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New Frontiers of Cooperation in U.S.-Korea Relations: Opportunities for Economic Engagement

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Abstract

In October 2015, the U.S. and Korean governments announced "New Frontiers of Cooperation" for the bilateral agenda following the summit meeting between U.S. President Barack Obama and Korean President Park Geun-hye. These areas include countering biological threats and advancing the global health security agenda; combating climate change; investing in a sustainable environment; increasing cyber collaboration; exploring space cooperation; and expanding science and technology collaboration.

The "new frontier" areas present good potential for expanding U.S.-Korea economic engagement, and a pathway of natural progression for the bilateral economic relationship. Beyond their importance from a national security and global cooperation perspective, each is the focus of emergent industry sectors in both countries with strong expectations for growth. They build on a robust partnership of science and technology cooperation that has evolved between the United States and Korea, and the growing convergence of U.S. and Korean interests in these fields also make them a natural area for cooperation at the global level.

This paper will broadly examine "new frontier" areas and their relevance to the U.S.-Korea economic relationship. It will review related previous and ongoing U.S.-Korea initiatives, and consider how engagement in these areas could build on other bilateral activities at the government and private sector levels. Success requires continued progress within existing economic frameworks, including implementation of the U.S.-Korea Free Trade Agreement (KORUS FTA), and broadening engagement to incorporate sub-national level stakeholders in both countries, including state and local governments, the private sector, and research community.

Key Words: *U.S.-Korea Relations, Science and Technology Policy, Korea Economic Policy, Innovation Policy, New Frontiers of Cooperation.*

Introduction

On October 16, 2015, U.S. President Barack Obama and Korean President Park Geun-hye held their third summit meeting, which focused primarily on traditional areas of cooperation, including strengthening the U.S.-Korea security alliance, deepening trade and economic relations, and increasing collaboration at the global level to pursue common goals and challenges. This summit also introduced to the bilateral agenda the "New Frontiers of Cooperation."[1] Then-U.S. Ambassador to Korea Mark Lippert described the issues falling under this category (hereafter the "new frontiers") as those which are "increasingly salient in the 21st century," on which the United States and Korea have considerable expertise and have previously made positive contributions.[2] They include global health, energy and climate change, environment and sustainability, cybersecurity, space, and science and technology.

Although seemingly a disparate set of issues, the "new frontiers" areas share several common elements. First is a focus on research and development (R&D), including through training exchanges and accelerating new technologies. Second is the goal of reducing threats to both national and economic security. Third, each incorporates initiatives at both the national and international levels. Fourth, each are sectors in which significant convergence of technologies from different fields is taking place, generating new capabilities and industries contributing to economic growth. Additionally, each reflects ongoing bilateral initiatives rather than new projects. In fact, virtually all of these

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areas were mentioned in the joint declaration issued following Presidents Obama and Park's first summit meeting in May 2013, in the context of global challenges for which the two countries aimed to strengthen collaborative efforts.[3]

Taken collectively, the "new frontiers" reflect the overall evolution of the U.S.-Korea relationship, and converging priorities and capabilities in U.S. and Korean science, technology, innovation, and economic development policies. They offer a new framework to focus on issues that are increasingly at the fore of national and bilateral agendas and are also relatively non-controversial within the bilateral relationship. Their position at the nexus of economic opportunity and national security make them ideal areas for cooperation.

At a time of political transition in both countries, the "new frontiers" offer opportunities for continuity and a forward-looking framework for economic engagement to expand. Amidst the new U.S. administration's concerns over the bilateral trade relationship with Korea, they represent sectors in which U.S. businesses are uniquely positioned to thrive in Korea's competitive domestic market due to the innovative technologies they offer. Similarly, they include fields in which Korea is increasingly a global technology leader. However, realizing the full bilateral economic potential of the "new frontier" areas requires long-term continuity in engagement, dialogue, and activity at multiple levels of government. Therefore, ensuring the continuity of "new frontier" areas within evolving national-level policy initiatives and frameworks must be a priority for new leadership in Seoul and Washington.

Defining "New Frontiers"

Before further analyzing the "new frontiers" and their importance, it is first useful to consider some of the specific projects outlined within these areas and examine the collaboration envisioned and undertaken by the two governments.[4]

Countering Biological Threats and Advancing the Global Health Agenda. Ongoing and envisioned activities included collaboration between the U.S. Department of Health and Human Services and Korean Ministry of Health and Welfare to advance public health goals; between the U.S. National Institutes of Health (NIH) and Korean National Institute of Health in biomedical research, training, and personnel exchanges; and international-level activities such as joint efforts to advance the Global Health Security Agenda and protect against biological threats and pandemics.

Combating Climate Change. Goals included increased cooperation between the U.S. Department of Energy (DOE) and Korean Ministry of Trade, Industry, and Energy (MOTIE) on smart grid, hydrogen and fuel cell technologies, and in implementing projects for micro grid analysis and design and energy storage systems. International-level priorities included cooperative efforts to achieve an ambitious climate change agreement at the 2015 United Nations Climate Change Conference (COP 21) in Paris; mobilizing climate finance including through the Green Climate Fund; and accelerating the deployment of clean energy technologies.

Investing in a Sustainable Environment. Distinct from energy and climate change, these activities included existing environmental initiatives such as the U.S.-Korea Environmental Cooperation Agreement Work Program and Environment Affairs Council established under the U.S.-Korea Free Trade Agreement (KORUS FTA); continued dialogue on Arctic issues; and collaboration on sustainable fisheries, such as a joint project between the U.S. National Oceanic and Atmospheric Administration (NOAA) and Korean Ministry of Oceans and Fisheries in research areas including ocean acidification, marine debris, and impacts of climate change on fisheries resources.

Increasing Cyber Collaboration. Goals included strengthening existing bilateral cooperation mechanisms, such as the U.S.-Korea Cyber Policy Consultations,[5] military Cyber Cooperation Group, and U.S.-Korea Information and Communication Technology (ICT) Policy Forum, while increasing cooperation through information sharing on cyber defense best practices and threats to critical infrastructure; collaboration in investigating cyber incidents; and joint research and development (R&D), education, and workforce training in cybersecurity fields.

Exploring Space Cooperation. Goals included concluding a Framework Agreement for Cooperation in Aeronautics and the Exploration and Use of Airspace and Outer Space for Civil and Peaceful Purposes, which was signed in April 2016 and entered into force in November 2016. This agreement sets forth terms and conditions for expanding bilateral cooperation in areas such as human space flight, space science, operational Earth observation for meteorological, oceanography, and environmental monitoring, aeronautics, space operations and exploration, education, technology, safety and mission assurance.[6] Also included were finalizing a memorandum of understanding between the National Aeronautics and Space Administration

(NASA) and Korean National Institute of Environmental Research for the Korea-U.S. Air Quality Field Study (KORUS-AQ);[7] and collaboration between NOAA and the Korea Meteorological Administration on geostationary meteorological satellites to maximize utilization of satellite data to improve weather forecasts and warnings. The growing space security relationship was also noted.

Expanding Science and Technology Cooperation. Concluding the joint statement's section on the "new frontiers" areas was a reaffirmation of the "deep and enduring bilateral relationship in science and technology cooperation," and the importance of science, technology, and innovation to shared economic prosperity and achieving mutual goals in the above-listed areas. Other priority areas for collaboration listed included nanotechnology, advanced manufacturing, biotechnology, ICT research, and information exchanges on best practices regarding innovation to maximize the application of R&D results.

"New Frontiers" and Science, Technology, and Innovation in the United States and Korea

The "new frontier" areas need to be considered within the broader context of science, technology, and innovation policies in fostering economic development in and between the United States and Korea. They reflect emerging, R&D-driven industries that both countries have identified as engines for new domestic economic growth. Additionally, these sectors represent areas of potential economic vulnerability and risk, as demonstrated by recurring high-profile hacking and cybersecurity breaches, and the outbreak of MERS in Korea in 2015, which generated negative effects on Korea's economy due to domestic and international concern about the potential for a pandemic.[8]

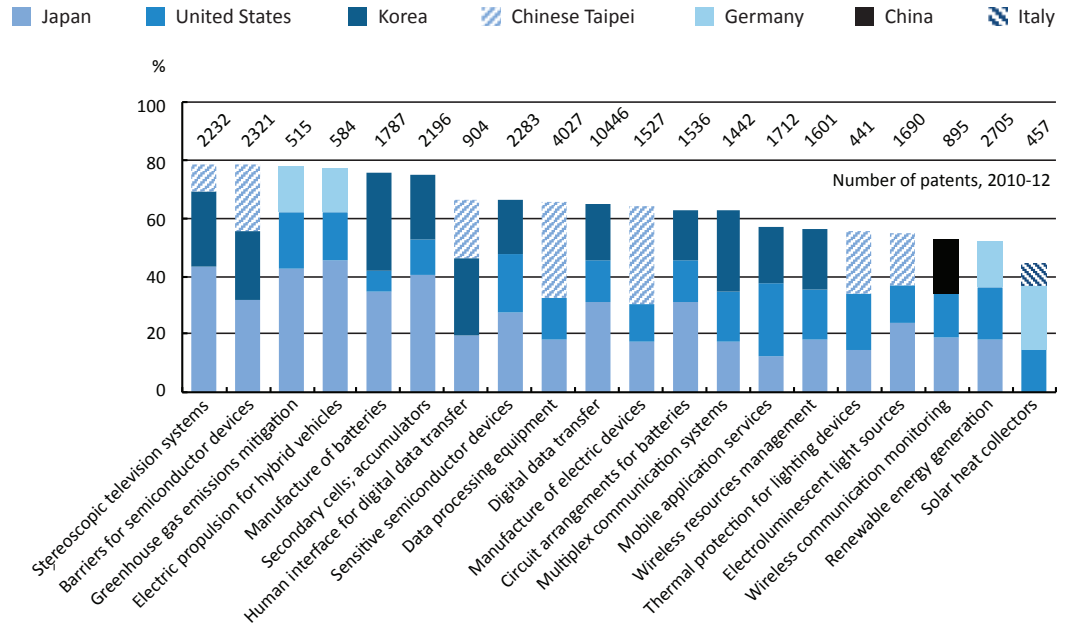
In the United States, global health initiatives, the "new space" industry, and clean technologies are among those reshaping their respective industry sectors. The Obama administration's *Strategy for American Innovation* prominently included "new frontiers" areas within its strategic initiatives for R&D investments in future growth sectors and in catalyzing breakthrough technologies to tackle leading national and global challenges.[9] It also identified cybersecurity as fundamental to the framework conditions required to facilitate the continued growth of the United States as an innovation economy, and set forward a cybersecurity agenda of increased public-private partnerships; enhanced protection of federal government networks; upgraded policies and capabilities to counter threats; and expanded international engagement including in law enforcement cooperation.[10]

Similarly, biotechnology, nanotechnology, new energy technologies, space, and the Internet of Things (IoT) are among the sectors that Korea has targeted as new growth industries and within broader science, technology, and innovation policy agendas. Successive Korean governments have sought to increase Korea's R&D budget and investments in basic research, improve science and technology coordination, and boost high-tech startup businesses as part of these efforts. The Park Geun-hye administration's creative economy agenda, which included significant focus on promoting convergence technologies as new economic growth engines, also attempted to address broader structural challenges in Korea's economy constraining its innovation environment.[11]

Korea has ascended the ranks of global leaders in science and technology. It has one of the highest levels of R&D expenditures among OECD members, at 4.23 percent of GDP in 2015.[12] It is an international leader in ICT and other technologies fundamental to the "new frontiers" sectors as new industries. Korea is a leading actor in 11 of 20 rapidly accelerating technologies tracked by the OECD, including technologies relating to the human interface for digital data transfer (a set of technologies that underpin IoT); battery manufacturing; sensitive semiconductor devices; and multiplex communication systems and mobile application services, among others as shown in Figures 1 and 2.[13] It is a leader in the patent family share of "disruptive technologies" of the kind that displace established technologies and lead to market entry of new firms, such as advanced materials, new generation ICT-related technologies such as IoT and telecommunications advances, and health-related technologies as shown in Figure 3.[14] Additionally, Figures 4, 5, and 6 illustrate how Korea has grown significantly as a leading source of patents in climate change mitigation, nanotechnology, medical technology and biotechnology.[15] These capabilities, combined with high levels of investment in R&D and education in science, technology, and engineering fields, position Korea for continued breakthroughs in these areas.

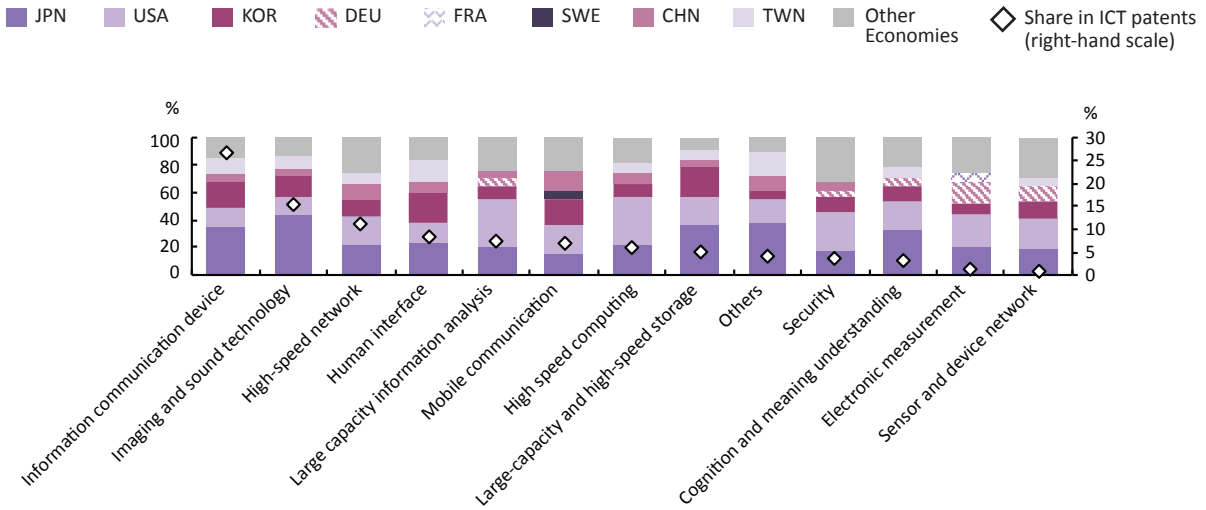
In line with its emergence as an advanced economy, Korea has increasingly taken on global leadership roles and responsibilities, including in the "new frontiers" areas. For example, the Lee Myung-bak administration, as part of its "low carbon, green growth" agenda, proposed a carbon emissions reduction of 30 percent by 2020 from a business-as-usual baseline, among the most ambitious in the international community at the time. It took leading roles on green growth issues within multiple global

Figure 1. Top Players in Emerging Technologies, 2010-12



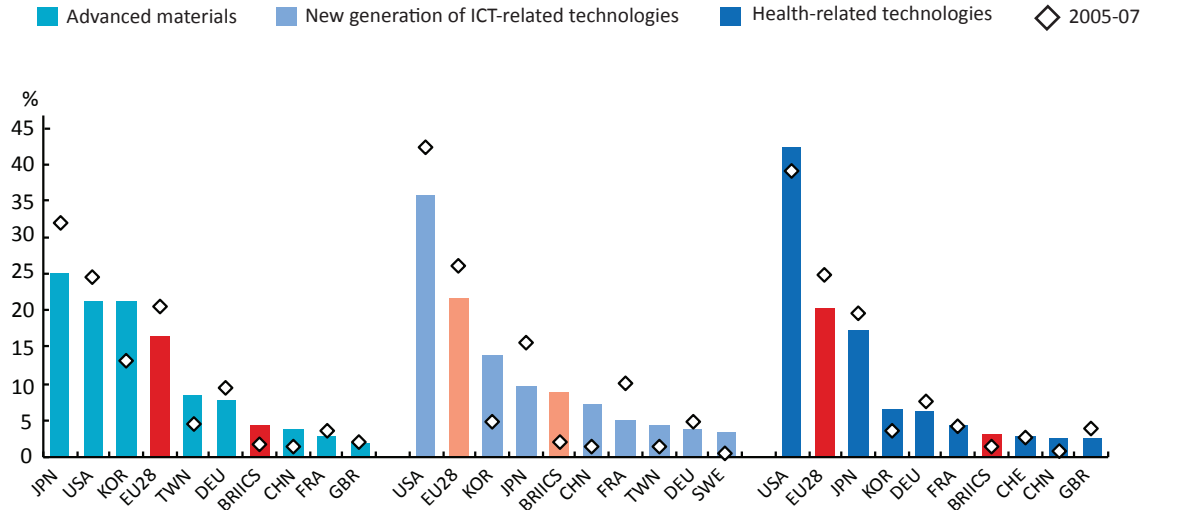
Source: OECD STI Scorecard 2015

Figure 2. Patents in ICT-Related Technologies and Major Players, 2010-13



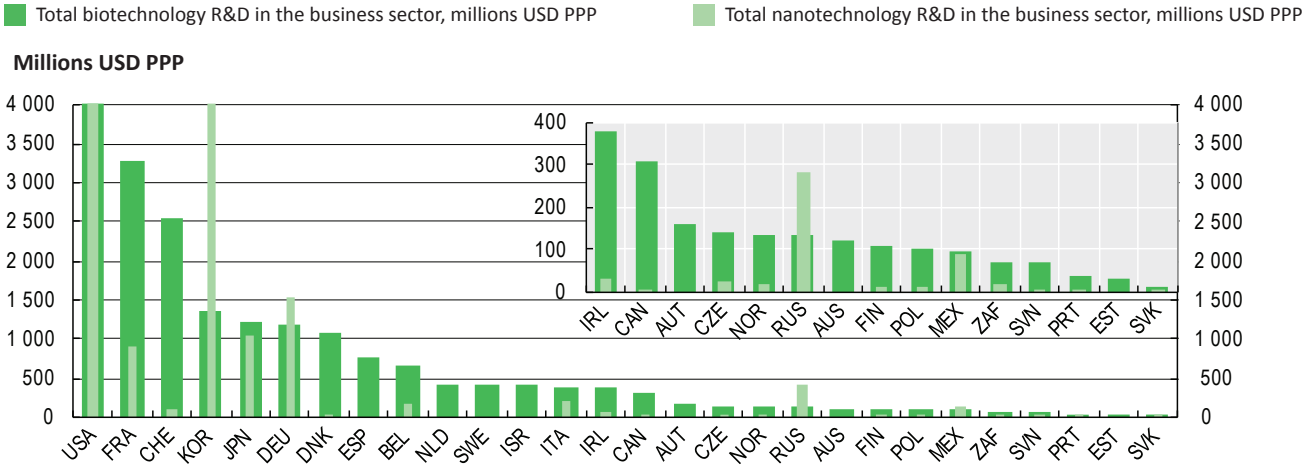
Source: OECD STI Scorecard 2015

Figure 3. Top Players in Selected Disruptive Technologies, 2005-07 and 2010-12



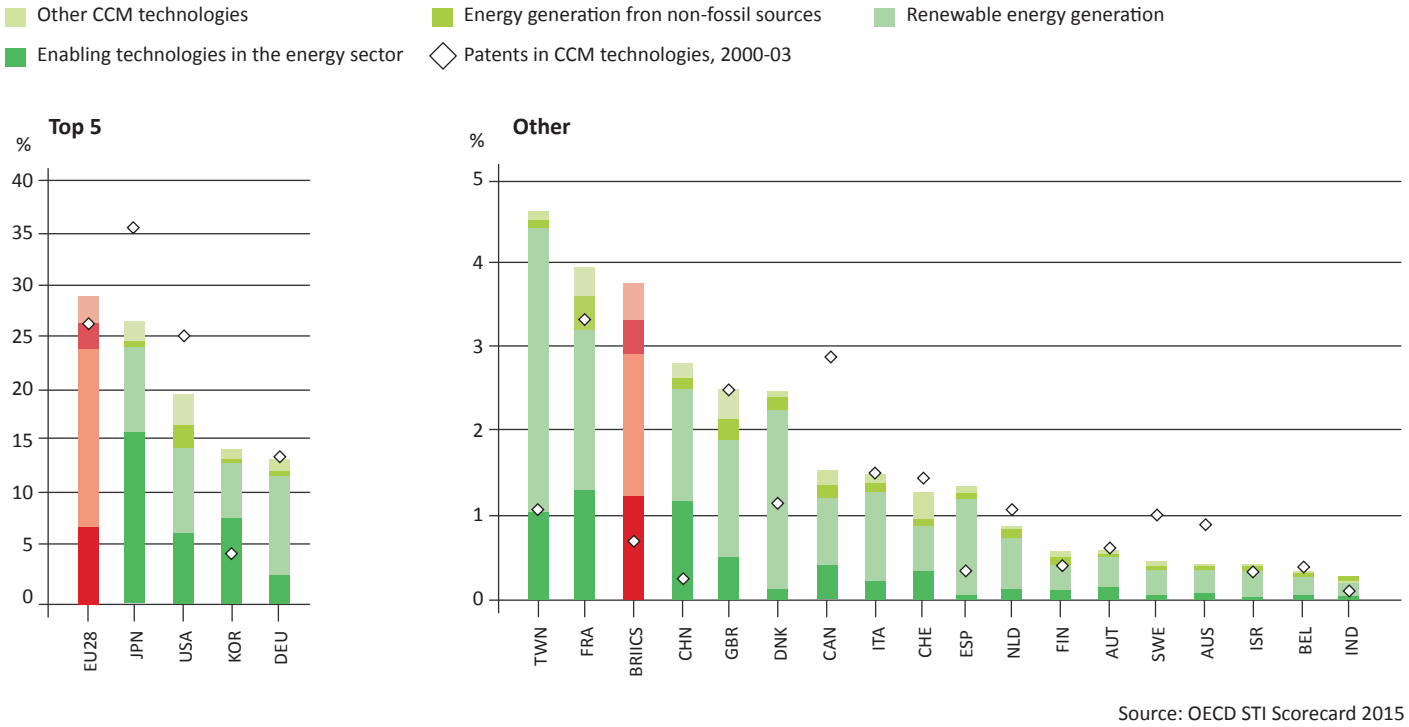
Source: OECD STI Scorecard 2015

Figure 4. Biotechnology and Nanotechnology R&D in the Business Sector, 2013



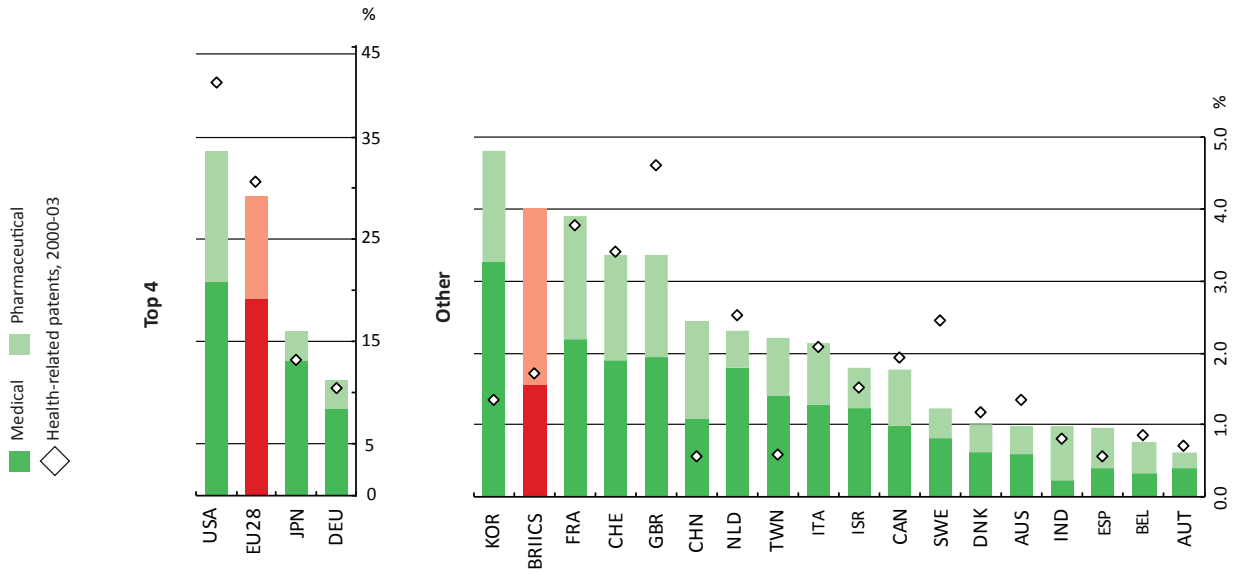
Source: OECD STI Scorecard 2015

Figure 5. Patents in Climate Change Mitigation (CCM) Technologies, 2010-13 and 2000-03



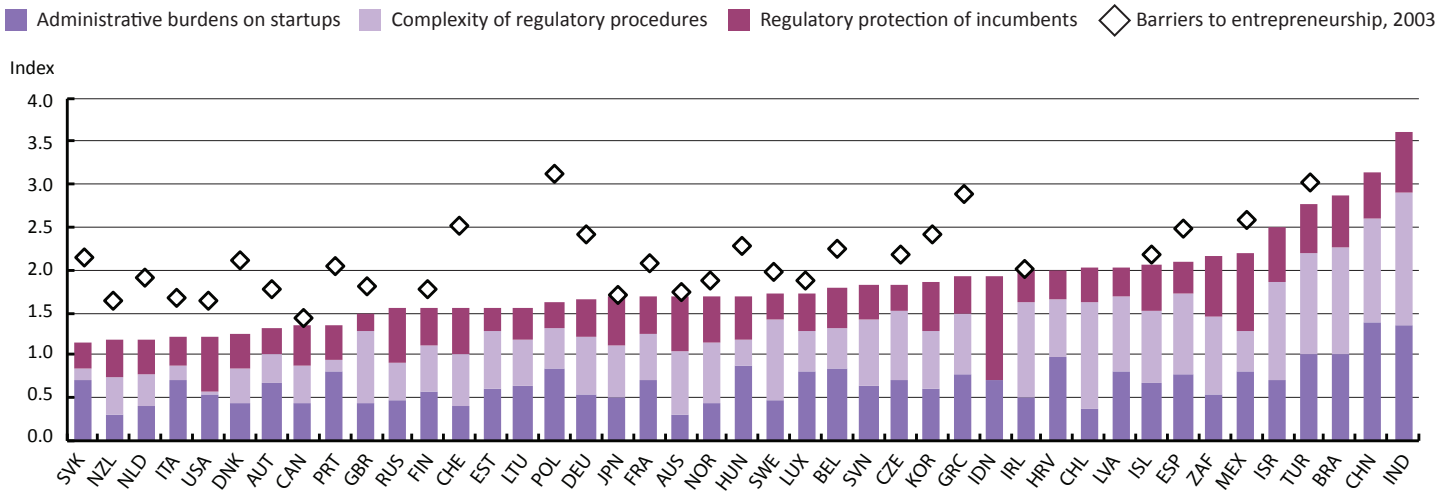
Source: OECD STI Scorecard 2015

Figure 6. Health-Related Patents, 2010-13 and 2000-03



Source: OECD STI Scorecard 2015

Figure 7. Barriers to Entrepreneurship, 2013



Source: OECD STI Scorecard 2015

Figure 8. International Scientific Collaboration, 2012 and 2003

Source: OECD STI Scorecard 2015

forums, and in launching new initiatives and organizations including the Global Green Growth Institute and Green Climate Fund (both of which are headquartered in Korea) aiming to advance environmentally sustainable economic development, particularly in developing economies.[16] The inclusion of several ongoing international partnerships and initiatives within the list of "new frontiers" areas reflects Korea's expanded capacities and capabilities, particularly in areas that converge with U.S. goals and priorities.

Despite these technological strengths and advances, Korea faces constraints that have held it back from its full potential for innovation-driven economic growth, including but not exclusive to the "new frontiers" areas. Several of these are structural, and reflect in part the historically dominant role played in Korea's economy by *chaebol* conglomerates: for example, a significantly stronger emphasis on applied research (particularly in manufacturing and ICT) over basic research; limited incentives for university-industry collaboration; education system challenges; and a challenging regulatory and business environment for entrepreneurship, reflected by Figure 7.[17] Korea also has lower levels of international collaboration on R&D, as shown in Figure 8, which reduces opportunities for Korean researchers and industries to reap the full potential benefits for boosting Korea's innovation capabilities.[18] This is one area in which opportunities for increased engagement and collaboration with U.S. partners, particularly related to the "new frontiers" areas, may benefit Korea's efforts to address these challenges.[19]

"New Frontier" Areas in U.S.-Korea Relations

The United States and Korea share a long history of collaboration in science and technology, and Korean approaches to innovation have been extensively shaped through interactions with the United States. In several areas, including nuclear energy technology, the United States and Korea today have a "relationship of technical equals" that makes possible new forms of collaboration not possible in the past.[20] The "new frontiers" areas build on this foundation. Examining some of these fields—energy and space—offers examples of the kinds of projects being undertaken, and considerations reflecting both the potential opportunities and constraints of these initiatives.

Energy: Bilateral activities related to new and renewable energy technologies, with focus both on reducing carbon emissions and advancing new growth industries, have accelerated during the past two decades. For example, during the George W. Bush administration, Korea became the second country to join the FutureGen International Partnership,[21] while Hyundai-Kia partnered with Chevron in a U.S. National Renewable Energy Lab demonstration project to develop a fleet of hydrogen-powered fuel cell vehicles and fueling stations.[22] These expanded under the Obama and Lee Myung-bak administrations, both of which prioritized their development and deployment in tandem with making significant carbon emissions reduction pledges. In 2011, DOE and Korea's Ministry of Knowledge Economy (today MOTIE) established the U.S.-Korea Clean Energy Technology Partnership, with the goal of strengthening cooperation in clean energy technology R&D through exchange of technical information and consultations to promote joint projects, in areas including energy efficiency, renewable energy, fuel cell and smart grid technology, green transportation, carbon capture, and energy storage systems.[23] Examples of these activities included a three-year project between Sandia National Laboratories and the Korea Energy Research Institute to design and construct advanced interoperability test beds for smart grid systems, and a robust consensus certification procedure for advanced inverter functions for adoption by an international standards organization.[24]

Although the Trump administration has emphasized the development of domestic coal, oil, and gas resources within its energy policies, and its climate change policies are evolving, these technologies will remain an important area for U.S. engagement with Korea. Clean coal, carbon capture, and storage technology development could present a renewed area for increased collaboration, particularly given Korea was the world's fourth-largest coal importer in 2015. Korea Western Power Co. initiated commercial operations of the Taean Integrated Gasification Combined Cycle (IGCC) demonstration power plant in August 2016,[25] which joins other IGCC facilities operating in the United States. Nuclear energy—although technically outside the scope of the "new frontiers" areas—is a longstanding and growing area of U.S.-Korea cooperation in science, technology, and development, and a significant component both of Korea's energy strategies and goal of reducing greenhouse gas emission levels by 37 percent from business-as-usual levels by 2030.[26] As will be explored below, U.S. states, which have their own energy and climate change policies, represent another potentially constructive field for U.S.-Korea activities in this area.

Space: Space is a comparatively new area for U.S.-Korea engagement, due in part to longstanding U.S. concerns about proliferation of dual use technologies. Cooperation has increased with the advancement of Korea's space program, which in 2013 conducted its first successful launch of a Korean-made space launch vehicle from within Korean territory. It also parallels increased emphasis on commercial space as a growth sector in both counties. The Park Geun-hye administration aimed to foster competitive domestic firms providing satellite imagery and communications, and also to contribute space-based data to international humanitarian responses and environmental management,[27] goals that dovetail in several respects with the burgeoning "new space" industry and growth of commercial space in the United States. The April 2016 Framework Agreement represents a significant step forward in these activities. Space is increasingly also an integral part of Korean security and defense policies.[28] The joint communiqué of the 2016 US-ROK Security Consultative Meeting called for "strengthening mission assurance for space capabilities and enhancing cooperation in space situational awareness and space cooperation table top exercise."[29]

"New Frontiers" at the U.S. State and Regional Level

The "new frontiers" represent a valuable venue for fostering engagement between Korea and U.S. stakeholders at a sub-national level. In the United States, it is often the case that successful city and state economic development programs serve as models for national policy. Moreover, regional industry clusters located across the United States are leading centers for innovation and businesses in each of the "new frontiers" sectors, and have already drawn great interest from Korea.

In fact, the "new frontier" areas have already emerged as areas for U.S.-Korea engagement at the state and local level. Though these have been pursued in an ad hoc manner, they share some common elements. These include an emphasis on R&D and technology solutions in new growth industries, interest by Korean stakeholders in developing U.S. regional connections related to science and technology, and interest in attracting foreign direct investment and building trade and economic relationships.

One of these is health technology, for which Maryland has been a focal area for activities due in part to NIH. In recent years, researchers from Chungcheongnam-do Province have conducted activities in biotech incubators in Montgomery County, Maryland, to take advantage of proximity to NIH; Maryland Governor Hogan noted a dozen Korea-affiliated biotech firms in the state in 2016.[30]

Energy is another active area, particularly in fields such as smart grid where the Korean government and businesses are looking to promote deployment of their technologies and systems overseas. Smart grid projects have been pursued in Hawaii and Illinois, including a project to install energy saving equipment in four buildings in Chicago, in which LG Electronics and KT Corporation invested more than $35 million.[31] In November 2016, Maryland Governor Hogan announced the signing of a letter of intent agreement between the Korea Electric Power Corporation (KEPCO) and LS Industrial Systems with Montgomery College in Germantown to donate technology and engineering services to the development of an environmentally friendly, solar energy generating micro grid on the college's campus. This followed the signing of an MOU between the State of Maryland and KEPCO in 2015 to assist Maryland entities developing energy-related technologies find partners and customers in Korea.[32]

In broader science and technology areas, the Consulate-General of Korea in Seattle has worked to facilitate connections between the carbon fiber and composites manufacturing industries in Korea with counterparts in Washington State. Although interest on the Korean side relates in part to opportunities to build linkages for Korean businesses with Washington's aerospace manufacturing value chain, Jeollabuk-do Province (which has a sister state relationship with Washington) is the location of Korea's leading carbon fiber research institute, the Korea Institute of Carbon Convergence Technology (KCTECH). In October 2015 and again in November 2016, the Consulate-General of Korea in Seattle partnered with Washington's Department of Commerce to hold a Washington-Korea Composites Conference, bringing together manufacturers and research institutes active in the carbon fiber field in both countries to discuss industry issues and potential opportunities for long-term collaboration.[33]

Considerations for Economic Engagement

The "new frontier" sectors represent areas of boundless potential for collaboration in developing new technologies and products to meet increasing global demands.[34] They also present economic opportunities for businesses in both countries. For U.S. businesses, the maturity and sophistication of Korea's domestic market can make it a competitive and challenging market to

enter unless they have unique, innovative technologies to offer,[35] which position the "new frontiers" areas as promising sectors for bilateral trade and investment. For example, cybersecurity has been identified as a "best prospect" sector for U.S. firms looking to enter the Korean market, particularly those with technologies and capabilities for critical infrastructure protections, and areas such as encryption for network access, end-to-end point detection, intrusion prevention systems, firewalls, and smart device identification. The U.S. Foreign Commercial Service has also noted that Korea's advanced ICT infrastructure makes it an ideal location for U.S. businesses looking for a test bed for cyber technologies prior to broader deployment.[36] Cybersecurity also has significant implications for broader emerging economic growth sectors prioritized in both countries, such as IoT.[37]

What factors will facilitate, or constrain, bilateral engagement and cooperation in these areas? One is the degree to which the regulatory, business, and political environments in both countries are conducive to market entry for both domestic and foreign participants, including through trade and investment, and to project partnerships. Both the United States and Korea have actively pursued domestic strategies to foster science, technology, and innovation-driven economic growth, with many of Korea's recent creative economy policies modeled in part on U.S. approaches viewed as successful. Additionally, the KORUS FTA includes several provisions important to the development of the "new frontiers" sectors, both as domestic industries and to encourage trade, investment, and collaboration in these areas that can foster new innovations and business opportunities. These include intellectual property protections; provisions on regulatory transparency and leveling the playing field for market entrants; and standards and testing procedures, among others. Full and faithful implementation of these provisions, along with other agreements and frameworks that intersect with "new frontiers" sectors and related technologies, will contribute to advancing these activities.

Another factor is identifying the mutual goals, expectations, and benefits that will justify the time, budget, and other resources committed to R&D and other projects. Related to technology demonstration projects, key questions for consideration include whether the project presents potential pathways for making the technology commercially viable, or whether it is ultimately a technology showcase; who controls the intellectual property generated through the project; cost sharing arrangements; and others.[38] To consider the example of smart grid demonstration projects, for example, questions for assessment include to what extent the projects offer active opportunities for local businesses and the broader community to participate as partners, suppliers, and customers; align with local goals; and help generate local benefits and opportunities that will build the longer-term support needed for these systems to be successful.[39]

Recommendations for Advancement

With the benefits for both the United States and Korea firmly established, the following are recommendations for advancing the "new frontiers."

Fully implement the KORUS FTA and address related trade issues that arise. Important for facilitating U.S.-Korea engagement on "new frontier" issues is ensuring that existing economic agreements are faithfully implemented, in particular the KORUS FTA. Within provisions that are closely related to "new frontiers" areas, Korea's intellectual property protections and enforcement are strong, but lingering restrictions on cross-border data transfer and data localization remain an issue and are considered at odds with other globalized economies, putting non-Korean firms at a competitive disadvantage.[40] Successful implementation of these and other KORUS FTA provisions will further build trust and confidence that will support increased collaboration on economic aspects of the "new frontiers" areas.

The Trump administration has announced a review of U.S. trade policy and all existing trade agreements, and has been critical of the KORUS FTA. Despite the uncertainly related to the agreement, of greater importance for facilitating economic engagement in the "new frontiers" areas is continued progress in its full and faithful implementation.

Additionally, it is important to swiftly address new issues that arise around "new frontier" sectors that may not be directly addressed within the KORUS FTA given the rapid evolution of technologies. For example, related to cybersecurity, the Office of the U.S. Trade Representative has identified as a trade barrier Korea-specific requirements for testing of network equipment such as routers and switches procured by the Korean government, even though both countries are members of the Common Criteria Recognition Arrangement (CCRA), under which products certified at any CCRA-accredited laboratory in any member country should be accepted as meeting the certification requirement in any other member country. Concerns have been raised by stakeholders

that Korea is pursuing this in a non-transparent manner, with very broad interpretation, and expanding the scope of the requirements to products not normally considered "security" products such as routers and switches.[41] Timely resolution of these kinds of issues will also contribute to trade and investment that will support the growth of "new frontiers" industries in both countries.

In future trade frameworks in which the U.S. and Korea participate, identify opportunities to advance shared priorities in "new frontier" areas. The future of U.S. participation in regional trade pacts is uncertain, with the withdrawal by the Trump administration from the Trans-Pacific Partnership (TPP) and its stated intent to instead focus on bilateral trade agreements. That said, it is important for the United States and Korea to consider regulatory, trade, and investment issues related to "new frontiers" technologies and sectors within other negotiations, agreements, and treaties to which either or both countries are party. Korea continues to move forward with several multilateral agreements, including the Regional Comprehensive Economic Partnership. As these and other negotiations move forward, the United States should consult closely with Korea on provisions impacting the "new frontiers" sectors, to ensure shared goals and priorities are advanced in these processes.

Collaborate on enhancing workforce training and educational development that prepares students and workers for careers in "new frontier" sectors in both countries. Fundamental to the successful development and growth of "new frontiers" areas in both countries is building a workforce equipped with the skills and knowledge to support these rapidly evolving sectors. This is a challenge in both the United States and Korea. Then-President Lee Myung-bak made headlines in Korea when he said that a four-year degree may not be the most appropriate path for all young people.[42] The same argument is gaining traction in U.S. communities after decades in which vocational training programs were cut back in many school districts. Many advanced manufacturers and information technology businesses in the United States complain that they cannot find enough skilled workers to fill positions. Even in communities with high-quality workforce training programs, community and technical colleges administering these programs describe difficulty filling seats with high school students.[43] This is particularly important in "new frontiers" sectors given the convergence of technological fields that characterize them.

One potential related area for U.S.-Korea cooperation is in information exchange and sharing best practices in workforce and vocational training for careers in these fields. Highly successful programs and models may offer valuable examples for communities in both countries. Elements of these activities could, for example, include technical expert and faculty exchanges, and short- and long-term student exchanges. U.S. community and technical colleges often work closely with industry to develop training course curriculum that meets current and future anticipated workforce needs; this could also be a potential area for information sharing and other similar activities. Cybersecurity in particular could be one promising area, particularly because of significant efforts in both countries to increase the scope and size of related training programs. Workforce development also presents a potentially valuable area for sub-national level engagement around "new frontiers" areas, as explained below.

Consider projects between Korea and U.S. states, cities, and sub-national actors focused on "new frontier" sectors. As noted, there is a growing list of collaborative activities between Korea and U.S. states in the "new frontier" areas. A similar model worth exploring are MOUs between Korea or its regional governments, and U.S. counterparts, for economic and technical collaboration on specifically defined "new frontiers" topics. Japan has pursued this model, signing MOUs with California, Washington, and Maryland that designate a list of economic and security fields targeted for collaborative activities. Activities could incorporate, for example, local-level technical and expert exchanges related to industry and workforce training as described above, and demonstration projects, such as those in Maryland and Hawaii. They also present alternate platforms to pursue projects and activities that may not coalesce at the national level. For example, Korea could explore climate change activities with states such as California, Oregon, and Washington that have prioritized climate change in their policy agenda and international relationships.

Encourage participation of a broad range of private sector, academic, and non-government organizations related to "new frontier" sectors. Reflecting on the "new frontiers" areas, Ambassador Lippert wrote that "broadening and enhancing our people-to-people ties, this issue set has the potential to involve new constituencies such as doctors, engineers, and research scientists in the relationship in increasing numbers."[44] The extensive cross-border networks of business, university, non-governmental organization, and people more broadly

linking Korea and the United States offer some of the most fertile ground for fostering cooperation related to the "new frontier" sectors. Again, there is a track record of these kinds of projects, particularly at the university level; for example, research collaboration between the University of South Carolina and Korea's Woosuk University in hydrogen fuel cells[45] and joint workshops between Virginia Tech's Future Energy Electronics Center and the Korea Microgrid Institute.[46]

Conclusion

The "new frontiers" reflect in many ways the continuing evolution of the U.S.-Korea relationship into a partnership that is positioned to address and develop solutions for complex global challenges. They also identify a set of areas around which the two countries can contribute their science, technology, and innovation capabilities to generate new industries and economic activity. In this regard, they can serve as catalysts for the future shape and scope of U.S.-Korea relations.

In the current context of political transition in both countries, there is important value for the United States and Korea to continue to explore and facilitate economic engagement related to the "new frontiers" areas, given their relevance to national priorities. As a comparatively new element of the bilateral relationship, both new administrations have the opportunity to rebrand these issues to make them their own and take ownership of them, particularly as their salience at the domestic and international levels continues to increase. At the bilateral level, full implementation of the KORUS FTA, particularly in increasing regulatory transparency and leveling the playing field, and swift resolution of market access and other issues that may emerge related to "new frontiers" areas, will support and build momentum. Engagement at the state, regional, and local levels, and involving the private sector and universities, offers additional platforms for activities in the "new frontier" areas that further expand linkages between the United States and Korea including at the people-to-people level.

Fundamental to successful outcomes of these initiatives will be robust science, technology, and innovation strategies in both countries that support these and broader bilateral economic activities. Particularly important in Korea will be continued efforts to address structural, regulatory, and cultural barriers that have constrained Korea's innovation ecosystem from reaching its full potential.

Endnotes

[1] The White House, Office of the Press Secretary, "Joint Fact Sheet: The United States-Republic of Korea Alliance: Shared Values, New Frontiers," Washington DC, October 16, 2015. Accessed May 3, 2017 at https://obamawhitehouse.archives.gov/the-press-office/2015/10/16/joint-fact-sheet-united-states-republic-korea-alliance-shared-values-new.

[2] Lippert, Mark W., "Expanding Ties and New Frontiers in United States-Republic of Korea Relations," Council of American Ambassadors (Fall 2016). Accessed April 23, 2017 at http://americanambassadors.org/publications/ambassadors-review/fall-2016/expanding-ties-and-new-frontiers-in-united-states-republic-of-korea-relations.

[3] The White House, Office of the Press Secretary, "Joint Declaration in Commemoration of the 60th Anniversary of the Alliance between the Republic of Korea and the United States of America," Press Statement (May 7, 2013). Accessed on May 3, 2017 at https://obamawhitehouse.archives.gov/the-press-office/2013/05/07/joint-declaration-commemoration-60th-anniversary-alliance-between-republ.

[4] White House, "Joint Fact Sheet: The United States-Republic of Korea Alliance: Shared Values, New Frontiers."

[5] U.S. Department of Defense, "Joint Communiqué of the 48th U.S.-ROK Security Consultative Meeting. Washington DC, October 20, 2016." Accessed on April 23, 2017 at https://www.defense.gov/Portals/1/Documents/pubs/USROKSecurityJointCommunique2016.pdf. The Joint Communiqué reaffirmed the need for strengthening cooperation in space and cyberspace and promoting the security of critical infrastructure. The two countries have, additionally, held biannual working level talks through the US-ROK Cyber Cooperation Working Group and the U.S.-Korea ICT Working Group.

[6] U.S. Department of State, *Framework Agreement Between the Government of the Republic of Korea and the Government of the United States of America for Cooperation in Aeronautics and the Exploration and Use of Airspace and Outer Space for Civil and Peaceful Purposes*. April 27, 2016. Accessed on April 23, 2017 at https://www.state.gov/documents/organization/265004.pdf.

[7] National Aeronautics and Space Agency (NASA), "NASA Partners on Air Quality Study in East Asia," Press release (February 24, 2016). Accessed on February 20, 2017 at https://www.nasa.gov/press-release/nasa-partners-on-air-quality-study-in-east-asia.

[8] Stangarone, Troy, "U.S.-Korea Economic Relations and the Next U.S. Administration," International Journal of Korean Studies, Vol. XIX, No. 2: p. 45. Accessed on February 20, 2017 at http://www.icks.org/data/ijks/1482965794_add_file_2.pdf.

[9] The White House, National Economic Council and Office of Science and Technology Policy, *A Strategy for American Innovation*, October 2015: pp. 86-106. Accessed on April 23, 2017 at https://obamawhitehouse.archives.gov/sites/default/files/strategy_for_american_innovation_october_2015.pdf. Examples of these initiatives included the National Nanotechnology initiative, DOE's Advanced Research Projects Agency-Energy (ARPA-E) for energy technology breakthroughs, and investments in cyber-physical systems research integrating computing, networking, and physical systems to facilitate smart cities and IoT. Others included precision medicine and innovations in health care delivery; smart vehicles and smart cities; clean energy technology and energy efficiency; educational technology; breakthrough space capabilities including lowering costs and expanding space exploration; and high performance computing.

[10] White House, *A Strategy for American Innovation*, pp. 53-55.

[11] A more extensive discussion of these topics is included in Connell, Sean, "Building a Creative Economy in South Korea: Analyzing the Plans and Possibilities for New Economic Growth," *Academic Paper Series*, 62, Korea Economic Institute of America (December 10, 2013): pp. 2-7.

[12] Organization for Economic Co-operation and Development (OECD), *Main Science and Technology Indicators* (Paris: OECD, 2017): p.60. Accessed February 20, 2017 at http://www.oecd-ilibrary.org/docserver/download/9215031e.pdf?expires=1493014656&id=id&accname=guest&checksum=D35321E63F5188C6D60B9308613775C8.

[13] OECD, *Scoreboard 2015*, p. 76. Also see OECD, "OECD Science, Technology and Industry Scorecard 2015: Korea Highlights," (Paris: OECD, 2015); p. 4. Accessed May 3, 2017 at http://www.oecd.org/sti/Korea-CN-EN-Scoreboard.pdf.

[14] OECD, *Scoreboard 2015*, p. 78.

[15] OECD, *Scoreboard 2015*, pp. 230-233.

[16] Kim, Haeyoung, "Korea's Green Growth Strategy: A Washington Perspective," *Korea's Economy 2011*, 27, Korea Economic Institute, pp.25-30. Accessed on May 3, 2017 at: http://www.keia.org/sites/default/files/publications/30848_kimhy_sp.pdf.

[17] Connell, "Building a Creative Economy in Korea," pp. 6-7.

[18] OECD, *Scoreboard 2015*, p. 130.

[19] Stangarone, "U.S.-Korea Economic Relations," p. 46.

[20] Remarks by Former U.S. Assistant Secretary of State Thomas M. Countryman, "U.S.-ROK 123 Nuclear Cooperation Agreement: Exploring the Road Ahead," University of Washington Center for Korea Studies and National Bureau of Asian Research, University of Washington, Seattle, WA, April 4, 2017.

[21] U.S. Department of Energy, "U.S. and South Korea Sign Agreement on FutureGen Project," Press release, June 26, 2006. Accessed February 20, 2017 at https://www.energy.gov/articles/us-and-south-korea-sign-agreement-futuregen-project.

[22] National Renewable Energy Laboratory, "Validation of Hydrogen Fuel Cell Vehicle and Infrastructure Technology," Fact Sheet NREL/FS-560-42284, October 2007. Accessed April 20, 2017 at http://www.nrel.gov/docs/fy08osti/42284.pdf.

[23] U.S. Department of Energy, "Department of Energy Announces New Clean Energy Partnership with the Republic of Korea," Press release, October 13, 2011. Accessed February 20, 2017 at http://www.energy.gov/articles/department-energy-announces-new-clean-energy-partnership-republic-korea. Also see U.S. Department of Energy, "Joint Statement between U.S. Department of Energy and Republic of Korea's Ministry of Trade, Industry, and Energy," Press Release, May 7, 2013. Accessed February 20, 2017 at https://www.energy.gov/articles/joint-statement-between-us-department-energy-and-republic-korea-s-ministry-trade-industry. This agreement also extended existing agreements for information exchange related to gas hydrate R&D and shale gas. Per discussions in 2013 with Korean and U.S. observers, interest in these sectors was in part related to finding new markets for Korean industrial products, for example in extraction of U.S. shale gas.

[24] Johnson, Jay Dean, "U.S.-Korea Bilateral Smart Grid Research on Advanced Inverter Interoperability and Functionality," Conference Presentation, Report No. SAND2014-4474C 521245, May 1, 2014: p. 2. Accessed April 20, 2017 at https://www.osti.gov/scitech/servlets/purl/1146956. Also see Flicker, Jack David, and Jay Johnson, "U.S.-Korea Smart Grid Research on Advanced Inverter Interoperability and Functionality," Conference Presentation, Report No. SAND2015-6863PE 598969, August 1, 2015: p. 13. Accessed April 20, 2017 at https://www.osti.gov/scitech/servlets/purl/1299990.

[25] Lee, Song-hoon, "Korea Western Power Begins Operation of Taean IGCC Power Plant," *Business Korea*, August 23, 2016. Accessed on May 3, 2017 at http://www.businesskorea.co.kr/english/news/industry/15621-commercial-operation-igcc-korea-western-power-begins-commercial-operation-taean.

[26] U.S. Energy Information Administration, *Country Analysis Brief: Korea*, January 19, 2017; pp.16-17. Accessed on May 3, 2017 at https://www.eia.gov/beta/international/analysis_includes/countries_long/Korea_South/south_korea.pdf.

[27] Pinkston, Daniel A, "Joining the Asia Space Race: South Korea's Space Program," *Academic Paper Series*, 69, Korea Economic Institute of America, September 10, 2014: pp. 2, 5, 6, 11.

[28] Work, Clint, and Seonhee Kim, "It's Not About the Moon: The Military and Economic Logic to South Korean Space Exploration," *Sino-NK*, May 31, 2016. Accessed April 23, 2017 at http://sinonk.com/2016/05/31/its-not-about-the-moon-the-military-and-economic-logics-to-south-korean-space-exploration/. The authors note that the Framework Agreement needs to be considered within the broader geostrategic context and Korea's efforts to conduct regional balancing, with a military that is a "more technology-intensive, civilian-dominated, and jointly interoperable force structure," in addition to the opportunities to promote the commercial aspects of space technology.

[29] U.S. Department of Defense, *Joint Communiqué*, pp. 4-6.

[30] Hogan, Governor Larry, "Maryland and Korea – Partners in Success," *U.S.-Korea Connect/Seoul Source* (blog), October 21, 2015. Accessed on April 10, 2017 at http://www.uskoreaconnect.org/blog/2015/10/maryland-and-korea-partners-in-success/.

[31] Office of Governor Neil Abercrombie, State of Hawaii, "Governor Abercrombie Secures Agreement with Republic of Korea for Smart Grid Development," Press release, February 3, 2012. Accessed on April 23, 2017 at http://www.hawaiicleanenergyinitiative.org/wp-content/uploads/2012/02/NR_KoreaSmartGrid_2.03.12.pdf.

[32] Office of Maryland Governor Larry Hogan, "Governor Larry Hogan Announces Agreement Between Two Major Korean Energy Firms and Montgomery College," Press release, November 18, 2016. Accessed on February 20, 2017 at http://governor.maryland.gov/2016/11/18/governor-larry-hogan-announces-agreement-between-two-major-korean-energy-firms-and-montgomery-college/.

[33] The author participated in the Korea-Washington Composites Conferences held on October 26, 2015 and November 3, 2016, Seattle Metropolitan Chamber of Commerce, Seattle, WA. Notes reflect combined discussion from both conferences. Over the course of the two conferences, participants have included leading Washington manufacturers and stakeholders working with carbon fiber, including SGL, Gemini Composites/Automobili Lambroghini Advanced Composites Structures Laboratory (affiliated with the University of Washington), the Composite Recycling Technology Center, and Kolon, Korea Institute for Industrial Economics and Trade (KIET), and KCTECH, along with other U.S. and Korean aerospace businesses.

[34] Stangarone, "U.S.-Korea Economic Relations," pp. 45-46.

[35] Author's conversation with U.S. Foreign Commercial Service.

[36] U.S. Foreign Commercial Service, "Korea – Cyber Security," *Korea Country Commercial Guide*. Accessed on April 10, 2017 at https://www.export.gov/article?id=Korea-Cyber-Security.

[37] Lee, Gwanhoo, *IoT Innovation and Deployment: A Blueprint for U.S. and Korean Leadership*, U.S.-Korea Business Council, 2016: p. 2. Accessed April 20, 2017 at https://www.uschamber.com/sites/default/files/final_accelerating_iot_growth_and_deployment_uskbc.pdf.

[38] Based on discussions with DOE sources.

[39] A more extensive analysis of this, examining the case of joint U.S.-Japan smart grid demonstration projects in Hawaii, is included in Connell, Sean, "Innovation and Growth Policies in Japan-U.S. Economic Relations: Considering Areas for New Engagement," *RIETI Policy Discussion Paper Series*, 12-P-018 (Tokyo, Research Institute of Economy, Trade, and Industry (RIETI), 2012): pp. 28-29.

[40] Office of the U.S. Trade Representative (USTR), *2017 National Trade Estimate Report on Foreign Trade Barriers*, pp. 281, 284. Accessed on April 23, 2017 at https://ustr.gov/sites/default/files/files/reports/2017/NTE/2017%20NTE.pdf.

[41] USTR, *2017 National Trade Estimate Report*, pp. 276, 280.

[42] McNeill, David, "After Decades of Building Colleges, South Korea Faces a Lack of Students," *Chronicle of Higher Education*, Vol. 58, Issue 15, December 2, 2011, p. A14.

[43] Author's conversations with community colleges, workforce training officials, and manufacturers in the greater Seattle region.

[44] Lippert, "Expanding Ties."

[45] University of South Carolina, College of Engineering and Computing, Hydrogen and Fuel Cell Center, "USC Department of Chemical Engineering to Collaborate with Woosuk University of South Korea." Accessed on April 20, 2017 at https://sc.edu/study/colleges_schools/engineering_and_computing/research/centersandinstitutes/fuelcells/.

[46] Virginia Tech Future Energy Electronics Center, "Korean Microgrid Center, July 29, 2010." Accessed April 20, 2017 at http://www.feec.ece.vt.edu/news.php.

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