Principles for National Innovation Success

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For many decades, international economists assumed that developed nations innovated and developing nations received those innovations through foreign direct investment (FDI), licensing and other forms of technology transfer, or simply by purchasing products. But now—because the ubiquitous rise of technologies such as the Internet, growing access to the world's knowledge pools, and deepening global supply chains have greatly reduced the cost of innovating—there is a growing recognition that innovation is something in which all nations can, and indeed should, be engaged.

Although few if any emerging economies can be at the global forefront of producing innovation in the most-advanced technology sectors, such as biotech and semiconductors, they can certainly engage in innovation in some specialized areas. They can also host production sites in innovation-based industries. Moreover, because innovation—as defined in the Global Innovation Index (GII) and elsewhere—is more than merely the development of advanced technology products but also involves the development of new processes and business models across all industries, all nations need to consider how they can best participate in and contribute to the global innovation economy.

But the real question is how. In fact, how to design and implement effective innovation policies in the context of lower- and middle-income economies is the theme of this edition of the GII. The many examples of global best practices for supporting innovation include everything from enabling start-up firms to register online easily with the government to implementing research and development (R&D) tax credits and supporting broadband deployment. Guiding any actions to spur innovation should be a set of innovation policy principles that nations, both developed and developing, can follow to maximize innovation advantage. This chapter presents six key principles nations need to consider, in conjunction with the lessons drawn from Chapter 3, 'Innovation Policies for Development'.

Principle 1: Innovation policy should focus on maximizing innovation in all industries

All too often when policy makers consider ways to spur innovation, their focus goes to the production of high-tech, high-value-added products. How can they open a data centre or attract a biotech firm to locate within their borders? How can they launch the next global technology company? A related but slightly more encompassing view focuses on spurring manufacturing above all else.

This focus on high-valued-added tradable goods mirrors a long tradition in international development literature of trying to grow by shifting a nation's industrial structure. A seminal 1943 paper by Rosenstein-Rodan, which argued for investment in manufacturing, set the stage for this framework when he discussed how 'unemployed workers ... are taken from the land and put into a large new shoe factory.'[1] Fifteen years later Hirschman doubled down on manufacturing with his theory of forward and backward linkages, which was largely premised on the notion of large-scale capital formation in select manufacturing industries that in turn provided linkages and other economic activities.[2] As Dasgupta and Singh explain, Cambridge economist Nicholas Kaldor built on these concepts, arguing that 'the rate of productivity growth depends on the expansion of the manufacturing sector. Expansion of the manufacturing sector will lead to more productivity growth from the manufacturing sector, which will lead to more productivity across the whole economy.'[3] If development no longer focuses on the shoe factory, it now focuses on the semiconductor factory.

Despite this tradition—and, frankly, this bias—in development literature and development practice, more recent evidence suggests that it is not the shift to high-tech production that maximizes growth in developing nations but rather it is the spurring of innovation in all

sectors, *including* traditional sectors such as farming, retail, logistics, and business services.[4] The ability to boost productivity in non-manufacturing sectors more easily through the application of information and communication technologies (ICTs) along with recognition of the increasing importance of traded services sectors has driven this new understanding. This explains why an increasingly robust body of economic literature finds that across-the-board productivity growth is actually the key driver of economic growth.[5] In other words, the productivity and innovation capacity of all of a country's sectors matter more than whether or not the nation develops a few innovation-based industries. That is why Uganda's National Science, Technology, and Innovation Plan, launched in 2012, recognizes the need to 'develop a sector-wide' approach to stimulate innovation across all sectors of Uganda's economy, including the agricultural, energy, services, and information technology sectors.[6] Likewise, Kenya envisions Konza, the Technology City of Kenya, as a hub for the development of innovative technologies empowering entrepreneurial start-ups launching innovative businesses in a range of sectors, from agriculture to mobile banking and ICT services.[7] Similarly, Ghana established its Farmer Field Fora, a participatory extension approach that leverages elements of the innovation systems perspective, which has been demonstrated to help farmers innovate.[8]

In a 2010 report, the McKinsey Global Institute provided compelling evidence that the developing nations that emphasize an across-the-board productivity and innovation approach perform best.[9] The report finds that countries that outperform their peers on productivity do not have a more 'favorable' sector mix (e.g., more high-tech industries), but instead have more productive firms overall, regardless of sector. Similarly, Kucera and Roncolato find that productivity growth across all sectors is more powerful than reallocating the mix of sectors towards those with higher productivity growth.[10] For India, for example, the authors find that within-sector effects contributed 5% and reallocation effects just 0.3% to India's average annual labour productivity growth from 1999 to 2008. That is, the growth effect accounted for 94% of all productivity growth. In short, while manufacturing generally, and high-tech manufacturing specifically, is an important component of innovation, maximizing innovation requires maximizing innovation across all industries.

Principle 2: Innovation policy should support all types and phases of innovation

To be most effective, countries' innovation activity should not only focus on all industries, it should also consider all points of the innovation value chain—in all types of innovation and along all phases of development. For the reality is that innovations can arise at many different points in the development process, including conception, R&D, transfer (the shift of the 'technology' to the production organization), and deployment or marketplace usage. Yet one of the biggest mistakes countries make with their innovation strategies is that they define innovation too narrowly, focusing mainly on developing and manufacturing high-tech products.

The Organisation for Economic Co-operation and Development (OECD) correctly notes in its *Oslo Manual* that innovation can entail a new product, process, marketing method, or organizational innovation.[11] Keely and Waters go further, arguing in their book *Ten Types of Innovation: The Discipline of Building Breakthroughs* that when it comes to business innovations there are multiple types of innovation, including network innovations, business structure innovations, service innovations, and channel innovations.[12] Their research demonstrates that firms that focus only on product innovations achieve suboptimal innovation performance. The same is true for a nation. Nations that succeed in innovation need all organizations in all industries to be able to innovate in all areas, not just new products from firms in high-tech industries. Nations also increasingly recognize that if they are to succeed 'at innovation' (especially the type of innovation that is not purely technological in nature) they need to train their CEOs, entrepreneurs, government staff, and so on in the latest tools and methods available to stimulate the development of innovative concepts and business models. Indeed, an increasing number of tools—such as the Business Model Canvas, the Autodesk Innovation Genome, and the Ten Types of Innovation—can help individuals think about innovation in a structured, systemic way, providing a resource equally valuable to policy makers and to business people.

Moreover, just as innovation is more than the development of shiny new widgets, innovation policy is more than just science policy. Innovation policy involves the same set of policy issues that countries deal with all the time, but it focuses on ways to address those issues with a view towards maximizing innovation and productivity. For example, countries can operate their government procurement practices the

same way they always have, or they can reorganize their practices in a manner specifically designed to promote innovation. Likewise, they can organize their corporate tax systems simply to raise revenues or to raise revenues in ways that also drive innovation and traded-sector competitiveness. They can set up their science policies just to support science, or they can organize their investments in scientific research in ways that also support technology commercialization and the innovation needs of industry.

The most sophisticated countries recognize this. Their innovation strategies constitute a coherent approach that seeks to coordinate disparate policies towards scientific research, technology commercialization, ICT investments, education and skills development, tax, trade, intellectual property (IP), government procurement, and regulation in an integrated fashion that drives economic growth by fostering innovation. As Finland's National Innovation Strategy argues, it is vital that a nation's innovation strategies comprehensively address a broad set of policy issues because 'piecemeal policy measures will not suffice in ensuring a nation's pioneering position in innovation activity, and thus growth in national productivity and competitive ability.'[13]

Principle 3: Enable churn and creative destruction

If innovation across all industries and parts of the innovation value chain is the key to innovation success and growth, then one critical ingredient in allowing this to happen is the embrace of churn and what noted innovation economist Schumpeter called 'creative destruction'.[14] That is, to succeed in innovation, nations need to do more than merely enable some value-added innovation to supplement what is already going on in other, leading economies. They need to enable disruptive innovation, which is often generated by new market entrants, especially those emerging in their own economies.

A key factor in enabling disruptive innovation is the presence of competitive markets. As William Lewis, the former head of the McKinsey Global Institute, has argued, perhaps no factor is more essential to driving economic growth than the presence of competitive markets. He finds that '[d]ifferences in competition in product markets are much more important [than differences in labour and capital markets]. Policies governing competition in product markets are as important as macroeconomic policies.'[15]

When countries design policies of all kinds to spur competition, this not only enables disruptive new entrants to gain market share, it also forces incumbent organizations to respond by becoming more innovative in order to survive. 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. But countries that protect entrenched, incumbent, or politically favoured industries from market-based competition only damage their own country's productivity and economic growth potential.

One straightforward way countries can foster competition is to make it easier to start a new business, a process that is needlessly complex and time consuming in too many countries. In some nations it can take more than a year to start a new business. Yet the evidence clearly shows that delays caused by entry regulations are associated with lower rates of firm entry. Malaysia requires just three procedures to start a business, ranking 15th in the 2014 GII for the ease of starting a business, while Armenia ranked 6th in this indicator.

However, just as an economy needs to make it easy for businesses to start, it also needs to make it easy for them to fail or to downsize so that innovators can take their place. This means reasonable bankruptcy policies and policies enabling labour market flexibility such that talent can be deployed (or redeployed) to the most productive pursuits. Yet many nations, desperate to keep employment high, do the opposite and try to protect workers from business downsizings and closings. Paradoxically, this situation results not in worker protection, but in employers deciding that they will minimize the numbers of workers they need. As the World Bank's World Development Report 2013 notes, 'Creative destruction, the mainstay of economic growth, happens to a large extent through labor reallocation. As workers move from jobs in low-productivity firms and obsolete firms to jobs in more dynamic economic units, output increases and the economy moves closer to the efficiency frontier.'[16]

One crucial driver of competitive markets is the ability of foreign firms to compete in domestic markets, either through exports or through direct investment. Research shows that FDI can contribute significantly to regional innovation capacity and economic growth. For example, foreign R&D investments have 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.[17] Clearly this is not an either-or situation.

Innovation cannot thrive in nations that depend solely on either foreign or domestic enterprises alone. They need a healthy ecosystem of both.

Principle 4: Keep the price of capital goods imports, especially ICT imports, low

Innovation success is not just about coming up with good ideas. It is also about process innovation, which is enabled by investment in machinery, equipment, and software, particularly ICTs. This makes robust capital investment in machinery, equipment, and software a fundamental driver of innovation and productivity growth. Without new capital investment refreshing a nation's capital stock, innovation loses its power, productivity growth stagnates, and business competitiveness declines. Firms' investments in capital equipment are especially important because they produce spillovers that extend beyond the firm itself and benefit the broader economy. For example, van Ark finds that the spillovers from investment in new capital equipment are larger than the size of the benefits accrued by the investing firm.[18] In other words, the total benefits to society from firms investing in ICTs are twice as large as the benefits received by the investing firm.

The impact on growth from investment in some capital goods—notably ICTs—is amplified because these investments enable downstream innovations in products, processes, marketing methods, and business organization. In fact, many economists consider ICTs to be a 'general purpose technology' that delivers outsized impacts—and not just in a few industries or application areas, but across virtually all industries and applications.[19] For example, Hitt and Tambe find that the spillovers from firms' investments in information processing, equipment, and software (IPES) are 'significant and almost as large in size as the effects of their own IPES investment.'[20] This is a primary reason why ICTs generate a bigger return to productivity growth than most other forms of capital investment. It also explains why ICTs have become the global economy's greatest driver of economic growth, in developed and developing countries alike. For instance, Heshmati and Yang find that ICTs accounted for 38% of Chinese total factor productivity growth and as much as 21% of Chinese gross domestic product (GDP) growth from 1980 to 2001.[21] Updating these data in 2013, Wang and Lin find that the contribution of ICTs to Chinese GDP growth remained steady at approximately 20% from 2003 to 2007.[22] Likewise, a World Bank report finds that 'ICT has been the main driver of Kenya's economic growth over the last decade', with ICTs responsible for roughly one-quarter of Kenya's GDP growth during the 2000s.[23] As Manchester University's Richard Heeks concludes, 'ICTs will have contributed something like one-quarter of GDP growth in many developing countries during the first decade of the twenty-first century.'[24] ICTs are particularly vital in developing nations that are further from the production possibility frontier and where there is still a vast amount of low-hanging fruit that ICT investment can capture. For example, simple things such as enabling the restructuring of the retail industry so that larger, ICT-driven chains can gain more market share can play a significant role in driving productivity.

There are several ways countries can keep the cost of capital goods low. The easiest and most important is to limit tariffs and other trade barriers. A number of studies have shown that nations that impose tariffs on ICT goods to create a competitive domestic ICT industry succeed only in limiting adoption of ICTs by users (businesses and consumers) by raising prices. Nations should also be sure to not tax ICT products at a higher rate than other products. Likewise, local content requirements for capital goods and ICT goods, by definition, raise the price of ICT goods for domestic businesses and consumers. In fact, a recent Information Technology and Innovation Foundation (ITIF) report estimates yearly growth reductions to be between 0.7 percentage points and 2.3 percentage points of GDP per capita for countries with the highest tax and tariff rates on ICT products.[25]

Although many nations impose high taxes and tariffs on ICT products in an attempt to either boost government revenue or to create a competitive domestic ICT industry or both, many nations—including China, Georgia, Malaysia, and Viet Nam—do a reasonably good job of limiting government-imposed costs on ICT products. The World Trade Organization's Information Technology Agreement, chartered in 1996, has played an important role in reducing tariffs on global trade in ICT products—and contributing to increased ICT goods and services exports from the countries participating in the agreement.[26] For example, Malaysia saw its exports of ICT goods increase by more than 50% from 1996 to 2011. In contrast, developing nations that did not join the Information Technology Agreement have seen their participation in global value chains for the production of ICT products decline by over 60% since that year.[27]

More proactively, nations can ensure that their tax policies towards capital investment are favourable. Many nations have put in place or expanded tax incentives designed to spur investment, including investment in manufacturing plants and equipment. In Malaysia, for example, companies can depreciate general plant and equipment over six years, and heavy machinery over four years; they can depreciate computer and information technology (IT) equipment even faster. For corporate income tax purposes, Brazil allows 100% depreciation in the year of acquisition for new machinery, equipment, and instruments exclusively dedicated to R&D as well as 100% amortization for intangibles used in R&D.

Principle 5: Support the creation of key innovation inputs

Firms not only need access to best-in-class, affordable ICT inputs, they also need access to other key innovation inputs, including digital infrastructure, a skilled workforce, and knowledge—both its production and its transfer.

Although physical infrastructures remain important, today digital infrastructure is a crucial enabler of innovation. Digital infrastructure is about much more than the landline telephone networks of the past. Today it refers to the deployment of advanced wireless telecommunications networks and high-speed broadband networks as well as to spurring deployment of a range of ICT applications, from intelligent transportation systems and mobile payments to health IT, digital signatures, and e-government. But although effective ICT policies can spur the digital transformation of a country's economy, they require that countries coordinate policies regarding competition and regulation, R&D, universal service, and spectrum allocation, often as part of national informatization plans. For example, the Modi government in India unveiled in 2014 its Digital India programme, which—among other goals—seeks to provide high-speed Internet access to every Indian village while also enabling universal access to mobile phones.[28] Africa is the world's fastest-growing mobile market, with the fastest growth occurring in African countries whose governments have implemented proactive policies to spur the digital transformation of their societies. For example, Kenya's National ICT Master Plan 2013/14–2017/18,[29] introduced in April 2014, has played a vital role in developing a strategy to comprehensively deploy digital infrastructure, notably wireless and broadband Internet, throughout Kenya and to complement that availability of infrastructure with demand for it generated by popular applications such as mobile money and mobile government services. One result is that 93% of Kenyans are mobile phone users and 73% are mobile money customers.[30]

Providing access to quality education is fundamental to any country's long-term economic success. Countries increasingly recognize talent as a vital source of competitive advantage and thus have made education and training a core component of their innovation strategies. These countries recognize that talent has become 'the world's most sought after commodity'.[31] They know that, if a child receives an education, he or she is much more likely to get out of poverty and achieve a more prosperous future. But success in innovation requires more than broad-based, quality education; it means a serious focus on science, technology, engineering, and math (STEM) education. For example, the Jordan Education Initiative seeks to enable Jordanian students to compete in the global knowledge economy in large part by focusing on STEM education, training teachers and administrators to use technology in the classroom, and guiding students through critical thinking and analysis.[32]

Ideally the focus of countries' strategies for educating their citizens should be broader than STEM to encompass STEEM (with the second 'E' standing for entrepreneurship). Policy makers around the world have increasingly come to realize that entrepreneurship, particularly high-growth entrepreneurship, is critical for economic development. Public policy can play a central role in supporting this entrepreneurship. One place to start is with entrepreneurial education (this is a central focus of innovation policy in Uganda, for example), because entrepreneurship is more than just talent and knowledge. Some nations have both in ample supply, but they lag in entrepreneurship, in part because of culture, but also in part because they do not do enough to teach and support entrepreneurship. Governments should support entrepreneurship education at both the high school and college levels. In addition, governments can help provide entrepreneurial 'infrastructure' such as accelerators—organizations that provide space for entrepreneurs and linkages to mentors and potential customers. This is why the United Nations Children's Fund (UNICEF) created a global network of innovation labs that act as accelerators that bring businesses, universities, governments, and civil society together to create sustainable solutions to the most pressing challenges facing children and youth.[33] The lab model creates opportunities for young people, who have a unique insight into the

challenges that affect their communities, and helps them team up with local leaders to develop creative and sustainable solutions to the problems they identify as a priority.

These kinds of support and intermediary organizations also can play a critical role in vetting and giving entrepreneurs a seal of approval, making it easier for a high-growth entrepreneur to make a pitch for their business or product to angel investors and customers. Yet it is very hard for potential investors or customers to know whether they are dealing with someone who has the next big thing or simply a person with an interesting, but not marketable, idea. For this reason, one role of innovation incubators such as the 1776 global incubator located in Washington, DC, is to evaluate entrepreneurs and show a portfolio of similar start-ups to bigger 'buyers'.[34]

Because entrepreneurship is so risky and often involves first-time entrepreneurs, initiatives to help entrepreneurs learn from each other can be critical. Hence the proposal for a global entrepreneurship corps—where leaders from other sectors bring capital, ideas, and mentorship and meet in specific cities where there is limited access to such talent and resources—may play an important role. In addition, setting up a web-based global entrepreneurship mentorship programme whereby mentors in developed nations can help budding entrepreneurs in developing nations, perhaps through Internet telephony tools, can also be a valuable tool.

In addition, a country's science and R&D policies are crucial determinants of its economic vitality. Relevant policies here include robust and growing public funding for R&D, ensuring that businesses have incentives to invest in R&D, and implementing policies that enable a nation's organizations to adopt newer and better technologies than are currently in use. Underlying these policies is the fact that, without them, the level of innovation in an economy is almost always 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 underpin innovation, including R&D.

Because small and medium-sized enterprises (SMEs) account for such a large share of enterprises in many developing countries, it is important that nations implement programmes to help those SMEs boost their productivity and innovation capacity. For example, India's Ministry of Micro, Small, & Medium Enterprises (MSME) aims to strengthen the science and technology potential of Indian MSMEs in semi-urban and rural areas, offering various awards and incentives to encourage entrepreneurship, cluster networking, and support to target groups—initiatives conceptually on par with efforts to support manufacturing SMEs in Western countries.[35] Likewise, a number of Latin American and Caribbean countries have launched programmes or ministries, such as Chile's SERCOTEC and Mexico's SPYME (Sub-Secretariat of the Small and Medium Enterprise), that seek to support growth and innovation among their small enterprises and manufacturers.[36]

Finally, nations need an infrastructure for technology transfer and diffusion to compound the return on their domestic innovation investments. Obtaining the full benefits of public support for research relies on the effective transfer of knowledge from the university and government lab to the private sector so it can be developed into marketable innovations. A range of policies can help spur the commercialization of research, but one indispensable policy enables vesting the IP rights of government-funded research with the university or research institution, as a wide range of economies—including Brazil, China, Indonesia, Malaysia, the Philippines, the Russian Federation, Singapore, South Africa, the Republic of Korea, and the United States of America—have done.[37]

An increasing number of nations are using innovation vouchers to spur innovation. These low-cost grants, typically US$5,000 to US$10,000, connect start-ups with public research institutes to incentivize R&D among young, innovative firms. The goals of these vouchers include enabling knowledge transfers between start-ups and research institutes/universities, supporting sectoral innovation in manufacturing, supporting innovation management and advisory services, speeding commercialization of start-up ideas, and focusing research institutions on the commercial applications of their research. India and Moldova—two of the eleven outperformer countries identified in the GII 2014—are among the almost two dozen nations (including many larger ones such as Austria, Canada, Croatia, England, Ireland, and the Netherlands) that have found success using innovation vouchers.

Principle 6: Develop a national innovation and productivity strategy and organizations to support it

Although innovation is largely driven by entrepreneurs and the private sector, government action (as described above) can play a strategic supportive role. That role can be optimized if nations develop well-designed national innovation and productivity strategies.

For example, in 2010, India established a National Innovation Council to define a new roadmap for research and innovation along with a Science and Engineering Research Board to act as a funding agency. In 2013, the Government of India published a new Science, Technology, and Innovation (STI) Policy Statement, which recognized that 'India has hitherto not accorded due importance to innovation as an instrument of policy,' and resolved to develop 'a New Paradigm of STI for the people.'[38] The plan focuses on the integration of science, technology, and innovation to create social good and economic wealth, recognizing Indian society as a major stakeholder. Although those policies were launched by the previous Singh administration, new Prime Minister Narendra Modi has built on them with a focus on entrepreneurship, notably by launching a new Ministry for Skill Development and Entrepreneurship.[39] The STI Policy Statement declared its goal to raise India's national R&D intensity (R&D as a share of GDP) from the 0.85% level of today to 2% by 2020. In another example of a national strategy addressing innovation, in 2010, the Government of Ghana released its National Science, Technology and Innovation Policy.[40] Over fifty nations have now developed national innovation strategies.[41]

In addition to national strategies, many successful nations have also established national innovation agencies specifically dedicated to spurring domestic innovation. For example, Kenya, India, Malaysia, Thailand, and Viet Nam have each established a National Innovation Agency. Many of these are relatively new institutions. For instance, Kenya launched the Kenya National Innovation Agency in 2013 and Malaysia founded its Agensi Inovasi Malaysia in 2010, although Thailand's National Innovation Agency dates back to 2003. Among other tasks, these agencies work to promote absorptive capacity and help firms—especially manufacturers and SMEs—increase productivity by adopting best processes and technologies, training firms and entrepreneurs in innovation skills and competencies, promoting knowledge/technology transfer from universities and labs to the private sector, and helping link domestic firms into global supply chains.

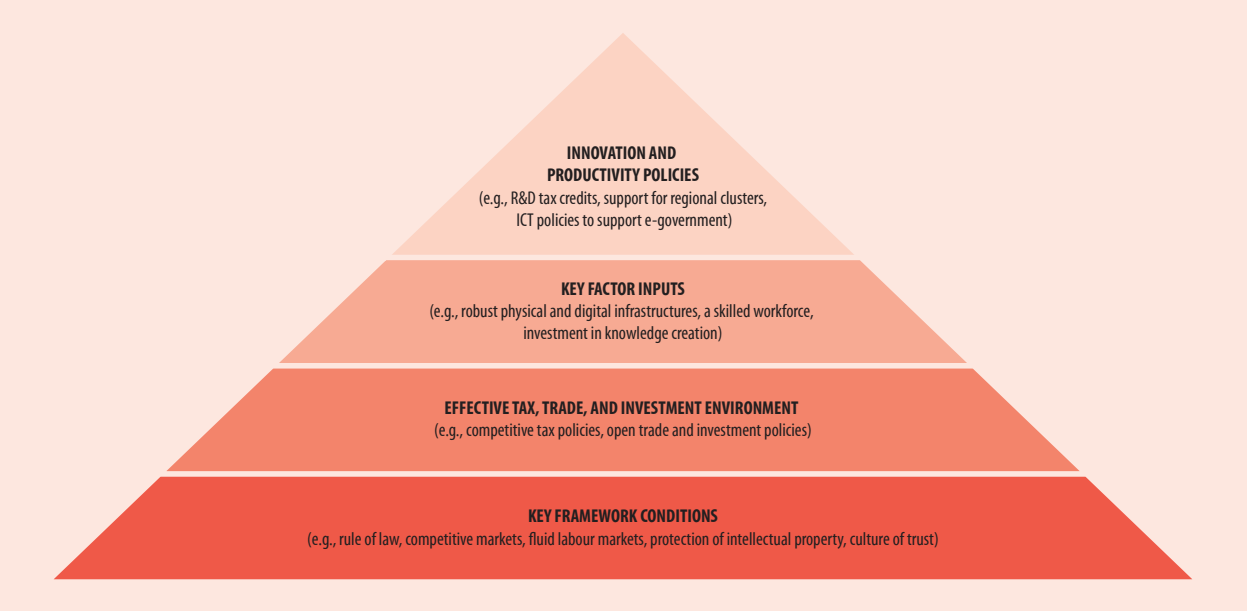
National innovation foundations also create national innovation strategies that constitute a game plan for how their countries can compete and win in a modern, innovation-based global economy. For instance, Kenya's National Science, Technology and Innovation Policy underscores the importance of mainstreaming science, technology, and innovation across all sectors of the economy. Uganda authored its first National Science, Technology, and Innovation Plan in 2011.[42] Armenia, China, India, Malaysia, Moldova, Mongolia, Thailand, and Viet Nam also have articulated similar national innovation strategies. Strengthening the intellectual property regimes that underpin innovation economies has been a core focus of the innovation strategies of many such countries, including notably in Jordan and Mongolia. For instance, Mongolia devotes an entire chapter of the *Science & Technology Master Plan of Mongolia 2007–2020* to 'Improving the system of protecting and utilizing intellectual property rights.'[43] India recently released a Draft National IPR policy and set up an IP think tank within its Department of Industrial Policy and Promotion.[44] And researchers in Jordan have connected the country's stronger embrace of IP rights in the 1990s with increases in GDP, inbound FDI, and decreased reliance on foreign aid.[45]

Conclusions

Countries attempting to achieve national innovation success need to envision a four-level pyramid as the path to prosperity (see Figure 1 on the following page). At the base level are key framework conditions such as the rule of law, ease of doing business, competitive markets, flexible labour markets, the effective protection of property (including intellectual property), and a culture of trust—topics addressed in Principles 1 through 3 of this chapter. Without these key framework conditions, even the most sophisticated innovation and industrial policies will not succeed. The next level includes an effective tax, trade, and investment environment. Key considerations here include establishing a globally competitive tax environment and implementing policies that encourage trade and FDI. Countries best succeed at attracting FDI when they use an attraction strategy, not a compulsion strategy, and welcome but not force investment in their nations.

After these factors are in place, nations need to focus on supporting the kinds of external factors firms need to succeed. These include robust physical and digital infrastructures; a skilled workforce with broad-based general capabilities as well as the specialized skills matching needs of key industries; and robust knowledge creation (e.g., investment in science and technology), as discussed in Principles 4 and 5. But even these are not enough. Indeed, with more nations realizing that mastery of these three levels is needed just to be in the game, success requires going to a fourth level that includes effectively crafted innovation and productivity policies specifically

Figure 1: Projected population: Uganda, 2015–25



Source: Based on Ezell et al., 2013, p. 58.

tailored to a country's competitive strengths and weaknesses. As discussed in Principles 4 and 6, policies here include provisions such as R&D tax incentives, support for regional innovation clusters, and support for innovative small businesses.

To be clear, these are not sequential in a temporal sense, but rather reflect the fact that even the most sophisticated innovation policies will not produce the desired results if they are not based on a strong foundation of key framework conditions; an effective tax, trade, and investment environment; and the presence of key factor inputs. Yet nations often focus on the top of the pyramid because these are often the easiest to implement politically (establishing a programme to develop a regional innovation cluster seldom faces opposition), while some of the policies at the base of the pyramid are much more difficult to achieve politically because change challenges entrenched interests in government or the private sector.

In conclusion, innovation policy—the constellation of government policies from tax, to trade, to talent, to technology that support a nation's innovation ecosystem—has become the single most important factor nations need to get right if they are to thrive in the globally competitive economy.[46] Countries must think holistically about how a wide variety of public policies impact the ability of their enterprises and industries to compete in the increasingly innovation-based global economy. Although this represents no easy task, the benefits to countries that get these policies right can be tremendous. Serious efforts at implementing policies that address the needs of innovation across all sectors and at all levels will certainly pay off over the long term—and probably much sooner.

Notes

1 Rosenstein-Rodan, 1943.

2 Hirschman, 1988.

3 Dasgupta and Singh, 2006, p. 9.

4 Ezell and Atkinson, 2010.

5 McKinsey Global Institute, 2010.

6 Ministry of Finance Planning and Economic Development (Uganda), 2011, p. 23.

7 Konza Techno City Kenya, 'Master Plan', available at http://www.konzacity.go.ke/the-vision/master-plan/.

8 Opare-Atakora et al., 2014.

9 McKinsey Global Institute, 2010.

10 Kucera and Roncolato, 2012.

11 OECD, 2005; for the OECD's definition of 'innovation', see also http://www.oecd.org/site/innovationstrategy/defininginnovation.htm.

12 Keeley and Waters, 2013.

13 Ministry of Employment and the Economy (Finland), 2009, p. 20.

14 Schumpeter, 1975, pp. 82-85.

15 Lewis, 2005.

16 World Bank, 2013, p. 313.

17 Atkinson et al., 2012, p. 35–6.

18 van Ark, 2002.

19 Atkinson and McKay, 2007.

20 Hitt and Tambe, 2006, p. 1797.

21 Heshmati and Yang, 2006, p. 15.

22 Wang and Lin, 2013.

23 World Bank, 2010, p. 3.

24 Heeks, 2011.

25 Miller and Atkinson, 2014.

26 Ezell, 2012.

27 OECD, 2013.

28 For details about the Digital India programme, see http://deity.gov.in/sites/upload_files/dit/files/Digital%20India.pdf.

29 For details about Kenya's *National ICT Masterplan 2013/14–2017/18,* see https://www.kenet.or.ke/sites/default/files/Final%20ICT%20Masterplan%20Apr%202014.pdf.

30 Demombynes and Thegeya, 2012, p. 2.

31 Atkinson et al., 2012, p. 117.

32 Jordan Education Initiative, available at http://www.jei.org.jo/.

33 Details about UNICEF's innovation labs can be found at http://www.unicef.org/innovation/innovation_73201.html.

34 For details about the 1776 incubator, see http://www.1776.vc/.

35 For details about India's MSME ministry, see http://msme.gov.in/mob/home.aspx.

36 Andes et al. 2013.

37 Atkinson et al., 2012, p. 46.

38 Ministry of Science and Technology (India), 2013, p. 2.

39 Borpuzari, 2014.

40 Ministry of Environment, Science and Technology (Ghana), 2010.

41 Ezell et al., 2015.

42 Ministry of Finance Planning and Economic Development (Uganda), 2011.

43 UNESCO, 2007.

44 Sridevan et al. 2014.

45 Cepeda et al., 2010, p. 11.

46 Atkinson and Ezell, 2012, p. 10.

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