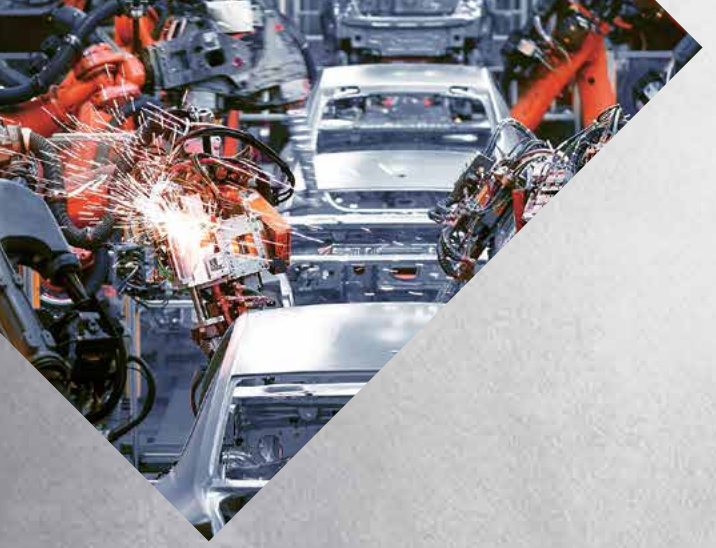


Productivity *Insights*

Vol. 1–6

Innovation-led Productivity

Dr. Amit Kapoor

Asian Productivity Organization

60 YEARS APO 1961–2021
Asian Productivity Organization

The Asian Productivity Organization (APO) is an intergovernmental organization committed to improving productivity in the Asia-Pacific region. Established in 1961, the APO contributes to the sustainable socioeconomic development of the region through policy advisory services, acting as a think tank, and undertaking smart initiatives in the industry, agriculture, service, and public sectors. The APO is shaping the future of the region by assisting member economies in formulating national strategies for enhanced productivity and through a range of institutional capacity-building efforts, including research and centers of excellence in member countries.

APO members
Bangladesh, Cambodia, Republic of China, Fiji, Hong Kong, India, Indonesia, Islamic Republic of Iran, Japan, Republic of Korea, Lao PDR, Malaysia, Mongolia, Nepal, Pakistan, Philippines, Singapore, Sri Lanka, Thailand, Turkey, and Vietnam.

INNOVATION-LED PRODUCTIVITY

OCTOBER 2021 | ASIAN PRODUCTIVITY ORGANIZATION

PRODUCTIVITY INSIGHTS Vol. 1–6
Innovation-Led Productivity

Dr. Amit Kapoor wrote this publication.

First edition published in Japan
by the Asian Productivity Organization
1-24-1 Hongo, Bunkyo-ku
Tokyo 113-0033, Japan
www.apo-tokyo.org

Designed by Convert To Curves Media

CONTENTS

PREFACE

The P-Insights, short for "Productivity Insights," is an extension of the Productivity Talk (P-Talk) series, which is a flagship program under the APO Secretariat's digital information initiative. Born out of both necessity and creativity under the prolonged COVID-19 pandemic, the interactive, livestreamed P-Talks bring practitioners, experts, policymakers, and ordinary citizens from all walks of life with a passion for productivity to share their experience, views, and practical tips on productivity improvement.

With speakers from every corner of the world, the P-Talks effectively convey productivity information to APO member countries and beyond. However, it was recognized that many of the P-Talk speakers had much more to offer beyond the 60-minute presentations and Q&A sessions that are the hallmarks of the series. To take full advantage of their broad knowledge and expertise, some were invited to elaborate on their P-Talks, resulting in this publication. It is hoped that the P-Insights will give readers a deeper understanding of the practices and applications of productivity as they are evolving during the pandemic and being adapted to meet different needs in the anticipated new normal.

EXECUTIVE SUMMARY

There is a constant search for generating and increasing prosperity. Countries, regions, and organizations alike are on the hunt to make rapid economic advancements and increase prosperity. Evidence from across the globe suggests that this prosperity need not be inherited through natural resources and existing endowments that a country may possess. Factors such as geographic location, labor supply, interest rates, and natural endowments, although significant, are not enough to generate prosperity in a country. National prosperity is created and inherited. It is based on the country's competitiveness and its industries' ability to innovate and upgrade. In order to ensure sustained growth, countries must consistently innovate and upgrade to boost their productivity.

The path to increased productivity can be achieved through innovation. Fostering innovation has become the need of the hour. While most countries recognize the need and importance of innovation, this understanding does not easily translate into successful growth and innovation practice. The present study is set on the premise that innovation-led productivity can tap into higher levels of growth, generating prosperity that is sustained over time. The benefits reaped through investment in innovation have the potential to cause development that promises social benefits as well. The overarching mechanism to drive innovation-led productivity in the case of poverty alleviation is one such example. Innovation-led productivity growth provides an understanding of the role that innovation plays in accelerating economic growth. It offers insight into improving competitiveness through innovation, thereby facilitating enhanced productivity levels. Countries like Singapore and the Republic of Korea are therefore able to achieve growth levels at impressive rates and provide high living standards that other developing nations, including Cambodia and Bangladesh, strive to achieve.

In facilitating innovation, the state must focus on human capital, R&D promotion, and supporting innovation through all its phases from inception to

its usage and commercialization. Providing legal safeguards is incremental to ensure that innovation takes place consistently and legitimately. In ensuring a robust system to promote innovation and allocating legal and financial support when necessary, countries can tap into exponential levels of growth and ensure their competitive advantage in the international market.

INTRODUCTION

Over the past decades, innovation has gained steady prominence. The Schumpeterian perspective shed light on the importance of innovation for enhancing economic growth and obtaining new definitions that deem technology and innovation as the Fourth Industrial Revolution. The prevailing belief is that through innovation, i.e., the creation and adoption of new products, services, and business models, the standard of living is improved [1]. Innovation is seen as a critical driver in ensuring economic prosperity.

The history of economic growth from various countries suggests that early development is characterized by exploiting natural resources and labor. As nations advance, economies are driven by capital accumulation and productivity. Innovation plays a significant role in strengthening and increasing productivity. Today, technology is considered to be a crucial element that underlies industrialization. The influx of technology and the changes it brought about have altered society as we know it. A study [2] points to the diverse range of innovation areas that may be disruptive individually but collectively prove to be world-changing. These areas include robotics, genetics, artificial intelligence, internet-enabled sensors, and cloud computing, all of which prove to be individually disruptive. Experts across the globe have come up with different set definitions for such a phenomenon. Klaus Schwab terms it the "Fourth Industrial Revolution," Alec Ross deems it "industries of the future," Martin Ford refers to it as the "rise of the robots," and Steve Case calls it the "third wave" of the internet. All these variations nevertheless understand the importance of an innovation-driven economy.

A critical function that innovation serves is increasing productivity. Economists who harbor conventional viewpoints would argue for capital accumulation as the most vital element to enhance growth. They endorse policies that encompass increasing savings. However, a recent shift in perspective suggests that capital accumulation and increased savings do not promise a better standard of living,

but innovation does. As innovation leads to the development of new products and technologies, the aggregate measure of innovation is growth in productivity. This growth in productivity is evaluated through measures such as value added per unit of labor. Enhanced productivity allows workers to produce more for the same amount of work, leading to a higher standard of living [1]. Paul Romer in his article on implementing national technology strategy asserts that any increase in the standard of living can be traced back to valuable discoveries, which take place in a set of complex market and nonmarket institutions that together constitute the national innovation system. He stated, "No amount of savings and investment, no policy of macroeconomic fine-tuning, no set of tax and spending incentives can generate sustained economic growth unless it is accompanied by the countless large and small discoveries that are required to create more value from a fixed set of natural resources" [3]. Having institutional arrangements that allocate financial support for innovative activity and directing it toward areas of economic profit are vital.

While the importance of innovation and its many advantages are well acknowledged, not all countries have been successful in promoting innovation. Countries that lag in innovation practices can have a severe negative impact on their economy, impeding productivity and growth. In Asia, countries like Japan and the Republic of Korea (ROK) have paved the way for phenomenal innovation-led productivity growth. Other economies, such as Bangladesh and Sri Lanka, are yet to catch up. Through consistent innovation efforts, countries can evade stagnancy, boost product sophistication, and increase growth. Innovation is therefore particularly critical in ensuring competitiveness.

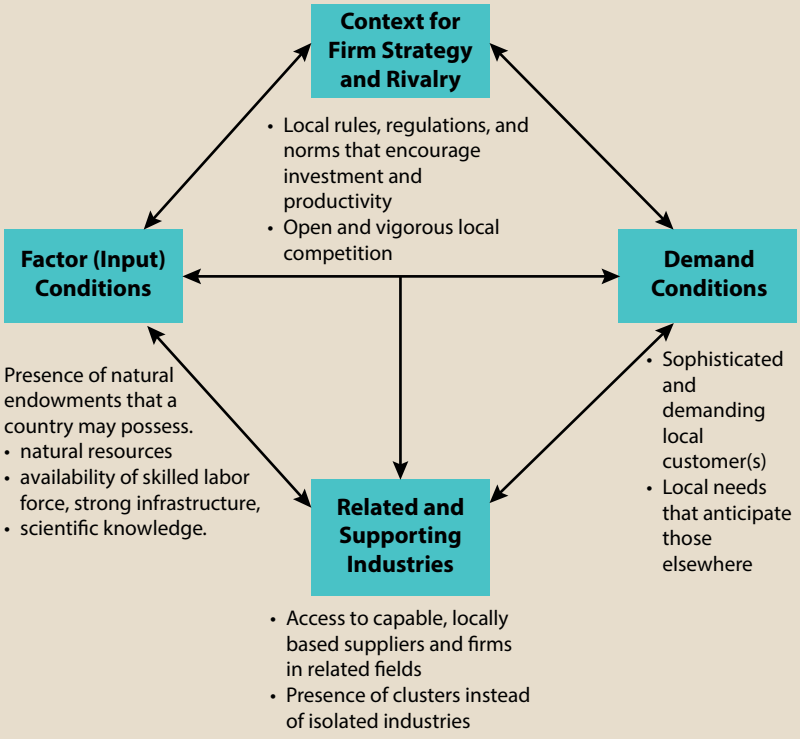
Improving Productivity and Competitiveness through Innovation

Competitiveness is the productivity (value per unit of input) with which a nation, region, or cluster utilizes its human capital and natural resources. Productivity depends on the value of products and services such as their uniqueness and quality and the efficiency with which they are produced. How firms compete in industries and what they choose to do in a particular location are fundamental to generating prosperity [4]. Notably, local industries must induce competitiveness, not just traded industries.

Nations vary widely with regard to their geographic locations, access to natural resources, labor pools, investments, and currency values. All these underlying factors showcase differences in patterns of competitiveness [5]. Nevertheless, countries do not have to be constrained by these factors alone. They may overcome these challenges by addressing their constraints efficiently through innovation and boosting productivity.

FIGURE 1

PORTER'S DIAMOND OF NATIONAL ADVANTAGE.



Source: Porter M.E., 2008 [5].

The attributes of factor conditions, demand conditions, related and supporting industries, and firm strategy, structure, and rivalry altogether constitute the diamond of national advantage (Figure 1). These specific determinants present in a country both individually and collectively provide firms with the environment to operate and compete.

The first determinant of factor conditions relates to various production factors, such as labor, labor skillsets, and natural resources. Factor conditions also determine the flow of trade. The crucial element here is not the number of factor conditions present in a country but how countries make the most of the factor conditions they possess. The presence of raw material or a strong labor force requires a proper strategy to utilize them efficiently. Similarly, having an educated population does not illustrate a robust competitive advantage unless it supports industry's highly specialized needs. Industries prove to be successful when they are good at factor creation.

Alternatively, any disadvantage can be utilized efficiently to propagate success. It is achieved through innovations that help address challenges. Disadvantages in a static model of competition become an advantage in a dynamic model. However, the translation to advantage only happens under certain preconditions. When companies can anticipate circumstances spreading to other nations, allowing companies to innovate in advance and compete against foreign rivals, they tend to translate their disadvantage to an advantage.

However, innovations can only happen when states have access to appropriate skills, home-demand conditions, and strong domestic rivals, pushing companies to improve. Another crucial precondition requires company goals to have a sustained commitment to the industry. Commitment, along with the presence of active rivalry, spurs innovation.

The second determinant, demand conditions, highlights the importance of home demand. Characteristics of home demand have an inordinate effect on how companies understand, interpret, and respond to buyer needs. Countries gain competitive advantage internationally only when national competitiveness is well established. Sophisticated home demand helps companies anticipate emerging trends in the international market. Here again, it is more critical to have an efficient home demand than a significant home demand. The nature of domestic buyers pushes companies to produce goods and services of higher quality, continually innovating to meet rising standards. Demand conditions provide companies with a national advantage when they can anticipate advanced customer needs, responding to tough challenges.

Competitive advantage through home demand is achieved when a particular industry segment is more extensive in the domestic market than in foreign

markets. A large market segment inevitably also garners more attention to local companies. Industries that possess a smaller market segment are deemed less desirable. The local buyer needs to provide "early warning indicators" of global market trends that are incredibly important for companies. These give a competitive advantage as local needs can anticipate and sometimes even shape foreign needs. Moreover, local companies can anticipate global trends when a nation's values are spreading. Spreading values, tastes, and products takes place through media, political influence, training foreigners, and engaging foreign nationals in local activities.

The third determinant pertains to the presence of related and supporting industries in a country. Home-based suppliers provide certain advantages that enhance international competitiveness. They provide more cost-effective inputs more efficiently at a faster pace. Additionally, closer working relationships in home-based and supplier industries allow for more significant innovation. The closer geographic proximity provides a short line of communication as well as rapid and constant flows of information. National competitiveness is even more enhanced when supplier industries are also highly competitive. Thus, home-based competitiveness in related industries increases companies' chances of adopting new skills, allowing new entrants to come in with superior ideas.

Home-based related and supporting industries provide an advantage in innovation and upgrading, an advantage possible due to close working relationships. When suppliers and end-users are located near each other, they can take advantage of a short line of communication, the quick flow of information, and ongoing exchanges of ideas and innovations. Companies can also influence their suppliers' technical efforts by serving as test sites for R&D and stimulating innovation.

When suppliers of industry are also global competitors, local companies benefit. Captive suppliers dependent on domestic industries alone, restricted from catering to foreign competitors, prove counterproductive. Nevertheless, not all supplier industries need to be globally competitive for companies to attain a national advantage. Companies can also acquire resources, materials, and components from abroad. Even sourcing generalized technologies such as electronics or software would not affect a company's ability to innovate or negatively impact its performance. Home-based industry increases the

possibility of companies to embrace new skills, allowing entry of new firms with a novel approach to competing.

The fourth determinator highlights the importance of firm strategy, structure, and rivalry. National circumstances create the blueprint for how companies come into existence, operate, and function. Furthermore, they also determine the kind of domestic competition that will persist in a country. No universal managerial system can work in every country. Competitiveness in a specific industry emerges as a result of management practices and organizational modes prevalent in that country. It largely depends on the sources of competitive advantage in the industry.

The goals that companies set to achieve reflect national elements such as capital markets and management compensation. Company goals reflect prevalent traits of capital markets and the compensation practice for managers. Geographic concentration increases the effect of domestic rivalry exponentially. Individual motivation also promotes national advantage as people work to expand their skills. The prevailing kind of education that people choose to undertake shapes a nation's success. Individual motivation to work and broaden skills provides another source of competitive advantage. Thus, dominant beliefs and practices of a country affect its competitive performance.

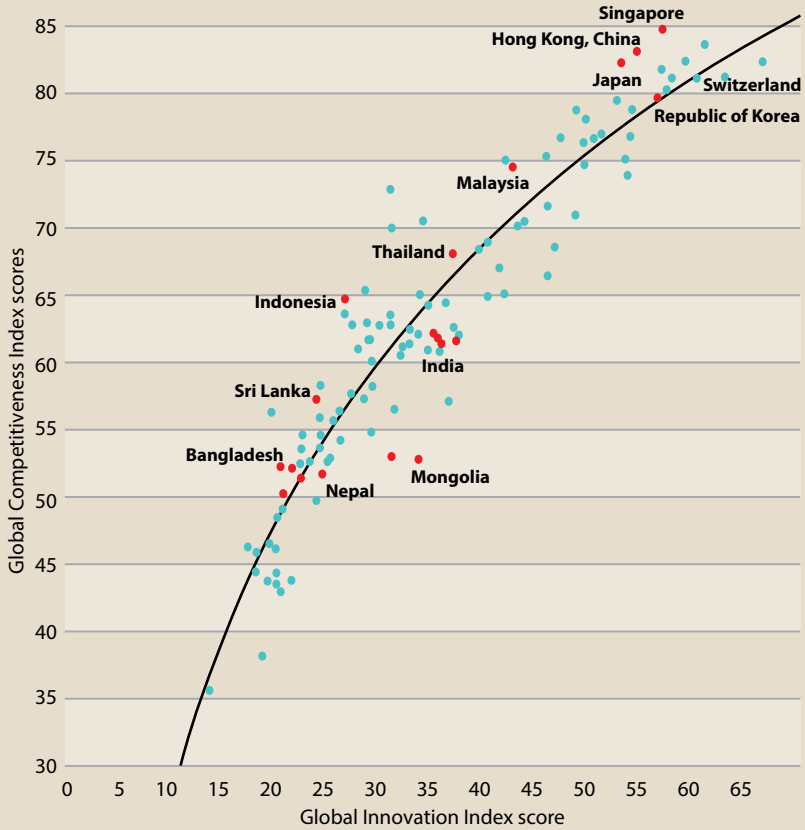
Stiff domestic competition ensures constant improvement of production processes, thereby reinforcing the creation and endurance of competitive advantage. Assuming domestic competition to be wasteful is an erroneous contention. Embracing and promoting only one or two national companies to combat foreign competitors prove to be futile. Often, such national champions are uncompetitive even though they are heavily subsidized and endorsed by the government. The protection given by the government in the end only distorts competition.

Furthermore, domestic rivalry encourages dynamic improvement over static efficiency. Constant improvement turns out to be exponentially more rewarding because static efficiency tends to become obsolete sooner or later. Local rivals push each other to lower costs, improve product quality, and create new products and processes. Local competition is not limited to market share but also extends to competing for people and technical excellence and "bragging rights" [4]. Rigorous domestic competition pushes local companies to look for international markets and prepares them with a competitive advantage to succeed.

Since organizations across the globe function differently, innovation plays a vital role in determining competitive advantage. Through innovation, competitive advantage is sought in unconventional ways, perceiving new markets and addressing local and foreign markets' needs. Subsequently, innovation is sought consistently as information spreads and new inventions risk becoming obsolete. With stiff competition, there are always attempts by other firms to replicate or improvise on previous innovations since innovation has the capacity to provide prosperity.

FIGURE 2

2019 GLOBAL COMPETITIVENESS SCORES VS 2020 GLOBAL INNOVATION SCORES.



Source: Global Competitiveness Index, 2019 [6] and Global Innovation Index, 2020 [7].

Evidently, countries with a higher level of innovation scores as shown by Global Innovation Index [6] scores also prove to be more competitive based on the Global Competitiveness Index [7] rankings. Singapore, Hong Kong, Japan, and the ROK are at the top (Figure 2). Nations that foster innovation will have better productivity, which warrants higher competitiveness in international markets.

DRIVING PROSPERITY: THE INNOVATION–PRODUCTIVITY NEXUS AND SHAPING COMPETITIVENESS

Innovation encompasses the ability to drive growth. Additionally, productivity processes may stagnate or decline if they are not consistently upgraded and improved, and innovation provides for that upgradation. Strategies that promote innovation-led growth in productivity view innovation as the key to raising productivity and improving the standard of living. It sets a departure from normative beliefs that view capital accumulation as the key to growth. Driving productivity through innovation therefore generates economic gains and enhances the standard of living.

The positive correlation between innovation and growth of an economy is well acknowledged. Manyika and Roxburgh [8] assert the connection between the maturity of the internet ecosystem and rising living standards. Their study revealed that an increase in internet maturity similar to the one experienced in advanced countries in the past 15 years correlates with an increase in real per capita GDP of USD500 on average in the given time period. The Industrial Revolution led to similar results after 50 years. Internet-led growth in developing countries specifically has the potential to make rapid advancements in the economy.

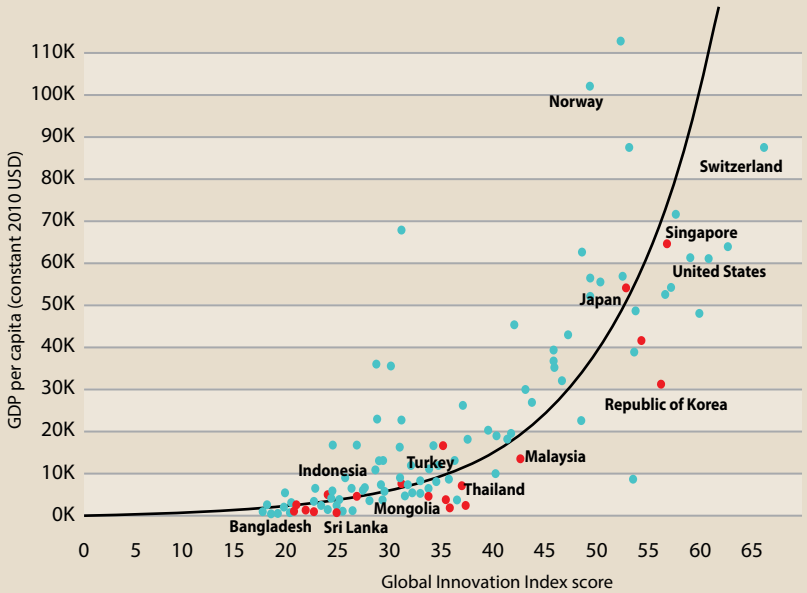
On the other end of the spectrum, innovation proves to be just as vital in sectors such as agriculture. A World Bank study [9] stated that "Productivity growth in agriculture has the largest impact of any sector on poverty reduction—roughly twice that of manufacturing." Rising productivity in several East Asian economies has contributed to large-scale declines in poverty. Productivity growth is comparatively low in the South Asian and African regions, which continue to witness extreme poverty levels. However, with investment in

knowledge generation and diffusion, productivity can increase vastly. For instance, estimates of rates of return to R&D in agriculture often fall between 30–40%, higher than many alternative investments. The World Bank study also pointed out that R&D as a share of agriculture is close to six times higher, and the R&D/worker is 50 times higher in developed countries than in developing ones. Nevertheless, the level of real spending has been increasing in PR China and parts of Asia. Facilitating investment in R&D and the knowledge economy therefore becomes significant to steer growth.

Perhaps the only way to ensure prosperity is to boost productivity. Increasing levels of productivity would propel higher wage rates, more significant investments, and a conducive environment for businesses. Innovations offer the grounds for boosting productivity at exponential levels. Here as well, the East Asian economies of Singapore, Japan, and the ROK showcase higher GDP levels in correspondence to their levels of innovation (Figure 3).

FIGURE 3

2019 GDP PER CAPITA (CONSTANT 2010 USD) VS 2020 GLOBAL INNOVATION INDEX SCORES.



Source: World Bank, 2019 and Global Innovation Index, 2020 [6].

Since innovation can enhance productivity, generating prosperity that is sustained over time, it provides countries with a competitive advantage that boosts their economic gains. Tushman and Nadler argue that, "Organizations can gain competitive advantage only by managing effectively for today while simultaneously creating innovation for tomorrow" [10]. Innovation has become fundamental to ensuring consistent growth. As Schumpeter stressed, organizations attempt to innovate by introducing new products or services only on the condition that they gain a strategic competitive advantage. It creates competition that does not affect profit margins and output of existing organizations but renews their existence [11, 12]. Considering that the innovation activity of organizations significantly boosts productivity, countries must facilitate initiatives that drive innovation practices and stimulate growth.

Facilitating Innovation

Since productivity is the key determinant of prosperity levels that countries can sustain over time, it is crucial to differentiate between "created" and "inherited" prosperity. Competitiveness, as understood from Porter's conception, is largely dependent on prosperity that is created through economic activity. It includes creating value by providing products and services above their production costs. Inherited prosperity, however, stems from exploitation of natural resources, as seen in Arab oil producers. Inherited prosperity does not depend on underlying competitiveness, it merely reflects an exchange of inherited natural resource wealth into financial assets [13]. Inherited competitiveness often acts as a barrier against upgrading underlying competitiveness. In establishing a robust innovation policy through government action, created prosperity can be further propelled into achieving maximum gains.

On the one hand, in their most simplified aspect, innovation policies facilitate, impact, and govern innovation. On the other hand, there may be three distinct perspectives on innovation policy as discussed below.

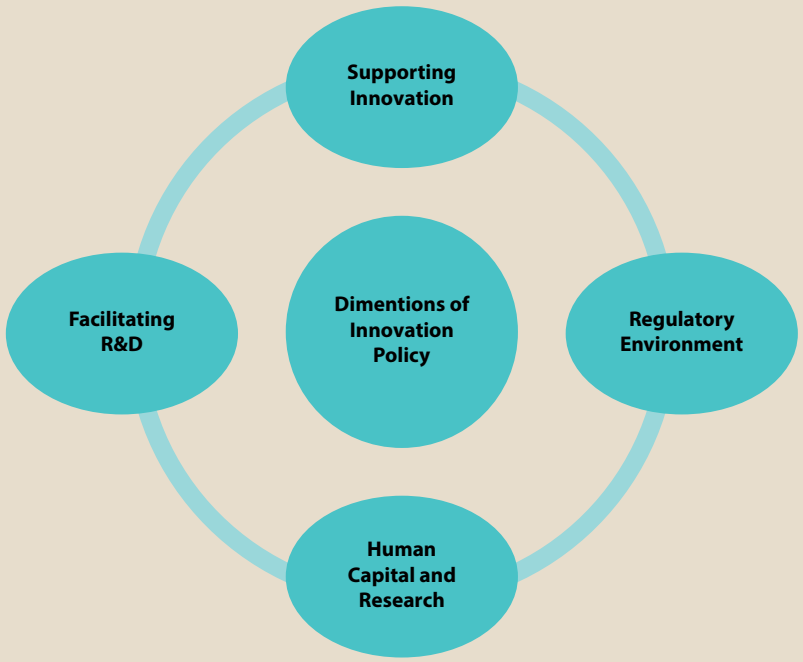
Mission-oriented policies aim to provide new solutions that address specific challenges on the political agenda. The underlying condition to such an approach is that the solution must work in practice. Hence, all phases of the innovation process must be taken into account. An example of mission-oriented policy includes innovation policies on defense.

Invention-oriented policies pertain to R&D and inventions. The later stage of exploitation and diffusion of innovation is left to the market. Such a practice was previously referred to as research or science policy, but today refers to innovation policy.

System-oriented policies refer to system-level features that include the interface between different parts of the system, the extent to which vital elements of the system need to improve, or the actors' capabilities that take part [14]. The development of such system-oriented polices led to the emergence of the "national innovation system (NIS)" approach in the 1990s, which was adopted and promulgated by the OECD.

FIGURE 4

DEMONSTRATING THE ROLE OF GOVERNMENT IN FACILITATING INNOVATION.



Source: World Bank, 2019 and Global Innovation Index, 2020 [6].

The dimensions of innovation policy are realized through the instruments utilized to incorporate innovation into society, including research, industry, education, and finance. The role of government is encapsulated by supporting innovation,

facilitating R&D, providing a robust regulatory environment, and strong human capital and research (Figure 4). As pointed out in the study by Edler and Fagerberg [14], the design of these instruments is governed by the theoretical understanding of the subject matter, lessons from practice, and stakeholders' involvement at different levels in society. The implementation primarily resides within the purview of the government. Ultimately, its value in social and economic development determines the diffusion and exploitation of the invention.

Another vital aspect of innovation policy relies on the impact and success of the policy employed. Methods of evaluation undertaken through various means and measures therefore determine the success of the policy. Over the years, with the rising recognition of innovation, due importance has been given to the innovation policy that the state undertakes. Countries that employ rigorous initiatives to incentivize and promote innovation are also seen to increase their productivity and economic performance.

The Global Innovation Index presents findings on innovation practices in countries across the globe and shows impressive performances by East Asian economies such as the ROK, Japan, and Singapore. The countries outperform several developed Western nations as well. Nevertheless, rising productivity and superior innovation capacity do not discount the presence of inequalities and other development concerns. However, overall, these countries have experienced a shift in their socioeconomic trajectory as their productivity increased and elevated their living standards.

Innovation promotion can take place in two ways. The government can directly invest in the development of technology or it can create an environment that promotes R&D.

The following section takes a closer look at the role of the government in facilitating innovation, delving into the four major areas of: incentives to support innovators; establishing institutions to facilitate R&D; providing an environment that supports innovation by removing obstacles faced by organizations; and investing in the creation of knowledge workers.

A sound business environment is vital for innovation to flourish as it encourages investment in technology and knowledge-based capital, enabling innovative firms to experiment with new ideas, technologies, and business models,

ultimately helping businesses to grow, increase their market share, and reach scale [15]. A conducive business environment therefore boosts innovation and drives productivity growth.

The APO member countries of Singapore, the ROK, and ROC show impressive scores in the Ease of Doing Business Index, demonstrating their conducive business environments [16]. Other countries such as Bangladesh, Lao PDR, and Cambodia still need to undertake proactive initiatives to improve their business environments (Figure 5). Having a supportive business environment also encourages local entrepreneurship and invites foreign investments on a larger scale.

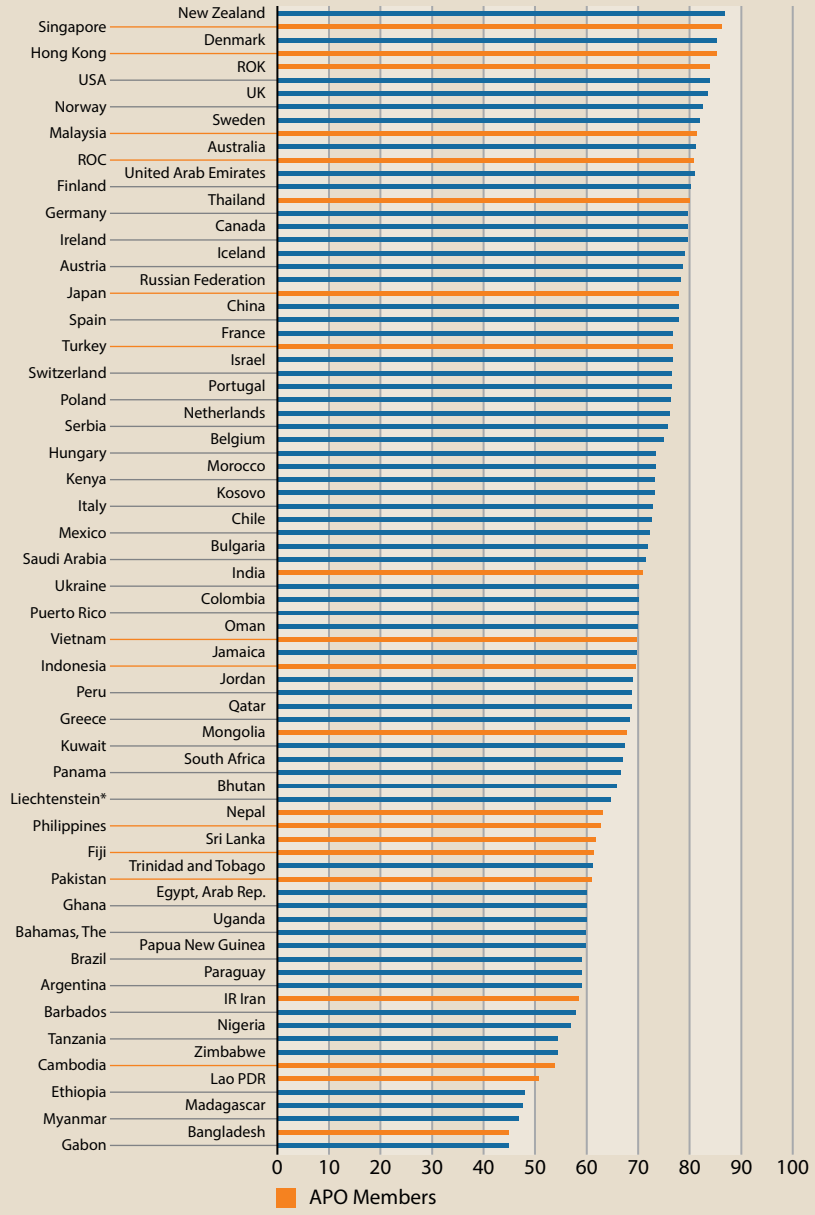
Investment in R&D is often neglected by countries, which leads to a decline in innovation practices. It can have severe repercussions in all sections of society and can even impede the trajectory of growth. Investment in R&D is therefore critical to stimulate innovation.

Among APO members, the ROK and Japan exhibit the highest percentage of R&D expenditures (relative to their GDP levels) (Figure 6). In comparison, countries like Colombia, Mongolia, and Pakistan fall far behind in their R&D investments. R&D promise not only economic returns on investment but have the capacity to provide in-practice solutions to deep-rooted problems in the society and economy alike. Even with all the advances made in society, basic research does not flow easily or with lowered costs across borders in the increasingly globalized world. Developing countries thus cannot simply reply on research generated in advanced economies. The spillover effects of R&D are not acquired easily. Translational research "that turns the fruits of science into meaningful outcomes is arguably even more difficult to transplant across borders" [2]. In such a scenario, it becomes imperative that all countries delve into extensive pursuit of domestic R&D activities. A sustainable, exhaustive approach to promote R&D activities locally is significant for development and economic growth.

A regulatory environment that enables innovation and removes obstacles plays a vital role in enhancing a country's innovation practices. Establishing a conducive regulatory system that facilitates innovation and manages competing needs for innovation and public protection is therefore essential. The regulatory environment from the Global Innovation Index framework looks to capture

FIGURE 5

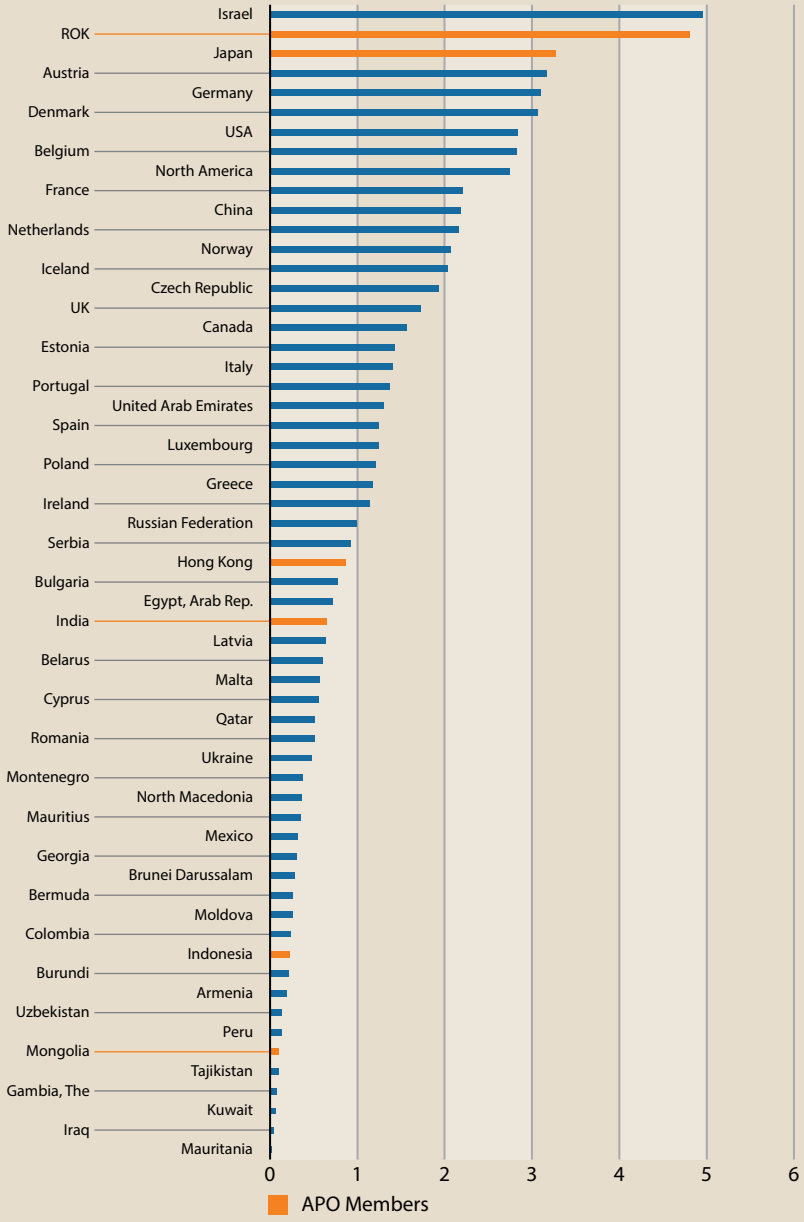
2020 EASE OF DOING BUSINESS SCORES.



Source: Ease of Doing Business Index, 2020 [16].

FIGURE 6

R&D EXPENDITURE AS A PERCENTAGE OF GDP.



Source: World Bank, 2018 (based on the latest data available) [17].

perceptions of the government's ability to formulate and implement cohesive policies. Such policies promote the development of the private sector and assess the extent of the prevalence of the rule of law (in terms of contract enforcement, property rights, etc.). It also captures the cost of the redundancy dismissal sum, in salary weeks, and cost of advance notice requirements added to severance payment when terminating a redundant worker.

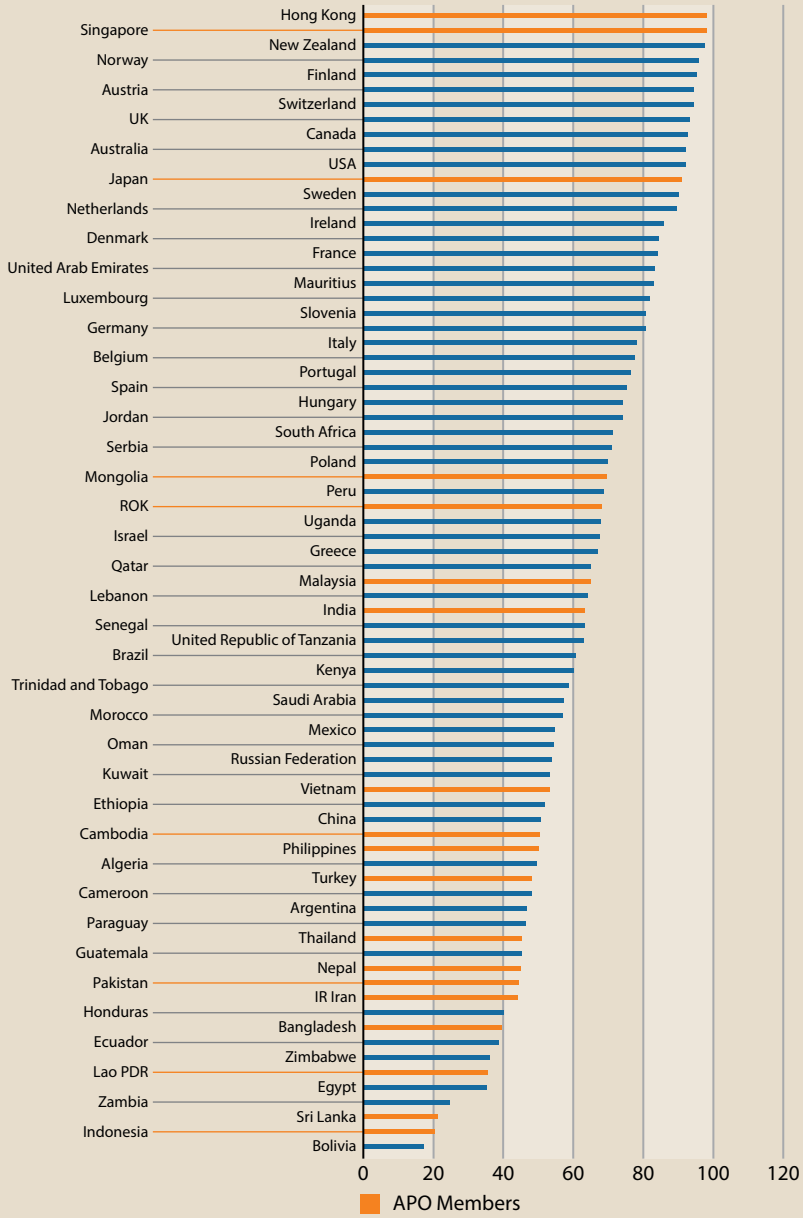
Hong Kong and Singapore appear to be the top performers in providing a proficient regulatory environment. When countries establish a democratic, efficient system in their governance, they are able to provide a stronger foundation that facilitates innovation and drives productivity. APO members Sri Lanka and Indonesia still lag behind in providing an efficient regulatory environment (Figure 7).

Economic growth is propelled by human capital just as much as other productivity factors. The World Development Report on the Changing Nature of Work notes that, "The cost of inaction on human capital development is going up" [17]. If human capital is not strengthened, countries will fail to achieve sustained economic growth and will not have a workforce prepared for highly skilled jobs in the future. Such countries will fail to compete effectively in the global economy. Particularly with advances made in science and technology, investing in human capital becomes imperative to diversify research activities and propagate higher-value knowledge. High-end research and lab facilities will not be utilized unless people are equipped with the right knowledge and technical skills to use them. Subsequently, R&D activities cannot lead to economic growth if the business skills to translate research into a profit-earning enterprise is absent [2]. Countries that can successfully bridge this gap achieve greater prosperity.

The ROK excels above all countries across the world in terms of human capital and research, whereas Singapore and Japan are also top-performing countries. Cambodia and Bangladesh appear to be worse off in human capital and research. Fostering innovation and research practice requires strong human capital (Figure 8). The ROK ranks second in terms of knowledge workers, preceded only by PR China. The knowledge worker scores derived from the Global Innovation Index frameworks measure employment in knowledge-intensive services, availability of formal training at the firm level, R&D carried out by business enterprises, and the like (Figure 9).

FIGURE 7

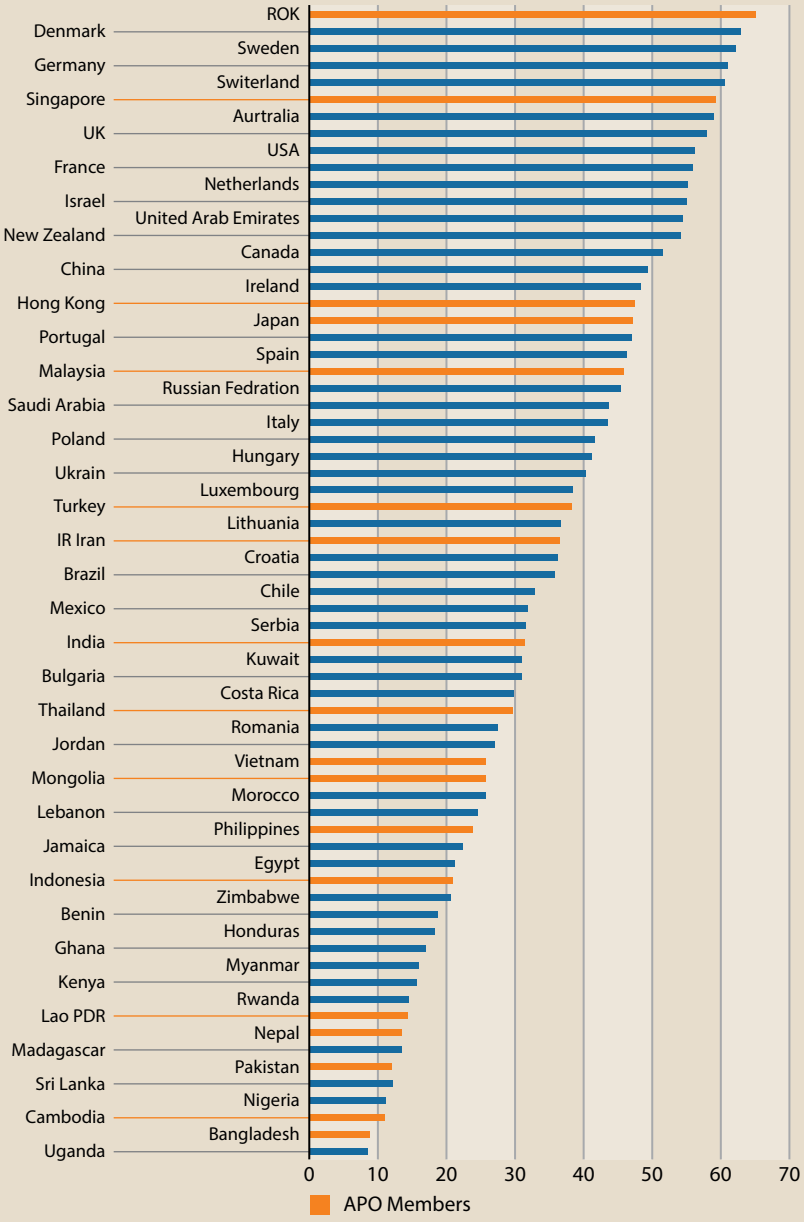
2020 REGULATORY ENVIRONMENT SCORES.



Source: Global Innovation Index, 2020 [6].

FIGURE 8

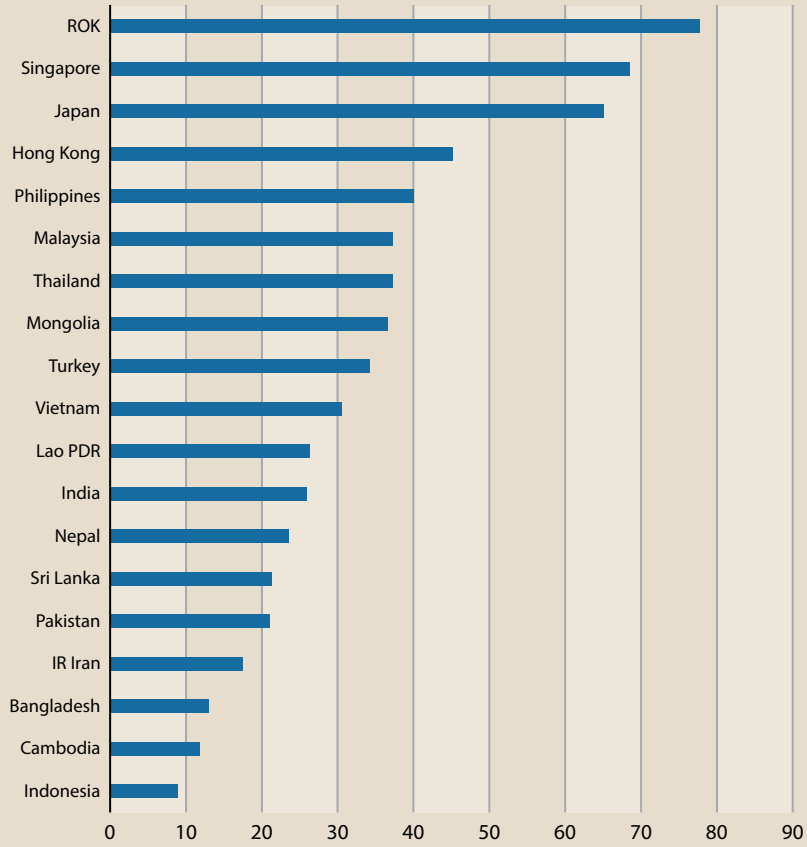
2020 HUMAN CAPITAL AND RESEARCH SCORES.



Source: Global Innovation Index, 2020 [6].

FIGURE 9

2020 KNOWLEDGE WORKER SCORES.



Source: Global Innovation Index, 2020 [6].

Other Asian countries that occupy positions in the top 10 include Singapore (ranked 7th) and Japan (10th). Building substantial local human capital proves to be incredibly beneficial. Secondary- and tertiary-level education appears to be weaker in developing countries, especially in science and technology. The ROK is the best example of a country that successfully transformed its education system to achieve technology- and innovation-led growth. In 1945, less than one-quarter of Koreans were literate, and only one-fifth of children attended secondary school. Due to a sustained government focus and investment, enrollment rates reached 90% for primary school in 1964, for middle school in

1979, and for high school in 1993. By the 1990s, the ROK had shifted focus toward tertiary education, leading to 65% of Koreans completing tertiary education (one of the highest rates in OECD countries). This increase in tertiary education was accompanied by top global test scores in math and science testing [2]. All these factors allowed the ROK to gain foreign direct investment due to its knowledge absorption and technology capabilities. Domestic capacity for innovation in the country consequently achieved new heights.

Extensive focus on building education will yield some of the most vital, sustained results in the long run. In building domestic capacity for R&D activities, emphasis must be laid on participation in the knowledge economy. Capable local researchers can tackle location-specific challenges in ways that would remain alien to foreign researchers [2]. Given how human capital has become increasingly salient in the modern world, governments must direct special attention toward building and improving their human capital capacity and addressing the challenges involved. In doing so, countries become equipped with the right resources that propel development in the right direction.

RECOMMENDATIONS TO FOSTER INNOVATION

Innovation policy must be carefully propagated to transform economies and address challenges. Policy focus must look toward incentivizing R&D activities. Furthermore, R&D investments that focus on addressing societal problems and tackling socioeconomic issues must be encouraged. They have the capacity to generate new ideas, exploit them in practice, enhance competitiveness, and respond to rising challenges. Simply tilting the focus toward R&D investment does not promise benefits for all sections of society. Edler and Fragerberg [14] point to distinct lessons that must be kept in mind when designing innovation policies:

1. Innovation policy would inevitably have to be carefully designed to propel a favorable environment in all innovation phases. Effective innovation policy must ensure some degree of longevity and provide a strong sense of direction to firms' innovation efforts with credibility (and not subject to instances of frequent changes).

2. Instrumentation of policy must shift from general subsidies given to firms for their R&D practice. While these may prove to be successful to a certain degree, they do not always impact societal effects on innovation, productivity, and jobs. Thus, policy formulation could also promote innovation to address problems plaguing society which are high on political agendas.

3. Innovation may also fail to survive between generating a novel idea and exploiting the concept. An effective policy must seek to prevent ideas from falling into this "valley of death." Due emphasis must be given to supporting, experimentation, implementation, and exploitation, especially at the early stages, while simultaneously encouraging innovation to develop and change.

4. For innovation to be widely practiced, it must not be relegated to any particular ministry or a handful of industries. All ministries and government levels must partake in promoting and undertaking innovation activities. Consequently, a cohesive innovation policy with support from organizations and institutions proves to be more effective and influences trajectories and innovation diffusion.

5. Developing a cohesive, practical innovation policy demands a thorough understanding of the NIS in which the policies are to be introduced. Strong policymakers who take cognizance of stakeholders in devising policies are crucial. There may be several distinct obstacles and systemic bottlenecks that would have to be addressed for the smooth implementation of effective innovation policies.

Since improving productivity may not be enough to promise sustained growth levels, various steps must be undertaken to promote innovation through innovation polices. While such measures are highly context specific, depending on the local environment, needs, and challenges, some essential recommendations are stated below.

- Increase collaboration among institutions, industry, and government. Consequently, government funding must also be increased to encourage greater participation and remove any issues due to a cash crunch.

- The focus on collaborations must not be limited to big firms and well-established institutions alone. Partnerships must be encouraged in public and private organizations of all calibers. Special attention to the growth of SMEs is also vital for cohesive growth.

- Cohesive policy initiatives to strengthen R&D and innovation in the country are required. Increased funding for R&D as a percentage of GDP is vital to sustaining innovation in a country.

- The policy focus must shift toward fostering an innovative, knowledge-based entrepreneurship and support ecosystem. Startups with more novel ideas and technologies must be stimulated with better access to finance.

- Institutionalizing science and technology through integrative methods is another necessary means of developing innovation.

- Diversifying to develop high-tech products and exports (linked to investments in machinery, technology, and skilled labor) also helps improve manufacturing capabilities.

- Promote innovations and developments for high-value industries, specifically those with resources that provide a competitive advantage to the country.

- Encourage technology adoption through the digitalization of businesses and fin-tech services.

- Encouraging regional clusters can enhance innovation and productivity, which provides room for the development of competitive industries.

- Provisions for explicit national innovation policy can steer innovation in the right direction and grapple with requirements for all stakeholders involved.

- Strengthen established institutions by providing them with necessary independence as well as the legal and financial support to correctly accomplish their functions. Consequently, commit to institutional audits that focus on innovation-related obstacles. The audits can be built on broader World Bank surveys to evaluate the business environment and governance conditions. Such audits can be carried out periodically by high-level, independent bodies that can provide recommendations, monitoring, and follow-up [18].

- Set up national bodies dedicated to innovation and help create well-funded, sophisticated agencies to support innovation. Such national innovation organizations are frequently present in advanced economies, accelerating innovation activities and promoting competitiveness. For example, Japan's New Energy and Industrial Technology Development Organization is a quasi-public agency with a USD2 billion budget from the Ministry of International Trade and Industry. The ROK's Korea Industrial Technology Foundation also

engages in a wide range of technology activities, such as technical training to develop industry technicians and cooperating with international entities to promote industrial technology development. Many innovation-promotion agencies have outreach efforts that help domestic companies partner with foreign companies or researchers. Foreign-innovation promotion agencies are not limited to R&D practice [1]. For example, the Danish Technological Institute and the Iceland Technology Institute help SMEs.

- Policy focus may differ for low-income and medium-income countries [18]. For low-income countries, with limited institutional capabilities, the policy focus must be directed toward primary investment in technology infrastructure and demonstration operations of "basic" innovations which can contribute to development in welfare, education, and agriculture. This will perpetuate technology-led development that looks beyond meeting the need to survive. On the other hand, countries with strong institutional capabilities can strive toward dynamic, structured policy. Vietnam provides a successful example. A firm policy was implemented to develop a new culture to take advantage of climatic features for the cultivation of coffee, cotton, etc. Vigorous action was taken to create a competitive software industry in selected niches, building state-owned enterprises, and other such initiatives. Reforms were gradually implemented in critical education, finance, and trading areas, ensuring a more lucrative innovation environment.

- Medium-income countries with no science and technology capabilities but with some degree of institutional capacities can develop new IT-oriented services. Countries with a robust science and technology workforce and low institutional capacity must develop autonomous innovation, establishing sustainable clusters of innovative firms. There is also a need to transform present R&D organizations and revitalize the entire R&D system, preventing decay. Such measures will help boost innovation and increase competitiveness.

In crafting policies or development initiatives to promote innovation, cultural specificities and the local environment must always be at the forefront. Each country differs in terms of its history, geopolitical scenario, development

issues, and innovation climate. Nurturing innovation based on unique needs will lead to the most effective results for growth.

Dual Capacity for Innovation: Social and Economic Benefits

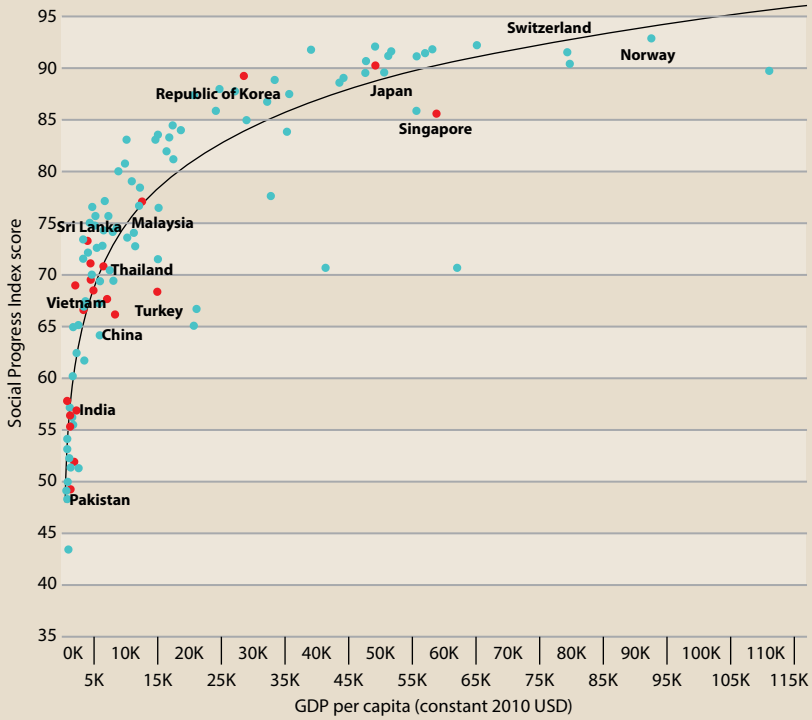
A growing interest in innovation has led to a popular notion that it pertains to science and technology. Innovation also pertains to nontechnological innovation that is not limited to scientific formulas or technical understanding. Adopting novel governance methods, improvements in management techniques, and experiments in new enterprises all contribute to innovation.

Today, the world experiences more opportunities than ever before. The fundamental shift in society brought about by globalization and consistent technological advances has led to a significant increase in competitiveness in markets. The changing global market has led to the emergence of tech-enabled firms with new business models that have disrupted the traditional practices in the economy. Along with the disruption, this shift in the global market has also led to significant growth and prosperity levels.

Tech-oriented firms have made remarkable gains at a global level. Countries with globally successful firms also generate great benefits in the world economy, which benefits local markets as well. Countries that have higher innovation practices also have higher GDP per capita, as shown in Figure 3. These countries include Singapore, Japan, and the ROK. Alternatively, countries that fall behind in innovation practice do not scale up their GDP per capita as swiftly. The returns on investment for innovation can provide steady to exponential economic growth levels to countries. The rise of East Asian economies is a testament to that fact. Focusing on innovation to propel productivity will lead to a surge in opportunities available for firms and organizations to grow, with sustained results that ensure better practices, upgrade production processes, and demand sophistication of products in local markets. As firms in local markets face stiff competition, the ability to compete in international markets also rises, giving them a competitive advantage. As productivity increases and innovation is maximized, the standard of living also rises. Sustaining robust innovation practices is the gateway to higher productivity, which generates more prosperity for the people. The returns on investment can also open pathways to social development.

FIGURE 10

2020 SOCIAL PROGRESS SCORES VS 2019 GDP PER CAPITA (CONSTANT AT 2010 USD).



Source: Social Progress Index, 2020 [19] and World Bank, 2019 [17].

The social progress index (SPI) [19] measures the extent to which countries provide social and environmental needs, foundations of well-being, and opportunity for progress to show the relative performance of nations. Banking on innovation to accelerate social progress can open the floodgates to development. The countries with higher GDP per capita scores also have higher SPI scores (Figure 10). Although higher GDP per capita does not guarantee the erosion of inequalities in society, the inequalities in developed nations may be lower than in countries with lower GDP. Nevertheless, countries with higher GDP and SPI scores, i.e., Singapore and Japan, boast higher standards of living than countries with lower scores in the indexes.

Innovation can ensure lucrative social returns. Societal challenges can be addressed through a collaborative effort among government, institutions, private enterprises, and independent researchers. Such collaborations can lead to the optimal results beneficial to all parties involved. Addressing issues related to climate change, for instance, can have the most effective results when all bodies of the government, civil society, private enterprise, and other institutions collaborate and consider the well-being of all stakeholders involved. Focusing on education to reduce existing gaps in access to basic literacy and instruction quality can jump-start the process of development. Access to basic literacy still evades close to a quarter of a billion children. Diagnosing this problem can leapfrog countries from low-income to middle-income status [2]. Internet and mobile technology can be harnessed to reach marginalized populations and provide educational tools and access on a broader scale.

Wagner [20] studied the link between innovation with high social benefits and corporate social performance. On the one hand, innovation produces private benefits such as improved products, which create an advantage for firms. On the other hand, innovation can have social benefits like process improvements that reduce environmental pollution. Wagner argued for innovation to have equilibrium in which firms are encouraged to innovate to obtain higher returns and simultaneously contribute to society. Innovation with high social benefits can be defined as having a positive direct social benefit, e.g., reduced environmental externalities or provision of products and services for the economically disadvantaged.

Scott [21] asserts that firms "play the game" of ensuring social benefits because they are rewarded for doing so with increased legitimacy, resources, and survival capabilities. However, looking beyond mere profits and acting out of concern to create social well-being cultivate benefit for all stakeholders involved.

Another perspective from Porter and Kramer [22] is of mutual dependence between corporations and society. Hence, both business decisions and social actions must follow the principle for shared value. Eventually, decisions must benefit both sides. If businesses or society pursue activities solely for their benefit at the expense of the other, there will be adverse consequences. In such a scenario, a momentary gain for one will weaken long-term prosperity for both. Ultimately, mutually beneficial decisions can lead to an all-encompassing

degree of prosperity. Lev et al. [23] state that those who pioneer innovation incur significantly more returns than those who follow it (earning an average return rate).

Competitive advantage can be secured from various sources such as lower costs, better productivity, and higher interest rates and investments. Nevertheless, innovation provides an advantage that is valuable not only by itself but also for all those areas. Pursuing innovation to boost productivity in all sectors of the society and economy will help tap into higher prosperity levels.

Intellectual Property Regimes

The rise in innovation practices has also led to a surge in licensing decisions and patent protections in firms and organizations. Intellectual property (IP) has become a crucial element that helps incentivize innovation. By incentivizing innovation, countries can sustain their economic growth. IP regimes, as defined by the OECD [24], allow income from the exploitation of IP to be taxed at a lower rate than the standard statutory tax rate. There are several ways to gauge the impact of IP regimes. The nexus approach laid out by the OECD also calls for the link between income benefiting IP regimes and the extent to which the taxpayer has utilized the underlying R&D that has generated the IP asset. Other approaches pertain to regimes like ring-fencing from the domestic economy and peer reviews. IP regimes can thus be classified as harmful (those that lack a nexus approach), not harmful (those incorporating both the nexus approach and other peer reviews), and potentially harmful (not meeting the nexus or any other approaches, but an assessment of economic effects has not been carried out). Providing a robust IP regime incentivizes innovation among firms. It does not merely cater to selfish gains of companies to acquire rewards like legitimacy and financial gains. In other words, trust is an essential factor in IP, even if applying for patents is often assumed to restrict competition. But this view does not hold. Patents can provide grounds for competing fairly.

Moreover, the economic value of innovation remains latent unless it is commercialized. Companies and investors will not risk capital for developing or discovering drugs unless their investment is protected from competing companies by a patent. The same rule applies to local community members like farmers who risk losing compensation for their knowledge without protection

mechanisms in place. Traditional knowledge and innovation in developing countries fail to enlarge their knowledge base [18]. With a robust IP regime, information, research tools, and discoveries can be shared correctly.

Without proper IP regimes, distortions in access to high-quality business inputs may occur in information, science, and technological infrastructure. Intellectual capital may not be easily recognized. If there are no stringent legal protections, then companies will not have any incentives to innovate. Without proper legal mandates, there will be a distortion of incentives to share knowledge. It will also reduce network effects in clusters as firms in clusters grow averse to sharing their expertise and business know-how. Without strong IP rights laws, there will be a lack of strict quality, safety, and acceptable environmental standards. Imports will increase as demand sophistication is enhanced but not met locally. Government procurement of advanced technology can also occur with no laws in place. Subsequently, local policies that incentivize innovation and investment will decrease. This leads to lower salaries with low-end work and declining capital investments. Innovation will be reduced without proper incentives.

Furthermore, there will be a distortion of competition among companies as there is no level playing field. Ultimately, companies expect outside R&D investments and reap benefits from them without taking initiatives independently [4]. Having a robust IP regime can boost innovation and R&D practice, enhance productivity, and promote competition. It helps coordinate complexities and resolve ambiguities that can otherwise easily come about without a proper regime in the system. Without a strong regime, innovation declines, productivity is hindered, and competition is stifled.

CONCLUSION

Technology, science, and innovation can generate an incredible number of resources and social and economic opportunities. A rapid rise in productivity levels does not necessarily indicate an increase in living standards for all social sections. However, through innovation, the gaps can be reduced.

For advanced economies, the growth of international trade, globalization, or production makes it increasingly essential to innovate, make improvements to maintain standards of living, and prepare for future challenges consistently. Atkinson and Wial [1] argue that PR China's and India's competitive advantages lie in the labor-intensive production process. Other countries could rely on innovation-based solutions to ignite their competitive advantage and induce productivity growth. For countries like Japan, making consistent upgrades to accelerate innovation practice is crucial. Other developing countries like Bangladesh would have to provide a lucrative environment for innovation to grow. The diagnosis needs to be country specific, catering to individual needs. Innovation encapsulates the ability to create growth opportunities for all countries, regardless of their stage of development. Resolving challenges to development through inclusive innovation practice is necessary. This is why innovation that does not remain limited to technological advances that result in incremental social development. Inclusive development must take place comprehensively to avoid having pockets of development in certain regions as the rest of the country falls behind. Innovation cannot be separated from economic practices prevalent in a country.

In their book Innovation Studies: Evolution and Future Challenges, Fagerberg et al. [25] cited arguments from various economists. Schumpeter's criticism of the notion that economics do not merely pertain to scarce resource allocation between competing initiatives holds true. Economics are equally concerned with innovation-driven changes, how these changes are brought about, and their consequences. There must be a comprehensive understanding of how

economic agents learn, create, exploit, and share knowledge. Traditional economics do not encompass this understanding. Therefore, economists must borrow from cognitive and social psychology, innovation studies, and evolutionary economics to gain thorough knowledge.

Furthermore, a broad interdisciplinary and historical perspective is required for understanding the selection process. Given that disruptive, novel innovations are not readily accepted by potential users, a selection process must be in place. Finally, understanding the financial dynamics in tandem with research is equally vital.

Designing and incorporating innovation policies comprising elements that support the principle of shared value and propel productivity pave the path for the growth trajectory that a country follows. Nevertheless, creating a climate that promotes innovation in enterprises, organizations, and institutions is equally important. Spurring innovation can occur gradually by building infrastructure and acquiring resources that eventually lead to development. This must be done to avoid perpetuating existing inequalities or causing growth at the expense of social harm. In driving innovation in the right direction, it can prove to be remarkably useful in achieving social progress. As stated under the dimensions of innovation policy, the role of government must be fulfilled through both direct and indirect methods of facilitating innovation. Enabling innovation through human capital, R&D investment, providing a lucrative business environment, and legal safeguards concerning IP regimes is imperative. As the scope for innovation-led productivity growth has increased, so have the challenges that come with it. Solutions enabled through innovation are the only way to achieve success.

REFERENCES

[1] Atkinson R.D., Wial H. Boosting productivity, innovation, and growth through a national innovation foundation. In: The Information Technology and Innovation Foundation and Metropolitan Policy Program at Brookings, eds. Blueprint for American Prosperity: Unleashing the Potential of a Metropolitan Nation; 2008.

[2] Rice C., Erol Y. Innovation-led Economic Growth: Transforming Tomorrow's Developing Economies through Technology and Innovation. Center for Strategic and International Studies; 2017.

[3] Romer P.M. (1993). Implementing a national technology strategy with self-organizing industry investment boards. Brookings Papers on Economic Activity, Economic Studies Program, Brookings Institution; 1993; 24: 2.

[4] Porter M.E. Institute for Competitiveness Analysis. ??Author: Please give publication title, year, and other details??

[5] Porter M.E. On Competitiveness. Cambridge, MA: Harvard Business School Publishing Corporation; 2008.

[6] Global Innovation Index 2020.

[7] Global Competitiveness Index 2019.

[8] Manyika J., Roxburgh C. The Great Transformer: The Impact of the Internet on Economic Growth and Prosperity. McKinsey Global Institute; 2011.

[9] Fugile K., Gautam M., Goyal A., Maloney W.F. Harvesting Prosperity: Technology and Productivity Growth in Agriculture. World Bank; 2020.

[10] Tushman M., Nadler D. Organizing for innovation. California Management Review 1986; 28(3): 74–92. http://dx.doi.org/10.2307/41165203.

[11] Tidd J., Bessant J., Pavitt K. Innovation Management: Introduction of Technological, Market and Organizational Changes. Translated by Nevrlá E. Brno: Computer Press; 2007. https://katalog.vsb.cz/documents/86514.

[12] Hana U. Competitive advantage achievement through innovation and knowledge. https://www.cjournal.cz/files/127.pdf.

[13] Ketels C. Michael Porter's competitiveness framework—recent learnings and new research priorities. Journal of Industry, Competition, and Trade 2006; 6: 115–136. https://doi.org/10.1007/s10842-006-9474-7.

[14] Edler J., Fagerberg J. Innovation policy: What, when, and how. University of Oslo, TIK Working Papers on Innovation Studies 2017; 20161111.

[15] OECD. The Innovation Imperative: Contributing to Productivity, Growth and Well-Being. 2015. https://www.oecd-ilibrary.org/science-and-technology/the-innovation-imperative/the-business-environment-for-innovation_9789264239814-6-en#:~:text=Policies%20for%20innovation%20also%20rely,market%20share%20and%20reach%20scale.

[16] Ease of Doing Business Index 2020.

[17] World Bank Human Capital Project. The World Development Report (WDR) 2019: The Changing Nature of Work. https://www.worldbank.org/en/publication/human-capital/brief/the-human-capital-project-frequently-asked-questions. https://www.worldbank.org/en/publication/wdr2019.

[18] Aubert J.E. Promoting Innovation in Developing Countries: A Conceptual Framework. World Bank Institute 2005; WPS3554: 1–39.

[19] Social Progress Index 2020.

[20] Wagner M. Corporate social performance and innovation with high social benefits: A quantitative analysis. Journal of Business Ethics 2010; 94(4): 581–594.

[21] Scott W.R. The adolescence of institutional theory. Administrative Science Quarterly. 1987; 32(4): 493–511.

[22] Porter M.E., Kramer M.R. Strategy and society: The link between competitive advantage and corporate social responsibility. Harvard Business Review 2006; 84(12): 78–92, 163.

[23] Lev B.I., Radhakrishnan S., Ciftci M. The stock market valuation of R&D leaders. NYU Working Paper No. 15; 2006.

[24] OECD. Intellectual IP regimes; 2019. https://qdd.oecd.org/data/IP_Regimes.

[25] Fagerberg J., Martin B.R., Anderson E.S. Innovation Studies: Evolution and Future Challenges. Cambridge, UK: Oxford University Press; 2013.

LIST OF FIGURES