, "Intellectual Property and Economic Growth" (working paper, George Washington University Law School, Washington, D.C., 2008), http://www.law.gwu.edu/Academics/research_centers/ciec/Documents/Notes%20on%20Creativity/IPANDECONOMICGROWTH.pdf.
4. Douglass C. North, *Institutions, Institutional Change, and Economic Performance* (Cambridge: Cambridge University Press, 1990).
5. Edmund W. Kitch, "The Nature and Function of the Patent System," *Journal of Law and Economics* 20, no. 2 (1977): 265–290.
6. See Charles Jones and John Williams, "Measuring the Social Return to R&D," *Quarterly Journal of Economics* 113, no. 4 (1998): 1119–1135; Edwin Mansfield, "Social Returns from R&D: Findings, Methods, and Limitations," *Research Technology Management* 34, no. 6 (1991): 24–27; Eric Brynjolfsson, Lauren Hitt, and Shinkyu Yang, "Intangible Assets: How the Interaction of Information Technology and Organizational Structure Affects Stock Market Valuations," *Brookings Papers on Economic Activity* 33 (2000): 137–199.
7. Eugenia Baroncelli, Ekaterina Krivonos, and Macelo Olarreaga, "Trademark Protection or Protectionism?" (working paper, World Bank, Washington, D.C., 2004).
8. Brent B. Allred and Walter G. Park, "Patent Rights and Innovative Activity: Evidence from National and Firm-level Data," *Journal of International Business Studies*, 38, no. 6 (2007): 878–900.
9. Keith E. Maskus, "Encouraging International Technology Transfer" (technical report, International Centre for Trade and Sustainable Development, Geneva, May 2004), http://ictsd.net/downloads/2008/07/b.pdf.
10. Ricardo Cavazos Cepeda, Douglas C. Lippoldt, and Jonathan Senft, "Policy Complements to the Strengthening of IPRS in Developing Countries" (working paper, OECD, Paris, 2010), http://dx.doi.org/10.1787/5km7fmwz85d4-en.
11. Ibid., 8.
12. Walter G. Park and Douglas Lippoldt, "International Licensing and the Strengthening of Intellectual Property Rights in Developing Countries during the 1990s," *OECD Journal: Economic Studies* 40, no. 1 (2005): 7–48.
13. David Encaoua, Dominique Guellec, and Catalina Martínez, "The Economics of Patents: From Natural Rights to Policy Instruments" (working paper, University of Paris, October 2003), ftp://mse.univ-paris1.fr/pub/mse/cahiers2003/V03124.pdf; Keith E. Maskus and Jerome H. Reichman, eds., *International Public Goods and Transfer of Technology Under a Globalized Intellectual Property Regime* (New York: Cambridge University Press, 2005).
14. Cavazos Cepeda, Lippoldt, and Senft, "Policy Complements," 2.
15. Ibid.
16. United Nations Conference on Trade and Development, *Periodic Report 1986: Policies, Laws, and Regulations on Transfer, Application, and Development of Technology* (Geneva: UNCTAD, 1986).
17. United Nations Commission on Transnational Corporations, *New Issues in the Uruguay Round of Multilateral Trade Negotiations* (New York: United Nations, 1990); United Nations Commission on Transnational Corporations, *The Determinants of Foreign Direct Investment: A Survey of Evidence* (New York: United Nations, 1992).

18. Edwin Mansfield, *Intellectual Property Protection, Direct Investment, and Technology Transfer: Germany, Japan, and the United States* (Washington, D.C.: World Bank, 1995); Jeong-Yeon Lee and Edwin Mansfield, "Intellectual Property Protection and U.S. Foreign Direct Investment," *Review of Economics and Statistics* 78, no. 2 (1996): 181–186.
19. Keith E. Maskus, *Intellectual Property Rights in the Global Economy* (Washington, D.C.: Institute for International Economics, 2000).
20. Cavazos Cepeda, Lippoldt, and Senft, "Policy Complements."
21. Ibid.
22. Titus O. Awokuse and Hong Yin, "Do Stronger Intellectual Property Rights Protection Induce More Bilateral Trade? Evidence from China's Imports" (conference paper, American Agricultural Economics Association 2008 Annual Meeting, Orlando, FL, July 27–29, 2008).
23. Cavazos Cepeda, Lippoldt, and Senft, "Policy Complements," 10.
24. Carsten Fink and Carlos A. Primo Braga, "How Stronger Protection of Intellectual Property Rights Affects International Trade Flows" (working paper, Word Bank, Washington, D.C., 1999).
25. Walter G. Park and Douglas G. Lippoldt, "Technology Transfer and the Economic Implications of the Strengthening of Intellectual Property Rights in Developing Countries" (working paper, OECD, Paris, 2008).
26. Ishac Diwan and Dani Rodrik, "Patents, Appropriate Technology, and North-South Trade," *Journal of International Economics* 30, no. 1 (1991): 27–47.
27. M. Scott Taylor, "TRIPs, Trade, and Technology Transfer," *Canadian Journal of Economics* 26, no. 3 (1993): 625–637.
28. Lee Bransetter and Kamal Saggi, "Intellectual Property Rights, Foreign Direct Investment, and Industrial Development" (working paper, National Bureau of Economic Research, Cambridge, MA, October 2009).
29. Pei-Cheng Liao and Kar-yiu Wong, "R&D Subsidy, Intellectual Property Rights Protection, and North-South trade: How Good is the TRIPS Agreement?," *Japan and the World Economy* 21, no. 2 (2009): 191–201.
30. Robert M. Sherwood, "Intellectual Property Systems and Investment Stimulation: The Ratings of Systems in Eighteen Developing Countries," *IDEA: Journal of Law and Technology* 37, no. 2 (1997): 261–370.
31. Cavazos Cepeda, Lippoldt, and Senft, "Policy Complements," 13.
32. Michael P. Ryan, "Patent Incentives, Technology Markets, and Public-Private Bio-Medical Innovation Networks in Brazil," *World Development* 38, no. 8 (2010): 1082–1093.
33. Park and Lippoldt, "Technology Transfer."
34. Maskus, "Encouraging International Technology Transfer."
35. Allred and Park, "Patent Rights and Innovative Activity," 6.
36. Cavazos Cepeda, Lippoldt, and Senft, "Policy Complements," 21.
37. Ibid.
38. Kyle Jackson, "International Property Rights Index 2011 Report."
39. Cavazos Cepeda, Lippoldt, and Senft, "Policy Complements," 6.
40. Ibid., 14.
41. Xiolan Fu, "Foreign Direct Investment, Absorptive Capacity and Regional Innovation Capabilities: Evidence from China," *Oxford Development Studies* 36, no. 1 (2008): 89–110.
42. Cavazos Cepeda, Lippoldt, and Senft, "Policy Complements," 27–28.
43. Gene M. Grossman and Elhanan Helpman, *Innovation and Growth in the Global Economy* (Cambridge, MA: MIT Press, 1991).
44. Ibid.
45. Walter G. Park, "International Patent Protection: 1960–2005," *Research Policy* 37, no. 4 (2008): 791–766.
46. Under this index, an economy may effectively protect patents but also issue many bad patents and still receive a high score.
47. Walter G. Park, "International Patent Protection: 1960–2005," *Research Policy* 37, no. 4 (2008): 791–766, http://ideas.repec.org/a/eee/respol/v37y2008i4p761-766.html.
48. Schwab et al., *Global Competitiveness Report*.
49. "ICRG Methodology," The PRS Group, accessed August 29, 2011, http://www.prsgroup.com/ICRG_Methodology.aspx.
50. Kyle A. Jackson, *International Property Rights Index: 2011 Report* (Washington, D.C.: Property Rights Alliance, 2011), 138, http://www.internationalpropertyrightsindex.org/ATR_2011%20INDEX_Web.pdf.
51. Gwartney, Hall, and Lawson, *Economic Freedom of the World: 2010 Annual Report*, 222. Scores for each country are compiled from individual economy profiles throughout the report.
52. Business Software Alliance, "Global Software Piracy," http://portal.bsa.org/globalpiracy2010/.
53. Business Software Alliance and IDC, *Seventh Annual BSA/IDC Global Software and Piracy Study* (Washington, D.C.: BSA, 2010), 6–7, http://portal.bsa.org/globalpiracy2009/studies/09_Piracy_Study_Report_A4_final_111010.pdf.
54. United States Trade Representative's Office, *2010 National Trade Estimate Report on Foreign Trade Barriers* (NTE) (Washington, D.C.: USTR, 2010), http://www.ustr.gov/sites/default/files/uploads/reports/2010/NTE/NTE_COMPLETE_WITH_APPENDnonameack.pdf.
55. U.S. International Trade Commission, *China: Effects of Intellectual Property Infringement and Indigenous Innovation Policies on the U.S. Economy*, Investigation No. 332-519, USITC Publication 4226, May 2011, http://www.usitc.gov/publications/332/pub4226.pdf.

56. United States Trade Representative's Office (USTR), *2011 Special 301 Report*, April 2011, 28, http://www.ustr.gov/webfm_send/2841.
57. USTR, *2011 Special 301 Report*, 30.
58. USTR, *2011 Special 301 Report*, 27.
59. United States Trade Representative's Office, *2010 National Trade Estimate Report on Foreign Trade Barriers* (NTE), 2010, 248, http://www.ustr.gov/sites/default/files/uploads/reports/2010/NTE/NTE_COMPLETE_WITH_APPENDnonameack.pdf.
60. USTR, *2011 Special 301 Report*, 42.
61. United States Trade Representative's Office (USTR), *2011 Special 301 Report*.

Chapter 6 Endnotes

1. Elhanan Helpman, *General Purpose Technologies and Economic Growth* (Cambridge, MA: MIT Press, 1998).
2. Dale W. Jorgenson, Mun S. Ho, and Kevin J. Stiroh, *Productivity Volume 3: Information Technology and the American Growth Resurgence* (Cambridge, MA: MIT Press, 2005); Atkinson and McKay, *Digital Prosperity*.
3. Alessandra Colecchia and Paul Schreyer, "ICT Investment and Economic Growth in the 1990s: Is the United States a Unique Case?: A Comparative Study of Nine OECD Countries," *Review of Economic Dynamics* 5, no. 2 (2002): 408–442.
4. George R. Clarke and Scott J. Wallsten, "Has the Internet Increased Trade? Developed and Developing Country Evidence," *Economic Inquiry* 44, no. 3 (2006): 465–484.
5. World Bank, *Information and Communication for Development: Extending Reach and Increasing Impact*, (Washington, D.C.: World Bank, 2009).
6. Atkinson and McKay, *Digital Prosperity*.
7. Ibid., 409.
8. World Economic Forum, *ICT for Economic Growth*.
9. Nancy Sundberg, "Overview of Trends in the ICT Market and in ICT Regulation," ITU, in *Trends in Telecommunication Reform 2010/11-Enabling Tomorrow's Digital World* (Geneva: International Telecommunications Union, 2011).
10. For the details on how overall affordability is calculated, see World Bank, *Information and Communication for Development*, 134.
11. Sundberg, "Overview of Trends."
12. Ibid.
13. OECD, "National Broadband Plans" (technical report, OECD, Paris, 2011), http://dx.doi.org/10.1787/5kg9sr5fmqwd-en.
14. Katz, "Impact of Broadband on the Economy."
15. Sundberg, "Overview of Trends."
16. International Telecommunications Union, "Trends in Telecommunication Reform 2010/11-Enabling Tomorrow's Digital World: Summary" (executive summary, ITU, Geneva, 2011), http://www.itu.int/dms_pub/itu-d/opb/reg/D-REG-TTR.12-2010-SUM-PDF-E.pdf.
17. Sundberg, "Overview of Trends."
18. World Trade Organization, "Tariff Download Facility," (accessed July 8, 2011), http://tariffdata.wto.org/ReportersAndProducts.aspx.
19. Ibid.
20. P.D. Kaushik and Nirvikar Singh, "Information Technology and Broad-Based Development: Preliminary Lessons from North India," *World Development* 32, no. 4 (2004): 591–607.
21. Ibid.
22. Catherine L. Mann, "Globalization of IT Services and White Collar Jobs: The Next Wave of Productivity Growth," (technical report, Peterson Institute for International Economics, Washington, D.C., December 2003), http://www.piie.com/publications/pb/pb03-11.pdf.
23. Philip N. Howard and Nimah Mazaheri, "Telecommunications Reform, Internet Use and Mobile Phone Adoption in the Developing World," *World Development* 37, no. 7 (2009): 1159–1169.
24. Economist Intelligence United, *Resilience amid Turmoil: Benchmarking IT Industry Competitiveness 2009* (London: EIU, 2009), 23, http://graphics.eiu.com/marketing/pdf/Benchmarking%20IT%202009.pdf.
25. Soumitra Dutta and Irene Mia, eds., *The Global Information Technology Report 2010-2011: Transformations 2.0* (Geneva: World Economic Forum, 2011), 31, http://www3.weforum.org/docs/WEF_GITR_Report_2011.pdf.
26. J. Scott Marcus et al., *Comparison of Privacy and Trust Policies in the Area of Electronic Communications* (Bad Honnef, Germany: wik-Consult, 2007), http://ec.europa.eu/information_society/policy/ecomm/doc/library/ext_studies/privacy_trust_policies/final_report_20_07_07_pdf.pdf.
27. National Information Society Agency, *Informatization* White Paper, 24.
28. Nagy K. Hanna et al., "National E-Government Institutions: Functions, Models and Trends," in World Bank, *Information and Communication for Development*, 84.
29. United Nations Department of Economic and Social Affairs, *United Nations E-Government Survey 2010* (New York: United Nations, 2010), http://unpan1.un.org/intradoc/groups/public/documents/un/unpan038851.pdf.

30. Australian Bureau of Statistics, "Australian Businesses Take $143 Billion Worth of Internet Orders," news release, June 23, 2011, http://www.abs.gov.au/ausstats/abs@.nsf/Latestproducts/8166.0Media%20Release12009-10?opendocument&tabname=Summary&prodno=8166.0&issue=2009-10&num=&view=.
31. Ibid.
32. Romina Cachia, *Social Computing: Study on the Use and Impact of Online Social Networking* (Brussels: European Communities, 2008), http://ftp.jrc.es/EURdoc/JRC48650.pdf.
33. Soumitra Dutta and Irene Mia, *Global Information Technology Report 2010-2011: Transformations 2.0* (Geneva: World Economic Forum, 2011), http://www3.weforum.org/docs/WEF_GITR_Report_2011.pdf.
34. World Bank, *Information and Communications for Development 2009: Extending Reach and Increasing Impact* (Washington, D.C.: World Bank, 2009); International Monetary Fund, International Financial Statistics (Exchange Rates; PPP Conversion Factor; accessed November 21, 2011).
35. "Information and Communications Policy, National Broadband Plans of OECD Countries," OECD, accessed September 25, 2011, http://www.oecd.org/countrylist/0,3349,en_2649_34223_38711225_1_1_1_1,00.html; International Telecommunications Union Statistics Database (Countries with a Separate Regulator; accessed September 26, 2011), http://www.itu.int/ITU-D/icteye/Indicators/Indicators.aspx; Dutta and Mia, *Global Information Technology Report 2010–2011*.
36. "Information Technology: Schedules of Concessions," World Trade Organization, accessed September 26, 2011, http://www.wto.org/english/tratop_e/inftec_e/itscheds_e.htm.
37. World Trade Organization, Tariff Analysis Online (HS Subheading Duties; accessed September 22, 2011), http://tariffanalysis.wto.org/.
38. World Bank, World Trade Indicators 2009/10 (ITU Foreign Participation/Ownership in Telecom Sector; accessed September 29, 2011), http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/TRADE/0,,contentMDK:22421950~pagePK:148956~piPK:216618~theSitePK:239071,00.html; International Telecommunications Union Statistics Database (IP Telephony; Interconnection Agreements and Prices/Reference Interconnection Offers; accessed September 26, 2011), http://www.itu.int/ITU-D/icteye/Indicators/Indicators.aspx; United States Federal Communication Commission, International Traffic Data, (2009 Annual Section 43.61 International Traffic Data for All U.S. Points: All Settlement Arrangements; accessed September 21, 2011), http://transition.fcc.gov/ib/sand/mniab/traffic/files09/pdfs/TAB-A14.pdf.
39. World Bank, *Information and Communications for Development 2009*.
40. Economist Intelligence Unit, *Resilience amid Turmoil: Benchmarking IT Industry Competitiveness 2009* (London: Economist Intelligence Unit, 2009); Dutta and Mia, *Global Information Technology Report 2010–2011*; International Telecommunications Union Statistics Database (Countering Spam Legislation and Responsible Countering Spam Authority; accessed September 26, 2011), http://www.itu.int/ITU-D/icteye/Indicators/Indicators.aspx.
41. Dutta and Mia, *Global Information Technology Report 2010–2011*; United Nations Department of Economic and Social Affairs, *United Nations E-Government Survey 2010*.
42. World Information Technology and Services Alliance, *Digital Planet 2010* (Vienna, VA: WITSA, 2010).
43. Dutta and Mia, *Global Information Technology Report 2010–2011*.
44. World Information Technology and Services Alliance, Digital Planet 2010.
45. Dutta and Mia, *Global Information Technology Report 2010–2011*.

Chapter 7 Endnotes

1. FORA, New Nature of Innovation (Copenhagen: OECD, 2009), 81, http://www.newnatureofinnovation.org/full_report.pdf.
2. Jakob Edler and Luke Georghiou, "Public Procurement and Innovation—Resurrecting the Demand Side," *Research Policy* 36 (7), (2007), http://dimetic.dime-eu.org/dimetic_files/EdlerGeorghiou2007.pdf.
3. C. Palmberg, "The sources of innovations—looking beyond technological opportunities," *Economics of Innovation and New Technology* 13 (2004): 183–197, http://www.tandfonline.com/doi/abs/10.1080/10438590410001628143.
4. R. Rothwell, "Technology based small firms and regional innovation potential: the role of public procurement," Journal of Public Policy 4, no. 4 (1984): 307–332.
5. Edler and Georghiou, "Public Procurement and Innovation—Resurrecting the Demand Side," 950.
6. Vinnova, "Public Procurement as a Driver for Innovation and Change," Vinnova Policy, 3 (2007), 26, http://www.vinnova.se/upload/EPiStorePDF/vp-07-03.pdf.
7. VINNOVA, Public Procurement as a Driver for Innovation and Change – Report on Government Commission to Nutek and VINNOVA (Stockholm: VINNOVA, 2007), http://www.vinnova.se/upload/EPiStorePDF/vp-07-03.pdf.
8. Australian Ministry of Innovation, Industry, Science, and Research, "Powering Ideas: An Innovation Agenda for the 21st Century," 2009, 54, http://www.innovation.gov.au/Innovation/Policy/Documents/PoweringIdeas.pdf.
9. Stephen Ezell, "Explaining International Leadership in Contactless Mobile Payments," Information Technology and Innovation Foundation, November 2009, 6, http://www.itif.org/files/2009-Mobile-Payments.pdf.
10. Stephen J. Ezell and Robert D. Atkinson, The Good, The Bad, and the Ugly (and the Self-Destructive) of Innovation Policy: A Policymaker's Guide to Crafting Effective Innovation Policy, Information Technology and Innovation Foundation, October 2010, 81, http://www.itif.org/files/2010-good-bad-ugly.pdf.

11. Ezell and Atkinson, The *Good, Bad, and Ugly* of Innovation Policy.
12. Jakob Edler and Luke Georghiou, "Public Procurement and Innovation—Resurrecting the Demand Side," 961.
13. United States Trade Representative's Office, *2011 National Trade Estimate Report on Foreign Trade Barriers (NTE)*, 2011, 29, http://www.ustr.gov/webfm_send/2751.
14. The White House, "U.S.-China Joint Statement," January 19, 2011, http://www.whitehouse.gov/the-press-office/2011/01/19/us-china-joint-statement.
15. World Trade Organization, "Parties and Observers to the GPA," http://www.wto.org/english/tratop_e/gproc_e/memobs_e.htm.
16. European Commission Market Access Database, "Canada: Public procurement," http://madb.europa.eu/madb_barriers/barriers_details.htm?barrier_id=970273&version=4.
17. European Commission Market Access Database, "Japan: Government procurement: restricted access," http://madb.europa.eu/madb_barriers/barriers_details.htm?barrier_id=095262&version=2.
18. Alan Wm. Wolff, "Testimony Before the U.S. China Economic and Security Review Commission," 22.
19. Global Trade Alert, "Statistics: "Measure Type: Public procurement or Local content requirement," http://www.globaltradealert.org/site-statistics.
20. Global Trade Alert, "Russia: Preferences to domestic producers in amendments to Government Procurement Law," January 18, 2010, http://www.globaltradealert.org/measure/russia-preferences-domestic-producers-ammendments-government-procurement-law.
21. Global Trade Alert, "Russia: Government Procurement preferences to domestic car producers," May 23, 2010, http://www.globaltradealert.org/measure/russia-government-procurement-preferences-domestic-car-producers.
22. Global Trade Alert, "Brazil: Implementation of Government Procurement Preferences under 'Bigger Brazil Plan,'" September 27, 2011, http://www.globaltradealert.org/measure/brazil-implementation-government-procurement-preferences-under-%E2%80%9Cbigger-brazil-plan%E2%80%9D.
23. Global Trade Alert, "Brazil: Public Procurement Ban and Tariff Increase on Imported Wind Turbines," August 6, 2009, http://www.globaltradealert.org/measure/brazil-public-procurement-ban-and-tariff-increase-imported-wind-turbines.
24. Global Trade Alert, "Spain: State Fund for a Dynamic Economy and Employment," August 20, 2009, http://www.globaltradealert.org/measure/spain-state-fund-dynamic-economy-and-employment.
25. Global Trade Alert, "Japan: 'Buy Local' at the provincial level," January 18, 2010, http://www.globaltradealert.org/measure/japan-buy-local-provincial-level.
26. Global Trade Alert, "United States of America: Buy American provisions for Amtrak," December 15, 2009, http://www.globaltradealert.org/measure/united-states-america-buy-american-provisions-amtrak.
27. Global Trade Alert, "Indonesia: Local content requirement for energy service contractors," March 24, 2010, http://www.globaltradealert.org/measure/indonesia-local-content-requirement-energy-service-contractors.
28. USTR, *2011 National Trade Estimate Report on Foreign Trade Barriers*, 243.
29. USTR, *2011 National Trade Estimate Report on Foreign Trade Barriers*, 379.
30. Opinions of the Ministry of Finance on Implementing Government Procurement Policies That Encourage Indigenous Innovation, Ministry of Finance, June 13, 2006.
31. The White House, "U.S.-China Joint Statement," January 19, 2011, http://www.whitehouse.gov/the-press-office/2011/01/19/us-china-joint-statement.
32. Alan Wm. Wolff, "Testimony Before the U.S. China Economic and Security Review Commission," 19.
33. Global Trade Alert, "Russian Federation: Introduction of the single website for the Government procurement auctions," March 22, 2011, http://www.globaltradealert.org/measure/russian-federation-introduction-single-website-government-procurement-auctions.
34. David S. Jones, "Public Procurement in Southeast Asia: Challenge and Reform," *Journal of Public Procurement*, 7, Issue 1 (2007): 5, http://www.ippa.ws/IPPC2/JOPP7_1/Article_1_JONES.pdf.
35. Bedri K. O. Tas and Ahu Genis-Gruber, "E-Procurement Savings and the Competition Effect: Analysis of Cultural Differences Through a Unified Model" (working paper No: 08-15, November 2008), http://ikt.web.etu.edu.tr/RePEc/pdf/0815.pdf.
36. Simon J. Evenett, "Government Procurement Policies and International Trade: Economic Considerations," http://www.evenett.com/publicpolicy/presentations/WTIProcurement07.ppt.
37. Evenett, "Government Procurement Policies and International Trade: Economic Considerations."
38. Gwartney, Hall, and Lawson, *Economic Freedom of the World Index 2010 Annual Report*, 3.
39. Gwartney, Hall, and Lawson, *Economic Freedom of the World Index 2010 Annual Report*, 219.
40. Gwartney, Hall, and Lawson, *Economic Freedom of the World Index 2010 Annual Report*, (data collected from individual economy profiles throughout the report).
41. OECD, "State Owned Enterprises in India: Reviewing the Evidence" (technical report, OECD, Paris, January 2009), 10, http://www.oecd.org/dataoecd/14/28/42095406.pdf.
42. OECD, *Corporate Governance in Israel 2011* (Paris: OECD, 2011), 35, http://dx.doi.org/10.1787/9789264097698-en.
43. Cabinet of Ministers of the Republic of Latvia, *Annual Review: Latvian State-Owned Assets 2009* (Riga: Cabinet Ministers of the Republic of Latvia, 2009), http://www.mk.gov.lv/files/2009_Latvia_Annual_Review_20100921.pdf.
44. "State-Owned Enterprises: Challenge and Opportunity," National Planning Commission, Republic of South Africa, accessed October 10, 2011, http://www.npconline.co.za/pebble.asp?relid=78.
45. Gwartney, Hall, and Lawson, *Economic Freedom of the World Index 2010 Annual Report*, 219.

46. OECD, *State-Owned Enterprises and the Principle of Competitive Neutrality* (Paris: OECD, 2010), http://www.oecd.org/dataoecd/43/52/46734249.pdf.
47. U.S. Department of State, "Background Note: China—Industry," http://www.state.gov/r/pa/ei/bgn/18902.htm.
48. Zhou Xin and Simon Rabinovitch, "China Inc. Gets New Chairman as State-Owned Firms' Clout Grows," Reuters, September 6, 2010, http://uk.reuters.com/article/2010/09/06/business-us-china-economy-state-idUKTRE68514720100906; "China state giants outstrip private firms," *Channel News Asia*, August 30, 2010, http://www.channelnewsasia.com/stories/afp_asiapacific_business/view/1077996/1/.html.
49. Transparency International, "APEC Procurement Transparency Standards in Mexico," 7, http://www.cipe.org/publications/papers/pdf/TI-Report-Mexico.pdf.
50. Terry Miller and Kim Holmes, *2011 Index of Economic Freedom*, The Heritage Foundation, 2011, 456, http://www.heritage.org/Index/pdf/2011/Index2011_Full.pdf.
51. Transparency International, "Corruption Perceptions Index 2010," 2010, 4, http://www.transparency.org/policy_research/surveys_indices/cpi/2010/in_detail#1.
52. Transparency International, "Corruption Perceptions Index 2010," 1.
53. For related proposals, see Daniel Castro and Robert D. Atkinson, "Ten Ideas for Policymakers to Drive Digital Progress," *IEEE Internet Computing*, Vol. 13, no. 2, March/April 2009, http://www.itif.org/files/IC-TenIdeas.pdf; Daniel D. Castro and Robert D. Atkinson, "The Next Wave of E-Government," StateTech Magazine, 2010, http://statetechmag.com/events/updates/the-next-wave-of-e-government.html.
54. Michael Grunwald, "How the Stimulus is Changing America," *Time*, August 26, 2010, http://www.time.com/time/nation/article/0,8599,2013683,00.html.
55. Transparency International, "Corruption Perceptions Index 2010," 8–10.
56. Schwab et al., *Global Competitiveness Report*, 492.

Chapter 8 Endnotes

1. David Hart, Sultan Aces, and Spencer Tracy, Jr., "High-tech Immigrant Entrepreneurship in the United States" (technical report, Small Business Administration, Washington, D.C., July 2009), http://www.sba.gov/advo/research/rs349tot.pdf. See page 35 of the report for a table comparing studies of the foreign-born share of high-tech entrepreneurship in the United States.
2. Antony Davies, "Costs and Benefits of High Skilled Immigration" (presentation, Foreigners Welcome? The Economics of High Skilled Immigration, Rayburn House Office Building, Washington, D.C., March 31, 2009), 12, http://mercatus.org/events/foreigners-welcome-economics-high-skilled-immigration.
3. Robert D. Atkinson, "H-1B Visa Workers: Lower-Wage Substitute, or Higher-Wage Complement" (technical report, ITIF, Washington, D.C., June 2010), http://www.itif.org/files/2010-H1B-Visa.pdf.
4. Ibid, 2–3.
5. Hashish Arora, Lee Branstetter, and Mate Drev, "Going Soft: How the Rise of Software Based Innovation Led to the Decline of Japan's IT Industry and the Rise of Silicon Valley" (working paper, National Bureau of Economic Research, Cambridge, MA, July 2010), 1, http://www.nber.org/papers/w16156.
6. Ibid, 39.
7. "People protectionism," *Economist*, July 1, 2009, http://www.economist.com/node/13938782.
8. David Hart, "Global Flows of Talent: Benchmarking the United States" (technical report, ITIF, Washington, D.C., November 17, 2006), http://www.itif.org/files/Hart-GlobalFlowsofTalent.pdf.
9. While it is likely that skilled STEM talent can make a greater contribution to global innovation if they are located in more technologically advanced nations, competition between countries for human service skills—such as teachers and nurses— very well could harm lower-income nations sending their skilled human service workers to richer nations like the United States. For countries like the United States to recruit teachers and nurses from developing nations simply reduces the number of these key skilled workers in these nations where they could make highly valuable contributions.
10. Surrender Gera and Tahitian Songsakul, "Benchmarking Canada's Performance in the Global Competition for Mobile Talent," *Canadian Public Policy* 33, no. 1 (2007): 63–84, http://economics.ca/cgi/jab?journal=cpp&view=v33n1/CPPv33n1p063.pdf.
11. Demetrios G. Papademetriou, "Talent, Competitiveness and Migration: Selected Book Highlights and Policy Takeaways," (presentation, October 28, 2009), 2, https://secure.migrationpolicy.org/images/2009.10.28%20Papademetriou.pdf.
12. Demetrios Papademetriou and Madeleine Sumption, *Rethinking Points Systems and Employer-Selected Immigration* (Washington, D.C.: Migration Policy Institute, 2011), 1, http://www.migrationpolicy.org/pubs/rethinkingpointssystem.pdf.
13. Hart, "Global Flows of Talent."
14. Papademetriou and Sumption, *Rethinking Points Systems*, 2.

15. Australian Government Department of Immigration and Citizenship, "Visas, Immigration and Refugees," http://www.immi.gov.au/skilled/general-skilled-migration/points-test.htm; Citizenship and Immigration Canada, "Skilled workers and professionals: Self-assessment test," http://www.cic.gc.ca/english/immigrate/skilled/assess/index.asp; Immigration Department of The Government of the Hong Kong Special Administrative Region, "Public Services: General Points Test," http://www.immd.gov.hk/ehtml/QMAS_8.htm; QADKAM, "Malaysian Immigration Opens," http://www.qadkam.com/pr.htm; Immigration New Zealand, "The Skilled Migrant Category Points Indicator," http://www.immigration.govt.nz/pointsindicator/; Korea.net, "Gov't launches point system for F-2 residence status," April 7, 2010, http://www.korea.net/news.do?mode=detail&guid=45539.
16. Papademetriou and Sumption, *Rethinking Points Systems*, 3.
17. Ibid., 4.
18. Ibid.
19. Ibid., 5.
20. Ibid.
21. However, the latest available data is from 2000, because data is based on decennial censuses, and data from the 2010 censuses undertaken in many economies is not yet available.
22. Frédéric Docquier et al., "International Migration Data Sets: Data Set 1990–2000 (Rel. 1.1)," http://perso.uclouvain.be/frederic.docquier/oxlight.htm.
23. Docquier et al., "International Migration Data Sets: Data Set 1990–2000 (Rel. 1.1)."
24. Docquier et al., "International Migration Data Sets: Data Set 1990–2000 (Rel. 1.1)."
25. Data on Immigrants as a Share of Population from: United Nations, Department of Economic and Social Affairs, Population Division, Trends in International Migrant Stock: The 2008 Revision, http://esa.un.org/migration/ (accessed September 19, 2011); Data on High-Skill Immigrants as a Share of Immigrants from: Docquier et al., "International Migration Data Sets: Data Set 1990–2000 (Rel. 1.1)," http://perso.uclouvain.be/frederic.docquier/oxlight.htm.

KAUFFMAN
The Foundation of Entrepreneurship

www.kauffman.org

4801 Rockhill Road
Kansas City, MO 64110
(816) 932-1000

ITIF
The Information Technology & Innovation Foundation

www.itif.org

1101 K Street, NW • Suite 610
Washington, DC 20005
(202)449-1351
Fax: (202) 638-4922

To download this report, go to www.kauffman.org/globalinnovationpolicy or to www.itif.org/globalinnovationpolicy

We'd also like to acknowledge the following individuals for their contributions to this report:

Dr. Suk-Gwon Chang, Professor, Hanyang University;
Dr. Atsushi Sunami, Associate Professor,
National Graduate Institute for Policy Studies Japan;
John Zoshak.

To download this report, go to www.kauffman.org/globalinnovationpolicy or to www.itif.org/globalinnovationpolicy

www.itif.org

Information Technology and Innovation Foundation
1101 K Street, NW • Suite 610 • Washington, DC 20005
email: mail@itif.org • Telephone: (202) 449-1351 • Fax: (202) 638-4922

02111000JP