IGE/BRIE/McKinsey & Company 국제회의

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IGE/BRIE/McKinsey & Company 국제회의

제4차 산업혁명과
한국 경제의 미래

The Fourth Industrial Revolution and the Future of the Korean Economy

세계경제연구원
Institute for Global Economics

IGE/BRIE/McKinsey & Company International Conference

The Fourth Industrial Revolution and the Future of the Korean Economy

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Program

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08:30-09:00	**Registration and Coffee**
09:00-09:40	**Opening Remarks** **Il SAKONG,** Chairman, Institute for Global Economics (IGE) **John ZYSMAN,** Co-Director, Berkeley Roundtable on the International Economy (BRIE), University of California, Berkeley **Congratulatory Remarks** **Ilho YOO,** Deputy Prime Minister and Minister of Strategy and Finance, Republic of Korea
09:40-11:00	**Session 1: Impacts of the Fourth Industrial Revolution** **Moderator** **Kyungjin SONG,** President, IGE **Speakers** **Carl Benedikt FREY,** Co-Director, Oxford Martin Programme on Technology and Employment **Dennis GOERLICH,** Managing Director, Kiel Institute for the World Economy **Panelists** **Jong-Guk SONG,** President, Science & Technology Policy Institute **Jonathan WOETZEL,** Director, McKinsey Global Institute **Justin WOOD,** Head of Asia Pacific, World Economic Forum
11:00-12:20	**Session 2: Drivers of the Fourth Industrial Revolution – Social Media, Big Data, Robotics, Artificial Intelligence** **Moderator** **Justin WOOD,** Head of Asia Pacific, World Economic Forum

	Speakers **John ZYSMAN,** Co-Director, BRIE, University of California, Berkeley **Kenji KUSHIDA,** Research Associate, Walter H. Shorenstein Asia-Pacific Program, Stanford University **Panelists** **Jin-Hyung KIM,** President, AI Research Institute **Gregory MULHOLLAND,** CEO, Citrine Informatics **Seong Jin PARK,** Vice President, Industry-Academic Affairs, POSTECH
12:30-14:00	**Luncheon** **Speech by Hyunghwan JOO,** Minister of Trade, Industry and Energy, Republic of Korea
14:00-14:30	**Special Address** **Dominic BARTON,** Global Managing Director, McKinsey & Company
14:30-16:00	**Conclusion:** **Major Policy Challenges and Implications for Korea** **Moderator** **Il SAKONG,** Chairman, IGE **Speakers** **Dominic BARTON,** Global Managing Director, McKinsey & Company **Dennis GOERLICH,** Managing Director, Kiel Institute for the World Economy **Sanghoon AHN,** Director and Vice President, Industry and Service Economy, Korea Development Institute **Gregory MULHOLLAND,** CEO, Citrine Informatics **John ZYSMAN,** Co-Director, Berkeley Roundtable on the International Economy (BRIE), University of California, Berkeley **Jaeyoung LEE,** Former WEF Staff/Former Lawmaker

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09:40–11:00	**세션 1 : 제4차 산업혁명의 영향** **사 회** **송경진** | 세계경제연구원 원장 **발 표** Carl Benedikt FREY | Oxford대 Martin Programme on Technology and Employment 소장 Dennis GOERLICH | Kiel Institute for the World Economy 전무이사 **패널리스트** **송종국** | 과학기술정책연구원 원장 Jonathan WOETZEL | McKinsey Global Institute 소장 Justin WOOD | World Economic Forum 아시아담당 총괄국장
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	발 표 **John ZYSMAN** | University of California, Berkeley 국제경제라운드테이블(BRIE) 공동의장 **Kenji KUSHIDA** | Stanford University Walter H. Shorenstein Asia–Pacific Research Center 연구위원 **패널리스트** **김진형** | 지능정보기술연구원 원장 **Gregory MULHOLLAND** | Citrine Informatics 회장 **박성진** | 포스텍 산학처장
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Participants (in alphabetical order)

Sanghoon AHN (Director and Vice President, Department of Industry and Service Economy, Korea Development Institute)
He is working as a director as well as a vice president of the department of industry and service economy at the Korea Development Institute. Previously he served as senior economist at the directorate for science, technology and innovation of the OECD. He also worked as an Advisor of the World Bank and taught at the KDI School of Public Policy and Management as an adjunct professor.

Dominic BARTON (Global Managing Director, McKinsey & Company)
He is the global managing director of McKinsey & Company. Prior to his current role, Dominic was based in Shanghai as McKinsey's Asia chairman from 2004 to 2009 and led the Korea office from 2000 to 2004. He is an active participant in international fora, including Davos, the St. Petersburg International Economic Forum, Les Rencontres Économiques d'Aix-en-Provence, the Asia Business Council and the China Development Forum.

Sang-mok CHOI (1st Vice Minister, Ministry of Strategy and Finance, Korea)
He has held senior positions in the ministry of strategy and finance and is currently the 1st vice minister of strategy and finance. He previously served as secretary to the President for economy and financial affairs. He also served as secretary general of the Public Fund Oversight Committee of the Financial Services Commission.

Carl Benedikt FREY (Co-Director and Oxford Martin Citi Fellow, Oxford Martin Programme on Technology and Employment)
He is co-director of the Oxford Martin Programme on Technology and Employment at the Oxford Martin School and economics associate of Nuffield College, both University of Oxford. He is also a senior fellow of the Programme on Employment, Equity and Growth at the Institute for New Economic Think-

ing in Oxford, and the department of economic history at Lund University. His research focuses on the transition of industrial nations to digital economies, and subsequent challenges for economic growth, labor markets and urban development.

Dennis GOERLICH (Managing Director, Kiel Institute for the World Economy)
He is head of the Kiel Institute's Global Challenges Centre and managing director of the Global Economic Symposium, IfW's annual research-based and solution-oriented conference addressing the most important global challenges. His research interests are the impact of technological transformations on the division of labour between and within countries, on organizations and governance.

Marn-ki JEONG (1st Vice Minister of Trade, Industry and Energy, Korea)
He currently serves as 1st Vice Minister of Trade, Industry and Energy. He has held senior government positions in the Ministry of Trade, Industry and Energy. He previously worked as Secretary to the President for trade, industry and energy.

Hyunghwan JOO (Minister of Trade, Industry and Energy, Korea)
Prior to his current position, he served as vice minister of Strategy and Finance. He also served as secretary to the President for economic and financial affairs. He previously took the role of secretary general of the Presidential Council on National Competitiveness and the Presidential Committee on Green Growth.

Jin-Hyung KIM (President, AI Research Institute)
He is the founding CEO of AIRI (Artificial Intelligence Research Institute) and Professor Emeritus of KAIST Computer Science Department. He is also serving as the chairman of the Korea National Open Data Strategy Council. His research interest spans various subfields of artificial intelligence such as probabilistic reasoning, neural networks, pattern recognition, and recently on computing education.

Kenji KUSHIDA (Research Associate, the Walter H. Shorenstein Asia-Pacific Program, Stanford University)
He is the Japan Program research associate at the Walter H. Shorenstein Asia-Pacific Research Center and an affiliated researcher at the Berkeley Roundtable on the International Economy. His research interests are in the fields of comparative politics, political economy, and information technology. He has four streams of academic research and publication: political economy issues surrounding information technology such as cloud computing; institutional and governance structures of Japan's Fukushima nuclear disaster; political strategies of foreign multinational corporations in Japan; and Japan's political economic transformation since the 1990s.

Jaeyoung LEE (Former WEF Staff/Former Lawmaker)
He worked at the World Economic Forum before coming to Korea to become a lawmaker. He also worked as vice president and head of youth and policy research centre at Youido Institute.

Gregory MULHOLLAND (CEO, Citrine Informatics)
As Citrine's chief executive officer, he is charged with company leadership, external interactions, and vision setting. Since his co-founding the company in 2013, it has worked with Forbes Global 2000 companies to accelerate the materials and chemicals design and manufacturing process. He has been invited to speak at government and private events internationally on the topics of materials informatics, the Fourth Industrial Revolution (Industry 4.0), and big data analytics in manufacturing. In 2015, he was named one of the Forbes 30 Under 30 in Energy.

Seong Jin PARK (Vice President of Industry-Academic Affairs, POSTECH)
He is a vice president of industry-academic affairs as well as a professor in the department of mechanical engineering at the POSTECH. He has also been the chief executive officer of the POSTECH Holdings. He previously worked as a research professor at the Center for Advanced Vehicular Systems, Mississippi State University and as a research associate, Center for Innovative Sintered Products, Pennsylvania State University, USA.

Il SAKONG (Chairman, Institute for Global Economics)
He previously served as minister of finance, senior secretary to the president for economic affairs and spent 10 years at the Korea Development Institute. As Chairman of the Presidential Committee for the G20 Seoul Summit, he was wholly responsible for the preparation and coordination for the G20 Seoul Summit. Simultaneously, he chaired the Korea International Trade Association. Currently, he is advising the JoongAng Media Group.

Jong-Guk SONG (President, Science & Technology Policy Institute)
He previously served as a fellow at the Fiscal Policy Advisory Committee, National Science and Technology Council (NSTC), International Science Business Belt Council as well as the Natural Science Subcommittee, Korean National Commission for UNESCO. He also worked as president of the Korean Society for Technology Management and Economics.

Kyungjin SONG (President, Institute for Global Economics)
She previously served the government of the Republic of Korea in various capacities. She served, 2009-2011, as special adviser to the chairman of the Presidential Committee for the Seoul G20 Summit in the Office of the President. She also worked, 2008-2009, as special aide to the special economic adviser to the President and chairman of the National Competitiveness Council in the Office of the President. From 2004-2007, she served the Ministry of Finance and Economy as foreign press spokesperson.

Jonathan WOETZEL (MGI Director and Senior Partner, Shanghai, McKinsey & Company)
Based in Shanghai since 1996, he has been instrumental in establishing and growing McKinsey's presence in China. In addition to his work helping Chinese and other Asian businesses prepare for global growth, he is responsible for convening the firm's work with city, regional, and national authorities in more than 40 geographies around the world. He leads McKinsey's Cities initiative and co-chairs the non-profit think tank Urban China Initiative—a joint venture led by Columbia University, Tsinghua University, and McKinsey & Company—that aims to develop and implement solutions to China's urbanization challenge.

Justin WOOD (Head of Asia Pacific, World Economic Forum)
He is responsible for the World Economic Forum's activities in the Asia Pacific region. He previously worked for The Economist Group in South-east Asia for 14 years. For eight of those years he ran an economic and political advisory service covering the Asia region. His clients were governments and companies from around the world with deep interest in the region. Before running the advisory business, he worked as a journalist, covering economics and business across Asia. In total, he has lived and worked in the Asia Pacific region for a total of 24 years, including in Singapore, the Philippines, Malaysia, Taiwan and South Korea.

Il-ho YOO (Deputy Prime Minister & Minister of Strategy and Finance, Korea)
He currently serves as deputy prime minister and minister of Strategy and Finance of the Republic of Korea. Before taking the position of deputy prime minister, he was the minister of Land, Infrastructure and Transport. He previously worked as chairman of the Policy Committee of the Saenuri Party as well as chief secretary to President-elect Park Geun-hye. He also taught at the KDI School of Public Policy and Management.

John ZYSMAN (Co-Director , Berkeley Roundtable on the International Economy (BRIE), University of California, Berkeley)
He is a professor emeritus at the University of California, Berkeley and co-founder of the Berkeley Roundtable on the International Economy (BRIE). He has written extensively on European and Japanese policy and corporate strategy; his interests also include comparative politics, Western European politics, and political economy. Previously, he has served on the Director's Advisory Board, Lawrence Livermore National Laboratory, the Industrial Advisory Board, Los Alamos National Laboratories and Scientific Board, and Centre D'Etudes Prospectives et D'Informations Internationales.

컨퍼런스 참여자 (가나다 순)

김진형 (지능정보기술연구원 원장 겸 KAIST 명예교수)
미래창조과학부 산하 소프트웨어정책연구소 소장 및 과학기술정보연구원 원장을 역임했다. 인공지능과 소프트웨어 분야의 전문가로서 정부 정책 및 국회 입법 등에도 활발히 참여하고 있다.

박성진 (포스텍 산학처장)
미시시피주립대 연구교수를 역임했으며 현재 포스텍 교수 및 포스텍 기술지주회사 대표이사로 재직 중이다.

사공 일 (세계경제연구원 이사장)
재무장관, 2010년 서울 G20 정상회의준비위원장, 국가경쟁력강화위원회장, 대통령경제수석비서관, 한국무역협회장, 한국개발연구원 부원장, 부총리 겸 경제기획원장관 자문관 등 요직을 역임했다. 현재 중앙일보 고문으로도 활동하고 있다.

송경진 (세계경제연구원 원장)
서울 G20 정상회의준비위원회 위원장 특별보좌관을 지냈으며 재정경제부 외신대변인과 한국무역협회 회장 특별보좌관을 역임했다.

송종국 (과학기술정책연구원 원장)
기획재정부 재정정책자문회의 위원 및 국제과학비즈니스벨트위원회 위원으로 활동중이다. 제18대 대통령직 인수위원회 교육과학기술분과 전문위원, 유네스코한국위원회 자연과학분과위원회 위원 등을 역임했다.

안상훈 (한국개발연구원 부원장 겸 산업서비스경제연구부장)
현재 한국개발연구원 산업서비스경제연구부장으로 재직 중이다. 국제경제, 경제성장 및 발전론, 기술혁신, 공공투자, 생산성 등의 분야를 전문으로 연구활동을 하고 있다. OECD 선임이코노미스트, 세계은행 자문관, KDI 국제정책대학원 겸임교수를 역임했다.

유일호 (부총리 겸 기획재정부 장관)
18대, 19대 국회의원을 지냈으며, 국토교통부 장관, 새누리당 정책위원회의장, 조세개혁특별위원회 위원장을 역임했으며 한국개발연구원 국제정책대학원에서 교수로 재직했다.

이재영 (전 세계경제포럼 부국장/전 국회의원)
세계경제포럼(WEF)에서 근무한 후 새누리당 국회의원을 지냈고 여의도연구원 부원장을 역임했다.

정만기 (산업통상자원부 제1차관)
대통령비서실 경제수석실 산업통상자원비서관을 역임하고 지식경제부 기획조정실장, 대변인 등을 거쳤다.

주형환 (산업통상자원부 장관)
기획재정부 제1차관, 대통령비서실 경제수석실 경제금융비서관을 역임했고 기획재정부 대외경제국장, 미래기획위원회 단장 등으로 활동한 바 있다.

최상목 (기획재정부 제1차관)
대통령비서실 경제금융비서관을 역임했고 기획재정부 경제정책국장, 정책조정국장, 정책협력실장 등 핵심 보직을 거쳤다. 금융위원회 공적자금관리위원회 사무국장으로 일한 바 있다.

Dominic BARTON (McKinsey & Company 글로벌담당 회장)
McKinsey 상하이 지사에서 아시아 담당 회장 및 한국 지사 지사장을 역임했다. 다보스 포럼, 상트페테르부르크 국제경제포럼, Les Rencontres □conomiques d' Aix-en-Provence, Asia Business Council 등 다양한 포럼에 참석하며 활발한 비즈니스 활동을 하고 있다.

Carl Benedikt FREY (옥스퍼드대 기술과 고용에 관한 마틴연구소 소장 겸 교수)
현재 영국 옥스퍼드대 Martin Programme on Technology and Employment 소장으로 재직 중이다. 그는 옥스퍼드대 Institute for New Economics Thinking의 고용, 평등 및 성장 프로그램 관련 선임연구원직을 맡고 있고, 스웨덴 룬드대학에서 경제사에 관한 연구를 병행 중이다. 프레이 교수는 산업국가의 디지털 국가로의

변천과 그에 따른 경제 성장의 난제들, 노동 시장과 도시 개발 등에 대해 집중적으로 연구하고 있다.

Dennis GOERLICH (Kiel Institute for the World Economy 전무이사)
독일 키엘연구소(Kiel Institute) 글로벌챌린지센터장이자 Global Economic Symposium 전무이사로 재직 중이다. Goerlich 박사의 주요 연구 분야는 국내외 노동 분야, 조직 및 거버넌스의 기술 변화이다.

Kenji KUSHIDA (스탠퍼드대 Walter H. Shorenstein Asia-Pacific Program 연구원)
스탠퍼드대 아시아태평양연구센터 일본 프로그램 연구원이자 UC버클리대 국제경제라운드테이블(BRIE) 소속 연구원으로 재직 중이다. 클라우드 컴퓨팅과 같은 정보기술 분야에 관한 정치경제학, 일본 후쿠시마 원전사고 관련 제도 및 거버넌스 구조, 일본 내 외국 다국적기업들의 정치 전략 및 1990년대 이후 일본의 정치 경제적 변천에 관한 연구를 수행하고 있다.

Gregory MULHOLLAND (Citrine Informatics 회장)
2013년 미국 실리콘 밸리에서 인공지능 벤처 Citrine Informatics를 창업하여 회장으로 재직 중이다. 제4차 산업혁명, 빅데이터, 인공지능 분야 전문가로서 2015년에는 미국 Forbes지의 에너지 분야 '30세 이하 30인 리더'에 선정된 바 있다.

Jonathan WOETZEL (McKinsey Global Institute 소장)
1996년부터 맥킨지 중국 상하이 지사에서 근무하며 중국을 비롯한 아시아 기업들뿐 아니라 전 세계 40여 국가의 지역 및 국가 기관들과 협력 관계를 맺고 있다. 또한 맥킨지의 Cities Initiative와 Urban China Initiative라는 비영리 연구기관을 공동 운영 중이다. 세계 경제, 도시화, 에너지 및 지속가능성, 적정형 주택, 전자상거래 등의 분야의 연구를 활발히 수행하고 있다.
도시화, 지속발전가능성, 자원, 경제 개발, 기술을 전문으로 연구하고 있으며 이와 관련해 전 세계의 기업과 정부의 연구를 수행했다.

Justin WOOD (World Economic Forum 아시아담당 총괄국장)
영국 시사주간지 이코노미스트 그룹의 아시아 특파원 재직 기간을 포함 한국, 싱가포르, 필리핀 등 다수의 아시아 국가에서 24년간 활동한 후 여러 정부와 기업에게

아시아 관련 자문 역할을 했다.

John ZYSMAN (UC 버클리국제경제라운드테이블(BRIE) 공동의장)
UC 버클리대 석좌교수이자 버클리국제경제라운드테이블(BRIE) 공동의장을 맡고 있다. 자이스먼 교수의 주요 관심 분야는 비교정치학, 서유럽정치학, 정치경제 등이며, 유럽과 일본의 정책과 경영전략에 관한 다수의 책을 저술한 바 있다.

Opening Remarks

Il SAKONG
Chairman, Institute for Global Economics

Good morning, Excellencies, Ladies and Gentlemen,

It is indeed a great privilege for me to welcome you all gathered here this morning. Of course, my special greetings and appreciations go to those coming from abroad.

Today, we are in the midst of rapidly progressing industrial changes which we commonly describe as the Fourth Industrial Revolution.

One of the major characteristics of the Revolution is its rapid speed of progress. The Revolution is already affecting not only production, distribution, and consumption of goods and services, but almost every aspect of our daily life. Artificial intelligence, robotics, big data, cloud computing, internet of things are not just reserved for experts and specialists, but they are already becoming almost household jargon.

Needless to say, this revolution brings about a variety of new opportunities and challenges. It is, therefore, urgent for us as a nation, as a society, and as an individual to get prepared for taking advantages of those new opportunities while properly dealing with challenges. The main purpose of this conference is to highlight and discuss the Revolution and its important implications particularly for government policymakers and corporate decision makers.

Since we were able to bring together globally renowned scholars, researchers and practitioners from the frontiers of the Fourth Industrial Revolution to this conference, I am certain that the discussions and

proceedings of this conference will be highly appreciated by all those who are interested in this very subject.

I am personally very much looking forward to sharing enlightening views and illuminating insights of all distinguished speakers.

Let me now take a brief moment to appreciate co-organizers of this conference together with the IGE. I am especially grateful to John Zysman, co-director of the UC Berkeley Roundtable on the International Economy and his colleagues for their special efforts. My appreciation also goes to Dominic Barton, global managing director of McKinsey & Company, and his colleagues. I must also thank vice minister of Strategy and Finance, Choi Sang-Mok, who is here with us to deliver a congratulatory remark on behalf of Dr. Yoo Il-ho, Deputy Prime Minister and Minister of Strategy and Finance who had to attend the opening session of the Budget Committee of our National Assembly at this very moment. As you may know, vice minister Choi is one of the most distinguished senior policymakers in the Korean government. Vice minister Choi too has to rush back to the National Assembly immediately after the delivery.

Lastly, I must recognize the presence of many distinguished participants present here this morning. Since the list is too long, I just cannot do that for all individually now. But I would like to recognize two National Assembly members who are present here out of their very tight parliamentary schedules. National Assembly person, Na Kyung-Won, former chairperson of the Committee for Foreign Affairs and National Unification, is here with us. Another National Assembly member is Dr. Yoon Sang-jik who served as minister of Trade, Industry and Energy, not long ago.

With no further ado, I should end my very brief opening remarks.

Thank you.

Opening Remarks

John ZYSMAN
Co-Director, BRIE, University of California, Berkeley

Since I will have a chance to talk with you substantively, I will be even briefer. What I want to do is to let you know what a delight it is and how pleased BRIE is to be co-sponsoring and joining with McKinsey and the IGE on this very important theme.

For those of you who don't know our group, we were formed several decades ago in the very early beginnings of the electronics industry, of the semiconductor industry, of the digital revolution, with the help and support of a good number of the industry leaders at that time. Some of you who know the industry certainly know David Packard, Robert Noyce, Jerry Sanders, and Steve Jobs.

We have worked over the last decades with governments and the industry to try to understand and shape this evolving digital revolution for the purposes of community and society. The real task and part of the pleasure have been to work with particular governments and particular places; and doing so with Korea has been one of our great honors and privileges and we hope we have been able to make some contribution and we hope to be able to continue to do that in the ongoing future.

So with that, welcome and it's a great pleasure and honor to be with you.

Thank you.

Congratulatory Remarks

Ilho YOO
Deputy Prime Minister and Minister of Strategy and Finance, Republic of Korea

Distinguished participants, ladies and gentlemen,

A warm word of welcome to everyone this morning as we celebrate this international conference on "The Fourth Industrial Revolution and the Future of the Korean Economy."

I would like to deliver my thanks to Dr. Il SAKONG, Chairman of the Institute for Global Economics, Dominic BARTON, Global Chairman of McKinsey & Company, John ZYSMAN, Director of the Berkeley Roundtable on the International Economy for convening this conference. Today we are here to share ideas for the Fourth Industrial Revolution and subsequent changes in our future. I hope this forum will serve as a venue for vigorous discussion regarding the possibilities and challenges brought on by the Fourth Industrial Revolution.

Honored guests, now we stand on the brink of the Fourth Industrial Revolution, where the convergence of different technologies will lead to the emergence of new industries. New technology appears and our imagination becomes the real as inter-industrial convergence accelerates. In the new world, the 3D printer produces the artificial joint, and drone delivery will be commonplace. But this is just the tip of the iceberg.

As the Fourth Industrial Revolution has progressed, a far-reaching and fundamental reform on the socio-economic system will occur. In this respect, we may note Klaus Schwab, chairman of the World Economic Forum, described the Fourth Industrial Revolution as "system revolution".

Manufacturing industries will experience a drastic change: smart factories will emerge with fully automated and functionalized assembly lines capable of autonomously making and implementing decisions regarding the production process. The manufacturing industry will become increasingly oriented toward providing services with the use of accumulated consumer data obtained in the production and sales process. Creativity and data utilization will determine the competitiveness of firms rather than physical resources such as facility or labor. The company that possesses and analyzes big data will lead the market, providing customized services and products.

By smartization of product process, low-skilled labor will be diminished, whereas high-skilled labor, which cannot be substituted by automated machines, will be increased. With the rise of the on-demand economy, where consumer's demand is satisfied immediately by provisioning of goods and services, the form of employment will become more flexible as well.

Recently, Korean economy has been experiencing unprecedented slowdown amid difficult external conditions including weak global growth and trade, a falling potential growth rate due to an aging population and the declining competitiveness of Korean industries. In these circumstances, the Fourth Industrial Revolution represents both a risk and an opportunity. If we could improve institutional rigidities and the lag behind intelligence information technology on the basis of our outstanding ICT infrastructure and manufacturing foundation, we could play a leading role in the Fourth Industrial Revolution.

Soon after being inaugurated, President Park introduced her creative economy initiative as a new paradigm for Korea's economic growth. With its focus on creativity and convergence, the initiative has prepared Korea for the Fourth Industrial Revolution.

The Korean government established 17 creative economy & innovation centers across the country. Its mentor matching program, which allies startups with major companies, provides a chance for new business to anyone with an idea. This effort has produced tangible results. Last year the number of venture companies exceeded 30,000 for the first time, and venture investment rose to a historic high level exceeding 2 trillion won.

The Korean government will work to build on the foundation created as a result of the creative economy initiative and take steps to proactively prepare for the Fourth Industrial Revolution.

First, we will promote new industries and technologies strategically. The government will provide tax incentives to encourage private sector investment in 11 promising industries and technologies including artificial intelligence, robotics, and advanced automobiles. Nine technologies central to the Fourth Industrial Revolution, such as artificial intelligence and virtual reality, will be designated as strategic national projects and receive 1.6 trillion won worth of support over the next decade.

Second, we will improve outdated regulations that hinder the convergence of technology. Regarding investment in new industries, we are trying to introduce a negative system of regulation that allows, in principle, firms to invest freely while enacting only necessary regulations as exceptions. Furthermore, since some regulations are difficult to be removed nationwide, we will designate a 'regulation-free zone', where deregulation is necessary for incubating new industries and relieve regulations only in these areas as a test-bed. By doing this, we hope to actively support the generation of new market and job opportunities.
Third, we will prepare for labor market changes brought on by the Fourth Industrial Revolution by adopting a labor policy based on the concept of "flexicurity." For the "flexicurity", we are trying to change

labor policies more flexible, while enhancing social security. We will focus on reallocating and retraining human resources as well as enlarging the social and employment safety net in order to prepare for the shift away from low-paying repetitive jobs and the emergence of new ones.

Lastly, we will foster a creative workforce that is necessary for the age of the Fourth Industrial Revolution. In order to help Korean young generation to think creative and to realize their thoughts in computer language freely, we will begin software programming education in elementary and middle schools starting in 2018. We will also increase the number of colleges that offer programs focused on software programming from the current 14 in order to strengthen the link between academic training and real-world application.

Ladies and gentleman, a huge transition to Fourth Industrial Revolution may be threatening but could be new opportunities, depending on our reactions. Korea has a great deal of experience with adapting to change. Overcoming Korea's lack of natural resources, we achieved success in the Second Industrial Revolution by developing an export-oriented economy. Utilizing Korea's outstanding human resources and IT infrastructure, Korea was a leader during the Third Industrial Revolution. Now, faced with the challenge of the Fourth Industrial Revolution, I am confident that Korea's past experience will help guide the country.

I would like to close my remarks by inviting all of you to share your valuable insights regarding the Fourth Industrial Revolution and the future of the Korean economy.

Thank you.

Luncheon Speech

Hyunghwan JOO
Minister of Trade, Industry and Energy, Republic of Korea

Good afternoon,
Dr. Il SaKong, Chairman of the Institute for Global Economics,
Dr. Kyung-Jin Song, President of the Institute for Global Economics,
Dr. John Zysman, Co-chairman of the Berkeley Roundtable on the International Economy,
Mr. Dominic Barton, Global managing director of McKinsey & Company,
Ladies and gentlemen.

I would first like to begin by offering my congratulations on the successful opening of the conference on "The Fourth Industrial Revolution and the Future of the Korean Economy." I take great pleasure in attending this important conference with global experts and opinion leaders. I also wish to express my gratitude to the dedicated staff from the Institute for Global Economics for organizing this meeting.

Let me open my speech with the story of the Wright Brothers, whom we all know for inventing and flying the world's the first airplane. While their invention is remembered today as the prototype for aircraft of all kinds, many would be surprised to find out that their invention was paid very little attention at the time. The invention of the airplane was indeed an enormous accomplishment in human history, but people had no clue of what it would mean for their lives until a few decades later.

Now, allow me to move on to some more recent news. The world's first self-driving taxis have debuted in Singapore. According to a survey

conducted by the Atlantic, most American households will own robots by 2025, only about 9 years from now. Meanwhile, Saudi Arabia and Soft Bank have jointly announced their plan to create a 100-billion-dollar investment fund for future technologies.

In many diverse ways like these, the world is re-shaping itself on the brink of a technological revolution that will fundamentally alter the way we live, work and relate to each other.

The Fourth Industrial Revolution, mostly driven by advanced economies, has been affecting industries, systems and the world as a whole. Yet, no one has a clear picture of what the future holds for us. On this account, I see great importance in having a conference like today's.

Ladies and gentlemen, since the global financial crisis, the world economy has faced unprecedented changes and challenges, including the global slowdown, and the post-2020 climate regime, just to name a few. I would say that the main driver of these changes is the Fourth Industrial Revolution, our important topic today.

I am sure we've all heard about the Advanced Manufacturing Partnership of the U.S. or Industry 4.0 of Germany, which have been making great contributions to accelerating the Fourth Industrial Revolution. The Revolution can be characterized by a fusion of technologies that blurs the lines of products, services, and business models. Disruptive technologies, such as IoT, AI, and Big Data are forcing companies to alter the core values of their products from price and quality to hyper-connectivity and intelligence. This has given birth to smarter products with greater value that had not existed before.

The production methods changed. The B2C method of the past is giving way to C2B. A deep shift is also being witnessed in business models. Convergence of manufacturing and service has been accelerating

on-line and off-line business integration and introducing platform business models. Accordingly, Korea is paying keen attention to the opportunities and possibilities that the Fourth Industrial Revolution will bring to our industries and the economy. In particular, we have been focusing our efforts to seek new opportunities in the manufacturing sector, which is our most important strength.

We have established the Manufacturing Innovation 3.0 Strategy as part of the Three Year Plan for Economic Innovation. In this strategy, we have highly empowered smart factories and fostered creative new industries. However, I believe this is only the start of our journey. I would like to share with you some of the government's mid to long-term goals, in response to the wave of the Fourth Industrial Revolution.

First, we are seeking to create an enabling environment to nurture new industries. Particularly, I would like to mention Korea has recently announced "9 National Strategic Projects." AI, self-driving vehicles, virtual reality(VR) and augmented reality(AR) and other emerging areas have been selected as national projects that will receive a total investment of 1.6 trillion won. The projects are more than just technical developments. They will involve nurturing of the upstream and downstream industries. We also aim to upgrade production methods by enhancing our smart factory system. We have already started to see some visible outcomes like a decrease in defect rates, cost reduction and shorter delivery times through IT integration across the whole manufacturing process. By 2020, we plan to secure more than 10,000 smart factories nationwide to create a strong base for customized mass production.

Second, we are seeking to create new market demands and improve existing infrastructure to systematically develop and effectively allocate human and material resources. We have been improving the regula-

tory framework under a negative list approach to remove hurdles that interrupt businesses' innovations and creativity. We have been trying to introduce Regulation Free Zones as test-beds of new industries throughout the nation. We are also improving industrial R&D policy to promote open innovation. In addition, we are planning to develop human resources with the values sought by new industries characterized by creativity and convergence. In terms of education policies, we have been trying to expand enterprise-based degree programs and improve current curricula for engineering.

At the same time, we will focus on financing in new industries that are attractive to private investors. And by offering tax incentives for investment in R&D and facilities, we will induce more investment for new industries.

Distinguished guests, the industrial history of Korea is not long, compared to other nations.

However, Korea already ranks as the 11th largest economy and the 6th largest exporter in the world. We Koreans are dynamic challengers. We have transformed a crisis into new opportunities. Going forward, the Korean government and business leaders will make a new future through bold innovations and faster response to all challenges. Peter Thiel, co-founder of PayPal, says, "If nothing about our society changes for the next 100 years, then the future is over 100 years away. If things change radically in the next decade, then the future is nearly at hand." But what and how do we change?

A White House report could be helpful. "Preparing for the Future of Artificial Intelligence," published in early October says, "AI can be a major driver of economic and social progress, if industry, civil society, government and the public work together to support development of the technology, with thoughtful attention to its potential and to managing its risks."

I think this provides a meaningful guidance for governments and industries who are seeking to grasp the impacts and future tasks of the Fourth Industrial Revolution. I hope this conference will be a lighthouse for those seeking the right path in this time of rapid change with great ideas and passion.

Thank you.

Special Address

Dominic BARTON
Global Managing Director, McKinsey & Company

Thank you so much, Dr. Il Sakong. With all the roles that you have played both in government and outside of government always as a thought leader, you have been my long-time mentor since I first came to Korea in 1997. So it is a pleasure to be here.

What I wanted to do for the next 25-30 minutes is just to take you through our views on the Fourth Industrial Revolution. Klaus Schwab is the person who defined it in a way that we can all understand, the word that I am going to refer to. But I am going to talk a bit from our perspective of what it is and what the opportunities might be.

And I am very excited to be doing it in Korea because I think this country is a country that I think can really use this as a growth curve and take advantage from it, and more so than any other country that is out there. Obviously, the United States is doing a lot. Germany is doing a lot. But South Korea has all of the key ingredients and more to thrive through these particular times.

As you know, when we talk about the Fourth Industrial Revolution, all I would say is that this one will dwarf all the other ones that we have seen because of the speed and the scale with which it is happening. I think that very few of us, including ourselves at McKinsey, are prepared for the transformation that is actually going to be occurring and is under way. As I mentioned about the book that Klaus Schwab put out, which I think is a worthwhile one to look at, where he emphasizes the combination of speed and scale and what that will do and how we all of us need to be prepared, including in particular policy makers.

So I want to do today is to focus on three things. Firstly, on what are some of the drivers – because it is difficult to be able to predict what they will look like. But if you have a good sense of the drivers, you should be able to do a better job of understanding what the implications are. Secondly, on implications for business – there are profound implications even today, let alone over the next five or ten years. Lastly, on implications for policymakers – I think policymakers are going to have some of the biggest challenges in dealing with the implications of what Industry 4.0 is going to mean.

In my opinion, there are three drivers of the Fourth Industrial Revolution. One is the scale and power of computing which is reaching such a state that we can do more than we have ever been able to do. The average washing machine, Samsung or LG washing machine, has more computing power today than NASA that had to send a man to the moon in 1969 and that just continues to scale and get more sophisticated. The connectedness of the world of both machines and humans has hit an unprecedented and critical mass scale. And then it is the data – a huge amount of data that we are collecting and what we can do with that. It is the combination of those three things that we think are really driving the Fourth Industrial Revolution. I am going to spend a little bit on each one.

On the connected devices, we have already well-passed the point where we have more devices than humans that are connected. There are predictions that it would go up to 50 billion connected devices by 2025. I bet we have even underestimated that. When we look at it, we tend to the scale and prevalence of these things. We are seeing a very significant drop in sensor cost. And when we talk about the sensor, there are many different types of sensors, whether it would be gyroscopes or oscillators and so forth. So the cost of being able to put sensors on things has significantly dropped.

Let me share with you an anecdote. In a Formula One, a racing car typically has 1800 sensors on it. I know this because we bought a firm that provided the data analytics for them. It is like two gigabytes of data comes off a Formula One car in every lap. So there is a driver that clearly has an important role to play in the car, but there is actually a lot more going on behind the scenes in making that car perform. What is even more important is that data and data analytics are actually used in innovation with the vehicle in the short cycle time. And those car companies that are able to leverage that gain and win the Formula One when there is. So this is prevalent for us to be thinking about.

The other notion is while sensor costs have declined, so has the cloud, 1000 times less today than it was in 2010. And this has had a very profound shift on how the world is working. The scale, rapid cost reduction, and power moving are some of the things that are changing the world. The Internet of Things (IoTs) basically allows one to capture data and use it to fundamentally improve the performance of whatever it is that data is being used for – whether it be preventative maintenance, whether it be being able to find mining sites more effectively, or whether it be thinking about how to disperse medicine in the most effective way. On every single element of what we do the IoTs is having an effect. This is not new and I am going to come back to this on artificial intelligence. It has been around and I think it is the speed and scale with which things are moving.

What I find most interesting is how it is affecting a lot of traditional industries. Egg food I believe is going to become one of the most important industries over the next 10-15 years. We have to feed the equivalent of the number of people in terms of the amount of food volume what we did for the last 10,000 years over the next forty years in absolute terms. So egg food is going to be incredibly important. And the technology that is being applied to egg food today is significant and it is going to grow. John Deere is not a machinery company but a

software company in terms of what it does. Its critical thing is capturing the data to be able to improve the performance of yields in crops, the effectiveness of resource used, and so forth. So, egg food is being transformed by the IoTs. This is an area where again a country like Korea can be playing a very significant role even though Korea may not have the land or the water or the climate. To be able to do, having the technology is going to be an incredibly important part of this industry value chain and its opportunities.

We are not using very much of the immense amount of data that we are capturing. We actually capture significant data but less than 1% of it is used for any insight as we go through it, sometimes because of the poor infrastructure, sometimes because of the weak data management capability, or sometimes because they do not have the analytical capabilities. Even if people do have the analytic capabilities, they do not know how to translate that to the business side of things. So, we are not leveraging the data that we do have. The data that we do leverage actually gives us a lot of insight. Again if you just think about what we can do with that to improve performance, there are going to be a lot of benefits. Interoperability is absolutely critical to be able to make the Industry 4.0 or the IoTs to be able to work because you have to be able to have devices, humans, and data analytics all talking together.

One of the challenges is a lot of the innovation is being done in silos; it is being done in a particular device, not thinking about how it would actually fit in the ecosystem of all the different players that are there. So, the notion of open platforms of sharing a common approach for how you are going to able to build this would be critical. What this means for the organizations is partnering is going to be critically important. For McKinsey, for example, who are way too introverted wanting to do everything ourselves, the game is over on that front. You have to partner and work with other organizations to be able to deliver the value that you need. There is no way that one institution can provide all of the different pieces.

Again, we are, I think, not being very creative in terms of how it is going to evolve. I will just say that a lot of the future is actually here now. Some of that is being restricted by regulation. I think one of the biggest challenges to IoT or the Fourth Industrial Revolution affecting health care is regulation. I think those countries or cities that were able to figure out how to get the regulation right to allow innovation and to allow people to use the data that is being captured on humans are going to see more innovation. So, regulation is one of the biggest bottlenecks to innovation. We are seeing it in fintech. Those countries where there are very restrictive rules around who can play in the financial services industry will restrict the innovation that is going on. If you look at Singapore today, it has actually created and it has called it "sandboxes" for the fintech companies to allow them to be able to operate in slightly different ways. I think in Korea that is going to be important. Regulators need to be more open-minded about allowing for unusual types of capabilities to be able to come into the market.

In terms of trying to seize what this could mean for the global economy, we just try to estimate it by looking at what it means for factories, cities, retail environments, and the industry overall. Especially cities are going to be very important beneficiary of what the IoTs do. The number of businesses, startups and enterprises that are going to be built around cities is going to be very significant. There will also be this notion of having the ecosystem as opposed to just devices because you have to have all three – the computing power, the sensors, and the data – and they all have to work together. I think this is where the organizations have to move out of the silos and work with others to be able to provide all of the capabilities that are going to be needed. So, that is just a bit of a background on some of the drivers. We are in the early stages. I think Larry Summers calls it, "We are in chapter one of a one hundred chapter book." If we think this is a big change now, we have seen nothing yet. That is a scale that we need to be thinking about.

In terms of business, there are three things we think will be affected by IoTs. One is just a business model transformation. The second is how we do product innovation and the third is around organization design. In the 30 years that I have been at McKinsey, it is the last 18 months I have never seen so many fundamental business model transformations that are occurring. The absolute number that I have seen in the last 18 months is about 10 times more than I have seen in the 28 years before holistically. That included restructuring some turnarounds. I would argue that the more successful you are as a business, you'd better start thinking very hard about your business model design because you may be complacent; you may think you have got it all and you do not. I look in the mirror, by the way, when I say that. I think this is a business model transformation that is very significant as we look out.

I think we are seeing much more on the business model side of people focusing on outcomes. What is the problem you are really trying to solve versus your input into an actual system? We have seen this with Rolls-Royce or GE with how they are using the information whether it is jet engines or locomotives. It is the information they are using. One example I often like to give is the one that actually got Jeff Immelt to be a believer in this stuff. When you look at locomotives, the average speed of a locomotive is about 22 miles per hour per day. You may say "Who cares?" But if you are a company that makes locomotives, it matters a lot. If you can increase the speed of a locomotive by one mile per hour over the course of a day or over the course of a year, the impact of that on profitability for a regular-sized North American railway is roughly $250 million. That is the value. So, what Jeff Immelt got concerned about was that we spend all this money on R&D on the power systems, the input and output, and the metal is being used in the wheels on a beautifully productive sustainable locomotive. But what we are worried about is that some Uber-like group coming in and saying, "That is great. Keep doing that. We are going to figure out how to manage that locomotive better to increase its average speed and we

will capture that share of the $250 million improvement." And that is when there is this notion of we have to be a software company, not a device or hardware company in where it is.

On the industrial side, what we are seeing right now being applied on preventative maintenance is very significant. If you are in the mining industry, the value that you get from the IoTs as it relates to just ensuring that the machinery keeps operating and you minimize the downtime is a very significant driver. We find it in many different industries. In fact, I would argue all as we look ahead.

Artificial intelligence and machine learning we think are going to allow you to do more to allow basically a computer to look at all sorts of different variations before you actually even try and produce something. We think it is going to be able to scale up the innovation that is required. Last week I was in Vancouver, looking at D-wave. D-wave is a quantum computing company. They are the first to sell them. If you think about quantum computer, its horsepower and what it can do will have very significant implications on data manipulation and on innovation. It is early days in where it is but there are serious efforts that are moving on to try and increase the power even further of what a computer can do. Again, I think we are going to have very different views about what owning a product means. I think one of the many innovations that Tesla has been pushing on its very own is the software updates on the car that you buy. You do not need to take it in. You get a software update like downloading an application. Obviously, at some point you have to do something with the equipment, but more and more of an automobile is the electronics and the software, again changing the paradigm of how we think about this.
On the organization side of things, I think there is going to be very significant changes. We do not think that many organizations have gone the whole way there. It is actually very difficult to find full reference cases of organizations that have done it. One that I pay a lot of

attention to is Haier in China. Haier did quite remarkable things basically on its organizational structure. It went from an 80,000 person classic pyramid to basically 40 units of 200 people. It completely flattened the organization. Haier is not a client of McKinsey. If it were, we would have told Haier not to do it because it is too dramatic. But it did because what it is able to do through using the technology it has, the IoTs, and is able to operate in a much flatter, faster, and innovative manner. And you see that in the performance and the results.

I think we are going to need to have some sort of a measure. The measure we are trying to use with our clients, which is a digital quotient (How digital are you? Whether you are an egg food company or a mining company, or a hospital chain, or a university, what is your digital quotient?), we think it is the number we need to look at and the boards should be spending time. If you cannot measure it, you'd better start to be able to measure it, again because of the speed with which it is moving. So, lots of changes are going on in the business side of things and again I think we are in the early stages of it.

The final part is about what it means to policymakers. There is a range of things but I just want to pick on three. One is making this a priority. This actually is important. We therefore need as a government to ask what the ecosystem is that we want to put in place to be able to encourage the invention and the R&D that is going on but also translating it into commercialization and allowing established businesses to be able to participate in it.

There are some countries that are actually pushing this further than others. The regulatory environment is one of the biggest blockers or the things that can destabilize what we are doing on IoTs. And it is very complicated to deal with that. But it is a muscle that policymakers are going to have to develop because it will lead to either a significant opportunity or a lost opportunity.

Then the third area is what this means for jobs and skills over time. This is going to have quite profound implications. Just quickly going through this, Germany has embraced this in a very full way. They are the ones who named Industry 4.0 in 2011. They have a lot of foreign investment conferences that they hold that are around Industry 4.0 and the prizes that they put out are around Industry 4.0. Angela Merkel knows what Industry 4.0 is and how it should work and how to encourage all parts of the ecosystem to do. It is not a just a phrase; it is something that everyone understands that it is going to be critically important.

Singapore is pushing this extremely hard in terms of the experiments that they are doing with the autonomous taxis, thinking about it in public service delivery but also the innovation hubs and trying to attract the right mix of people from different parts of the ecosystem to try and do this in Singapore.

As I said at the outset, this is a natural place for Korea to be on it. We have got the industry; we have got more scale than Singapore does; and we have got the IT infrastructure that people are jealous of and would love to have, especially the 5G system we have. Also the consumers that are one of the most sophisticated consumers of technology in the world. That is why a lot of people would like to test new products here, even though they do not do business here. So we have all the ingredients. We have universities and we have the research. It is a matter of having an ambition around it to be able to push it.

There are challenges, of course. Cyber security is one. These countries I named up here are basically, according to the Asia-Pacific defense outlook, have nine times more vulnerable to cyber attack, precisely because they are more sophisticated on the technology front. This is going to be an area that we are going to have to look at; there have been some Lloyds on the insurance side trying to estimate what the impact

of some of the cyber attacks might be. A former National Security Advisor in the US said there are basically two types of companies: those that have been hacked and those that they do not know that they have been hacked. I think that it is something that we should just keep in mind as we do this. This is the sense of the most vulnerable IoT security targets. There is an Internet of Things Institute. But I think that thinking about the vulnerability is actually an important part from a regulatory point of view as this gets built out.

And the final area is on jobs. Today about 45% of paid activities could be automated. It does not mean that the whole job would be taken away. It is the activities of the job that will likely be automated. But the fact of the matter is that is today, let alone looking out. If you are a commercial driver in the US, I would be thinking very hard about this because the driverless trucks are already operating in Utah. This is going to have a very significant change on jobs. I am not sure our skilling systems are up to speed and some work.

We are doing with the Canadian government right now on growth and one of our focus areas is on skills innovation. The key question is how we are going to ensure that 18.1 million Canadians that are working today are going to be able to have a job in the next 5-10 years. It will not happen by the current education and training system we have in place. Singapore has launched an experiment that is very interesting. There is a skills innovation council where they give every Singaporean over the age of 25 a skills credit of 500 Singapore dollars that is topped up. You have to learn something that is related to a skill that might help you be employed. People try to work this out. It is going to be a big issue and if we do not sort it, my view is that we will have the Brexit type of thing occurring because we are going to get a lot more winners and losers in this world that we have ever had before.

The last one is artificial intelligence. This is an area where I think is

the next horizon. It is another area where Korea can do a lot. The way I look at artificial intelligence is it is basically a way to lower the cost of prediction. Semiconductors really lower the cost of arithmetic and it had profound implications on business. What this one is doing is lowering the cost of prediction. When you think about it from that lens and what it can do is going to have a huge impact on disruption, in a both positive and negative way. But I think that having that horsepower and capability and being able to build it is something that would be a very good thing to look at.

That is all I wanted to talk about. I think we are in chapter one of a one hundred chapter book. I think we are going to see more profound implications from this industrial revolution than we have seen in other three combined. And I think we all just need to be prepared and work together to capture the benefit of it.

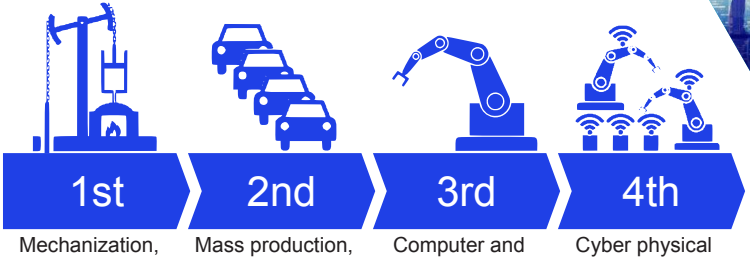
Thank you.

Special Address : Dominic BARTON

The Fourth Industrial Revolution
Key Drivers and Implications

Institute for Global Economics
Dominic Barton | Global Managing Partner
McKinsey & Company

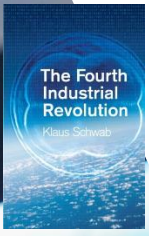
Fourth Industrial Revolution is characterized by range of new technologies that fuse physical, digital, and biological worlds



1st	2nd	3rd	4th
Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer and automation	Cyber physical system

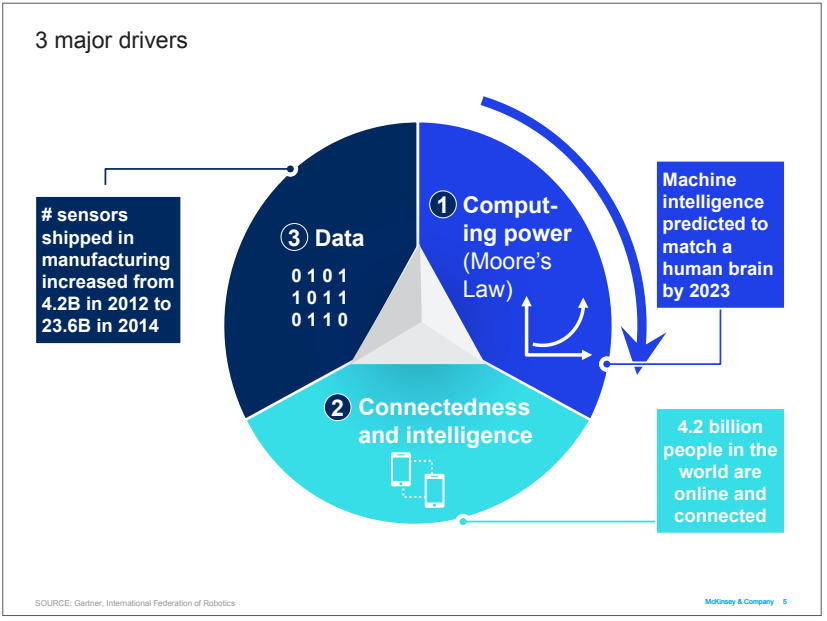
SOURCE: Forbes, World Economic Forum

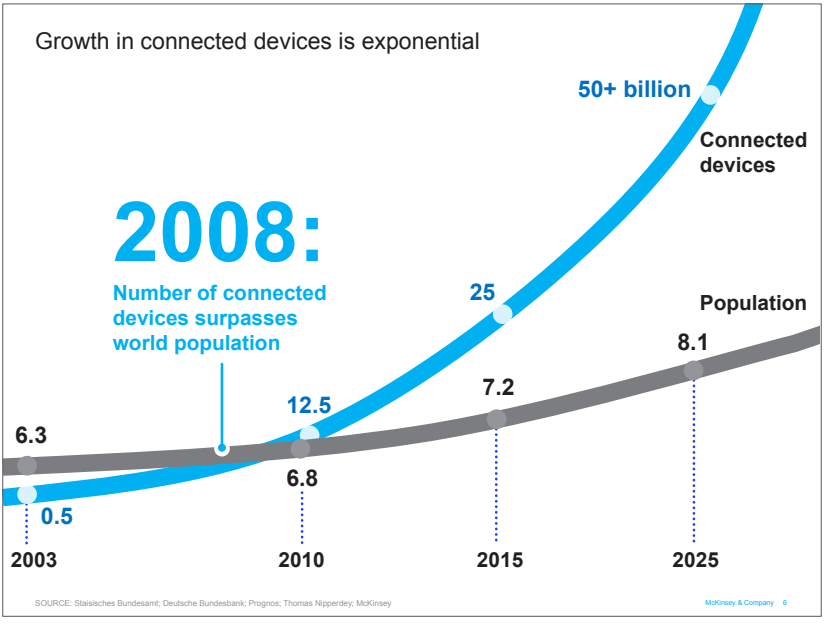
"Unprecedented and simultaneous advances in artificial intelligence (AI), robotics, **the internet of things**, autonomous vehicles, 3D printing, nanotechnology, biotechnology, materials science, energy storage, quantum computing … we have dubbed this the Fourth Industrial Revolution…"



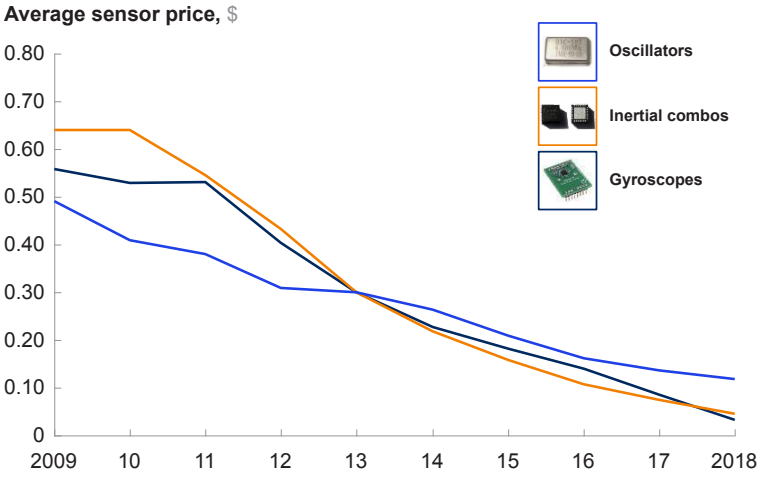
– Klaus Schwab
Founder and Executive Chairman,
World Economic Forum

1. Key drivers
2. Implications for businesses
3. Implications for policymakers


3 major drivers
sensors shipped in manufacturing increased from 4.2B in 2012 to 23.6B in 2014
3 Data
0 1 0 1
1 0 1 1
0 1 1 0
1 Comput-ing power (Moore's Law)
Machine intelligence predicted to match a human brain by 2023
2 Connectedness and intelligence
4.2 billion people in the world are online and connected
SOURCE: Gartner, International Federation of Robotics
McKinsey & Company 5


Growth in connected devices is exponential
50+ billion
Connected devices
2008:
Number of connected devices surpasses world population
25
Population
8.1
12.5
7.2
6.3
6.8
0.5
2003
2010
2015
2025
SOURCE: Staisisches Bundesamt; Deutsche Bundesbank; Prognos; Thomas Nipperdey; McKinsey
McKinsey & Company 6

Declining **sensor costs** are catalyzing growth in IoT

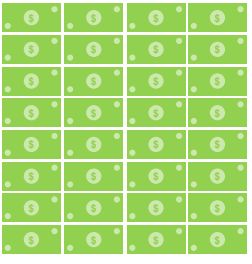


SOURCE: McKinsey Global Institute

In addition to sensors, a continuing price decline in cloud computing is helping propel growth

Cost of cloud computing

2010



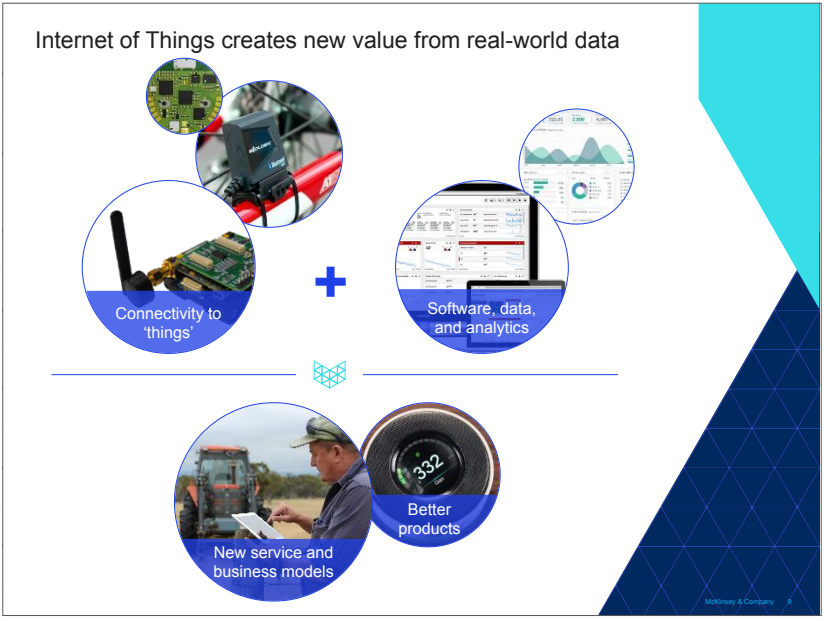
Today

The cost of storing a gigabyte on the cloud is over

1000x

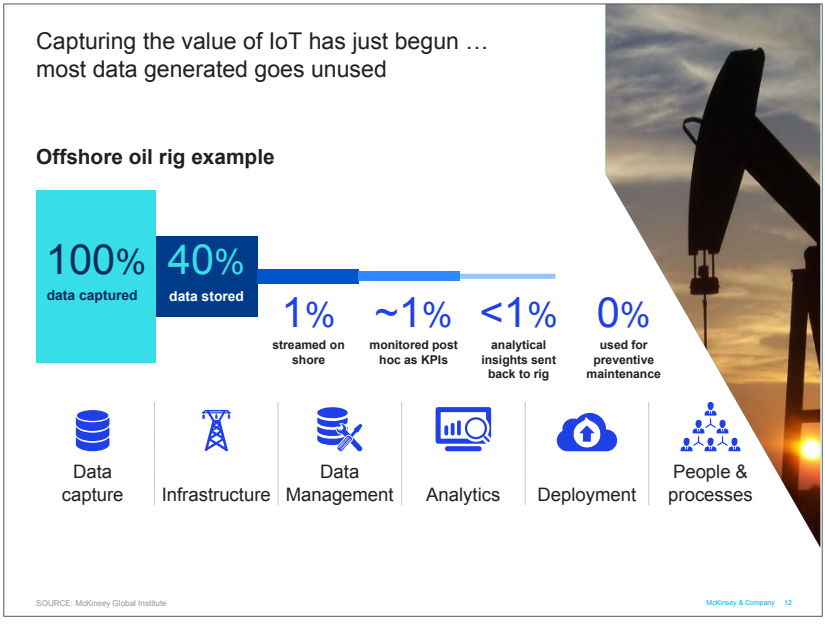
less today than it was in 2010

SOURCE: McKinsey Global Institute


Internet of Things creates new value from real-world data
Connectivity to 'things'
Software, data, and analytics
Better products
New service and business models
McKinsey & Company 8


IoT is not new, but it has evolved
10 Years ago
5 Years ago
Today
GPS / telematics
Nike+ FuelBand
Amazon Echo
FUEL
McKinsey & Company 10


IoT is transforming industries …
From products
JOHN DEERE
To services
SOURCE: John Deere


Capturing the value of IoT has just begun …
most data generated goes unused
Offshore oil rig example
100%
data captured
40%
data stored
1%
streamed on shore
~1%
monitored post hoc as KPIs
<1%
analytical insights sent back to rig
0%
used for preventive maintenance
Data capture
Infrastructure
Data Management
Analytics
Deployment
People & processes
SOURCE: McKinsey Global Institute
McKinsey & Company 12

Interoperability is required to unlock the full of potential IoT value

~40% value of IoT cannot be realized without interoperability

IoT will continue to evolve

10 Years ago — GPS / telematics

5 Years ago — Nike+ FuelBand

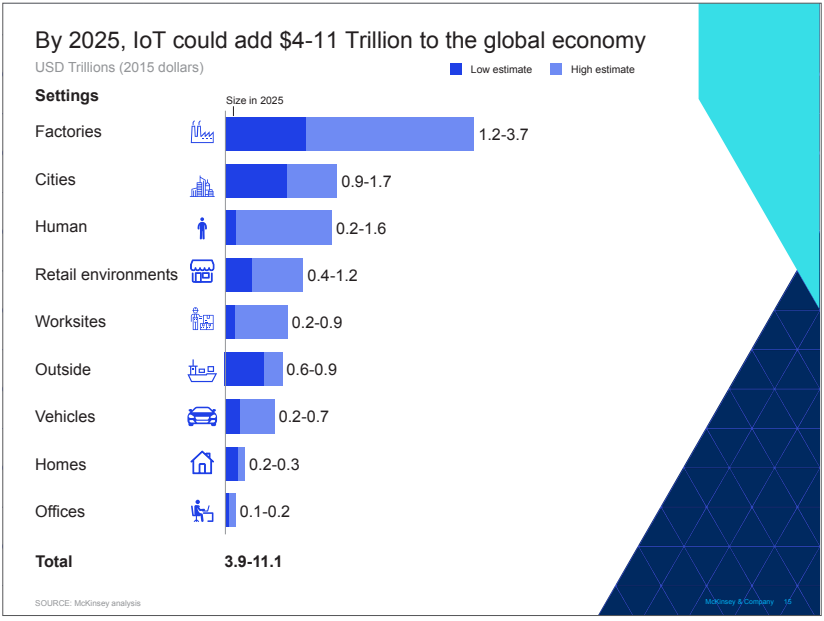
Today — Amazon Echo

3 Years from now — Self-ordering and drone delivery

5 Years from now — Autonomous cars

10 Years from now — AI traffic control

SOURCE: McKinsey


By 2025, IoT could add $4-11 Trillion to the global economy
USD Trillions (2015 dollars)
Low estimate
High estimate
Settings
Size in 2025
Factories
1.2-3.7
Cities
0.9-1.7
Human
0.2-1.6
Retail environments
0.4-1.2
Worksites
0.2-0.9
Outside
0.6-0.9
Vehicles
0.2-0.7
Homes
0.2-0.3
Offices
0.1-0.2
Total
3.9-11.1
SOURCE: McKinsey analysis
McKinsey & Company 15


In the future, discrete devices will be replaced by ubiquitous sensors and radical integration into everyday objects

1. Key drivers of IoT

2. Implications for businesses

3. Implications for policymakers

What does IoT mean for business?

1 Disruption to existing business models

2 New frontiers of product innovation

3 Need for organizational transformation and new talent

DISRUPTION TO EXISTING BUSINESS MODELS

1 Value will come from generating outcomes instead of selling devices

ROLLS ROYCE

Results:

9%

Revenue Growth

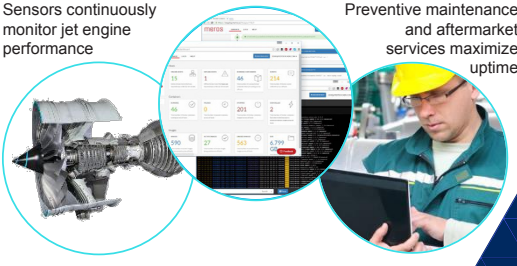
30%

Increase in engine availability

Live data enable real-time condition alerts and parts inventory management

Sensors continuously monitor jet engine performance

Preventive maintenance and aftermarket services maximize uptime



SOURCE: Rolls Royce, press search

McKinsey & Company 19

"We don't pay for products, we pay for services"

– Jeroen Tas, CEO of Phillips Connected Care and Informatics

SOURCE: World Economic Forum

McKinsey & Company 20

DISRUPTION TO EXISTING BUSINESS MODELS

1 Repair and replace becomes predict and prevent

- Maintenance
- Healthcare
- Insurance
- Risk management

SOURCE: McKinsey Global Institute

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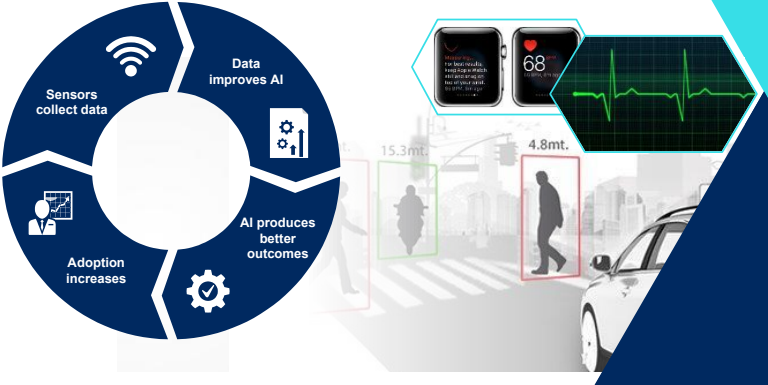
NEW FRONTIERS OF PRODUCT INNOVATION

2 AI and machine learning will power further product innovation



SOURCE: McKinsey Global Institute

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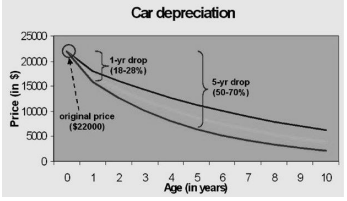
NEW FRONTIERS OF PRODUCT INNOVATION

2 Product kaizen: Products get better in service



DAMON LAVRINC 11.15.13 5:55 PM

TESLA TWEAKS MODEL S WIRELESSLY AS FEDS INVESTIGATE BATTERY FIRES

This Model S is just one of the 19,000 or so slated for a wireless update to its suspension system software, a move that comes in response to a federal investigation into two recent Model S battery fires. *Photo: WIRED*

SOURCE: Hal Varian, WIRED, McKinsey Global Institute

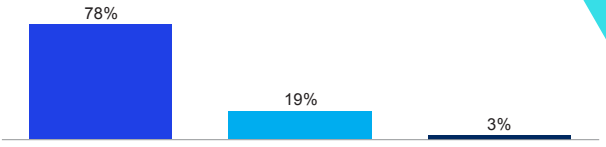
ORGANIZATIONAL TRANSFORMATION AND NEW TALENT

3 Competing in a digital world will require major shifts for organizations

ORGANIZATIONAL TRANSFORMATION AND NEW TALENT

3 Most companies are just beginning to experiment with IoT

IoT journey, Percent of companies



Examples[1]

KOMATSU · SONY · MITSUBISHI · SAMSUNG · GE · HUAWEI

Characteristics

- **Opportunistic/ reactive initiatives** on the fringe of company strategy
- **Supported by third parties**

- **Aligned with company** strategy and provide marginal bottom line benefits
- Use of IoT **borrows from competitor use cases**
- Delivering on IoT **strains organization**

- **Core to strategy/business model**
- Balanced R&D portfolio and **new use cases pioneered**
- **Organization and talent** positioned to lead industry

1 Representative companies for each category

SOURCE: McKinsey Internet of Things survey, 2015

1. Key drivers of IoT

2. Implications for businesses

3. Implications for policymakers

What does IoT mean for policymakers?

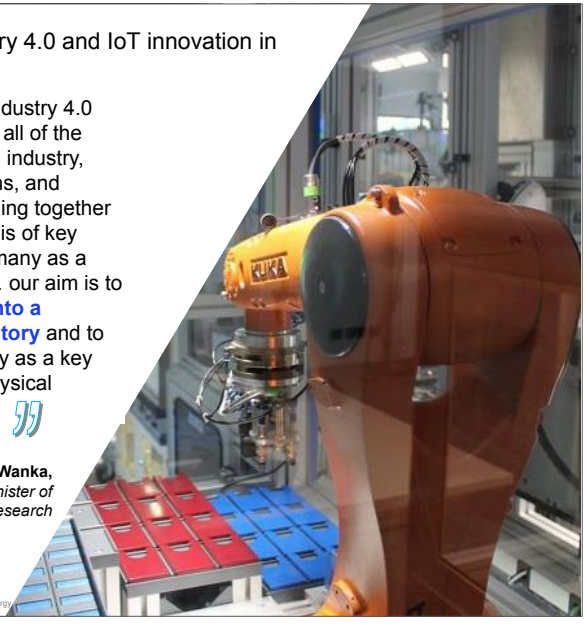
1. Identify an IoT focus
2. Develop regulation to support safe IoT
3. Prepare for future skill and talent needs

IDENTIFY AN IOT FOCUS

1 Germany: Industry 4.0 and IoT innovation in manufacturing

"The launch of the Industry 4.0 platform shows that all of the relevant actors from industry, science, trade unions, and government are pulling together in this area – which is of key importance for Germany as a business location … our aim is to **turn Industry 4.0 into a German success story** and to establish our country as a key supplier of cyber-physical production systems"

– **Johanna Wanka,**
Federal Minister of Education and Research



SOURCE: Federal Ministry for Economic Affairs and Energy

IDENTIFY AN IOT FOCUS

1 Singapore: test-bed for “connected city” and urban IoT solutions

First autonomous taxi pilot

IoT for public service delivery

SOURCE: Nutonomy, https://govinsider.asia/connected-gov/exclusive-singapore-govt-to-launch-in-house-iot-unit/

IDENTIFY AN IOT FOCUS

1 South Korea could focus on becoming an IoT test-bed in key economic sectors, such as automobiles and manufacturing

Become the global “test-bed” for IoT solutions

IoT in automobile – “connected” car revolution

Industry 4.0 and IoT in industry and manufacturing

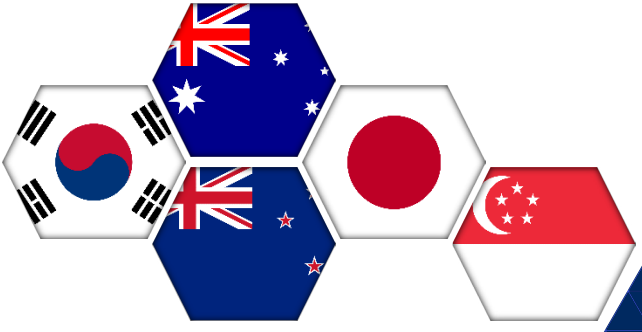
SOURCE: Nutonomy, https://govinsider.asia/connected-gov/exclusive-singapore-govt-to-launch-in-house-iot-unit/

DEVELOP REGULATION

2 The rise of connectivity poses major cybersecurity threats

South Korea, Australia, New Zealand, Japan, and Singapore are

9x more vulnerable to cyberattack than other Asian countries



SOURCE: Asia-Pacific Defence Outlook 2016

DEVELOP REGULATION

2 As connectivity grows, infrastructure will become more vulnerable to attack

Potential effects of a cyber-attack on the U.S. power grid

15 states affected

93M people are left without power

Factories and commercial activity that account for 32% of U.S. economic production are shut down

All phone systems, internet, TV, radio, street lights, and traffic signals are shut down

SOURCE: Lloyd's "Business Blackout" Report, 2015

DEVELOP REGULATION

2 Policymakers should actively prepare regulation to ensure the security of IoT

10 most vulnerable IoT security targets

1. Industrial facilities
2. Cars
3. Video cameras
4. IoT-enabled spying and cyberwarfare
5. Power grids and utilities
6. Buildings
7. City infrastructure and transportation
8. Medical devices and hospitals
9. Airplanes
10. Retail stores and databases

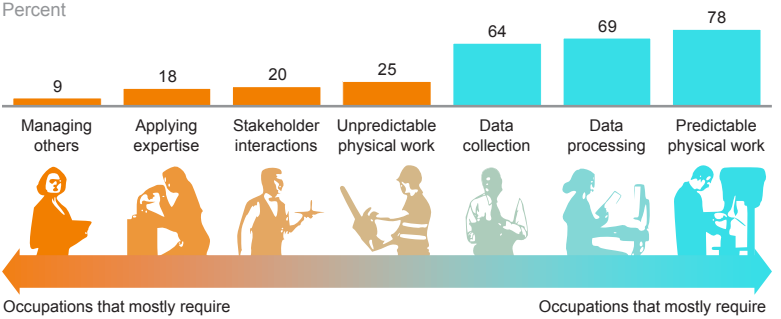
SOURCE: Internet of Things Institute

FUTURE SKILLS AND TALENT

3 Policymakers should understand how jobs will evolve in the future – even today 45% of paid activities could be automated

Activity that can be automated using existing technology

Percent



Occupations that mostly require **managing others** are **least likely** to be automated

Occupations that mostly require **predictable physical work** are **most likely** to be automated

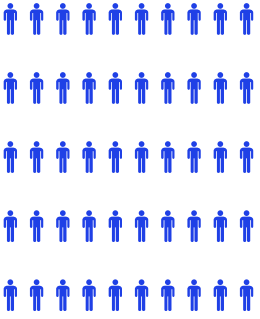
SOURCE: McKinsey Global Institute

FUTURE SKILLS AND TALENT

3 Policymakers should also foster critical skills needed in the future economy – for example, the world faces an AI shortage

North American working population

100M



Data scientists

8,900

Wild life biologists

17,900

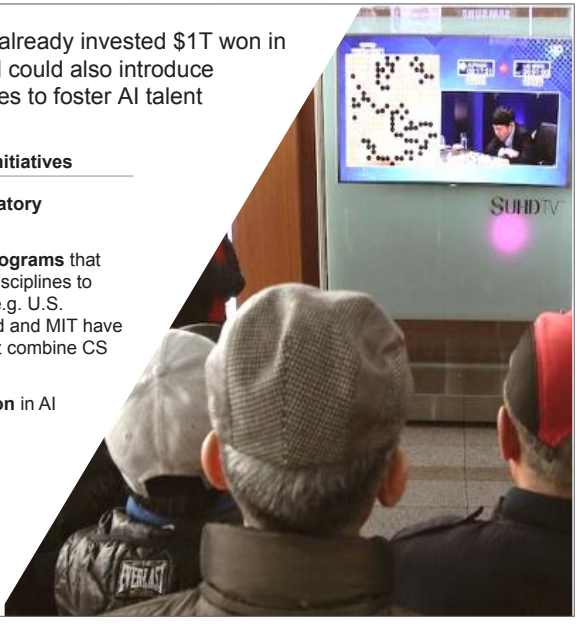
SOURCE: LinkedIn

FUTURE SKILLS AND TALENT

3 South Korea has already invested $1T won in AI research – and could also introduce education initiatives to foster AI talent

Potential AI education initiatives

- Make AI learning **mandatory** for high school students
- Introduce **university programs** that combine AI with other disciplines to encourage innovation: e.g. U.S. universities like Stanford and MIT have created joint majors that combine CS and humanities
- Sponsor **adult education** in AI



SOURCE: Nature

The Fourth Industrial Revolution

Key Drivers and Implications

Institute for Global Economics
Dominic Barton | Global Managing Partner
McKinsey & Company

Session 1

Impacts of the Fourth Industrial Revolution

- **Moderator**

  Kyungjin SONG, President, IGE

- **Presentations**

  Carl Benedikt FREY, Co-Director, Oxford Martin Programme on Technology and Employment

  Dennis GOERLICH, Managing Director, Kiel Institute for the World Economy

  Jong-Guk SONG, President, Science & Technology Policy Institute

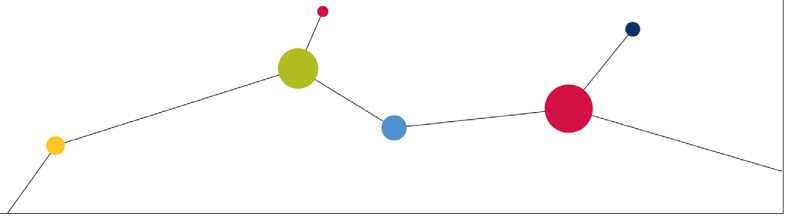
  Jonathan WOETZEL, Director, McKinsey Global Institute

Presentation : Carl Benedikt FREY

OXFORD MARTIN SCHOOL

The Future of Work: Is This Time Different?

Carl Benedikt Frey



The future of work: an old concern

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Emperor Vespasian (69 AD)

“How will it be possible to feed the populace?

Queen Elizabeth I (1589)

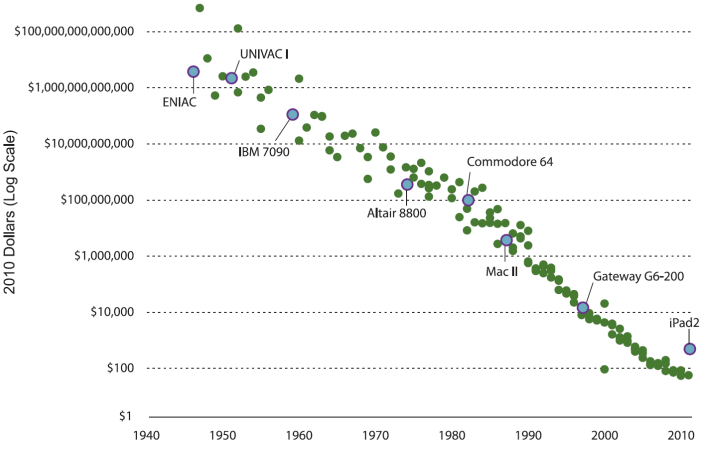
“Thou aimest high, Master Lee. Consider thou what the invention could do to my poor subjects. It would assuredly bring to them ruin by depriving them of employment, thus making them beggars”

Bill Gates (2014)

"Software substitution, whether it's for drivers or waiters or nurses […] it's progressing […] Technology over time will reduce demand for jobs, particularly at the lower end of skill set.”

The declining cost of computers

OXFORD MARTIN SCHOOL



Is this time different?

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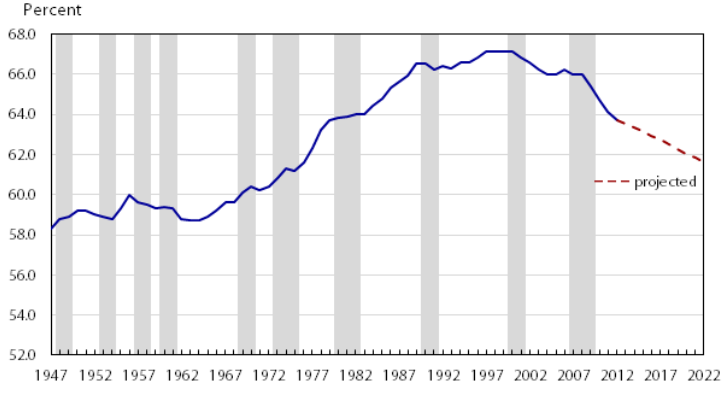
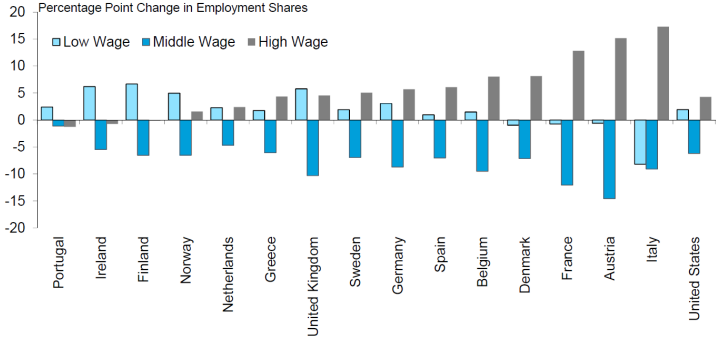
U.S. Civilian Labour Force Participation Rate



Source: US Bureau of Labor Statistics

Job polarization and wage disparities

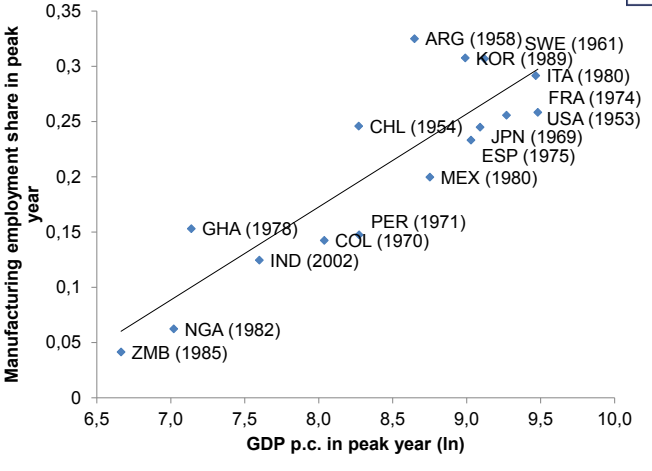
OXFORD MARTIN SCHOOL



Source: David Autor (2010), "The Polarisation of Job Opportunities in the U.S. Labor Market: Implications for Employment and Earnings," Center for American Progress and The Hamilton Project. Wage categories are based on average wage levels at the start of the period measured

The end of industrialization?

OXFORD MARTIN SCHOOL



The expanding comparative advantage of computers

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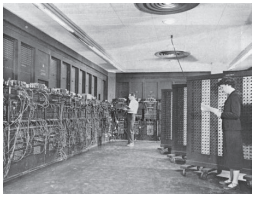
Human computers performing mathematical calculations

"The human computer is supposed to be following fixed rules; he has no authority to deviate from them in any detail." (Turing, 1950)

Electronic computers performing routine tasks:

- **Calculation**
- **Repetitive customer service**
- **Picking or sorting**
- **Repetitive assembly**



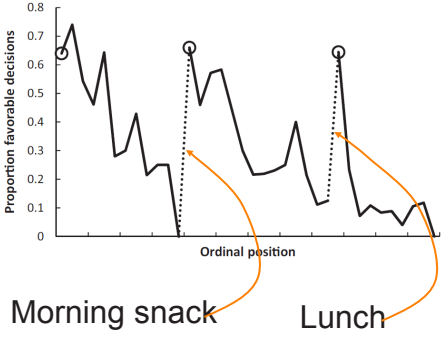
Machine learning algorithms performing **non**-routine tasks:

- **Medical diagnostics**
- **Document review**
- **Translation**
- **Driving**

Google Translate
Break through language barriers.

Computer technologies offer workers free from human heuristics and biases

OXFORD MARTIN SCHOOL

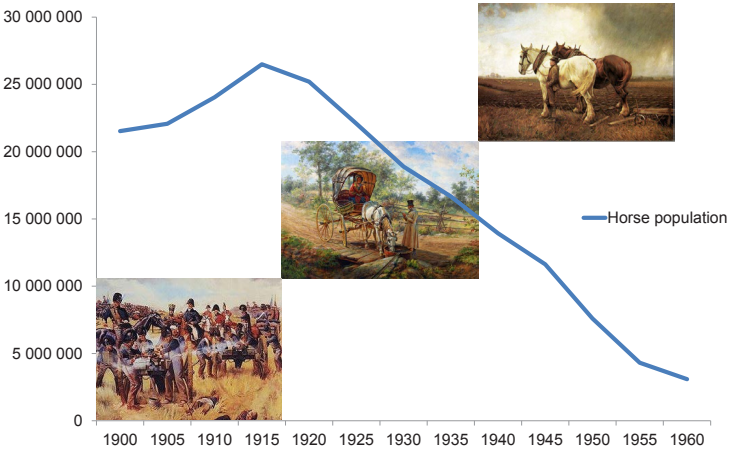


Israeli judges are significantly more lenient after a food break (Danziger et al 2011).

Will automation cause a jobless future?

OXFORD MARTIN SCHOOL

"I believe in the horse. Automobiles are a passing phenomenon."
- Kaiser Wilhelm II



Where will human workers still hold the comparative advantage?

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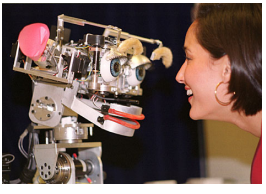
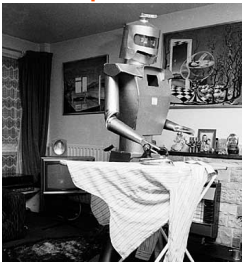
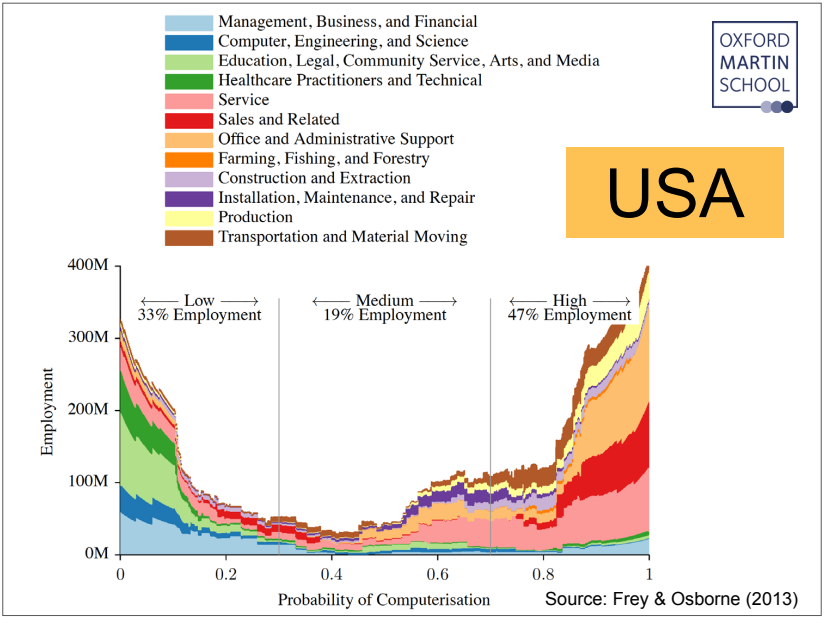
Creativity

Social intelligence



Perception and manipulation




Management, Business, and Financial
Computer, Engineering, and Science
Education, Legal, Community Service, Arts, and Media
Healthcare Practitioners and Technical
Service
Sales and Related
Office and Administrative Support
Farming, Fishing, and Forestry
Construction and Extraction
Installation, Maintenance, and Repair
Production
Transportation and Material Moving
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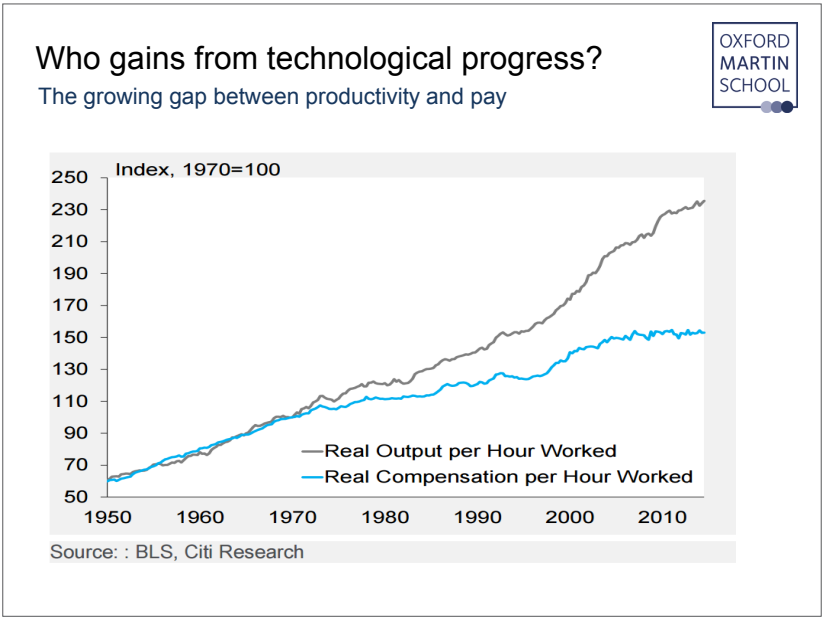
USA
400M
300M
200M
100M
0M
Employment
Low
33% Employment
Medium
19% Employment
High
47% Employment
0
0.2
0.4
0.6
0.8
1
Probability of Computerisation
Source: Frey & Osborne (2013)

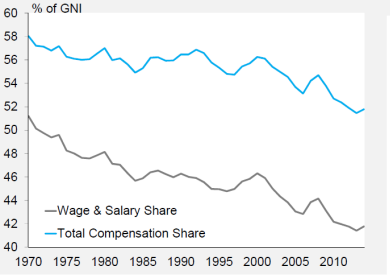

Who gains from technological progress?
The growing gap between productivity and pay
OXFORD MARTIN SCHOOL
Index, 1970=100
250
230
210
190
170
150
130
110
90
70
50
1950
1960
1970
1980
1990
2000
2010
Real Output per Hour Worked
Real Compensation per Hour Worked
Source: : BLS, Citi Research

Who gains from technological progress?

OXFORD MARTIN SCHOOL

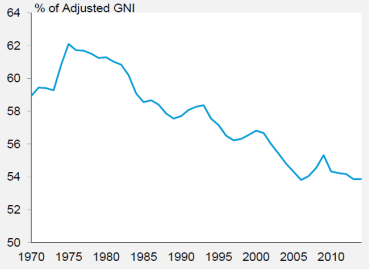
The falling labour share of income

USA



Source: BLS, Citi Research

19 Industrial Economies

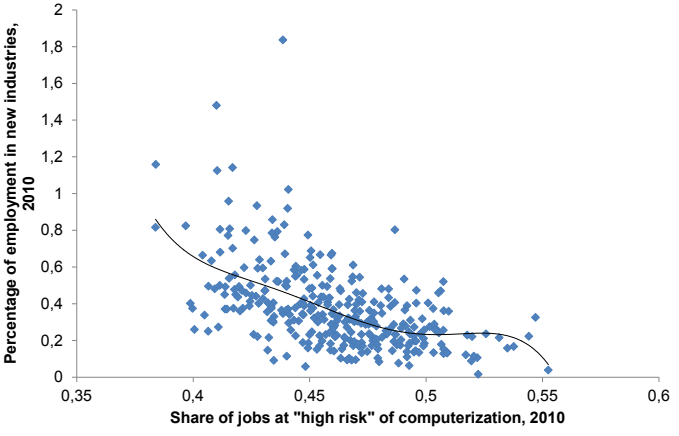


Source: European Commission, Citi Research

Who gains from technological progress?

OXFORD MARTIN SCHOOL

The growing regional divide



Who gains from technological progress?

OXFORD MARTIN SCHOOL

New jobs, but only for the highly skilled

Detailed industry (examples)	% of US Employment	% with college degree	Avg. Wages ($)
Internet publishing and broadcasting	0.06	69.6	81,138
Electronic shopping	0.08	49.7	45,372
Data processing, hosting, and related services	0.08	48.0	64,729
Electronic auctions	0.01	52.2	47,257

0.5 % of the US workforce is employed in new industries created in the 21st century

Source: Berger & Frey (2015)

A tale of two cities: Detroit and Silicon Valley

OXFORD MARTIN SCHOOL

Top 3 companies: key statistics

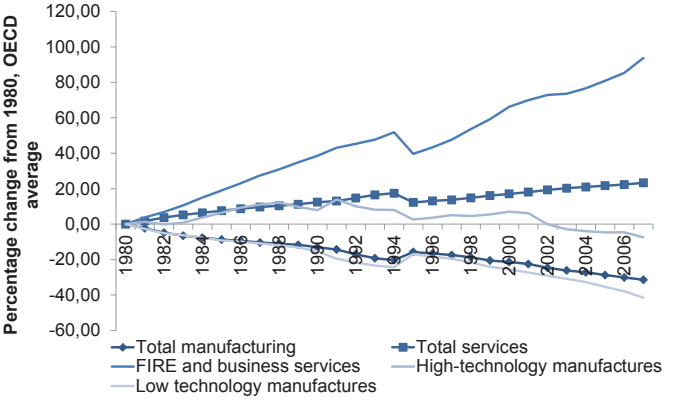
Detroit in 1990	Silicon Valley in 2014
$250bn revenues	$247bn revenues
1.2m employees	137,000 employees
$36bn market capitalization	$1.09tn market capitalization

Source: McKinsey (2014).

A Deindustrial Revolution

OXFORD MARTIN SCHOOL

We are being afflicted with a new disease […] namely, technological unemployment.
- John Maynard Keynes, 1930



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Presentation : Dennis GOERLICH

Policies for the New Digital Age

Dennis Görlich
Kiel Institute for the World Economy

Outline

- Technological transformations
  - The Internet of Things
  - Advanced Manufacturing
  - Technology-Enabled Platforms
- Characteristics of Work and Labour Markets in IoT Age
- Challenges for Education and Regulation
- Challenges for Governments / Int'l. Cooperation
- Policy recommendations

1. The Internet of Things

- Also called: Industrial Internet
- Industrial machines are:
  - Equipped with sensors
  - Connected to the internet (incl. cloud)
- Implications:
  - Sensors provide live data → preventive maintenance
  - Sensors write into cloud → big data
  - Machines communicate with each other
    → automation, small lot sizes

1. The Internet of Things

Jenbacher gas engines (Austria)

Production:
- Industrial robots produce engines
- Integrated, automated facility

Maintenance:
- 5500 engines digitally surveilled, remote maintenance
- 80 engines proactively maintained (preventive maintenance)
- Downtime of 6-8 weeks = USD 160,000

2. Advanced Manufacturing

- Additive manufacturing (3D printing)
- Digital thread linking all production stages
  design, engineering, manufacturing, supply chain, distribution, servicing

- Implications:
  - Printing prototypes and testing → speed, lower cost
  - Printing spare parts → decentralized maintenance
  - Digital thread → customization
    → multitasking
  - → changes in global value chains

2. Advanced Manufacturing

AIRBUS GROUP

Aviation (France, Germany)

3D Printing:

- used for tooling, prototyping and making parts for test flights
- also in commercial in-service aircraft
- Produce missing, non-standard parts in low quantities and in less than 24 hours
- Currently: plastic and titanium
- Planned: alloy and superalloy

3. Technology-Enabled Platforms

- Seminal examples: Uber, Airbnb
- Matching supply & demand for under-utilized assets
- Incl. many platforms for labour services
- Implications:
  - Companies can employ talent globally → tradable tasks
  - Fewer standard employment relationships → individualization
  - National regulation undermined (minimum wages)?

Characteristics of Work and Labour Markets in New Digital Age

- New occupations (e.g. big data jobs, geoinformation)

Characteristics of Work and Labour Markets in New Digital Age

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Characteristics of Work and Labour Markets in New Digital Age

- New occupations (e.g. big data jobs, geoinformation)
- Ongoing automation
  - Lawyers, financial analysts, doctors, journalists, accountants
  - Polarization, shrinking middle class
  - Safe: jobs requiring social and creative skills
- On-demand work (e.g. Uber, Task Rabbit, CoContest)
  - New forms of collaboration: company ←→ personnel
- Multitasking

Characteristics of Work and Labour Markets in New Digital Age

Trends in Multitasking (Germany)

- Sample of 1,014 employees in Germany in 2013
- Detailed questions about job tasks carried out at work

- Would you say that, within the past 5 years, the scope of your work activities has…
  - Become smaller (N=77, 8%)
  - Stayed roughly identical (N=363, 36%)
  - Become broader (N=428, 42%)

- More pronounced in manufacturing

Challenges for Education and Labour Market Regulation

- Diverse employment biographies
  - Non-standard employment relationships
- Change in # of jobs…
- …but also where jobs are
  - Depends on changes in global value chains
- Digital Age didn‘t (yet?) create jobs
  - 0.5% employed in new industries
  - But: large local multiplier effects

Challenges for International Cooperation

- New patterns of comparative advantage
  - Localization (protectionism or technology?)
- Global hiring of labour services
  - National regulation?
  - Stand-by workforces, social protection?
- Network externalities
  → giant multinational companies
  - Taxation
  - Competition policy

Policies

- Education & Training
  - Forecast occupations in future demand
  - Teach competencies to cope with *change*
  - Creativity! Interpersonal skills!
- Business Governance
  - New forms of motivation and control / work-life balance
- Welfare state
  - As employment relationship become more diverse:
    - Adapt benefit entitlements to new realities
    - Decouple benefits from employment relationship
      → move to universalism?
  - Deal with a wave of long-term unemployed?

Industrie 4.0 – A Primer

- Aim: Shaping digitalization
- Germany: 15 million jobs in manufacturing; many SMEs

Industrie 4.0 is:

- Support programme (100 million Euro for R&D)
- Platform
  - business, employees, trade unions, federations, politics, academia
  - develop actionable recommendations
  - develop standards
  - develop show cases / testing grounds

Industrie 4.0 - Facts

Adoption

- Internet of Things applications: 51%
  - driven by logistics (RFID)
- Big data: 22%
- Robotics/sensorics: 12% (in manufacturing)

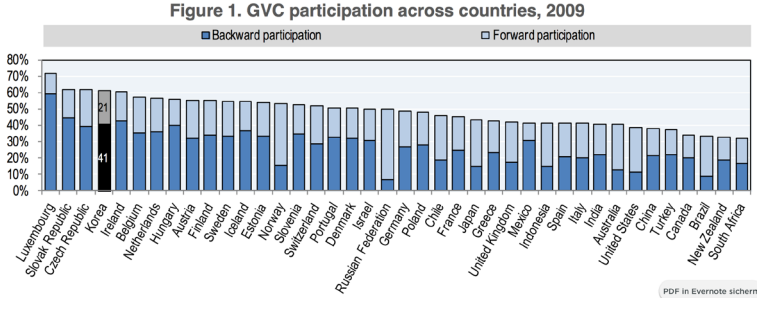
Limitations

- Broadband infrastructure
- Data security concerns
- Qualified personnel

Specific challenges for South Korea

- Re-Shoring trends
  - Korean industry relies on upstream producers from other Asia

Specific challenges for South Korea



Specific challenges for South Korea

- Re-Shoring trends
  - Korean industry relies on upstream producers from other Asia
  - Technological transformations → „re-shoring“ → declining demand for labour-intensive production
  - Risk for Korea‘s industry?

Specific challenges for South Korea

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- Chaebols vs. MSMEs (micro, small and medium-sized)
  - Who drives innovation?

Specific challenges for South Korea

- Re-Shoring trends
  - Korean industry relies on upstream producers from other Asia
  - Technological transformations → „re-shoring“ → declining demand for labour-intensive production
  - Risk for Korea‘s industry?
- Chaebols vs. MSMEs (micro, small and medium-sized)
  - Who drives innovation?
- Education
  - Creativity / social skills

Presentation : Jong-Guk SONG

IGE/BRIE/McKinsey & Co. International Conference

Impacts of the Fourth Industrial Revolution and Policy Agenda to Korea

October 28, 2016

Science and Technology Policy Institute
Jong-Guk SONG, President

STEPI 과학기술정책연구원 SCIENCE AND TECHNOLOGY POLICY INSTITUTE

Contents

The Fourth Industrial Revolution? : Mixed Views

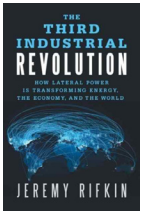
[4th!] Unprecedented Transformation vs. **[4th?] Steep, but Continuous Path**

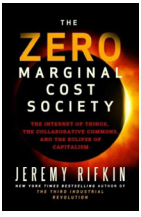
Navigating the next industrial revolution

Revolution	Year	Information
1	1784	Steam, water, mechanical production equipment
2	1870	Division of labour, electricity, mass production
3	1969	Electronics, IT, automated production
4	?	Cyber-physical systems

Klaus Schwab

"There are three reasons why today's transformations represent not merely a prolongation of the Third Industrial Revolution but rather the arrival of a Fourth and distinct one: velocity, scope, and systems impact."





"The Third Industrial Revolution - the digital revolution - has yet to reach its vast potential, making it far too early to declare it over and done."

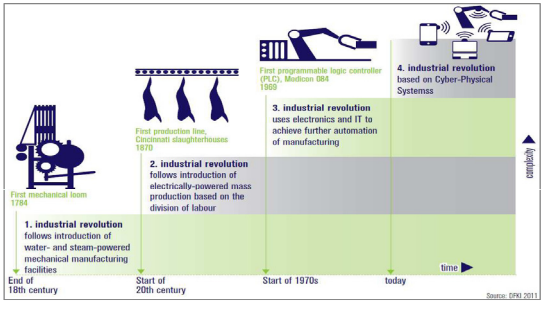
Jeremy Rifkin

Define the Changes? Cope with Them!

STEPI 과학기술정책연구원

The Fourth Industrial Revolution? : What makes it possible?

* GPT: General Purpose Technology



GPT	Water/Steam Power	Electric Power	Electronics / IT	No GPT? • Cloud computing (70s~) • Big Data analysis (90s~) • Artificial Intelligence (50s~) - Deep Learning (90s~) • under the remarkable development of materials, ICT and technology convergence
Role	Mechanize Production	Create Mass Production	Automate Production	

Source: Industrie 4.0 Working Group (2013.4). Recommendations for implementing the strategic initiative INDUSTRIE 4.0

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The Fourth Industrial Revolution? : What makes it possible?

- U dream failed to meet Peter Drucker's Inequality Condition
- Reality: Value << Cost
- Because of Huge Cost
  - Sensors in Goods (RFID)
  - Sensor Networks
  - Processing Servers embedded in Environment
  - Vast Storage Devices
  - Business Analytics
- Invent Smartphone makes it possible

Byungtae Lee(2016.2.16)

5

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The Fourth Industrial Revolution !

Connectivity 2.0 (Matchmaker, Go-Between)	Big Data (Cloud, Analytics, Deep Learning)
• Design business models, Collaborate • Create ecosystems and Platforms	• Gather, Store, Analyze Data • Create Intelligence and Values

6

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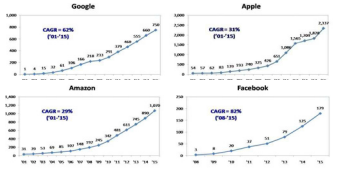
The Fourth Industrial Revolution? : Impacts?

- **The velocity, scope and system impact of technological convergence makes unpredictable business environment**
  - **Business model will be led by cloud computing and big data analysis in the fourth industrial revolution**
  - **The speed of the fourth industrial revolution depends on the degree of trust in each society and deregulation**
- **The products and services in fourth industrial revolution characterized by increasing return to scale**
- **Polarization of Job quality**
- **Deepening income inequality**
- **Individual Privacy, human ethics, security**

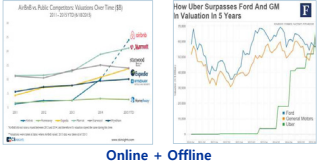
Byungtae Lee(2016.2.16)

Impacts : Industries

Dominance of Digital Platform Companies

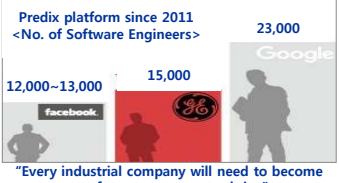


New Convergence Business Models



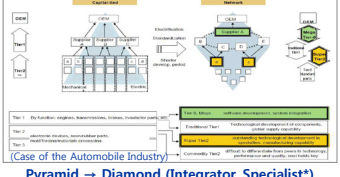
Online + Offline

Shift from Product to Software & Service



"Every industrial company will need to become a software company to thrive"

Industry Landscape Change

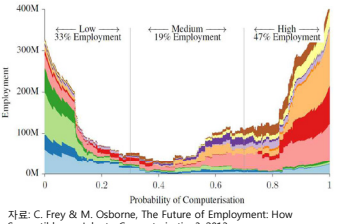


Pyramid → Diamond (Integrator, Specialist*)

* ex) ultra low power chips

Impacts : Economy and the Society

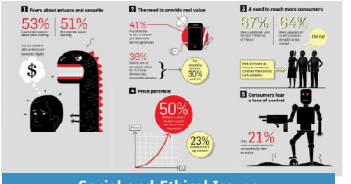
Unemployment



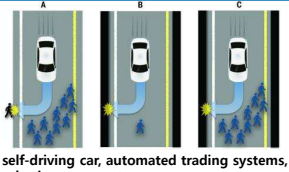
자료: C. Frey & M. Osborne, The Future of Employment: How Susceptible are Jobs to Computerisation?, 2013.

Fear	Number of Jobs		Quality of Jobs
Hope	AI (specific tasks)	vs.	Human (creativity, multiple tasks, integration)

Complexity and Risk



Social and Ethical Issues



- self-driving car, automated trading systems, robotic surgery, etc
- responsibility, justice, conflict, regulation

Policy Agenda to Korea

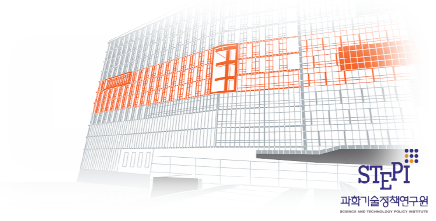
Industry
- Digital platform
- Convergence, Integration
- Software & Service

Economy
- Unemployment
- Lower quality of jobs

Society
- Privacy, security
- Conflict
- Transaction costs

Facilitate Innovation	• Component innovation → system innovation • Soft Innovation: product / process → business model • Reform silo regulation
Nurture Skills	• Productivity → Creativity • Holistic talent: Sci-tech + business + humanities
Build Trust	• Ensure privacy, protect data, prevent fraud • Resolve conflict: new players vs. incumbent players

Thank You !

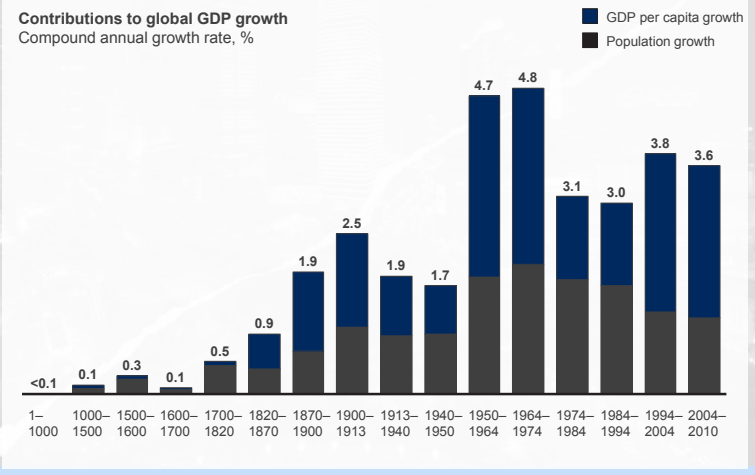


Presentation : Jonathan WOETZEL

Thoughts

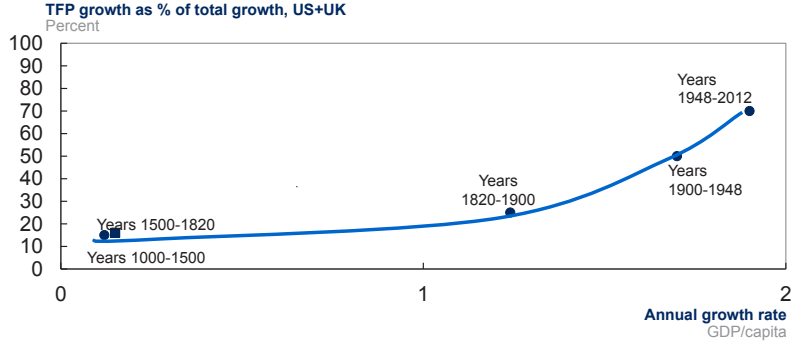
- Spaceship earth – the critical role of technology in improving our planet now and in the future
- But only the skilled survive at the sector, company and individual level
- The cases of China and Korea
- Toward a new new deal?

Unprecedented levels of GDP growth since the 1950s



SOURCE: Jutta Bolt and Jan Luiten van Zanden, *The first update of the Maddison Project: Re-estimating growth before 1820*, Maddison Project working paper number 4, University of Groningen, January 2013; UN Population Division; McKinsey Global Institute analysis

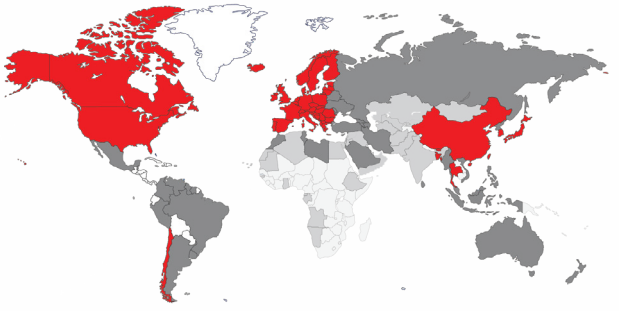
Tech is becoming the major driver of global growth



SOURCE: Maddison; OECD; Jones; McKinsey

By 2040, about 1 in 4 people in advanced economies and China will be 65 years old or older

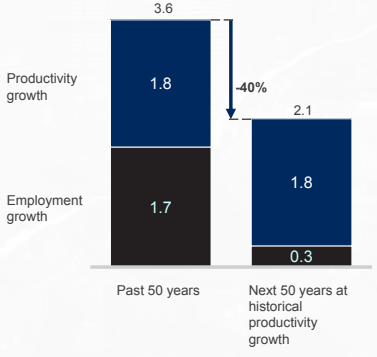
Share of population 65+, 2040E



SOURCE: UN Population Division; McKinsey Global Institute analysis

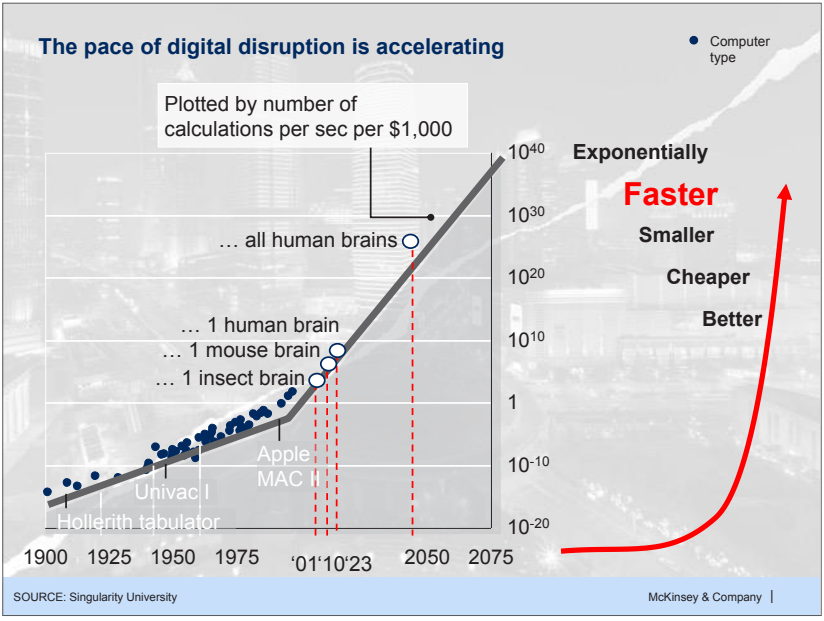
At past rates of productivity growth, global GDP growth would slow by about 40 percent

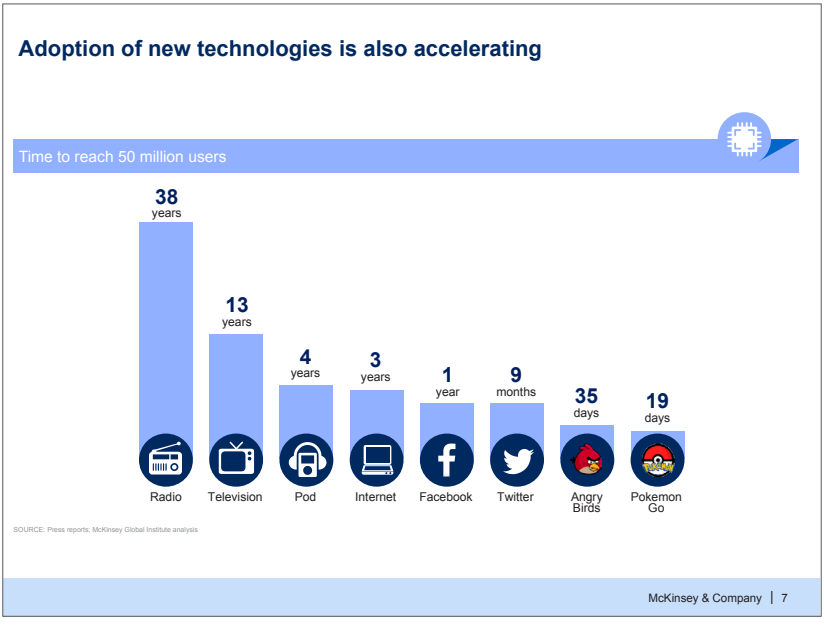
GDP of G19 and Nigeria
Compound annual growth rate, %



NOTE: Numbers may not sum due to rounding.

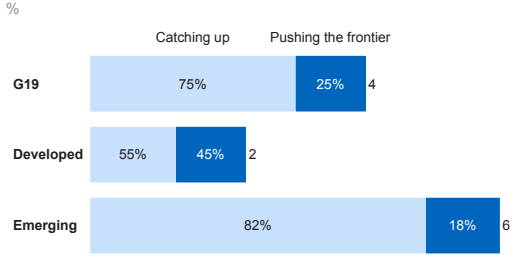
SOURCE: The Conference Board Total Economy Database; UN Population Division; McKinsey Global Institute analysis


The pace of digital disruption is accelerating
Computer type
Plotted by number of calculations per sec per $1,000
… all human brains
… 1 human brain
… 1 mouse brain
… 1 insect brain
Apple MAC II
Univac I
Hollerith tabulator
10^{40}
10^{30}
10^{20}
10^{10}
1
10^{-10}
10^{-20}
1900 1925 1950 1975 '01 '10 '23 2050 2075
Exponentially
Faster
Smaller
Cheaper
Better
SOURCE: Singularity University
McKinsey & Company


Adoption of new technologies is also accelerating
Time to reach 50 million users
38 years
Radio
13 years
Television
4 years
Pod
3 years
Internet
1 year
Facebook
9 months
Twitter
35 days
Angry Birds
19 days
Pokemon Go
SOURCE: Press reports; McKinsey Global Institute analysis
McKinsey & Company | 7

There is plenty of potential to accelerate productivity growth – and three-quarters of the productivity potential comes from catching up

Potential per annum productivity growth rate



Lack of productivity opportunities is not the constraint on growth

The productivity-improvement opportunities identified, extrapolated to the overall economy, are sufficient to raise annual productivity growth to 4% a year to 2025—more than double the historical 1.8% annual rate

SOURCE: McKinsey Global Institute analysis

The technology revolution is impacting industrial value chains

NON-EXHAUSTIVE

TECHNOLOGICAL ADVANCEMENTS

Advanced robotics

Robots increasingly capable, with sense, improved dexterity and intelligence to automate human tasks

3D Printing

Additive processing techniques to create objects by "printing" material layers on the basis of digital plans

Automation of cognitive processes

Smart software that can perform cognitive tasks involving unstructured commands and subtle judgments

KEY FIGURES

75–85%
Lower prices for the advanced robot Baxter compared to a typical industrial robot

90%
Price reduction for home 3D printer in the next 4 years

100x
Increased computing power of IBM computers between 1997 and 2011

400+ million
Increase in the number of digital assistant users (e.g., Siri) in the past 5 years

POTENTIAL IMPACT TO VALUE CHAIN

Re-industrialization of developed countries, through the development of cost structures resulting from **the substitution of labor by capital**

Potential decentralization of production and the emergence of flexible small plants, which shifts manufacturing from the industrial era to mass customization

Substitution in the trade from goods to basic materials and digital data

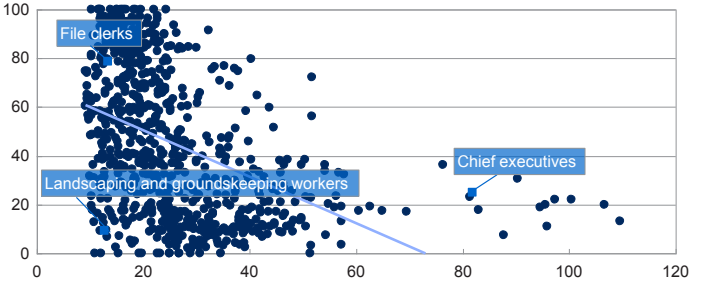
Potential decline in the outsourcing of services requiring human intervention (e.g., contact centers for customer relations)

Automation will affect all occupations to some degree

Comparison of wages and automation potential for US jobs

Ability to technically automate

Percent of time on activities that can be automated by adapting currently demonstrated technology

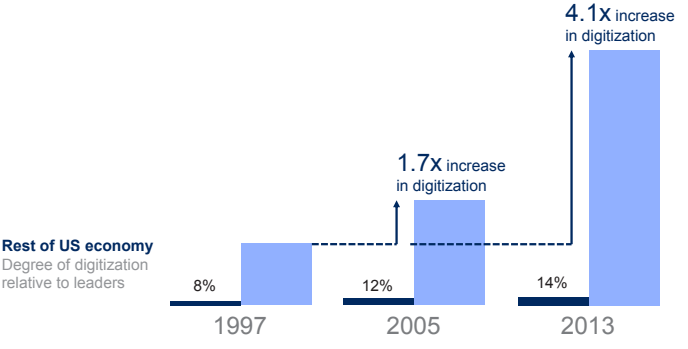


OVER NEXT 10 YEARS

- **44% of activities ($2.2 trillion in wages) likely automated… but only <5% of whole occupations likely to be fully automated**
- **At least 30% of activities in 60% of occupations likely automated, redefining most occupations**

Digitization is rapid – but uneven

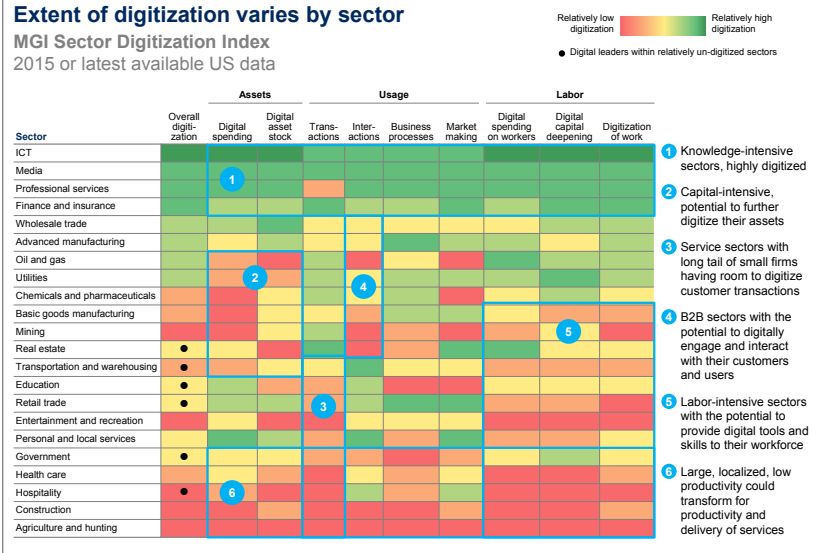
Leading US sectors in 1997 = 100%



Extent of digitization varies by sector

MGI Sector Digitization Index

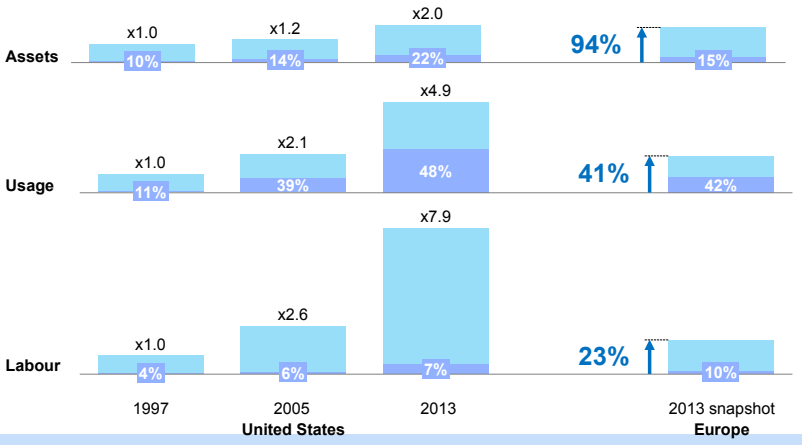
2015 or latest available US data



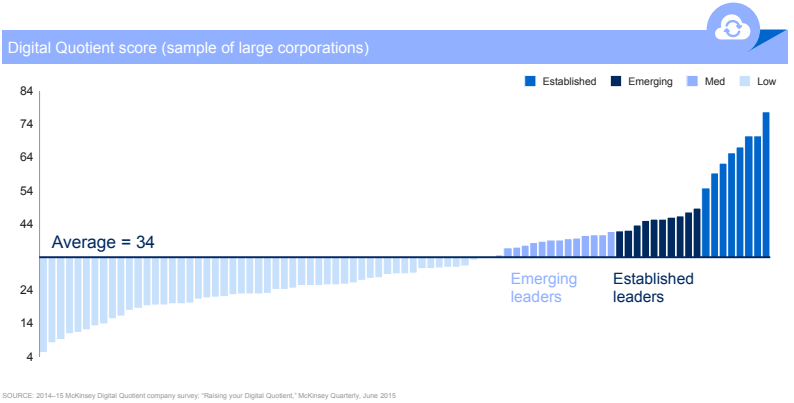
The most digitized sectors are driving growth in the US economy

Growth in digitization

Index: 1x = Most digitized sectors, 1997

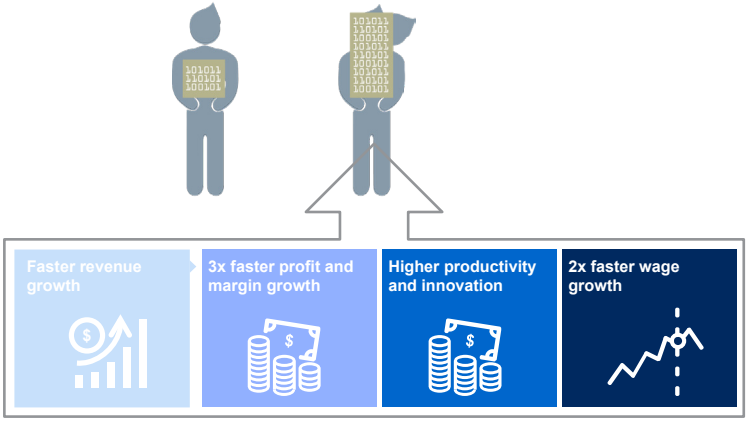


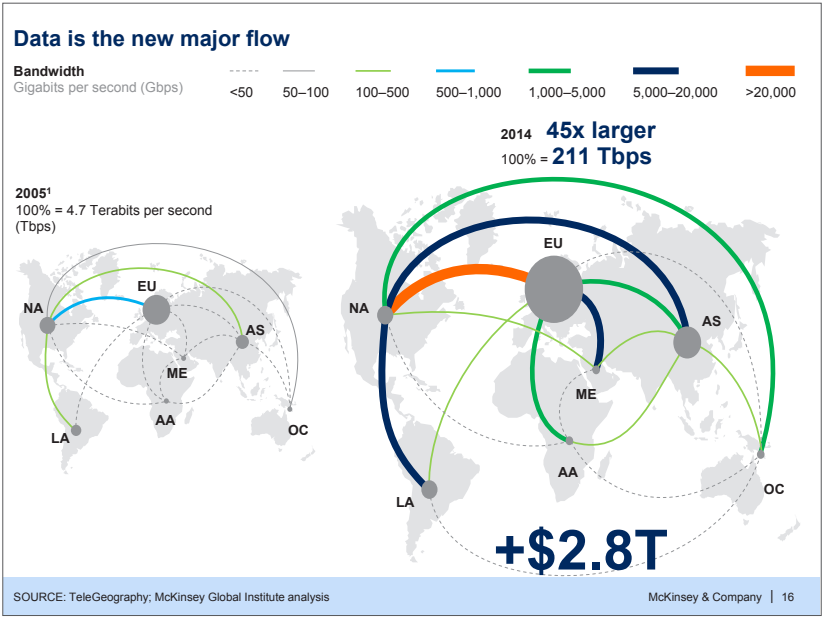
Among businesses, there is a large gap between digital leaders and the rest

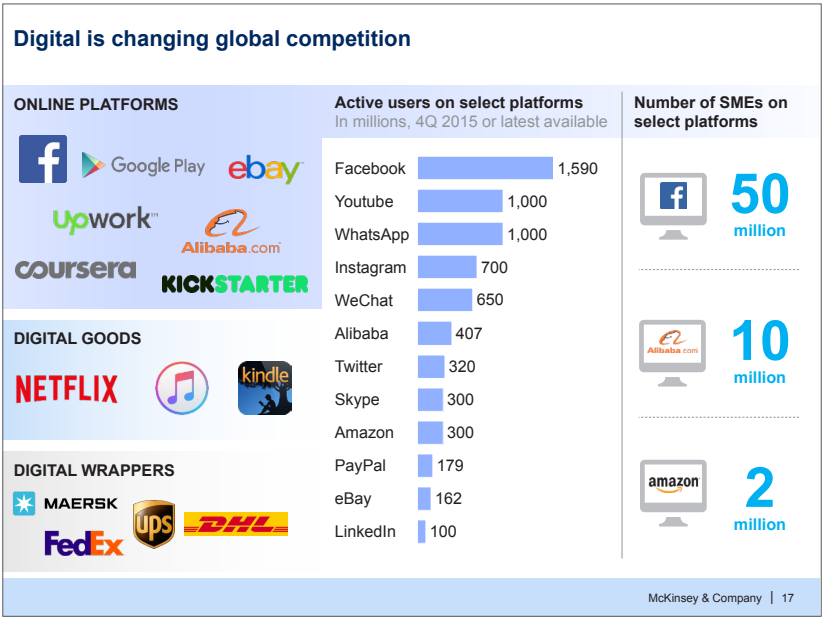


SOURCE: 2014–15 McKinsey Digital Quotient company survey; "Raising your Digital Quotient," McKinsey Quarterly, June 2015

Digital "haves" and "have-mores"

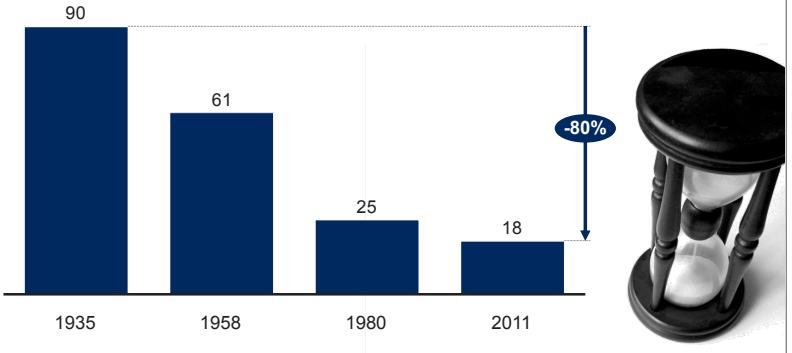



Data is the new major flow
Bandwidth
Gigabits per second (Gbps)
<50
50–100
100–500
500–1,000
1,000–5,000
5,000–20,000
>20,000
2014 45x larger
100% = 211 Tbps
2005[1]
100% = 4.7 Terabits per second (Tbps)
NA
EU
AS
ME
AA
LA
OC
+$2.8T
SOURCE: TeleGeography; McKinsey Global Institute analysis
McKinsey & Company | 16


Digital is changing global competition
ONLINE PLATFORMS
Google Play
ebay
Upwork
Alibaba.com
coursera
KICKSTARTER
DIGITAL GOODS
NETFLIX
kindle
DIGITAL WRAPPERS
MAERSK
FedEx
UPS
DHL
Active users on select platforms
In millions, 4Q 2015 or latest available
Facebook 1,590
Youtube 1,000
WhatsApp 1,000
Instagram 700
WeChat 650
Alibaba 407
Twitter 320
Skype 300
Amazon 300
PayPal 179
eBay 162
LinkedIn 100
Number of SMEs on select platforms
50 million
10 million
2 million
amazon
McKinsey & Company | 17

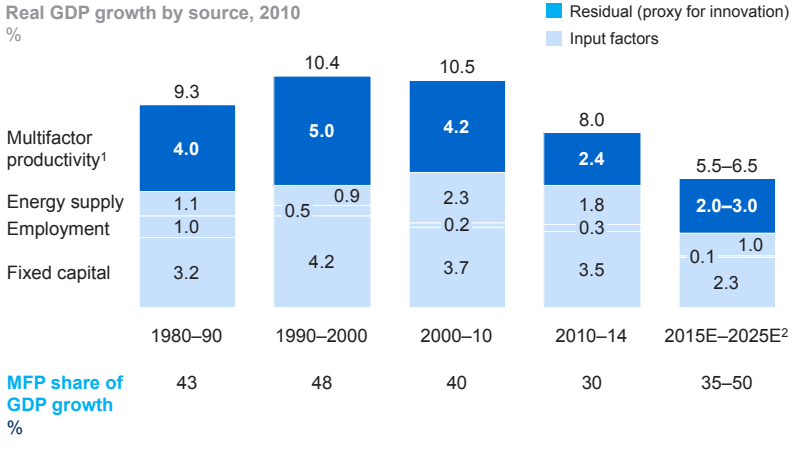
Average lifetime of companies is declining

Average tenure on the S&P 500
Years



Innovation (broadly defined) must contribute 2 to 3 percentage points of GDP growth in China by 2025

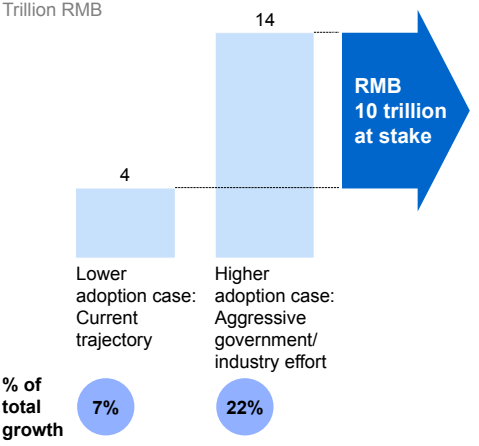
Real GDP growth by source, 2010
%



1 Multifactor productivity defined as GDP growth minus input factors (energy, labor, capital). Multifactor productivity provides a broad, indirect measure of innovation on the economy.
2 McKinsey Global Institute estimate, based on regression of more than 100 variables and assuming no major shocks.
NOTE: Numbers may not sum due to rounding.
SOURCE: McKinsey Global Institute analysis

By 2025, new Internet applications could enable some RMB 4–14 trillion in annual GDP

Potential GDP contribution by 2025
Trillion RMB



What does this number mean?

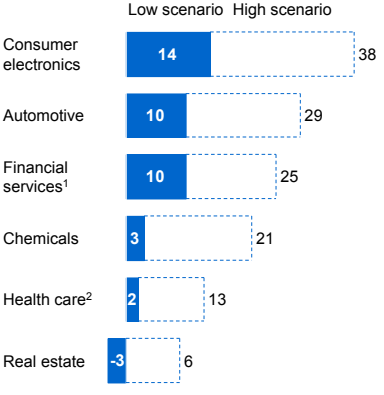
2013 Australian GDP =
RMB 10 trillion

2013 China total exports =
RMB 14 trillion

SOURCE: McKinsey Global Institute analysis of growth projections from IHS

Adoption of new Internet applications will have substantial economic impact across sectors

Contribution of new Internet applications to GDP growth, 2013–25
% of sector GDP growth



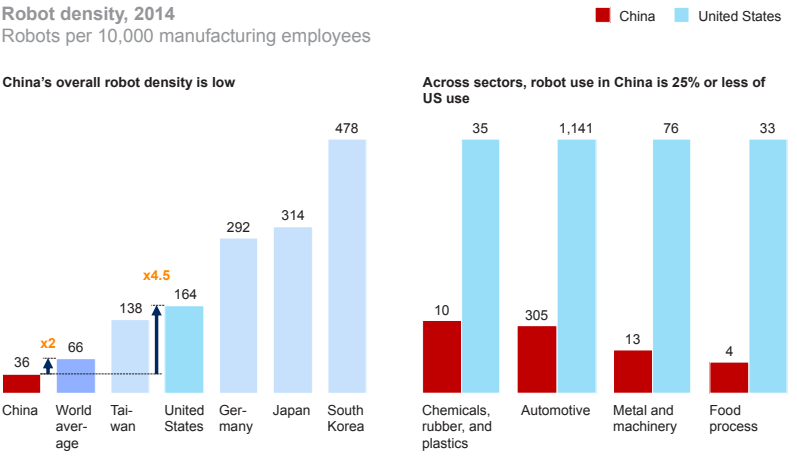
Examples of the Internet application

- **Connected devices** : Allow consumers to control home devices remotely, better manage utility and enhance home security
- **Supply chain logistics :** Use real time supply chain data to optimize inventory and transportation routes
- **Risk management**: Leverage big data capabilities to substantially reduce nonperforming loans
- **High tech farming**: Observe, measure and respond to "hyper-local" conditions (e.g., crop yield, terrain features, moisture levels)
- **Remote monitoring:** Collect clinical data from patients and transmits the information to healthcare providers for clinical review and patient education
- **Online sourcing:** Enable developers/contractors to purchase construction materials, equipment and interior decoration online

1 Does not include the effects of capital reallocation throughout the economy.
2 Refers to reduced health-care expenditures.
SOURCE: McKinsey Global Institute analysis

China has a significant opportunity to increase automation across manufacturing sectors

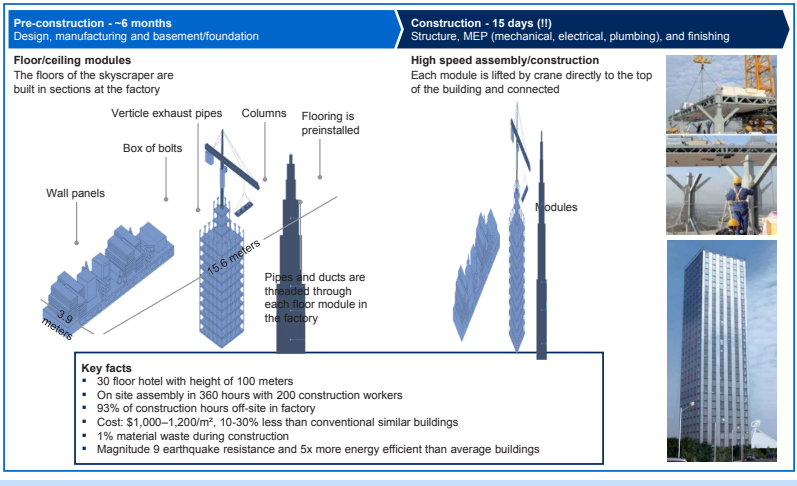
Robot density, 2014
Robots per 10,000 manufacturing employees



NOTE: Not to scale.

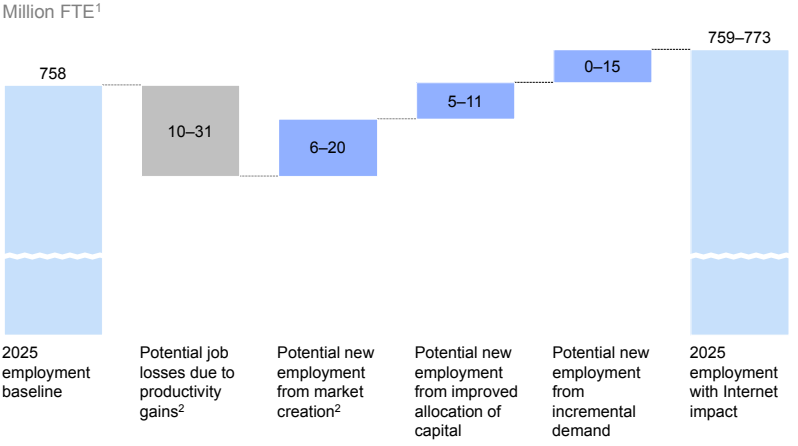
SOURCE: International Federation of Robotics, World Robotics 2015; McKinsey Global Institute analysis

Broad Group's industrial approach to erect a 30 story hotel in 15 days



SOURCE: Broad Group; expert interviews; McKinsey Global Institute analysis, Resource revolution

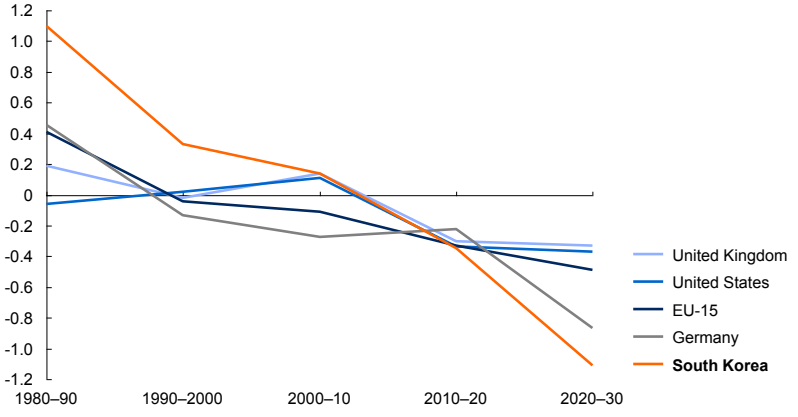
Job losses caused by productivity gains could be more than offset by the creation of up to an estimated 46 million new jobs



1 Full-time equivalent. These estimates do not take into account the flexible and diverse working modes enabled by the Internet.
2 Extrapolated from detailed analysis of the employment changes likely to be caused by new Internet innovations in six representative sectors.
SOURCE: McKinsey Global Institute analysis

South Korea is already feeling the largest effects from slowing flow of prime working-age population into the labor force

Growth in contribution of working-age population to GDP per capita
%



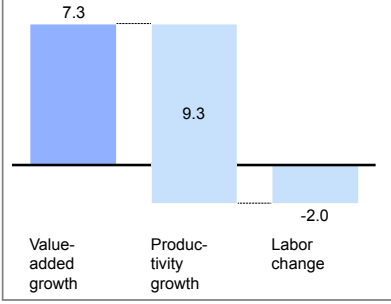
SOURCE: United Nations Population Division; McKinsey Global Institute analysis

Large Korean manufacturing companies have grown rapidly, but productivity gains and overseas expansion have made it "jobless growth" at home

Large manufacturing companies have raised productivity and cut domestic employment …

Compound annual growth rate, large manufacturing companies in Korea, 1995–2010[1]

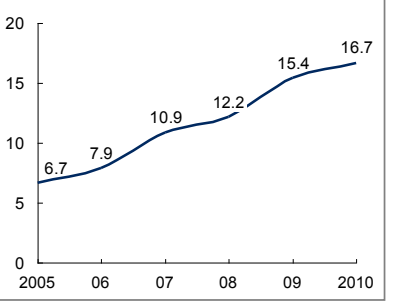
%



… while growing overseas operations rapidly

Share of overseas production, 2005–10[2]

%



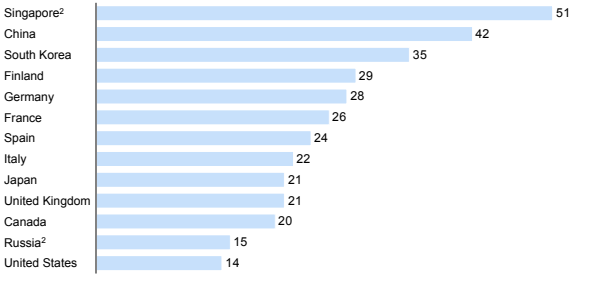
1 Manufacturing companies with more than 300 employees from Mining and Manufacturing Business Survey.
2 Share of total revenue from overseas operations, 2010.

SOURCE: Statistics Korea; Export-Import Bank of Korea; McKinsey Global Institute analysis

Korea starts from a good position relative to peers in its education levels

Share of STEM[1] in total college degrees awarded

2008, Percentage

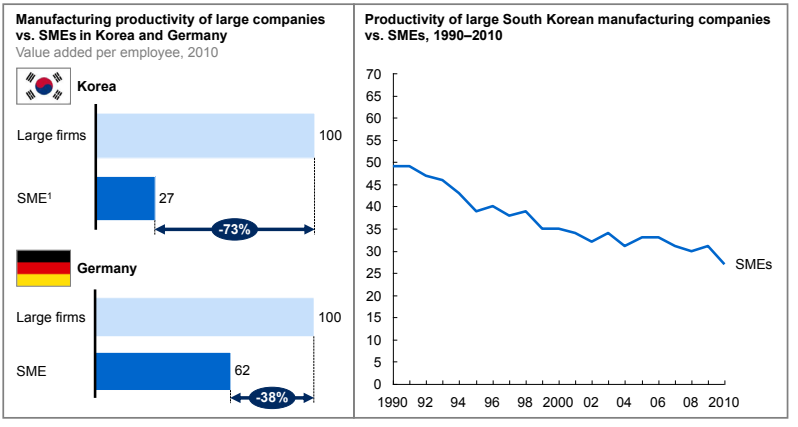


1 Fields of Physical/biological Sciences, Mathematics, Computer Sciences, and Engineering
2 Data for 2007

SOURCE: National Science Board USA, Science and Engineering Indicators, 2012

The productivity of manufacturing SMEs is less than 30 percent of the productivity of large manufacturing companies—and falling

Index: 100 = Large firms



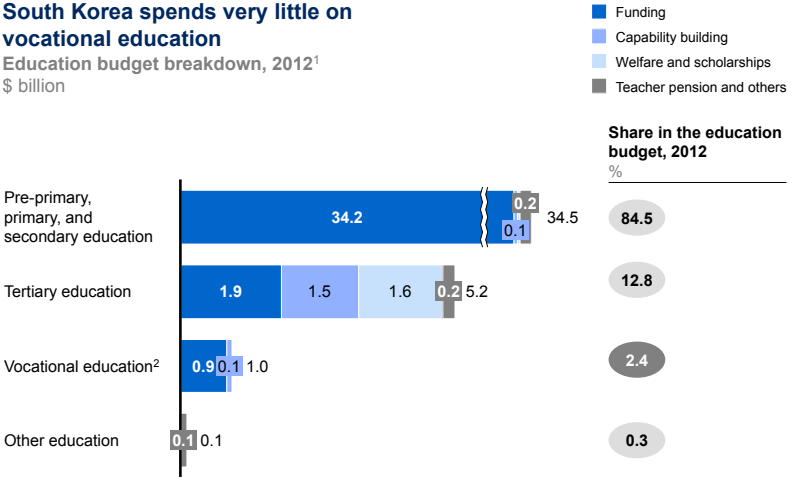
1 South Korean SME is defined as a company with fewer than 300 employees; a German SME has fewer than 250 employees.

SOURCE: Korea Federation of SMEs; Federal Statistical Office of Germany; McKinsey Global Institute analysis

South Korea spends very little on vocational education

Education budget breakdown, 2012[1]

$ billion



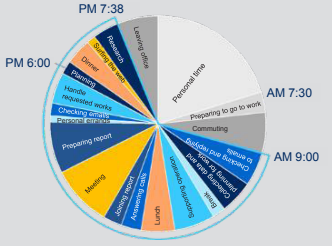
1 Total expenditure excludes internal transactions.
2 Includes vocational high school scholarship and national Meister high school budget that have been transferred to the control of local government and the Small and Medium Business Administration.

SOURCE: Ministry of Education, Science and Technology; Small and Medium Business Administration (SMBA); McKinsey Global Institute analysis

There is an ample room for productivity improvement – 100 Korean company culture survey conducted in 2016

Typical day of the middle manager[1]

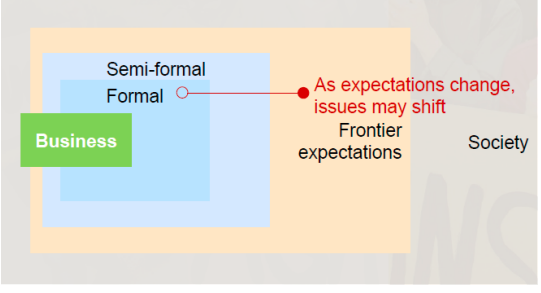
- Average working hours: 10 hr 58 min
- Productive working hours: 5hr 32 min(57%[2])



Frequent overtime	
Average number of days working overtime a week	2.3 days
Working overtime at least three days a week	43%
Inefficient meetings	
Unproductive meeting hours	39%
Excessive reporting	
Unproductive hours spent on reporting and report preparation	31%

1 Constructed based on the average data generated from Time survey results (average of 45 people)
2 Calculated as the percentage of productive working hours except meal breaks(1 hr 14 min) in average daily working hours (time from coming to leaving the office)
SOURCE: Aggregated scores – Korea OHI (n=37,168 no. of surveys=95), Time survey
Some companies did not participate in the survey on the uniqueness of Korean corporate culture, so respondents of those organizations are not included

The New New Deal?



Formal
- Regulation
- Tax policy
- Private contracts
- IPR

Semi-formal
- Standards
- Norms
- Promises

Frontier
- Attitudes
- Issues

Session 2

Drivers of the Fourth Industrial Revolution – Social Media, Big Data, Robotics, Artificial Intelligence

- **Moderator**

  Justin WOOD, Head of Asia Pacific, World Economic Forum

- **Presentations**

  John ZYSMAN, Co-Director, BRIE, University of California, Berkeley

  Kenji KUSHIDA, Research Associate, Stanford University

  Jin-Hyung KIM, President, AI Research Institute

  Gregory MULHOLLAND, CEO, Citrine Informatics

  Seong Jin PARK, Vice President, POSTECH

Presentation : John ZYSMAN

Berkeley Roundtable on the International Economy
University of California, Berkeley

The 4th Industrial Revolution: and the Future of the Korean Economy

John Zysman
Co-director, BRIE
Professor Emeritus, UC Berkeley

Zysman.john@gmail.com
www.brie.berkeley.edu

IGE/BRIE/McKinsey
Seoul, Korea
October 28, 2016

The 4th Industrial Revolution:

The journey from Chips to the Cloud..

From chips to the cloud

Korea has been a leader along that journey

With new technology “Drivers”
tools for thought and information evolve..

Korea must consider:

- **Strategies to maintain leadership**
- **Consequences for society**

Is the Digital Revolution restructuring economy and society?

Utopia or Dystopia?

THE PIONEERS: Creating a utopia

- *Noyce, Jobs, Sanders, Sporck (Gates in Seattle)*

THE SKEPTICS: Will it be a dystopia?

- *Vonnegut (Player Piano)*
- *Davidow-Mohr Davidow (HBR)*

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The Digital Revolution: THE NEW QUESTION

IS THE DIGITAL REVOLUTION OVER?

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The Digital Revolution: THE NEW QUESTION

IS THE DIGITAL REVOLUTION OVER?

- The core argument:
  - Drop in Productivity: Secular Stagnation
  - Dramatic change in life is past
- The IcT technology wave has burst
  - Limited scope in the economy
  - Limited power of the technology
- Robert Gordon forces the debate with *The Rise and Fall of American Growth*
  - The question is universal but posed in the American context

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The digital wave continues…..

- *The digital wave is just beginning*: sweeping from pure information services to
  - Services with everything
  - IoT (Internet of things)
  - Manufacturing Transformation – Industrie 4.0 and its cousins
  - Digital Platforms
  - Big Data
  - Computation Intensive automation
- Where we are in the Wave is, for now, speculation and argument.
- How will Korea effectively deploy the drivers will be crucial.

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The digital wave continues…..

Is Korea ready? Will it be a leader?

- The OECD Debate: Leaders and Followers
  - The top 10% and the rest
    - Dramatic gains vs. stagnation
  - Why? The cynical
    - Monopoly/oligopoly profit
    - Reconstituted value chains
  - Why? Diffusion and possibility
- How technology is deployed is the key to the impact of technology on productivity

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To address our questions -
Consider the current phases of the digital revolution:

1

Globalization and the Emergence of Networked Services

2

The Cloud

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10

Globalization, the Internet, and changes in competition

1

Globalization
&
The Commodity Trap

2

Services With Everything

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#1 The Commodity Trap:

Globalization

- Decomposition
- Recomposition

Competition at each Node

- Price competition

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#2 Services with Everything: Escape from the Commodity Trap

Constant very rapid product development:

- **BUT rapidly integrating hardware and software very difficult**

Products embedded in digital service networks

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Services with Everything: The IcT Enabled Services Transformation

- **Blurring of services and manufacturing**
  - Contract manufacturing
  - Contracted R and D
  - Contracted services.
- **Products become embedded in networked services**
  - iPod/iTunes
  - Cranes and Ports
  - Tires
  - Aircraft
  - IBM
- **The Digital revolution!**

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Now the Accelerator: abundant computing

The Era of Cloud: Child of Abundance

Era of the Cloud

Four Dimensions to consider today

- Cloud is the technical foundation of this era
- Platform: algorithms that run in the Cloud
- Data: The raw material of the digital era and the platform economy
- Computation Intensive Automation: The transformation of work

The Cloud

CLOUD FUNDAMENTALS

- Cloud is a question of *how* computing is done, not where
- Cloud computing is enabled by era of abundance
- Abundance facilitates virtualization and *abstraction*

BRIE Working Paper 2014-2, "Cloud Computing: From Scarcity to Abundance."
Kenji E. Kushida, Jonathan Murray, and John Zysman (2014)

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Era of the Platform and the Cloud

THE CONSEQUENCES OF CLOUD

- For the **User**
  - Availability of computing power
  - Speed of development of applications
  - Value moves up the chain from infrastructure to applications
- For the **Provider**
  - Scale matters
  - Winner take all characteristics
  - Facilitates giants

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The Present Era: The Cloud facilitates drivers

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*. The Rise of the Platform Economy

Platforms:
Digital algorithms that run in the Cloud

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What are (digital) platforms?

COMPUTER SCIENCE DEFINITIONS

- The key aspect is that platforms provide a set of shared techniques, technologies, and interfaces to a broad set of users who can build what they want on a stable substrate.
  - Platforms all the way down (Stu Feldman)

CONVENTIONAL ECONOMIC USAGES

- Multi-sided digital frameworks that shape, intermediate, the terms on which participants interact with one another
- Algorithm-enabled “cyberplaces” where constituents can act or transact
- Not just matchmaking or markets….
  but **social community**

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Platforms Diversity:

1. ***Services and Entertainment***:
   Uber
   Task Rabbit
   YouTube
2. ***Goods Markets***:
   Etsy
   Amazon
3. ***Labor Markets:***

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What do digital platforms do to work and labor?

HOW WILL LABOR MARKETS WORK

- How will work be organized in the market
  - Gig, putting out
  - Contract
  - Employment
- Job matching
  - The friction efficiency story
  - Uber, Upwork
- Rules for the market and for work

23

Platforms beyond the consumer space:

1

Manufacturing

- Customers and markets
- Suppliers
- Production and supply chain management

2

IoT
(Internet of Things)

- Service systems
- Network management

24

The consequences of (digital) platforms?

- **Efficiency: Do current things better**
  - Uber/AirBnB
  - Task Rabbit
- **Disruption: Changes what is possible, not just what is efficient**
  - The ability to do radically different things:
    - The Economy from horses to airplanes- more than efficient travel
    - YouTube/Google Search

25

Platforms (Consumer) Emerging in China and US

1

China: Groups and Cross Fertilization

2

US: Best of Breed

26

Platforms: The Corporate and Policy Challenges

Who sets the Game?

Corporate Combat: Who Sets the standards in Industry and IoT

Public vs. Private Governance: Who sets the *Rules*:

27

*. The Fuel

Data and Data Analytics

28

The Uses of Data

1

Markets

2

Products

29

Data Power: Where is the Advantage

1

Sources of Data

- Consumer
- Industrial

2

Analytic Tools

- Build
- Buy

30

Data Beyond Privacy

1

Who Owns the Data?

2

What Rules for Data?

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*. The Transformation of Work and Production

Computation Intensive Automation

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32

The Transformation of Work and Production

1. Artificial Intelligence
2. Machine Learning

BRIE

33

The Issues

1. For Corporations:
   Competitive Advantage
2. For Society:
   Work and Employment

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34

Computation Intensive Automation: The search for competitive advantage

1. Displace Work
2. Augment Skills
   Upgrade the workforce

35

What does Computation Intensive Automation do to jobs?

THE EVIDENT

- Automation touches much of work and employment

BUT CRITICAL QUESTIONS REMAIN

- How much is displaced?
- How much is created?
- How much is transformed

36

What do digital platforms and computation intensive automation do to jobs?

THE EVIDENT

- Automation touches much of work and employment

BUT CRITICAL QUESTIONS REMAIN

- How much is displaced?
- How much is created?
- How much is transformed

} ***We cannot know this now***

37

What balance will emerge?

WHAT INFLUENCES THE BALANCE OF-

- Displacement
- Creation
- Transformation

38

Two Considerations

1

The Algorithmic Dilemma

2

Workers: Asset or Cost

The algorithmic dilemma will affect that balance

THE ALGHORITHMIC DILEMMA & the 4th Services Revolution

- The Routine can be automated
- Most of automation can be copied
- The high road adaptation to the algorithmic revolution is innovation effectively using People

Responding to the algorithmic dilemma will affect that balance

THE ALGHORITHMIC DILEMMA & the 4th Services Revolution

- *The Question:*
  Does sustained innovation require human imagination and implementation?

- *The Answer?*

  The high road adaptation to the algorithmic revolution is effectively using People

BUT

BRIE

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#2 Workers, Asset or Cost?

DEPLOYMENT STRATEGIES AND WORK ORGANIZATION

What happens to workers?

- An asset to be promoted?
- Or a cost to be contained?

The Walmart Choice!

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The policy and strategy question – *replacing or redesigning work?*

BACK TO THE BALANCE

- Will robots / software simply replace workers?
- Will we redesign work to take advantage of human cognition and creativity?

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There will be national variations in deployment choices and variations in deployment outcomes

- How will Cyber be integrated into production
  - Consider Industrie 4.0
  - What standards will favor whom?
- What choices will Korea make?

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ICT Automation:

Corporate Strategy and Public Policy come together

1

Competitiveness
for the
Firm

2

Productivity and Employment
for
Society

45

The Drivers:
Choices for Korea

46

The Korean Opportunity: Competitive Advantage and Policy Strategy

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The Next Session:

What choices for Korea?

Where will Korea fit in the new digital order?

BRIE

48

Berkeley Roundtable on the International Economy
University of California, Berkeley

The Next Phase in the Digital Economy:
Platforms, Abundant Computing, Growth

• "The Rise of the Platform Economy" Martin Kenney and John Zysman in Issues in Science and Technology
http://issues.org/32-3/the-rise-of-the-platform-economy/

• "The Next Phase in the Digital Revolution: Platforms, Abundant Computing; Growth and Employment". BRIE Working Paper 2016-3. John Zysman and Martin Kenney (August 2016)

• "The algorithmic revolution---the fourth service transformation" John Zysman in Communications of the ACM - Services science CACM Homepage archive Volume 49 Issue 7, July 2006 Page 48

• *How Revolutionary Was the Digital Revolution: National Responses, Market Transitions, and Global Technology*, ed. With Abraham Newman Stanford University Press 2006

• *The Third Globalization: Can Wealthy Nations Stay Rich in the 21st Century,* Dan Breznitz and John Zysman Editors; Oxford University Press 2013

• Other BRIE research on the Digital Economy:
www.brie.berkeley.edu

49

Presentation : Kenji KUSHIDA

Drivers of the 4th Industrial Revolution

A Silicon Valley and University Vantage of the Algorithmic Revolution

Kenji E. Kushida, Ph.D
Berkeley Roundtable on the International Economy (BRIE),
Stanford Silicon Valley – New Japan Project
10/28/2016

The Core Questions

What are the fundamental underlying drivers of the 4th Industrial Revolution?

- Beyond the buzzwords such as IoT (Internet of Things), Fintech, Big Data, AI (Artificial Intelligence), Bitcoin/Blockchain

Where the drivers coming from?

(Why does Silicon Valley continually produce business disruptions?)

How to harness these innovations?

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Drivers of Innovation (Industrial Revolutions): Principles

- Shaped global technological trajectories
- Transformed/created major global industries
- Contributed to innovations in industrial production processes

- → Force everybody else to adjust… or ride the wave early

Stanford University

Examples:

Stanford University

Example: The Smartphone Revolution

- SV firms disrupted previously distinct industries
  - Mobile Phones (Nokia, SonyEricsson, Motorola)
  - PDAs (Palm, HP)
  - Digital Cameras (Canon, Nikon, Sony, Kodak, Olympus, Fuji Film)
  - Scanners (Canon, Epson, HP)
  - Video recorders (Sony Panasonic JVC)
  - Portable Gaming (Nintendo, Sony)
  - Point of Sale (POS) terminals (IBM, NEC, etc.)
  - Barcode readers, fingerprint readers, flashlights, household microscopes, metronomes, etc tec
- Samsung, (and LG) were able to ride the wave

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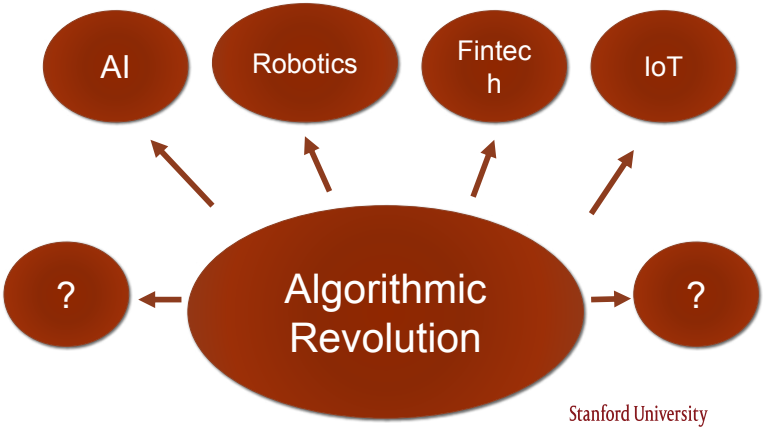
Fundamental Driver: Algorithmic Revolution



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The Algorithmic Revolution

- Basic driver behind recent business disruptions in wide range of industries
- Enabled by transformation of computing resources from scarce to abundant resource
- Allows increasing swath of human activity to be captured by algorithms
- Human activities can be split apart, transformed, recombined, magnified

Stanford University

Transformation of Activities with Algorithms

Human Activities Transformed by Algorithms

High Medium Low

Productivity Gains

Stanford University

Computing Power: From Scarcity to Abundance

Ability to store and process information = scarce resource throughout most of human history

Now → era of computing abundance

Whenever scarce resources become abundant → civilizational transformation

The advent of global-scale Cloud Computing (beyond the buzzwords)

- Cloud is not the Internet
  - Internet = decentralized network of networks
  - Cloud = global scale providers are centralized, large actors (Google, Microsoft, Amazon)
  - Capital Intensive: billion dollar scale datacenters around the world

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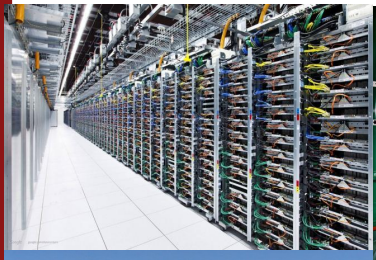
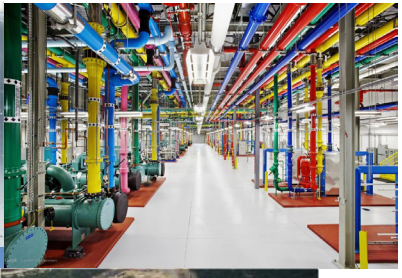
Computing Power: From Scarcity to Abundance

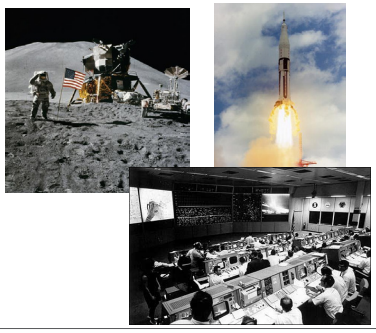



ersity

Evolution of computing power

Over 2nd half of 20th century = 1 trillion times processing power increase (simply measuring FLOPS)… 76 trillion over the 20th century when considering manual calculations

- 1969 Apollo mission to the moon (main mission guidance computer) = 1983 Nintendo Family Entertainment System



=

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Evolution of Computing power

1985: fastest computer in the world = Cray 2 supercomputer

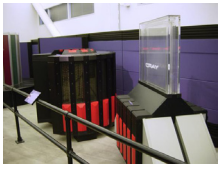
vs. Processing power of 2014 Apple iPhone 6

→ 1/6

Only a few Cray 2 computers in the world in 1985

vs

1.5 billion smartphones shipped in 2015



x 6 =

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Now in a World of AI

Shocking advances:

- Google's Deep Mind (purchased 2014 for $500 million+)
- Surprised the world by beating world champion at Go using AlphaGo. Surprised observers. Solved several critical problems – theoretical breakthroughs.
- Google Datacenters use approximately 0.01% of the world's electricity
- July 2016, DeepMind optimized Cooling of datacenters, achieving 40% increase in efficiency, cutting electricity consumption by 15%

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When Cutting Edge Becomes Commonplace

- Major impact is when resources available internally become commonplace
- What happens when DeepMind become a subscription based service that anybody can use?
  - What if the price is low monthly subscription fee?
  - This isn't far in the future
- My "DeepMind question"
  - What would you do if you could use Deep Mind?
  - Who in your company will adopt it? What can they do with it? What are the barriers internally?

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Silicon Valley Delivering Disruptions—Why?

Google

salesforce

TESLA MOTORS

PayPal

ebay

NETFLIX

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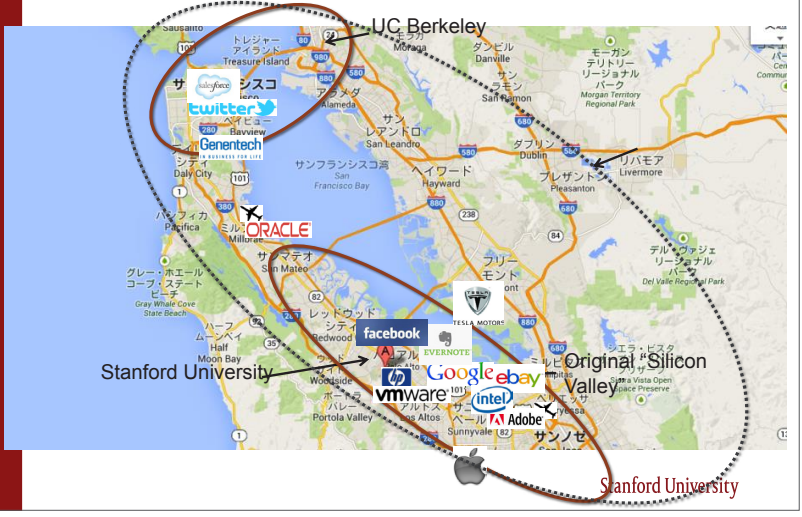
First, a little bit about Silicon Valley



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Why Silicon Valley?

VC Funding searching for the one or two firms that return entire performance of portfolio

- Intense pressure from limited partners (LPs) to post high returns from just one or two massively successful fast-growth firms
- Fastest growth from radical rises in productivity
- → automating human activity… it scales

Portfolio not a normally distributed curve, one or two firms return entire portfolio performance

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Characteristics of Silicon Valley

- Dual ecosystem of large firms and small startups
- Highly competitive industries, balancing between "open innovation" and secret protection
- High financial returns for successful entrepreneurs and startups' early employees
- Finance and governance of startups by venture capitals
- High level and diverse human resources for all stages of startups
- High labor mobility (at all levels)
- Top class universities (bidirectional circulation of people and ideas, not one way)
- Extensive government role in shaping technological trajectories and basic science (NIH, NSF etc)
- Business infrastructure (law firms, accounting firms, mentors, etc.)
- Acceptance of failures (=effective monitoring and evaluation)
- Legal platform

Source: Dasher et al. NIRA Report.

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Advantages of Startups

- Unencumbered by Innovator's Dilemma

  … but just as importantly…

- Free from legacy IT systems
- → can make use of logic of computing abundance

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Beyond the Buzzwords

- Big Data: 1000 Gigabytes = 1 Terabyte, 1000 Terabytes = 1 Petabyte, 1000 Petabytes = 1 Exabyte
  - Most "Big Data" is actually pretty small data with some analysis thrown in

- IoT (Internet of Things)
  - Imagination rather than cost as upper bound of what can be measured with cheap sensors and abundant processing power.
  - The Tesla Auto Pilot Paradigm

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Beyond the Buzzwords (2)

- "Sharing Economy" of Uber/Lyft, AirBnB, etc: Extremely computing resource intensive, only possibly recently. What's next?
- Fintech: startups using IT tools can measure things in new ways (risk for loans, insurance, etc), and move faster, with far smaller overhead. New levels of automation.
- Blockchain (and Bitcoin): distributed ledger… the "IP telephony question"

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Beyond the Buzzwords (3)

AI (Artificial Intelligence:

- Replacing or Augmenting human activity? (Automated vs hybrid?)
- The Uber buyout of Carnegie Mellon robotics/AI lab
- Intelligence vs Consciousness
- Nascent OpenX movement

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How to Harness?

- Not just try to duplicate, but harness.
- What parts are best for vertical integration and in-house, which are best to harness external resources (open innovation)
- Adjusting to a world in which AI, robotics is a commodity, but developed elsewhere. Resources are data. Where to collect what?
- Effective user of new tools to create high value – how to become effective users

Stanford University

Presentation : Jin-Hyung KIM

4th Industrial Revolution and Transition to Artificial Intelligence Era

2016.10.28

Prof. Jin Hyung Kim

President & CEO, Artificial Intelligence Research Institute
Professor Emeritus, KAIST Computer Science

AIRI 지능정보기술연구원

AI is already Here

2 [이미지 출처 : 구글 검색]

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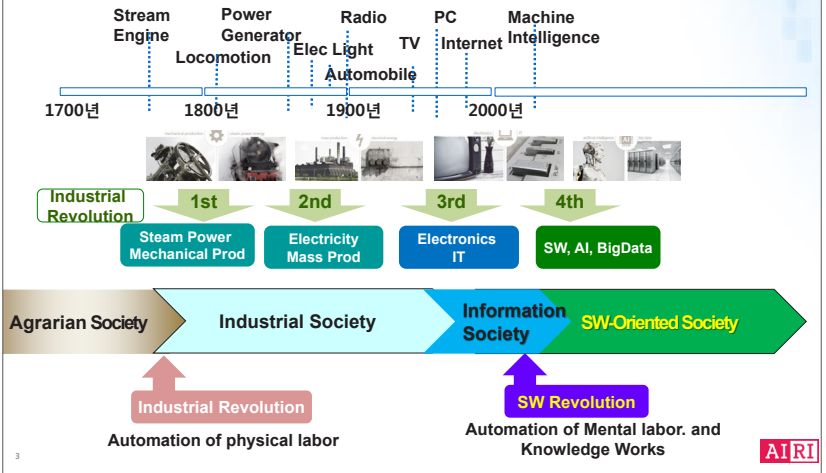
AI is the Key Driver of 4th Industrial Revolution



3

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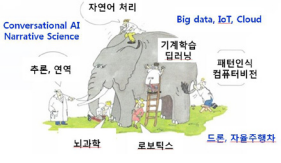
Artificial Intelligence

Definition

- branch of computer science doing automation of intelligent behavior (Luger & Stubblefield, 1993)
- a science and a set of computational technologies to sense, learn, reason, and take action* (ai_100, ARTIFICIAL INTELLIGENCE AND LIFE IN 2030
- Making Computer Smarter
- Making Computer Think
- …

Research Subjects

- 지각 (Perception)
- 인식 (Recognition)
- 이해 (Understanding)
- 추리 (Reasoning)
- 계획수립 (Planning)
- 의사결정 (Making decisions)
- 학습 (Learning)
- 적응 (adaptation)



4 ARTIFICIAL INTELLIGENCE AND LIFE IN 2030

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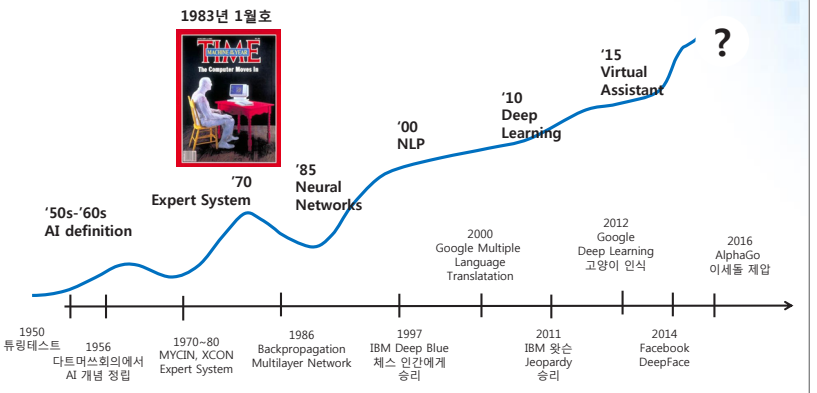
AI History of Ups and Downs



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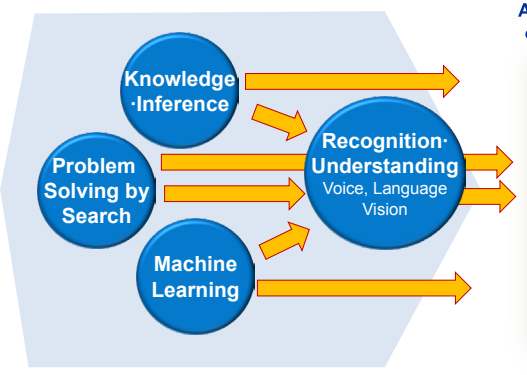
AI's Active Application Areas



Active AI Application areas over the next fifteen years

- Transportation
- Home/Service Robot
- Healthcare
- Education
- Low-resource Communities
- Public Safety & Security
- Employment & Workplace
- Entertainment

6 https://ai100.stanford.edu/

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All Apps will have AI Feature Soon

- Focus on Intelligent systems that can collaborate effectively with people
  - AI feature : Sense, Comprehend, Act intelligently
- "Today, only 1% of software apps with AI feature, but it will be 50% in 2018
  - IDC research referred by NY Times, 2016-03-26
- "AI is a spice to make food delicious"

All companies are now AI company

:

7

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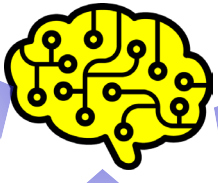
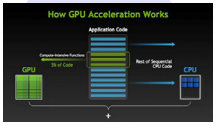
Factors of AI's Success



Algorithm
Open Source SW
개방·공유·협업의 성과

Computing Power
강력한 병렬 및 분산처리 능력



Big Data Power
인터넷, IOT, Sensor 기술을 통한
수집, 저장, 관리 능력

8

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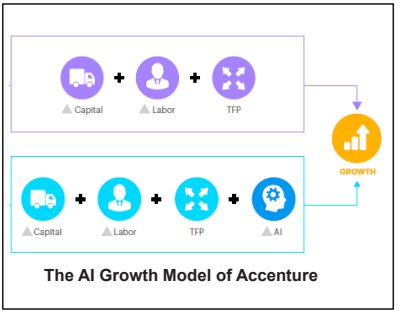
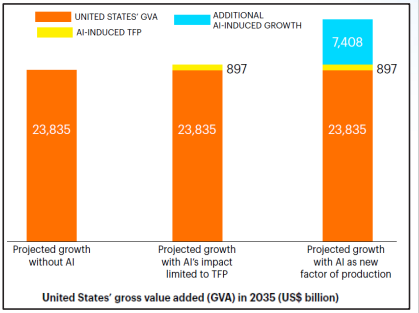
AI as a Factor of Production

- AI as a transformative set of technologies
- A new factor of production rather than just a productivity enhancer



The AI Growth Model of Accenture



United States' gross value added (GVA) in 2035 (US$ billion)

9 자료 : https://www.accenture.com/lv-en/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth.pdf

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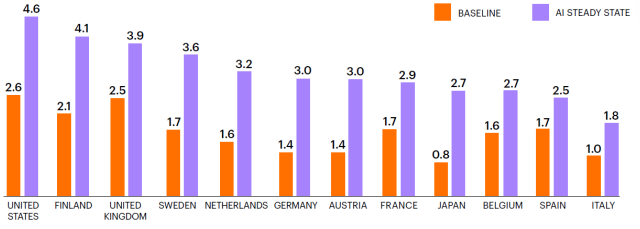
The Economic Impact of AI

- AI has the potential to double annual growth rates



Real gross value added (GVA) (%, growth)

10 자료 : https://www.accenture.com/lv-en/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth.pdf

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Three Channels of AI-led Growth

Intelligence Automation

Creation of Virtual Workforce

intelligent automation assets improve by self-learning of AI, whereas traditional one degrades over time

Labor and Capital Augmentation

Economic growth from existing labor & capital used more effectively, not from replacing them

Innovation Diffusion

Innovation begets innovation. Value from new goods, services and innovations.
AI is catalyst for Digital Transformation.

11 자료 : https://www.accenture.com/lv-en/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth.pdf

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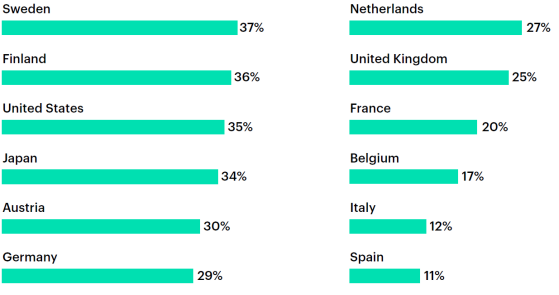
Labor Productivity Increased by AI

- **AI promises to boost productivity of labor in developed economies.**



Percentage difference between baseline in 2035 and AI steady state in 2035

12 자료 : https://www.accenture.com/lv-en/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth.pdf

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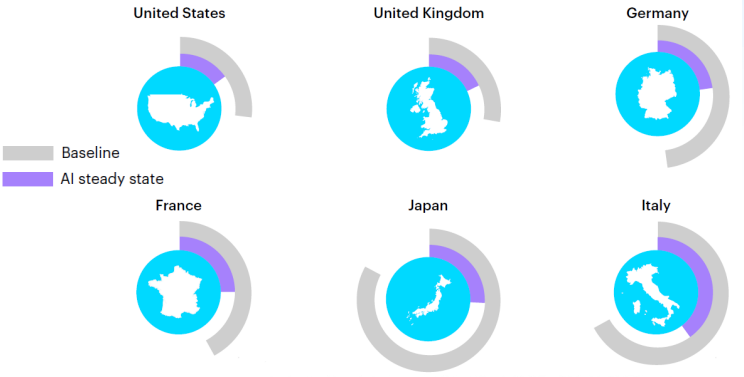
AI paves the way to Faster Growth



Time for Economies to DOUBLE IN SIZE
(a full circle represents 100 years)

13 자료 : https://www.accenture.com/lv-en/_acnmedia/PDF-33/Accenture-Why-AI-is-the-Future-of-Growth.pdf

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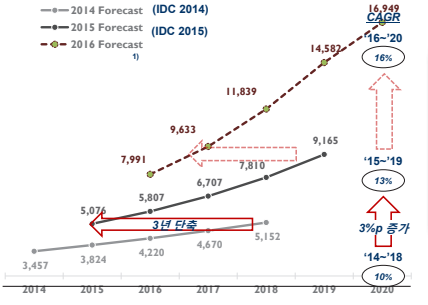
성큼 다가온 AI Market

글로벌 AI 시장 전망 결과 (SW 시장 기준)[1] (단위: $M)



"우리가 예상한 것보다 시장은 빨리 오고 있고, 더 빨리 움직여야 한다"

Accenture Digital Leadership Meeting (2016.1月)

Source : Expert Interview, Accenture Analysis, 1) 14년, 15년 IDC Data 상의 시장규모 증가율을 가설적으로 추정

SK 주식회사 C&C

KCC2016 Keynote Speech "AI & Data for Digital Transformation" by 이호수

14

Google Alert “Artificial Intelligence”

Emergence of new Disciplines : “Computational X“

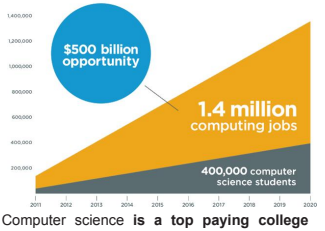
- Computational Biology
- Computational Chemistry
- Computational Physics
- Computational Mathematics
- Computational Geometry
- Computational Logic
- Computational Statistics
- Computational Engineering
- Computational Electronics
- Computational Mechanics
- Computational NeuroScience
- Computational Material Science
- Computational Toxicology
- Computational Cosmology
- Computational Cognitive Science
- Computational Sociology
- Computational Linguistics
- Computational Economics
- Computational Medicine
- Computational Journalism
- Computational Culture
- Computational Sustainability
- Computational Legal Studies
- Computational Intractability
- Computational Learning Systems
- Computational Metaphysics
- Computational Crystallography
- Computational Thinking
- Computational Creativity
- Computational Photography
- …

16

Many Descent SW Jobs

One Million More Jobs on Computing

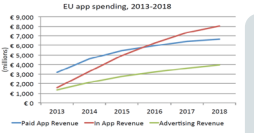
1,000,000 more jobs than students by 2020

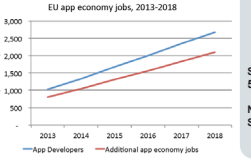


Computer science **is a top paying college degree** and Computer programming **jobs are growing at 2X the national average.**

90% of Jobs Need e-Skills in Europe

Study finds a total of 1.8M jobs in the EU app economy, with €17.5bn in revenues taken in by EU app companies in 2013

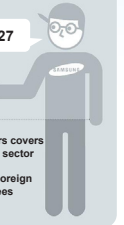




Samsung Electronics SW Engineers

In 2014

40,527



SW engineers covers 58% in R&D sector

Number of Foreign SW Employees
- 19,512

Best Jobs 2014

#1

Software Developer

★★★★★ (8.4 out of 10)

#2

Computer Systems Analyst

★★★★★ (8.2 out of 10)

[Source: http://eurapp.eu/sites/default/files/Sizing%20the%20EU%20App%20Economy.pdf, http://eurapp.eu/2014/02/13/study-finds-total-18-million-jobs-eu-app-economy-%E2%82%AC175-billion-revenues-taken-eu-app]

17

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Transition to AI era

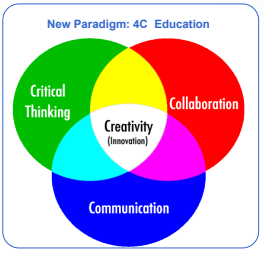
SW중심사회 실현 전략 보고회
2014.07.23

Preparing Next Generation for AI future

"65% of children entering grade school will ultimately work in jobs that don't exist today"

– New York Times, 2011.08.

- **47% of US employment under threat by computerization (Frey & Osborne, 2013)**
- **63% of Korea employment under threat (SPRi, 2015)**
- **Should Reform on What to Teach and How to Teach**



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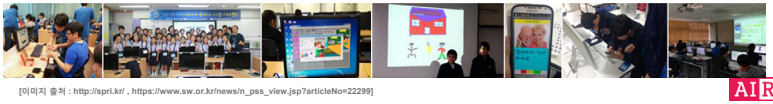
AIRI

SW in K-12 Education

- **Curriculum Changed in 2015, Implement in 2018**
- **Emphasis on Computational Thinking and Coding**

	Reform content	Educational Objectives and Contents
5th and 6th Grade	**As a Practice course, 17Hours** From ICT Application into SW as a basic Knowledge	• Algorithm by Playing Unplugged Game • programming experience with tools • Understanding Copyright
Middle School (7th ~ 9th)	**'Information' subject, 34Hours as a required course**	• Applying the Principles of Computer Science, learns how to solve real-life problems
High School (10th ~ 12th)	**'Information' subjects as elective**	



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[이미지 출처 : http://spri.kr/ , https://www.sw.or.kr/news/n_pss_view.jsp?articleNo=22299]

AIRI

Hackathone, StartUp Camp, Maker's Fair, …





AppCenter
Since 2009

AIRI

Korea's AI Technology Initiatives

1. Establish AI Research Institute
2. Catch up state-of-the-art AI technology
3. Foster AI talents
4. Build data infrastructure
5. Create ecosystem for AI startups

Source : Ministry of Science and Technology, ICT, and Future Planning

AIRI

AIRI Artificial Intelligence Research Institute

- A Research Service Company working on AI , Big Data, IOT, SW
- Founding members

NAVER	SAMSUNG	SK Telecom	LG전자	kt	한화생명	HYUNDAI
Internet	Electronics	Telco	Electronics	Telco	Insurance	Motors

  - Starting capital ~$20M
  - Investment open to the public giving favor to SMBs
- Government's commitment of research grant to AIRI

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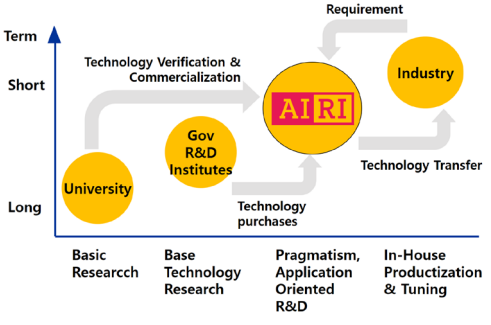
AIRI

AIRI Position in National R&D system



Development Strategy

- Outsourcing of existing technology regardless of location and ownership
- Producing output first and replacing components later if needed
- Leveraging open source software

Agility is the key Competence of AIRI

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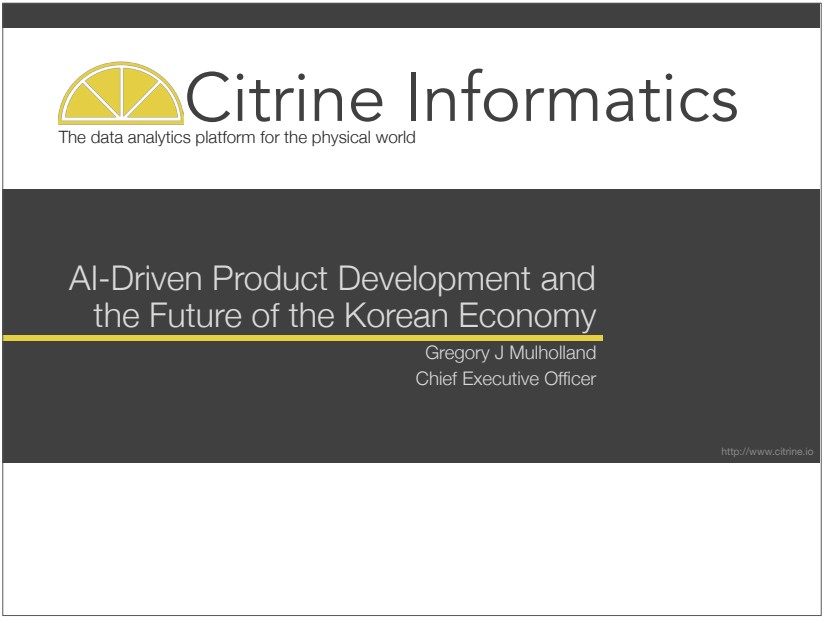
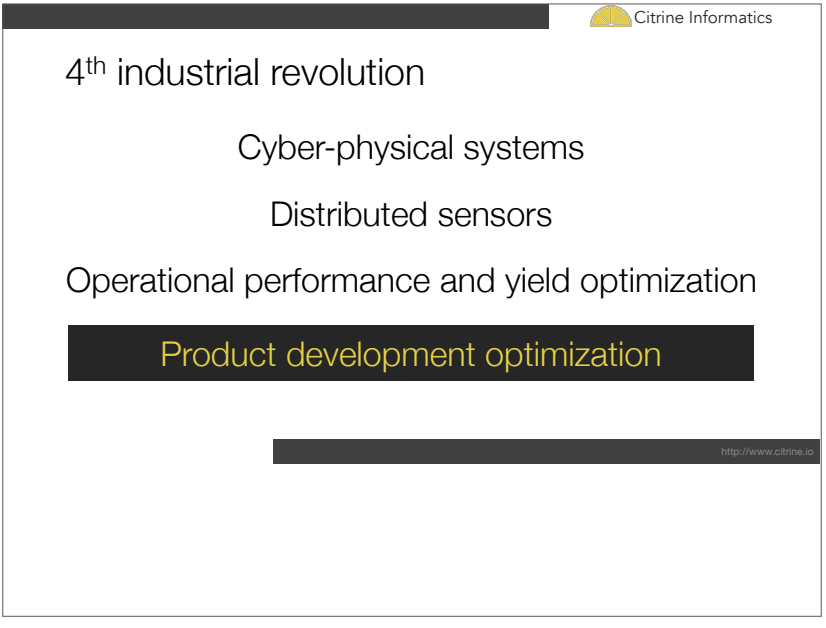
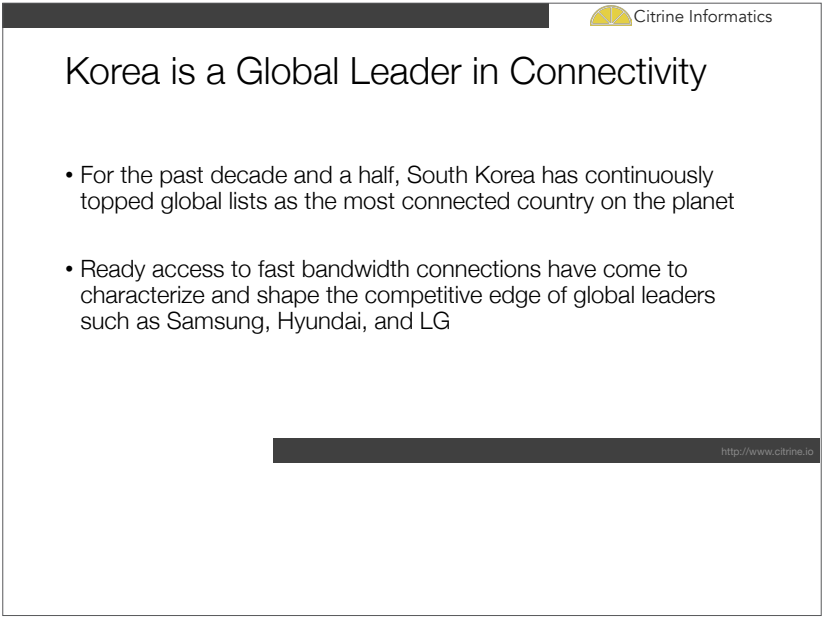
AIRI

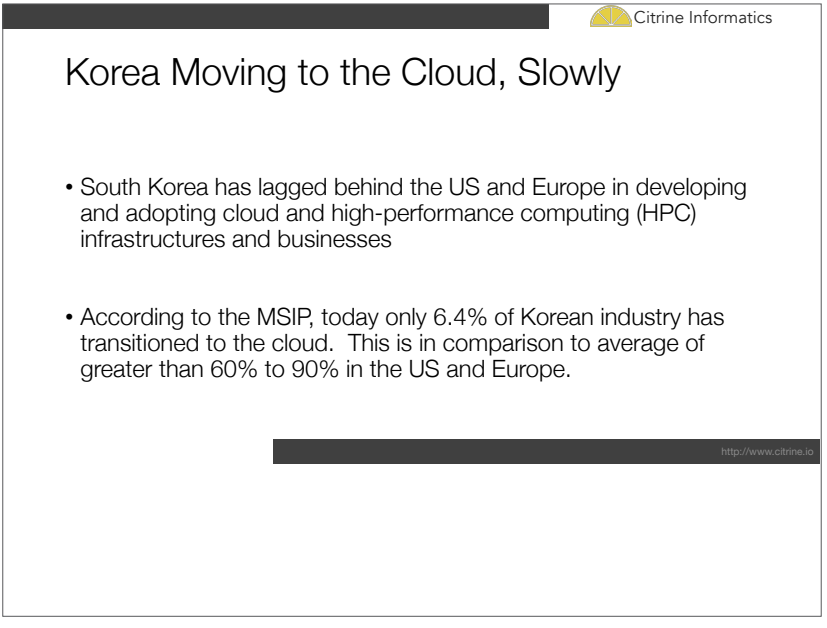

Is 4th Ind.Rev Opportunity for Korea ?
한반도의 지난 150년
~ 1850 ~
농업사회
1945 ~ 1953
해방, 건국, 한국전쟁
1910 ~ 1945
일제 강점기
~ 1960 ~
경공업
~ 1970 ~
중화학공업
~ 1980 ~
민주화
~ 2000 ~
하이텍산업
2010 ~
창조경제
25
[출처] 구글검색
AIRI

Presentation : Gregory MULHOLLAND






Citrine Informatics
Korea is a Global Leader in Connectivity
• For the past decade and a half, South Korea has continuously topped global lists as the most connected country on the planet
• Ready access to fast bandwidth connections have come to characterize and shape the competitive edge of global leaders such as Samsung, Hyundai, and LG
http://www.citrine.io


Citrine Informatics
Korea Moving to the Cloud, Slowly
• South Korea has lagged behind the US and Europe in developing and adopting cloud and high-performance computing (HPC) infrastructures and businesses
• According to the MSIP, today only 6.4% of Korean industry has transitioned to the cloud. This is in comparison to average of greater than 60% to 90% in the US and Europe.
http://www.citrine.io

Citrine Informatics

Readying for the Next IT Revolution

- Korea has the infrastructure, talent, and technical know-how to rapidly emerge as a AI/ML leader within the next 5 years
- In early 2016, MSIP committed ₩100m for investments in cloud computing, AI, and HPC and created a new cloud computing hub in Daegu
- MSIP anticipates creates a ₩1.1 trillion domestic market in the AI and cloud segment in the coming years

http://www.citrine.io

Citrine Informatics

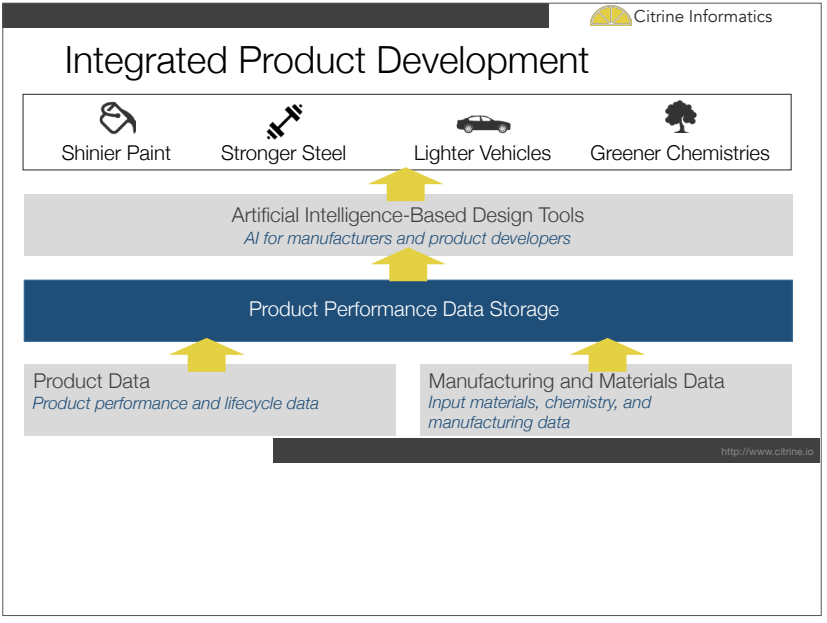
Vertical Integration: Incredible Opportunity

- **Data** drives the Fourth Industrial Revolution
- Manufacturing efficiencies can be gained within a single facility.
- Product understanding relies on data collected from across the supply and value chain.

US and Europe: data partnerships between vendors and customers

Korea: vertically integrated chaebol can share data and insights

http://www.citrine.io


Citrine Informatics
Integrated Product Development
Shinier Paint
Stronger Steel
Lighter Vehicles
Greener Chemistries
Artificial Intelligence-Based Design Tools
AI for manufacturers and product developers
Product Performance Data Storage
Product Data
Product performance and lifecycle data
Manufacturing and Materials Data
Input materials, chemistry, and manufacturing data
http://www.citrine.io


Citrine Informatics
The data analytics platform for the physical world
Thank You
Gregory J Mulholland
greg@citrine.io
http://www.citrine.io

Presentation : Seong-Jin PARK

Features of Fourth Industrial Revolution

1

Automation / Unmanned Technology

Reduction of Fixed Cost

4 INDUSTRIAL REVOLUTION

AI Substitution for Human Experts

Expansion of Blockchain Application Field

Reduction of Inventory Cost

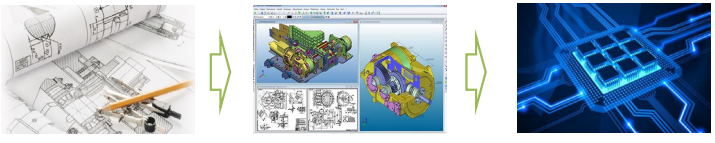
Novel education system that nurtures talents for the next generation is necessary

Education Paradigm Change (1/3)

2

Different Ways to Express Domain Knowledge

※ Example of Mechanical Engineering



- Hand Drafting -

- CAD / CAE -

- Machine / System Interface-

Mathematics

Big Data

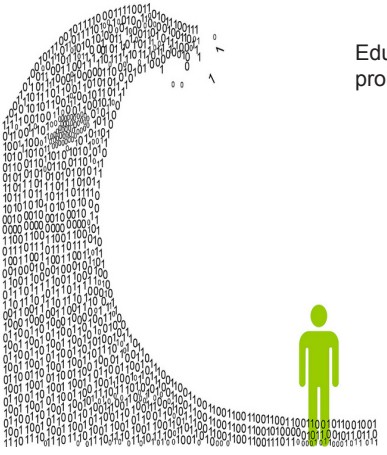
AI

1,000 Times Greater Utilization

Application

Education Paradigm Change (2/3)

The Generation of Too Much Information



Education that can train students to solve a problem by themselves is necessary

Impart Basic Knowledge

+

Problem Based Learning

Education Paradigm Change (3/3)

In education, Next Level-Cooperation is essential between university and corporation

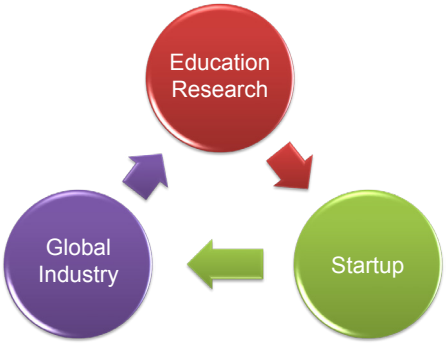
Well-ordered Education and Curriculum + **Practical modification, real world application and industrialization**

Education that meets the demands of industry
by fostering excellent students
who will strengthen a company's competitiveness

Conclusion

5

To create new knowledge industry, both corporation and university should establish Large Cluster of Education / Research / Industrialization



Conclusion

Major Policy Challenges and Implications for Korea

- **Moderator**

  Il SAKONG, Chairman, Institute for Global Economics

- **Presentations**

  Dominic BARTON, Global Managing Director, McKinsey & Company

  Dennis GOERLICH, Managing Director, Kiel Institute for the World Economy

  Sanghoon AHN, Director and Vice President, Industry and Service Economy, Korea Development Institute

  Gregory MULHOLLAND, CEO, Citrine Informatics

  John ZYSMAN, Co-Director, BRIE, University of California, Berkeley

  Jaeyoung LEE, Former WEF Staff/Former Lawmaker

- **Presentations**

  Sanghoon AHN, Director and Vice President, Industry and Service Economy, Korea Development Institute

Il SAKONG: This session is supposed to be a wrap-up and a concluding session. Throughout the morning up to now, so many useful things for policymakers, business decision makers, consumers, and individuals have been said. In this session, I would like our panels to focus on Korea; during their presentations they came up with varied suggestions for policymakers and corporate decision makers. I would like the speakers to re-emphasize and highlight what they want to recommend. All the panelists have been introduced, except two: Dr. AHN, who is a research fellow in charge of KDI's industry, services and economy and Mr. Jaeyoung LEE, a former National Assemblyman, one of the young aspiring political leaders. Lee used to work with Professor Klaus Schwab in the World Economic Forum before he returned to Seoul to become a politician. Now I would like to ask the panelists to make short initial remarks.

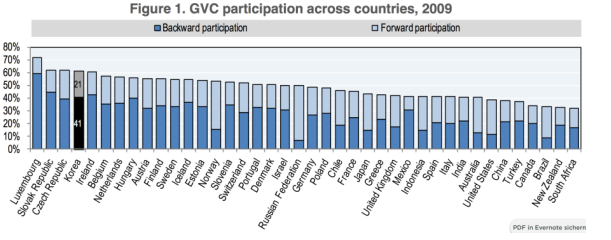
Dennis GOERLICH: I thought about a few specific challenges that all these technological transformations may bring to Korea. There are lots of speculations, of course. Due to all these transformations, we observe some kind of localization of production and "re-shoring" trends. Several production steps are being brought back to the countries where consumers are.

Now Korea is a country that, as far as I see it, relies very heavily on upstream producers from other Asian countries. This is a chart from an OECD study where you see the global value chains (GVCs) participation across countries. Korea is strongly participating in the global value chains. Only Luxembourg is participating more than Korea, which is natural because it is a tiny country. For Korea, the GVCs participation is extremely important. To a large extent, it is relying on backward participation. It is relying on upstream producers, most of which, to my knowledge, come from other Asian countries.

Keeping this in mind, when you consider that technological transformations might lead to a re-shoring of production, maybe back to

Europe and the US, you will see declining demand for labor-intensive production, particularly here in Asia. And the question is the risk for the Korean industry, in the sense that maybe the business model goes away. You can no longer rely on these producers. So, it will be critical for Korea to invest in these technologies as well as to make sure that they will not be left behind when other producers are taking production back home. So as I said, this is really a thought. It does not mean that it must happen.

Specific challenges for South Korea

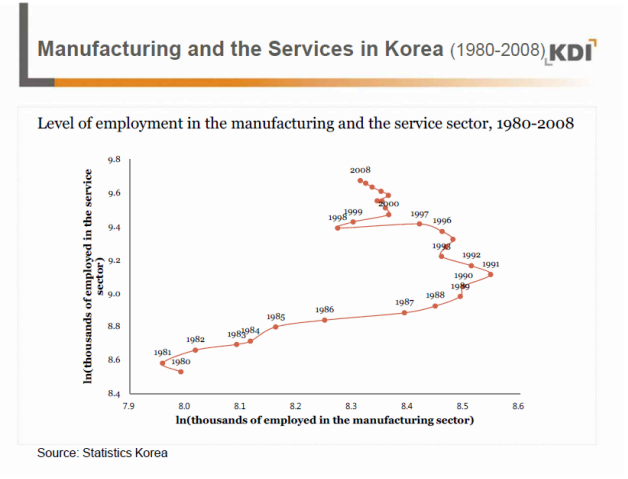


Another point I look at is these questions of chaebols versus micro, small and medium-sized enterprises (MSMEs). The important question is who really drives innovation. Because as we have learned this morning from Carl Frey's presentation, there are important local multiplier effects of innovation jobs. So it will be very important to be the innovator. The question is who it is. Is it big corporations like chaebols or MSMEs? How do you make them innovative? What we have also learned this morning is that maybe Korea is investing too much in SMEs and maybe keeping them alive for too long, even if they are not good companies. So here I think policymakers will be asked to find a good balance, to find out who the innovators are and help them in their business.

Finally, the next subject seems to be a big issue here. I was surprised to see how much Korea actually does in terms of education and how much thought is put into how to teach people creativity, social skills, and to deal with changes. Dominic Barton just mentioned that, too; he is working on that in Canada. I would be very curious to hear how this can be done and what the lessons are. This is essential because these are after all the tasks that cannot be automated, at least not in the near future. I think it would be a good idea not only for Korea but for every country to make sure that the workforces are prepared like that. These are, in my opinion, special challenges to Korea.

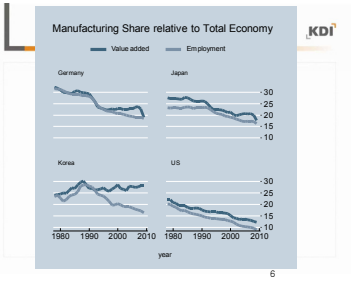
Sanghoon AHN: I would like to share with you some details because all the big pictures have been well presented throughout the sessions. It is on the evolution of industrial policy in Korea. Even though we are talking about an industrial revolution, Korea's responses to all these challenges can be understood as an evolution. Afterwards, I would like to point out some serious issues to be addressed.

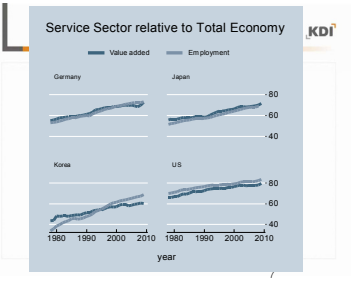
I would like to talk briefly about structural transformation in Korea. Then I will show you some details about the evolution of the industrial policy in Korea. Afterwards, I will present some policy challenges.



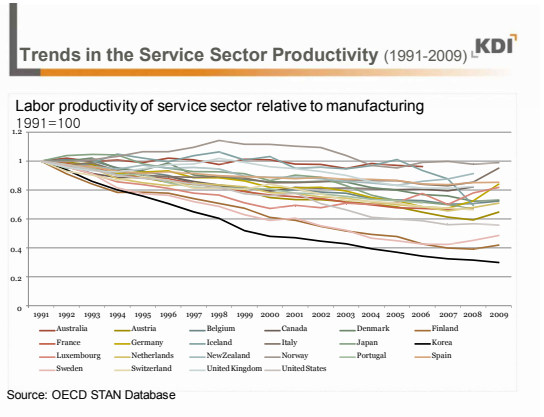
First, this figure below shows that until 1990 employment was increasing in both manufacturing and services. But since the 1990s, manufacturing employment started to shrink, while that in services continued to grow. More recently, since 2009, manufacturing employment has also temporarily been increasing. However, it will not last long because we are in the trend of shrinking manufacturing and growing services. The issue here is that while manufacturing is known to be productive and competitive worldwide, Korea's services sector has not been performing well. It will be nice if we are very good at manufacturing and could become a little better on services. In that case, how better could it be? The thing is if we cannot transform ourselves and make services productive enough, manufacturing itself will be in the crisis. Why? That is the main idea of the Fourth Industrial Revolution. The wall between manufacturing and services is disappearing.

Here, I show you the long-term trend of manufacturing declining in all the other advanced countries. In the case of Korea, manufacturing employment is shrinking, while manufacturing output or manufacturing value added is not shrinking yet. At the same time, we can see that in the US, Japan, and Germany, the service sector has been expanding. Korea is following their footprints. But the speed of service expansion in terms of output is far slower than that of expansion of services in employment, which means Korea's labor productivity in the service sector is stagnant or even declining.





OECD statistics show that labor productivity of services relative to that of manufacturing is declining very rapidly in Korea. The gap between manufacturing and services in terms of productivity is the biggest in Korea.



Source: OECD STAN Database

That is the background. One thing I want to show you is that in 1960, Korea was exporting iron ore, tungsten ore, raw silk, anthracite and cuttlefish. Now here in 2000, we were exporting semiconductors, computers, automobiles, petrochemical products and ships. We made a very rapid and radical structural transformation. Our policy response to this change was also changing a lot.

Now I will turn to the evolution of industrial policy. These days, industrial policy is not a popular word. I started my career at OECD. A report I wrote there has a term called “industrial policy” in the conclusion part and my boss advised me to erase it because it is not a good word. The reason why the industrial policy is not a good word these days is that in the 1940s and 50s, many developing countries tried industrial policy. Not only Korea but also many other countries wanted to have their own steel mill. Even though they wanted to have their own automobile factory, most of them failed. Korea made a success. Korea is kind of an exception. Since the 1970s, people started to realize that government intervention created problems than solving them.

But more recently, the focus of discussion has been shifted to what a smarter way of policy making would be in terms of promoting industrial transformation.

In this context, I believe industrial policy in Korea can be summarized in four terms. First, the industrial policy had a clear goal, promoting export. It provided a good monitoring and evaluation tool because we had one clear goal of maximizing export. If a firm hit the goal of exporting a certain amount, they would continue to receive support from the government. This performance indicator was a real-time indicator and the review was made annually. That is why in some other countries the government wanted to pick winners, but they were stuck with losers for many years. However, Korea could avoid that issue because there were good monitoring and evaluation. Furthermore, industrial policy in Korea had a rapid evolution. Whenever we detected a problem, we changed it rapidly. Finally, industrial policy in Korea was a successful public-private partnership. The government set the goal and it was the private sector who achieved that.

Korea's Development Strategies

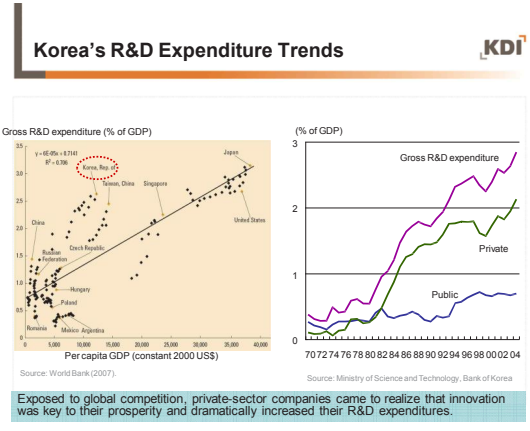
	Development goals	Major policy directions	Macroeconomic policy framework	Human resource development	Science and technology
1960s	•Build a production base for exports	•Expand light industries • Mobilize capital	•Prepare institutional bases for industrialization	•Decrease illiteracy	•Build legal basis & administrative frameworks
1970s	•Build a self-reliant growth base	• Promote HCI • Build SOC	• Picking winners • Market intervention	•Increase vocational training	•Set up S&T infra (Daeduck Science Town)
1980s	•Expand tech-intensive industries	•Industrial rationalization •Trade liberalization	•Macroeconomic stabilization •Private autonomy and competition	•Expand the higher education system	•Promote business R&D • NRDP
1990s	•Enhancing productivity through innovation	•Nurture venture business •Build ICT infrastructures	•Reform and restructuring •Regain growth potential	•Develop lifelong learning systems	•Frontier research and innovation clusters

Actually, in 1976, they set the six core industries to be promoted. In the 1970s, the government wanted to promote heavy and chemical in-

dustries. In the 1970s, all the industrial policy tools were hired. If you want to know what tools a government can use, look at Korea in the 1970s. Everything is there. But it also created huge problems, including high inflation and we had two oil shocks; so we were in crisis.

In the 1980s, we had to make a big change, a 180-degree turnaround from the previous approach. Actually, one of the leaders who made such big change was Chairman SaKong. We made a big change from a growth-oriented approach to stabilization and from government-led growth to private sector-led growth. In the 1980s, some advanced countries wanted to start privatization, deregulation, etc., such as the United Kingdom and the United States. Korea was at the frontier in that change.

As a result, for example, this trend in R&D expenditure shows that from 1980s Korea's R&D expenditure, a share of R&D in GDP, has been increasing fast; but it was not driven by public R&D but by private R&D.



What I want to say is that the Korean government played a very important role in economic development and whenever we started to solve problems, we were very quick at solving them.

I will mention policy challenges in Korea now. I hope that we will be able to solve them quickly. One example is the core industries, which are now semiconductors and telecommunication equipment, shipbuilding, steel and petrochemicals. In shipbuilding and steel industry, we are in a big problem because of global excess capacity on the back of heavy investment made in China. One example is the shipbuilding industry. In 1965, Japan became the number one country in shipbuilding. In 1999, Korea became the number one country in shipbuilding. From 2010, China is the number one country. We have severe competition in this industry. After 2000, Korea has been the leading country in shipbuilding, caught up by a rapid growth in China. Japan has been declining a little bit but they are coming back.

In this sector, the problem is that since the global financial crisis in 2007-08, global trade has been slowing down, while the total world fleet of ships continues to grow. When global trade slows down, seaborne trade also slows down. So we have a huge excess capacity in shipping and shipbuilding. That will create a big problem for Korea. Probably this month, the government will announce some plan how to deal with the shipbuilding industry. What you can see is the demand for shipbuilding is closely related to the real oil price. Now we see that the real oil price is around US$50 per barrel. We will have a tough future ahead. We can talk about yard closures and restructuring. That is a big issue for Korea now. One way out of this problem depends on how we can upgrade the core industries, taking advantage of the Fourth Industrial Revolution.

The final question is “Are we ready for that?” This is the figure already introduced to you in the morning session which is the ranking of readiness in the Fourth Industrial Revolution. No. 1 country is Switzerland followed by Singapore, the Netherlands, Finland, the US and the UK. It is from a white paper of the World Economic Forum. Korea ranked very low. Especially in labor flexibility, Korea ranked the 83rd in the world. This is a problem not only in new industries but also in dealing

with the excess capacity in core industries where we have the same issue. We should deal with this very urgently.

Are We Ready for the 4th Industrial Revolution? KDI

Adapted relative rankings from World Economic Forum Global Competitiveness Report, using Fourth Industrial Revolution categories[3].

	Labour structures flexible?	Skill level high?	Education allos adaptive skills?	Infrascructure suitable?	Legal protections?	Overall impact	Developed (DM), emerging market (EM) or frontier market (FM)?
Switzerland	1	4	1	4.0	6.75	3.4	DM
Singapore	2	1	9	3.5	9.00	4.9	DM
Netherlands	17	3	8	6.5	12.50	9.4	DM
Finland	26	2	2	19.0	1.25	10.1	DM
United States	4	6	4	14.0	23.00	10.2	DM
United Kingdom	5	18	12	6.0	10.00	10.2	DM
South Korea	83	23	19	20.0	62.25	41.5	EM

In terms of some infrastructure, like patents in the internet of things and big data, Korea is actually doing all right. We belong to the top 7 countries. In the global share of industrial robots, Korea also belongs to top countries.

In terms of hardware, we seem to be well prepared. But as was already mentioned by Gregory Mulholland, the penetration rate of cloud computing in Korea seems to be only slightly higher than 6%. That is a big issue. In terms of hardware, we are well prepared, but in terms of software and practices, we have some problems.

This is the final issue I want to mention. I know why cloud computing is not widely used in Korea. One reason is related to regulations. I am working for Korea Development Institute (KDI), which is a semi-public institution. At KDI, we are not allowed to get access to a cloud server from our offices. Even these days, I am not allowed to access to my Gmail. They are all related to the security reasons. Probably, government officials cannot use Gmail in their office. We need to change

our attitude and approach. We need to change our software. That is my final point. Thank you very much.

Il SAKONG: By the way, what made up our five largest export items in the early 1960s were iron ore, tungsten, raw silk, anthracite and squid. The total export volume was about US$40-50 million. We reached US$100 million mark in export in 1964. Since then, we started to celebrate our Export Day which later became the Trade Day. Actually, I played a role in changing the name when I was senior economic secretary to the President. We were a trading nation, not just an export nation. So we made it the Trading Day. It tells us and the world what the right policies and strategies can do to a country.

You know, economies cannot be put into a lab situation. But let's take an example of the two Koreas. As late as early 1960s, the per capita income of North Korea was twice as high as that of South Korea. Now Korea's per capita income is about US$30,000, and officially North Korea says theirs is US$1,200 but I think it is well below US$1,000. So it is really an exemplifying case of what the right policies and strategies can do. When I thought about organizing this conference, that was exactly what I thought. If you look out 20-30 years time from now, unless you do the right things now, you are going to be really sorry. That is why I wanted to get more public and policymakers' attention. That is why I gathered this good group and we have good media presence here. So I just hope that the Korean people as a whole, particularly politicians and legislators, pay attention to this.

Then I want to talk about the industrial policy. Actually, when people talk about it, it is a narrowly defined industrial policy. What I mean by a narrowly defined industrial policy is the "picking-the-winners" type of industrial policy, which is not generally accepted nowadays. If you do that, you will be subject to countervailing duties and antidumping charges and so forth. You are not allowed to do that under the WTO

regime. Another type of widely defined industrial policy Dr. Ahn mentioned is what I would call the functional industrial policy under which it is acceptable to assist R&D and so forth rather than giving direct subsidies.

Gregory MULHOLLAND: In my earlier comments, I have made several recommendations for Korea specifically but I would like to highlight three particular notes that I think are of high importance.

The first is the importance of changing the cultural landscape in Korea toward the use of cloud technologies. I think Dr. Ahn really hit the nail on the head when he made the point about the low cloud penetration. In my opinion, security is often used as a rationale for not embracing cloud adoption. There are real concerns around security whenever data is moved from one place to another. However, I believe that is oftentimes a false reason for not adopting cloud. Mr. Barton's comment on what John Holdren said is that there are companies who have been hacked and the companies who do not know that they have been hacked. I think it is also important that we highlight that there is another dichotomy you can draw, that is, there are companies that have expertise in security and there are companies that do not. I am afraid to say that most industrial companies do not have expertise in security. Therefore, I would venture to say that oftentimes data is safer in the cloud because you have your data managed by experts than having it managed by the person who happens to have security assigned to them at a certain industrial level. I think it is important that Korea embraced cloud. It is going to be a tough transition, particularly at the policy level but it is something that needs to happen.

The second point I would like to make is that data is what will fuel the next industrial revolution. I think there is a lot of discussion around collecting data. I think Mr. Barton made a really good point about the F1 cars and how they can generate 2 Gigabytes (GB) per lap. In many

factories we can see Gigabytes or Terabytes per minute come off of these majoring systems and only the best data stored in the best way and analyzed well is going to actually yield any real results. I think that is important to think about because unless you admit that and start treating data as a first class citizen of the industrial world, you are actually not going to harvest any of the benefits of this Fourth Industrial Revolution.

The third thing, I have heard it being mentioned several times in the context of education but I would like to broaden it, is the idea of incentivizing agility. I think Korea has a very interesting set of business models in the chaebol. There are some huge opportunities there because of the vertical integration that exists. However, the reality is the rigidity that exists within the system can also be a major source of liability. So what I would suggest is that incentivizing people to break those business models, even in small ways to start with, could yield great results. As a personal example, the reason my company Citrine got started was because I worked in the materials industry and was unsatisfied with how we were analyzing data. I was collecting Gigabytes a day and doing nothing with it. In Silicon Valley, which we have mentioned several times, we have the opportunity to break business models and try new things. And maybe we are not loaded if we fail but still given the opportunity to really branch out and embrace new technologies. I think that is going to be a critical step for Korea to take on to be able to break these older legacy business models and embrace these new models of industry.

I guess I just will leave you with the idea that in 10 years from now these tools and technologies that we are talking about today are going to be like spreadsheets are for the finance industry. When the spreadsheet first came out, I am sure they were seen as threatening. If you ask any of my business school classmates or any financier any of you know, they would say finance probably did not exist before spread-

sheets did. These tools are the things that are going to power the future and the way we analyze and handle our data today is going to pave that path, whether it is for Korea or the rest of the world. So the real question is not whether this is going to happen but whether Korea is going to be at the forefront or learn the hard way that these changes came and have to play the game of catch-up. Thank you very much for your time.

Jaeyoung LEE: From my own experience, I see several challenges. Number one is changes are very fast. As Mr. Barton said that he saw more business model changes or new business models over the past 24 months compared to his 28 years at McKinsey combined. And tenacity and velocity of this change are great. In spite of that, if you ask Korean government or I would say any government in the world, pushing through one piece of legislation takes about seven years. When I started in 2012, I put up my first legislation which got passed at the end. However, it passed in 2016. So it took me four years of hard work to push a one simple legislation. If you look at the decision-making process of Korean policymakers or lawmakers, what we are simply asking is something really difficult to happen. Then what can we do about it? I think maybe there are some creative ways to go around the current systemic problem that we have in politics to bring these changes about. However, the changes that we want from the political side or policymakers' side would not happen at the speed that you are asking for.

Second, it brings to the next question that especially in the democratic world we have to go through vote in the election every 2-3 years poses a basket of very simple yet difficult questions. For example, one question about the Fourth Industrial Revolution could be "Is this another satanic meal or a Holy Grail?" The problem is that we do not know. During the first session I saw Dr. Frey who put up the slide showing the revenue comparison of Detroit and Silicon Valley. The two cities have similar revenues but Silicon Valley took much fewer people to

create it. I presume that means there is much more wealth going to fewer people today than before. Now when I saw McKinsey's slide in that same session, it said about 20-30% of the jobs that exist today will disappear or change. They would be simply replaced by other jobs. So overall we are going to have the same amount of jobs. Yet we have to ask a question "What is going to happen to those people who are going to lose jobs?" or "Are they going to really transit into the new jobs that are being created?" A lot of people are saying "No".

But the real challenging question that I cannot answer is about high-skill people gaining lower pay. They are afraid of these new challenges that with their education and experience they will have absolutely no place in the world. We talked about the longevity of life because of the new technological change. Furthermore, they are retiring at 60 or even younger these days. What are they going to do about the next 30 years? They are highly educated and they are used to getting highly paid, but yet this new world will not allow them to have any job or have very low paying jobs. We know it is going to happen and we know it is happening. We have heard it many times, yet we are faced with these real everyday challenges of how to solve these problems.

Now I think it is policymakers' homework to think more critically. Throwing out all these very big questions, what can Korea do at this point? One of the things that I have heard this morning or this entire day is that we really need to pay attention to what future skills and future jobs are going to look like and how we are going to prepare future generations. I am thinking, with all these changes that are going to happen that they say is imminent and absolute, if my four-year old takes the same old test, it will mean that the Korean education system has completely failed to transform into a new education system to prepare this young generation or I have to completely fail as a parent to show this child a new way to learn. The education system that we have today in Korea will simply not be able to prepare our next generation to these new challenges that we will have. I think it is going to be

and I would like to believe this is a Holy Grail because it seems that no matter what, it is going to increase the pie as it did over the past three revolutions. As policymakers and politicians, we must think about how that wealth can be allocated at least reasonably among all population. For that reason, I think the private sector, who is driving these challenges or these changes, needs to jump in with its nimbleness, flexibility and creativity and make suggestions of how we can solve this sort of philosophical questions. Thank you.

John ZYSMAN: There are three themes that I want to emphasize. The first one of promotion is the issue of Korea pursuing its strategies of making sure that the infrastructure and the resources for advanced computing are widely available. One aspect of that is dealing with the security problems; so one does not have the fear of the security problem. This is very important when dealing with the security problem for real because this infrastructure of IoT is extremely vulnerable. Many of you may have noticed that last week in the United States there was a denial of service activity, basically through children's toys. It was done through marginal aspect; it was not core computing resources. It was all those refrigerators that suddenly started being asked talked to each other. So the security problem is real. I think Gregory's point is very important. Anyone at Google would insist, to a point that they are willing to make a bet on a personal fortune, that they could protect your data better than you can if you are an industrial company. Therefore, it is really a serious matter looking of what constitutes security and how to achieve it as a society. There is no simple answer but it is crucial.

A related issue in the promotion here is what the cost of access of the connection facilities is since in fact in the cell phone world the interconnect rules become crucial. They become quite crucial in this era of data. Dominant players can oftentimes want to set the rules in a way that their competitors do not have easy interconnect access; but that means their customers have higher prices. I am fairly sure that it is actually a debate going on right now in Korea. So let me just leave that

particular observation to say how that debate is resolved for the pricing of that resource is important.

The second thing I would turn to is this debate about regulation or re-regulation. I would say, “Let’s approach it with some care.” I would start with two observations. One is that a colleague of mine and friend of Kenji’s and mine wrote a rather brilliant book about the Japanese economy, which is called “Freer Markets, More Rules”. The question is “How do you end up with flexibility? How do you end up with functioning markets?” The issue is not just doing away with rules; the question is what the rules that you need for a particular moment in a particular economy are. So his book ultimately is about the re-regulation of the Japanese economy. I would suggest here we really need to think through what the re-regulations that we require for this particular era are.

That turns to the second observation of that, which is, a number of years ago in the US, a very good book was written, some of you may know by Larry Lessig, called “Code and Other Laws of Cyberspace”. He is a constitutional lawyer and taught at Harvard and Stanford. What he was really saying is that the code that gets written in a platform in an algorithm is binding. And you can pass any law you want. But if it does not pay attention to what the code is driving to be done, it is irrelevant. Therefore, the question really becomes not just whether we deregulate but “Do we deregulate in a way that means those algorithms that are private algorithms intrude in the areas that should be public discussion and debate?” Who writes the algorithms? Who reviews them? We often say that in the platform era of this rise of the platform economy there really is a debate on inherent tension between public and private governance and how we reconcile those two different sides. There is not the winner or loser; that is really a question of how we find reconciliation. I think that is more important. Those of you who work in Silicon Valley or have associations there have heard the mantra that comes out of Silicon Valley with new startups undermining business

models is “Do not ask permissions, ask forgiveness”. Well, that is OK if you are not making a blood testing device. So for a company like Theranos in the Silicon Valley that make blood testing device it does not work right. So the issue again becomes “We need it more flexible.” There is no debate about that. No argument! But the question of how we get there is we have to rethink these rules and significantly, in that sense, rewrite them. It is not enough just to say “We believe in privacy and the same rules apply in cyberspace” because unless we write the law in a way that deals with the code, it will not.

The third point and the last that I want to make comes to the issue of workers. We were talking earlier about the need to promote augmented intelligence and promote workers. There are really two aspects to this. On one hand, there does need to be labor market flexibility and I was very encouraged this morning to hear the discussion of flexicurity. For those of you who do not know, it is a notion that really comes out of the Danish policy world, in which the idea really is that unions consciously gave up certain claims to restrict labor market operations in exchange for real assurance that their workforces would be protected and taken care of. So that really is a part of that question “What is the social bargain that is going to be struck about this?” It is not whether you have welfare policy or not. It is “What is the social bargain about?” How those who in fact are benefitting and are driving this process work with those who are in the shipbuilding industry being left behind? How do we deal with this rather basic problem? Part of it is purely economic and part of it is cultural. People’s lives are changed and when that happens they have become quite distressed. Part of it is being an asset to be promoted. Then it comes to the questions that are being asked: “What does the education system need to look like? What kinds of skills do people need to have to be able to effectively apply these technologies?”

Another point that was made this morning that I thought was extremely important was that it is not just a mastery of the method or the

tools. Main knowledge matters. You know, Gregory's company [Citrine] depends on the fact that he actually is a material scientist. He actually knows something about materials. All of that ability to manage data would be of no relevance and no importance without that. So part of the question becomes "What demands can a country encourage?" The point that was being made is I grew up in an agricultural area and applying these kinds of knowledge to farming, agriculture is a perfect instance of how we can improve all that.

The last point I would simply make is, in some ways, there is the whole array of things a government has to do. They have to build roads. In our era they have to provide social security, some medical care. In most societies, that is not a debate but in fact the question is "Can that provision of those functions, which governments have democratically agreed or basic to what they need to do, be used to help and drive innovations in these areas by setting terms and standards, on which that provision is done, setting the character in terms of the kinds of technologies that might be deployed?" So those 4 areas: promoting access, the question of what we mean by regulation and deregulation, taking care of workforces, and letting the government be an agent of technological innovation it drives would be the four areas that I would emphasize.

Dominic BARTON: I agree with a lot of themes. I just want to focus on two.
First, on the notion of the right regulation I am with what you have said. I do not think it is about taking it away, but it is just about what the right system is you put in place to ensure it works. I think flexibility is going to be important. How we manage the data, not just the security aspect but availability? I think it is an asset class now. How do we think about that? Ensuring the infrastructure is in place for this to hope to be able to happen.

Second, on the public-private notion, I think there is a lot of what we

can learn from what Korea has done through the decades. I think the public sector has to change. This is one of the most difficult challenges in the world because it is very constrained. What I worry about the most is the ability to think in long terms because you are not going to get magic happening in the two-year timeframe. This is not the criticism, but it is just the reality. I think what I worry the most about is if these two systems do not keep up with each other, then we get a huge amount of this situation of the winners and losers and then it gets worse for the public. So it is a big conundrum.

And the thought that was going on my mind was what Bismarck did in one of the previous industrial revolutions. Bismarck is the one who invented kindergarten that did not exist. I think moving from an agrarian world to a more of an industrial world where people are going to be working in a factory, you are going to have to have people learning about new things on a regular basis. Kindergartens were set up. The interesting thing is when you look at the kindergarten today in most parts of the world and you compare it to the pictures of 1881, there is not a big difference. The desks are made of carbon fibers instead of wood. But I think we need to really think about that public sector model. Innovation has to occur in a very constrained situation.

My final point is back to education. I have never heard Shimon Peres talk about why we keep 14 year old boys and girls behind the desk for eight hours? It just makes no sense. But who is going to be willing to challenge the classic K-12 (From kindergarten and twelve years at school from elementary to high school)? Because I would argue that I do not think that is the best system to be able to develop the skills that we need as we go ahead. But we are rooted in that system, so I can tell you if governments are to change, I think probably the hardest group of people to change in a world is people in education. I deeply respect them but if you have ever tried to make change happened in the university, I guarantee you will see the scars on the person's back would be bigger than any business person's back I have you ever seen. It is

difficult, let alone when you start messing with K-12. Those are not giving any solutions. I just think those two areas we are going to have to get at in a serious way quickly because it is happening so fast. We do not have a generation to figure it out. I think it has to be done in the next five years, the big steps.

Il SAKONG: Thank you very much. Before I invite some questions and comments from the floor, I would like to add something again, in the sense to highlight again what we have been discussing today. I think one of the consensus views and one of the general views regarding this forthcoming industrial revolution or currently progressing industrial revolution is that job turnover rate will be much higher than we have ever experienced. High job turnover rate has very significant implications for the labor market and education.

Regarding education, we have been saying about life-long learning, training, retraining, pedagogy, curriculum, and so forth. But I sometimes think about "Why four years of university now?" Those four year universities were designed to serve the industrial age; and now it is time for life-long learning. From that perspective, this education system has to be overhauled, not only in the way of teaching but in the way of educating. Collaboration between industry and educational institutions for training and retraining is necessary because of this high job turnover.

Then that brings us to what you want to do about the social safe net. What are you going to do about those who do not have a job during the transition period? Again, we should do something about there, too. So this again reminds me of a dictum, a strongly advocated by one of the Nobel laureates who earned the Nobel Prize in 2011, Christopher Pissarides, who is teaching at the London School of Economics. I had an hour long discussion with him recently at his office in London. His dictum is "Protect workers, not jobs." It has very significant policy implications. As Mr. Ahn talked about the Korean shipbuilding industry and

steel industry, I think one of the problems there is that they try to protect jobs that should disappear. Of course, we need the social safety net to help them out during the transition period. But if you keep insisting on keeping the jobs that have to go, the company will be loss-making and the loss will pile up. There will be these serious consequences.

Without labor market flexibility how can you accommodate so many jobs that are disappearing and so many jobs [that are being] newly created? So to facilitate this, to win the competition in the Fourth Industrial Revolution era, the policies, the government policy particularly, should be ready to redesign the legal institutional infrastructure which is very important. I think we all agree that educational reform is the key and the labor market flexibility and labor mobility are very important. So here we see big challenges. But again who does the best will win.

Presentation : Sanghoon AHN

The 4th Industrial Revolution and the Future of the Korean Economy
Major Policy Challenges and Implications for Korea

Evolution of Industrial Policy in Korea: Challenges Ahead

Sanghoon Ahn
Director and Vice President In
dustry and Service Economy
Korea Development Institute

28 October, 2016

Korea's Leading Think Tank KDI

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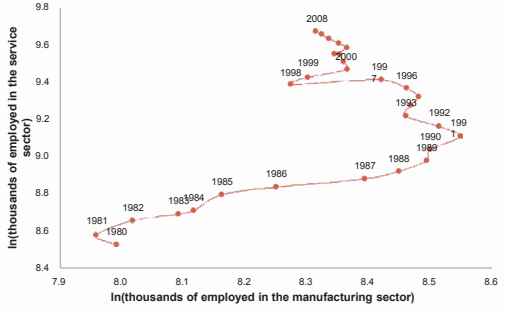
Korea's Leading Think Tank

Part-01 | **Structural Transformation in Korea**

KDI

Manufacturing and the Services in Korea (1980-2008) KDI

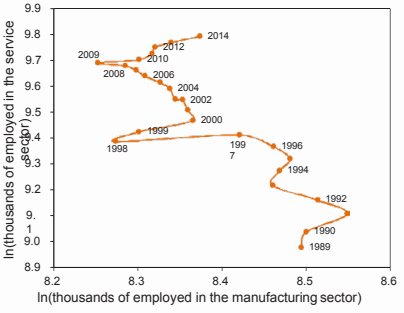
Level of employment in the manufacturing and the service sector, 1980-2008



Source: Statistics Korea

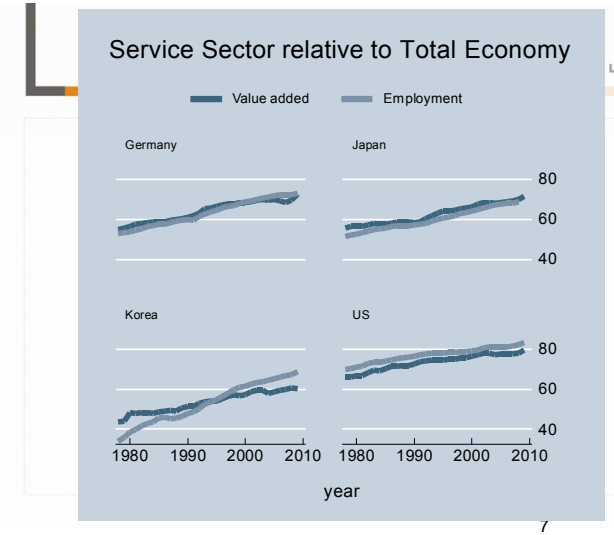
Manufacturing and the Services in Korea (1989-2014)

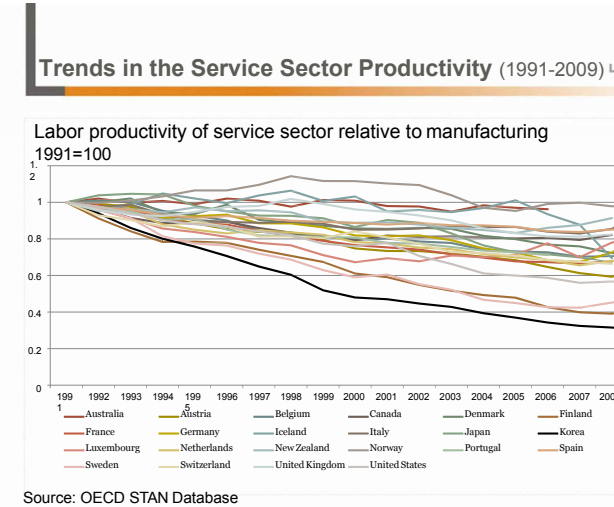
Level of employment in the manufacturing and the service sector, 1989-2014



Source: OECD

Manufacturing Share relative to Total Economy

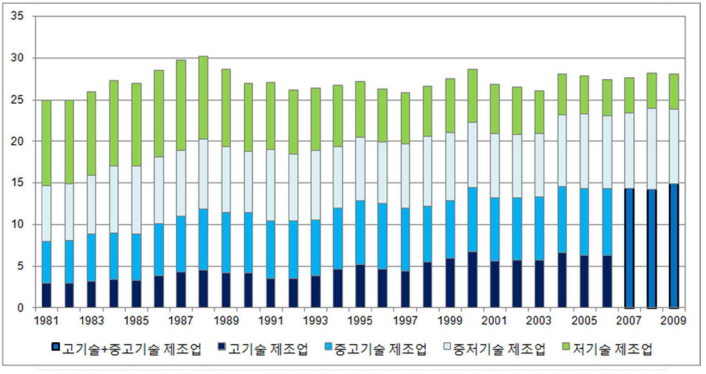




Source: OECD STAN Database

Value-Added Share of Manufacturing

KDI



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Employment Share of Manufacturing

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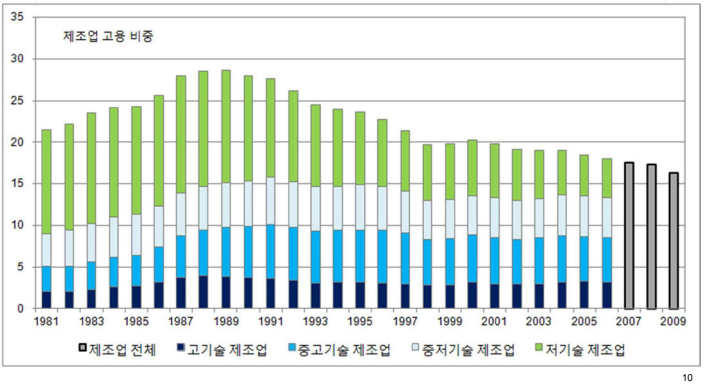

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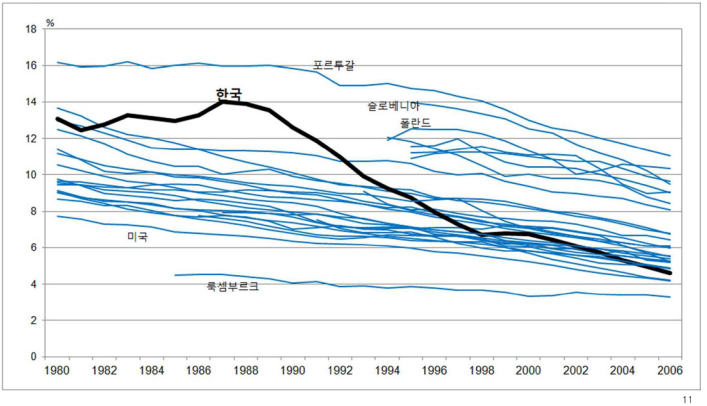
Low-tech manufacturing employment share has been declining most rapidly in Korea

KDI



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Korea's Top 10 Exports: Evidence on Industrial Upgrading

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	1960	1970	1980	1990	2000
1	Iron Ore	Textiles	Textiles	Electronics	Semiconductors
2	Tungsten Ore	Plywood	Electronics	Textiles	Computers
3	Raw Silk	Wigs	Iron and Steel Products	Footwear	Automobiles
4	Anthracite	Iron Ore	Footwear	Iron and Steel Products	Petrochemical Products
5	Cuttlefish	Electronics	Ships	Ships	Ships
6	Live Fish	Fruits and Vegetables	Synthetic Fibers	Automobiles	Wireless Telecommunication Equipment
7	Natural Graphite	Footwear	Metal Products	Chemicals	Iron and Steel Products
8	Plywood	Tobacco	Plywood	General Machines	Textile Products
9	Rice	Iron and Steel Products	Fish	Plastic Products	Textile Fabrics
10	Bristles	Metal Products	Electrical Goods	Containers	Electronics Home Appliances

Industrial Policy: Definition

KDI

∅ A broad definition of Industrial Policy:
"any type of intervention or government policy that att empts to improve the business environment or to alter the structure of economic activity toward sectors, tech nologies or tasks that are expected to offer better pros pects for economic growth or societal welfare than wo uld occur in the absence of such intervention" (Warwic k, 2013).

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Industrial Policy: Rationale and Practices

KDI

Table 5.5. **Evolution of theory and practice in industrial policy**

Phase	Rationale and key approaches	Policy practices and instruments
1940s to late 1960s	Industrialisation is necessary for development. Market failures prevent this from happening automatically. Market failures are pervasive in developing countries.	Industrial policy is needed, particularly infant industry protection, state ownership and state co-ordination.
1970s to 1990s	Government failure is worse than market failure. Industrial policy is an invitation to waste and rent-seeking. Practical obstacles to industrial policy are significant.	Trade liberalisation (export), privatisation and attraction of foreign direct investment (FDI) together with macroeconomic stability and minimum government interference are the basic requirement for growth and industrialisation. Ubiquity of structural adjustment programmes.
2000s to present	Market and government failures are present. The "how" rather than the "why" of industrial policy is important. Differences exist with respect to the extent to which comparative advantage needs to be defined, not the principle.	Institutional setting matters but design is difficult. Flexibility in the practice of industrial policy is important. Innovation and technological upgrading should be a central objective of industrial policy. Promoting national innovation systems should also be an important objective.

OECD STI Outlook 2014

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Industrial Policy in Korea

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- Ø IP for Export Promotion
- Ø IP in a Rapid Evolution
- Ø IP with Effective Monitoring and Evaluation
- Ø IP as a Public-Private Partnership

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Korea's industrial policy involve top down / economy wide directives for technological upgrading and achievement of international scale

Industry	1st 5 Year Plan 1962-66	2nd 5 Year Plan 1967-71	3rd 5 Year Plan 1972-76	4th 5 Year Plan 1977-81	5th 5 Year Plan 1982-86
Basic Policy Direction	•Onset of industrialization •Export-first principle •Development of import substitution industries	•Strengthening of the international competitiveness of light industry •Domestic production of industrial raw materials •introduction and absorption of technologies (KIST)	•$10bn exports **•Proclamation of HCI (development six leading industries)** **•Proclamation of domestic development of technologies, education of technological manpower**	**•Expansion of research facilities** **•industrial rationalization (energy saving)**	**•International class** **•Precision** **•Plant export**
Light	Import substitution	Establishment of export oriented infrastructure	Export maximization	Saving energy	Intl. scale
Chemical	Cement /Fertilizer/ Oil refinery	Petrochem. Complex	Methanol Plant		Fine chemical industry
Metal		Iron & steel mukk			Intl. scale (20-60mn tons)
Shipbuilding	Wooden vessels		Hyundai shipyard		Intl. scale
Machine	Small car assembly	Bus, truck assembly	Parts development / automobile mfg. plant	Mass production (300K) / Exports ($150MN)	Precision machinery large scale machinery
Electronics	Radios, telephones	TV	Gumi complex	Mini computer, VTR	Semiconductors & Computers
Technology & Engineering	Civil & architect	Equipment sub contract / R&D by KIST	Scientists	Specialised research institute (Daeduk)	Plant engineering / Process development

Source: Planning Office, Heavy and Chemical Industry Promotion Council, Government of the Republic of Korea 1976

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1950s

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- Ø One of the poorest country in the world
- Ø Pursued import-substitution industrialization
  - § "Three white" industries etc.
  - § Limited by the small size of domestic market
- Ø Dependent on foreign aid
  - § 50% of government expenditure, 70% of import
  - § Domestic currency overvalued, import regulated
  - § Lack of foreign currency for investment

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1960s

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- Ø First 5-year economic development plan (1962-)
  - § To end the vicious circle of poverty
- Ø Rapid export expansion started
  - § Three devaluations triggered export expansion
- Ø Export drive by strong export promotion policy
  - §Export targets (1962), monthly export promotion meetings (1964), Korea Trade Promotion Agency (KOTRA, 1962)
  - § Comprehensive Export Promotion Program (1964)
  - § Subsidies, tax incentives, credit incentives, tariff rebates …
  - § All abolished by the 1980s (too costly; countervailing duties)

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1970s

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- Ø Government-led HCI promotion
  - § To promote the defense industry for self-defense
  - § To catch up Japan in HCIs
  - § To respond to increased protectionism in light industries
  - § To achieve import-substitution in capital goods
- Ø Top-down approach towards private firms
  - § Long-term policy loans at preferential rates with tax benefits
  - § Public investment in human capital and infrastructure
  - § Giving favors to large enterprise groups (“Chaebol”)
- Ø Temporary import-substitution measures to protect HCIs

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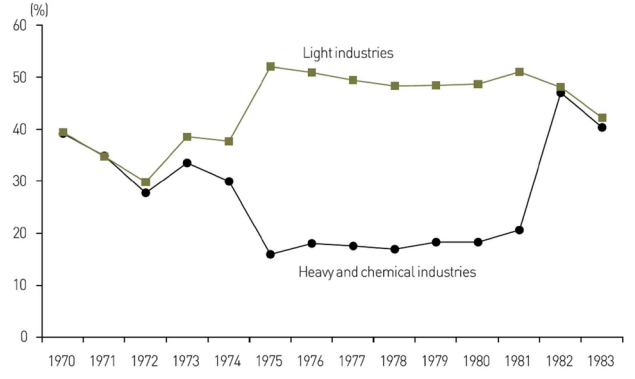
Marginal effective tax rates on corporate income



Source: Tae-won Kwack (1985), Recited from Jungho Yoo (1991).

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1980s

- Drastic change in policy directions
  - From growth to stability
  - From government-led to private-sector-led
- Macroeconomic stabilization
  - Comprehensive Economic Stabilization Program (1979)
- Industrial rationalization
- Financial liberalization
- Market opening

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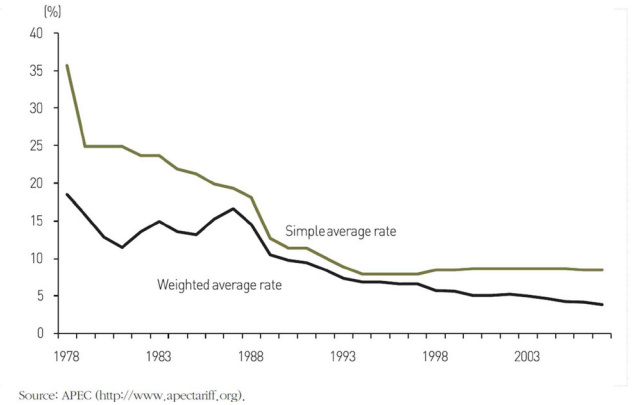
Korea's tariff rates (1978-2007)



Source: APEC (http://www.apectariff.org).

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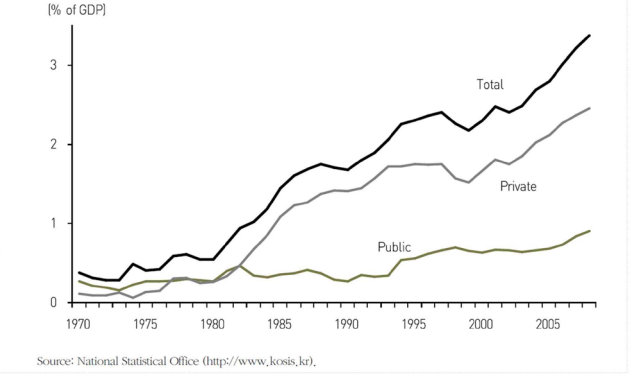
Trend in R&D expenditure



Source: National Statistical Office (http://www.kosis.kr).

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Korea's Development Strategies

	Development goals	Major policy directions	Macroeconomic policy framework	Human resource development	Science and technology
1960s	•Build a production base for exports	•Expand light industries • Mobilize capital	•Prepare institutional bases for industrialization	•Decrease illiteracy	•Build legal basis & administrative frameworks
1970s	•Build a self-reliant growth base	• Promote HCI • Build SOC	• Picking winners • Market intervention	•Increase vocational training	•Set up S&T infra (Daeduck Science Town)
1980s	•Expand tech-intensive industries	•Industrial rationalization •Trade liberalization	•Macroeconomic stabilization •Private autonomy and competition	•Expand the higher education system	•Promote business R&D • NRDP
1990s	•Enhancing productivity through innovation	•Nurture venture business •Build ICT infrastructures	•Reform and restructuring •Regain growth potential	•Develop lifelong learning systems	•Frontier research and innovation clusters

Korea's R&D Expenditure Trends

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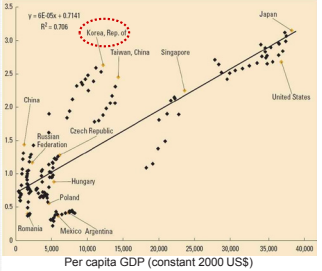
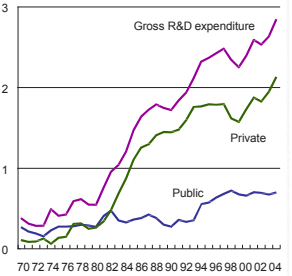
Gross R&D expenditure (% of GDP)



Source: World Bank (2007).

(% of GDP)



Source: Ministry of Science and Technology, Bank of Korea

Exposed to global competition, private-sector companies came to realize that innovation was key to their prosperity and dramatically increased their R&D expenditures.

Industrial R&D History

1960~70's	• KIST(1966) / Ministry of S&T(1967) • Technology Development Promotion Law(1972)
1980's	• Accreditation system of industrial R&D centers and National R&D programs (1981) • Industrial R&D support program launched - Tax credit on R&D(1981), Military service exemption(1981), Customs duties credit(1983)
1990's	• Industrial R&D restructuring : Asian Economic Crisis(1997) • Venture Promotion Act: Surge of Venture Companies' R&D centers
2000's	• Industry becoming the core of NIS(10,000 centers, 75% of national R&D) • Foreign R&D centers' increase

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Part-03 | **Challenges Ahead**

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Case Study: Shipbuilding Industry

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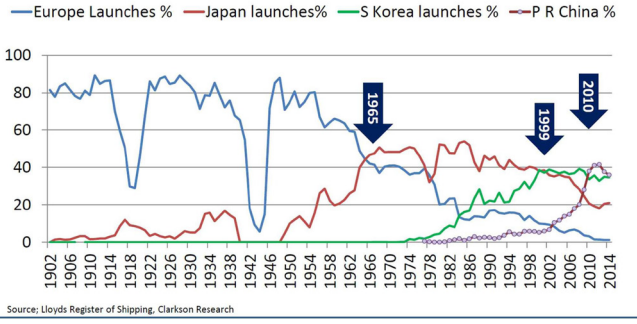
Chart 5: Regional shipbuilding market shares

In 2010 China overtook S Korea to become No.1 shipbuilder



Source; Lloyds Register of Shipping, Clarkson Research

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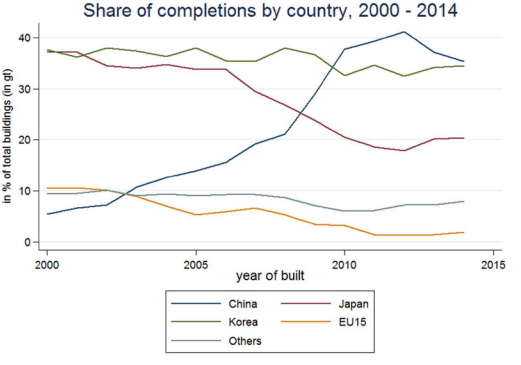
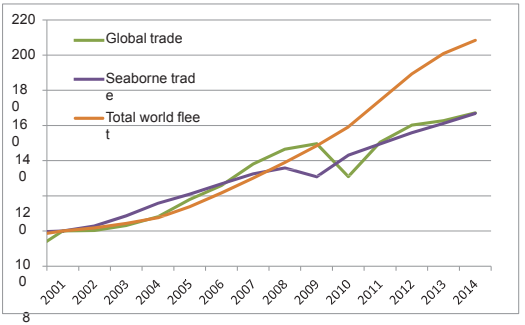
Share in global ship completions



Note: The EU15 comprised the following 15 countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom. Source: IHS SeaWeb; aggregation of output by country and year.

Slowdown in trade and increasing gap between fleet size and seaborne trade

Global trade, seaborne Trade and Fleet size
Index 100 in 2001



Sources: CPB for global trade, Clarkson Research (2015) for seaborne trade; derived from disposals and loss ratio of IHS (Former Lloyd's Register) "Casualty Return" until 1989. "World Casualty Statistics" from 1990.

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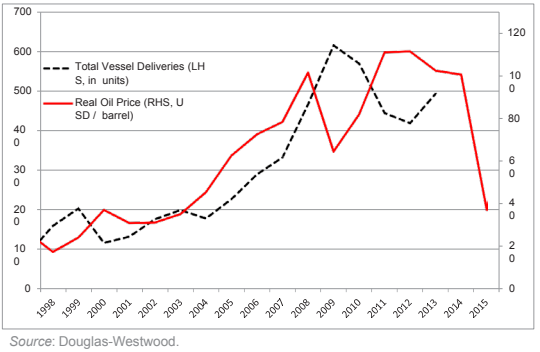
Weak oil price weighs on offshore vessel deliveries

Offshore vessel deliveries and oil price (in USD per barrel)



Source: Douglas-Westwood.

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Shipbuilding Cycles 1900-2015

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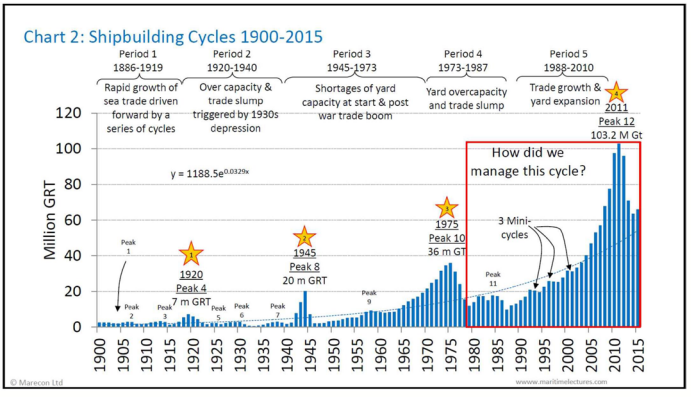
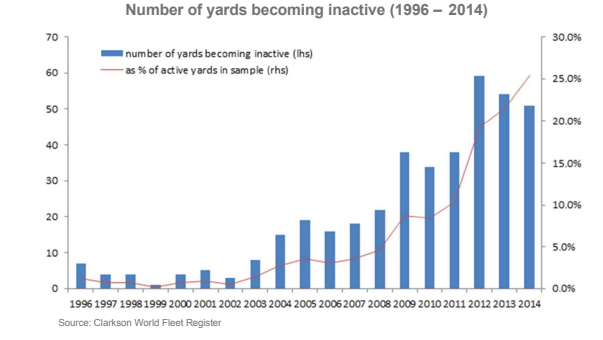


Development of yard closures in the global shipbuilding industry



Ø Upward trend in rate of exit since 2002 – and now over ¼ of the "stock" of yards becomes inactive in the course of the year.

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Steel vs. shipbuilding: different industry characteristics but common approaches to deal with excess capacity

5. How to deal with excess capacity?

	Steel	Shipbuilding
Substitutes	Material substitution very possible	Limited
Tradability	Very high	Specific sector in trade system
Input intensity	Capital (sunk) Energy	Labour
Delivery time	Short	Long
Possible reorientation areas	None	Offshore
Environmental clean-up costs	Very high	Limited
Heterogeneity of Products	Low	Very high
Demand drivers	50% construction 50% manufacturing	International trade

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Are We Ready for the 4th Industrial Revolution?

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Adapted relative rankings from World Economic Forum Global Competitiveness Report, using Fourth Industrial Revolution categories[3].

	Labour structures flexible?	Skill level high?	Education allos adaptive skills?	Infrascructure suitable?	Legal protections?	Overall impact	Developed (DM), emerging market (EM) or frontier market (FM)?
Switzerland	1	4	1	4.0	6.75	3.4	DM
Singapore	2	1	9	3.5	9.00	4.9	DM
Netherlands	17	3	8	6.5	12.50	9.4	DM
Finland	26	2	2	19.0	1.25	10.1	DM
United States	4	6	4	14.0	23.00	10.2	DM
United Kingdom	5	18	12	6.0	10.00	10.2	DM
South Korea	83	23	19	20.0	62.25	41.5	EM

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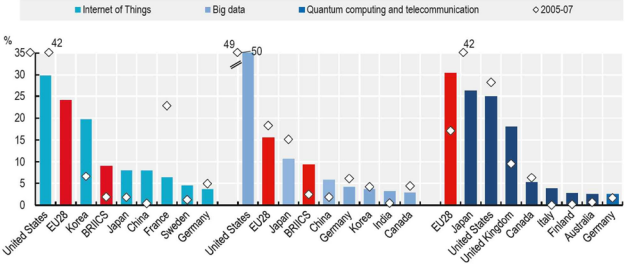
Figure 3. Leaders in IoT, big data and quantum computing technologies, 2005-07 and 2010-12

Share of IP5 patent families filed at USPTO and EPO, selected ICT technologies



Source: OECD Science, Technology and Industry Scoreboard 2015. OECD calculations based on IPO (2014), Eight Great Technologies: the Patent Landscapes and STI Micro-data Lab: Intellectual Property Database, June 2015.

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Figure 4. Global Sales of Industrial Robots, 1993-2013

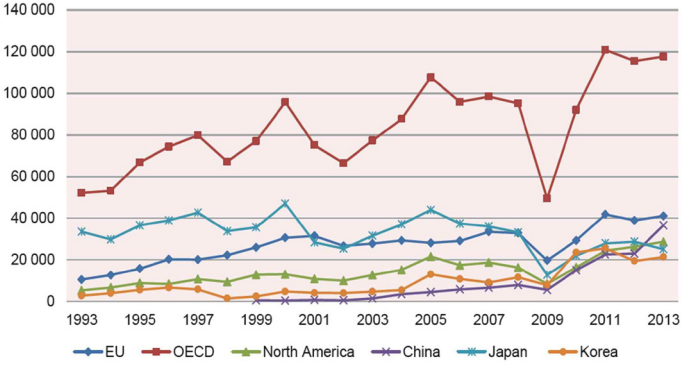

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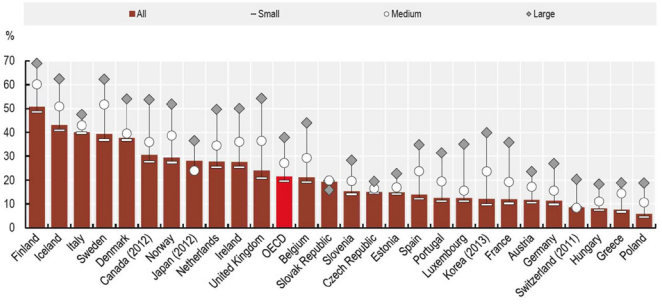
Figure 2. Enterprises using cloud computing services by employment size class, 2014

As a percentage of enterprises in each employment size class



Note: Data for Canada refer to the use of "software as a service", a subcategory of cloud computing services.

Thank you !

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01-02	Rebuilding the International Financial Architecture (EMEPG Seoul Report)	Emerging Markets Eminent Persons Group
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03-02	The New World Order and Korea [Ⅱ]	Institute for Global Economics
03-03	The New World Order and Korea [Ⅲ]	Institute for Global Economics
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93-03	Apr 9	The Economy and Financial Markets: Outlook and Issues	Allen Sinai
93-04	Jun 22	Economic Outlook for the Pacific and Implications for Korea	Lawrence Krauss
93-05	Nov 4	Challenges of a Nomadic World	Jacques Attali

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94-01	Jan 5	Korea in the World: Today and Tomorrow	Paul Kennedy
94-02	Mar 22	US-Japan Technological Competition and Implications for Korea	Ronald A. Morse
94-03	Mar 25	The Problems of the Japanese Economy and their Implications for Korea	Toyoo Gyohten
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94-06	Sep 6	Prospects for New World Monetary System and Implications for Korea	John Williamson
94-07	Oct 18	Prospects for New Trade Order and Implications for Korea	Arthur Dunkel
94-08	Dec 15	Financial Reform for the New Economy: Evaluations and Prospects	Jaeyoon Park

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No.	Date	Title	Speaker
95-01	Jan 26	Strategies for Globalization and Future Economic Policy	JaeHyong Hong
95-02	Jan 27	Mexican Peso Crisis and its Implications for the Global Financial Market	Charles Dallara

No.	Date	Title	Speaker
95-03	Mar 6	The World Economic Trend and US Economic Outlook	Allen Sinai
95-04	Mar 29	Korea and US: The Year 2000 in the Global Economy	James Laney
95-05	Apr 11	New Games, New Rules, and New Strategies	Lester Thurow
95-06	Apr 21	The United States and North Korea Future Prospects	Robert Scalapino
95-07	May 18	US Foreign Policy toward East Asia and the Korean Peninsula	James A. Baker Ⅲ
95-08	Jun 14	New World Trade Regime in the Post-UR Era and its Implications for Korea	Anne O. Krueger
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95-14	Nov 7	Current US Political Trends and their Implications for US-Korea Relations	Thomas Foley
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95-17	Dec 6	WTO and the World Trading System - Where Do We Go from Here?	Anne O. Krueger

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No.	Date	Title	Speaker
96-01	Jan 25	Challenges for the Global Trading System	Robert Lawrence
96-02	Feb 1	Trade Polices of the New Economy	Jaeyoon Park
96-03	Feb 26	Technology Issues in the International Trading System	Sylvia Ostry
96-04	Mar 19	Information Era: Korea's Strategies	Sukchae Lee

No.	Date	Title	Speaker
96-05	Apr 9	Future European Model: Economic Internationalization and Culture Decentralization	Jørgen Ørstrøm Møller
96-06	Apr 23	Evolving Role of the OECD in the Global Economy	Donald Johnston
96-07	May 7	New Issues for the Multilateral Trading System: Singapore and Beyond	Chulsu Kim
96-08	May 17	Financial Globalization and World Economy: Implications for Korea	Paul A. Volker
96-09	May 21	Cooperation or Conflict? - A European Perspective on East Asia's Place in the Global Economy	Martin Wolf
96-10	May 23	East Asia in Overdrive: Multinationals and East Asian Integrations	Wendy Dobson
96-11	May 28	Japan's Banking Difficulties: Causes and Implications	Hugh Patrick
96-12	Jun 29	The Political Context and Consequences of East Asian Economic Growth	Francis Fukuyama
96-13	Jul 9	President Clinton's First Term and Prospects for a Second: Implications for Korea	Robert Warne
96-14	Sep 17	Global Free Trade: A Vision for the Early 21st Century	C. Fred Bergsten
96-15	Oct 22	Korea's New Global Responsibilities	A. W. Clausen
96-16	Nov 26	The Free Trade Area of Clinton's Second Term: Implications for APEC and Korea	Richard Feinberg

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No.	Date	Title	Speaker
97-01	Feb 25	Economic management in the Era of Globalization	Duckwoo Nam
97-02	Mar 18	German Unification: Economic Consequences and Policy Lessons	Juergen B. Donges
97-03	May 27	American Security Policy in the Asia Pacific-Three Crisis and How We Dealt With Them	William Perry
97-04	Jun 10	Global Cooperations and National Government: Why We Need Multilateral Agreement on Investment	Edward Graham
97-05	Jul 8	Public Sector Reform in New Zealand and its Relevance to Korea	Donald Hunn

No.	Date	Title	Speaker
97-06	Sep 18	Korean-American Relations: The Search for Stability at a Time of Change	W. Anthony Lake
97-07	Oct 21	Korea: From Vortex to Hub of Northeast Asia	Donald P. Gregg
97-08	Dec 9	The Japanese Economic Slump and Currency Crises in Other East Asian Economies	Ronald McKinnon

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98-01	Jan 14	Globalization and versus Tribalization: The Dilemma at the End of the 20th Century	Guy Sorman
98-02	Feb 3	Asian Currency Turmoil and Japan's Role	Takatoshi Kato
98-03	Feb 5	The Asian Financial Crisis and Challenges Facing Korea: From An American Perspective	Charles Dallara
98-04	Apr 28	The Significance of the European Economic Monetary Union: in Europe and Beyond	Tue Rohsted
98-05	Jun 23	Asian Currency Crisis: What Has Happened?	Anne O. Krueger
98-06	Sep 17	How to Reform Public Sector Management	Nyum Jin
98-07	Dec 4	Economic Outlook for 1999: Asia and Korea	Hubert Neiss
98-08	Dec 11	North Korea in Global Perspective	Marcus Noland

1999

No.	Date	Title	Speaker
99-01	Feb 11	Korea in the World Economy: An OECD Appreciation of its Newest Member	Donald Johnston
99-02	Mar 5	Prospects for US Stock Exchanges and US Economy	Richard A. Grasso
99-03	Apr 6	The International Financial Market and the US Dollar/Yen Exchange Rate: An Overview and Prospects for the Future	Kenneth S. Courtis
99-04	May 19	Reflections on Contrasting Present-day US and Japanese Economic Performances	Hugh Patrick
99-05	Jul 22	Challenge for the World Economy: Where Do the Risks Lie?	Rudiger Dornbusch

No.	Date	Title	Speaker
99-06	Oct 5	How Should Korea Cope With Financial Globalization	James P. Rooney
99-07	Dec 2	Global Financial Market: Current Status and Prospects	Robert Hormats
99-08	Dec 14	North Korea-US Relationship: Its Current Condition and Future Prospects	Stephen W. Bosworth

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00-01	Jan 19	The Outlook for Asia and Other Emerging Markets in 2000	Charles Dallara
00-02	Feb 15	Global New Economy: Challenges and Opportunities for Korea	Soogil Young
00-03	Feb 29	Asia Grows, and Japan Slows- Prospect for the World Economy and Markets	Kenneth S. Courtis
00-04	Mar 28	The Future of International Financial System and its Implications for Korea	Morris Goldstein
00-05	Apr 26	Policies toward Continued Corporate and Financial Reform	Youngkeun Lee
00-06	May 26	Prospects for Millenium Round Trade Negotiations and Korea-US Free Trade Agreement	Jeffrey Schott
00-07	Jun 23	Prospects for Multilateral Economic Institutions	Anne O. Krueger
00-08	Jul 13	Avoiding the Apocalypse: The Future of the Two Koreas	Marcus Noland
00-09	Sep 14	Attracting FDI in the Knowledge Era	Andrew Fraser
00-10	Nov 10	The Economic and Foreign Policies of the New US Administration and Congress	C. Fred Bergsten

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No.	Date	Title	Speaker
01-01	Feb 6	The US Economy on the Brink? Japan on the Edge? Implications for Asian and the World Economy	Kenneth S. Courtis
01-02	Feb 27	Economic Policy of the Bush Administration toward Korea	Marcus Noland
01-03	Apr 26	Jeffrey Jones' Evaluation of Korean Business and Economy: Overcoming Three 'C's	Jeffrey D. Jones

No.	Date	Title	Speaker
01-04	Jun 5	High Tech, The Consequences of our Relationship with Technology on our Lives and Businesses	John Naisbitt
01-05	Jul 9	Korea and the IMF	Stanley Fischer
01-06	Jul 19	Outlook on Korea Over the Next Ten Years	Dominic Barton
01-07	Sep 4	The World Dollar Standard and the East Asian Exchange Rate Dilemma	Roland McKinnon
01-08	Oct 9	Europe's Role in Global Governance and Challenges to East Asia/Korea	Pierre Jacquet
01-09	Nov 6	Globalization and Dangers in the World Economy	Martin Wolf
01-10	Nov 16	Preventing Financial Crises: The Chilean Perspective	Carlos Massad
01-11	Nov 20	The New US-Japan Economic Relationship and Implications for Korea	Marcus Noland

2002

No.	Date	Title	Speaker
02-01	Jan 9	Globalization: A Force for Good	Patricia Hewitt
02-02	Jan 16	The World After 9/11: A Clash of Civilizations?	Francis Fukuyama
02-03	Feb 22	Hanging Together: On Monetary and Financial Cooperation in Asia	Barry Eichengreen
02-04	Apr 16	US and Global Recovery: For Real? Prospects and Risks	Allen Sinai
02-05	May 7	The Global Economy Rebounds - But How Fast and For How Long? Issues and Implications for Korea	Kenneth S. Courtis
02-06	Jun 14	The US Economy and the Future of the Dollar	Marcus Noland
02-07	Jul 10	The Doha Round: Objectives, Problems and Prospects	Jagdish Bhagwati
02-08	Sep 24	The Outlook for Korea and the Global Economy 2002-2003	Paul F. Gruenwald
02-09	Oct 11	The Outlook for US Economy, the Dollar and US Trade Policy	C. Fred Bergsten
02-10	Oct 22	9/11 and the US Approach to the Korean Peninsula	Thomas C. Hubbard

No.	Date	Title	Speaker
02-11	Oct 24	The US and World Economy: Current Status and Prospects	John B. Taylor
02-12	Dec 3	New Challenges and Opportunities for the Global Telecommunications and Information Industries	Peter F. Cowhey

2003

No.	Date	Title	Speaker
03-01	Apr 8	The US and World Economy: After the Iraq War	Allen Sinai
03-02	May 30	2003 Global Economy and Key Economic Issues: From the OECD's Perspectives	Donald Johnston
03-03	Jun 10	The New Role of the US in the Asia-Pacific	Charles Morrison
03-04	Jul 4	Global Economic Outlook and the Impact of President Bush's Economic Stimulus Package	Phil Gramm
03-05	Oct 28	The Global Exchange Rate Regime and Implications for East Asian Currencies	John Williamson
03-06	Nov 4	Europe and Germany in Transition, Where Will the Economies Go?	Hans Tietmeyer
03-07	Nov 21	Regional Financial Cooperation in East Asia	Eisuke Sakakibara

2004

No.	Date	Title	Speaker
04-01	Feb 3	An Outlook for the US and World Economy in 2004	Allen Sinai
04-02	Apr 7	Korea After Kim Jong-il	Marcus Noland
04-03	Apr 21	A Foreign Businessman's Observations on Korean Economy and Other Things	William C. Oberlin
04-04	Jun 1	- The US Election, US-Japan Relations, and Implications for Korea - US Economic Performance, Japanese Economic Performance, and Implications for Korea	- Gerald Curtis - Hugh Patrick
04-05	Jul 13	China's Economic Rise and New Regional Growth Paradigm	Zhang Yunling
04-06	Oct 14	The Case for a Common Currency in Asia	Robert Mundell

No.	Date	Title	Speaker
04-07	Nov 2	Impact of the Presidential Election on US Trade Policy	Peter F. Cowhey
04-08	Dec 7	Asia in Transition and Implication for Korea	Dominic Barton

2005

No.	Date	Title	Speaker
05-01	Jan 18	Post-Election US and Global Economies and Markets Prospects, Risks, and Issues	Allen Sinai
05-02	Mar 2	The Korean Economy: A Critical Assessment from the Japanese Perspective	Yukiko Fukagawa
05-03	Apr 12	A Rating Agency Perspective on Korea	Thomas Byrne
05-04	May 10	The Impact of China and India on the World Economy	Wendy Dobson
05-05	May 31	Visions of East Asian and Asian-Pacific Integration: Competing or Complementary	Robert Scollay
05-06	Jun 30	Mutual Independence: Asia and the International Economy	Anne O. Krueger
05-07	Sep 1	The Blind Man and the Elephant: Competing Perspectives on Global Imbalances	Barry Eichengreen
05-08	Oct 13	Measuring American Power in Today's Complex World	Paul Kennedy
05-09	Oct 28	China "Rising": What Lessons for Today from the Past?	Bernard Gordon
05-10	Nov 15	Oil Prices, Ben Bernanke, Inflation, and the Fourth Energy Recession	Philip K. Verleger

2006

No.	Date	Title	Speaker
06-01	Jan 23	US Global Economy and Financial Market Prospects: Picking up Steam	Allen Sinai
06-02	Feb 14	Korea-US FTA: A Path to Sustainable Growth	Alexander Vershbow
06-03	Mar 28	Japan's Economic Recovery: Policy Implication for Korea	Yukiko Fukagawa
06-04	Apr 18	The Global Scramble for IT Leadership: Winners and Losers	George Scalise
06-05	May 10	Korea's Growing Stature in the Global Economy	Charles Dallara
06-06	Jun 20	Japan's Foreign Policy for Economy and Japan-Korea FTA	Oshima Shotaro
06-07	Jun 30	Whither China?	Richard N. Cooper
06-08	Jul 20	M&A in the 21st Century and its Implications	Rpbert F. Bruner
06-09	Sep 1	Korea and the US - Forging a Partnership for the Future: A View from Washington	Edwin J. Feulner
06-10	Sep 12	Asian Economic Integration and Common Asian Currency	Eisuke Sakakibara
06-11	Sep 15	Germany: Understanding the Economic Underperformance since Reunification	Juergen B. Donges
06-12	Sep 21	Changing Economic Environment and their Implications for Korea	Angel Gurría
06-13	Oct 12	The Feasibility of Establishing an East Asian FTA: A Chinese Perspective	Zhang Yunling
06-14	Nov 9	The Global Oil and Gas Market: Paradigm Shift and Implications for Korea	Fereidun Fesharaki
06-15	Nov 29	The Changing World Economy and its Implications for Korea	Anne O. Krueger

2007

No.	Date	Title	Speaker
07-01	Jan 9	Seismic Shifts, the World Economy, and Financial Markets in 2007	Allen Sinai
07-02	Feb 13	The Longest Recovery of the Japanese Economy: Prospects and Challenges	Yukiko Fukagawa
07-03	Mar 9	Digital Networked Economy and Global Corporate Strategy	Ben Verwaayen

No.	Date	Title	Speaker
07-04	May 3	The Outlook for East Asian Economic Integration: Coping with American Protectionism, Chinese Power, and Japanese Recovery	David Hale
07-05	May 8	Key Trend in the 2008 US Presidential Campaign	Stephen J. Yates
07-06	May 11	Strengthening Korea's Position in the Global Economy	Charles Dallara
07-07	Jun 21	Moving Forward the KORUS FTA: Now for the Hard Time	Jeffrey Schott
07-08	Aug 24	The Korea Economy and the FTA with the United States	Barry Eichengreen
07-09	Oct 4	Why the US Will Continue to Lead the 21st Century?	Guy Sorman
07-10	Oct 19	The Outlook of the Indian Economy from Business Perspective: Implications for Korean Business	Tarun Das
07-11	Oct 25	Globalization, Diversity and Recruitment of Business Talents	Ben Verwaayen
07-12	Nov 8	Economic Outlook for Korea and the Region	Jerald Schiff
07-13	Dec 14	Successes of Globalization: the Case of Korea	Anne O. Krueger

2008

No.	Date	Title	Speaker
08-01	Jan 15	The US "Risk" to Asia and the Global Expansion	Allen Sinai
08-02	Mar 25	Sovereign Wealth Funds: Perceptions and Realities	Robert C. Pozen
08-03	May 14	Europe's Slow Growth: A Warning for Korea	Guy Sorman
08-04	May 30	Global Challenges that Will Confront the Next US President	James A. Baker III
08-05	Jun 10	Current Status and Prospects of the Japanese Capital Market	Atsushi Saito
08-06	Jun 18	Economic and Political Outlook for America and their Implications to the World	Phil Gramm

No.	Date	Title	Speaker
08-07	Sep 17	The Outlook of the Regional and Global Economic and Financial Situation: Perspectives on International Banking	Charles Dallara
08-08	Sep 23	Can South Korea Still Compete?	Guy Sorman
08-09	Oct 17	Global Financial Markets under Stress	Jeffrey Shafer
08-10	Nov 4	Current Global Financial Crisis, the Dollar, and the Price of Oil	Martin Feldstein
08-11	Dec 9	Global and Regional Economic Development and Prospects, and the Implications for Korea	Subir Lall

2009

No.	Date	Title	Speaker
09-01	Jan 13	Competing in an Era of Turbulence and Transition	Deborah Wince-Smith
09-02	Feb 3	US and Global Economic and Financial Crisis: Prospects, Policies, and Perspectives	Allen Sinai
09-03	Feb 24	Current Crisis and the Impact on Developing Countries	Danny Leipziger
09-04	Feb 25	US Trade Policy in the Obama Era	Jeffrey Schott
09-05	Mar 19	Obama, Can It Work?	Guy Sorman
09-06	Apr 15	Lessons from the Current Economic Crisis	Anne O. Krueger
09-07	Jun 23	Beyond Keynesianism	Justin Yifu Lin
09-08	Jul 21	The US-Korea Economic Partnership: Working Together in a Time of Global Crisis	Jeffrey Schott
09-09	Aug 20	Prospects for Investment after the Current Economic Crisis: The Role of IFC and Developing Countries	Lars H. Thunell
09-10	Oct 15	Is a Double-Dip a Realistic Possibility?	SungWon Sohn
09-11	Dec 8	The EU in Transition in the New Global Paradigm: Opportunities for Korea?	Jean-Pierre Lehmann

2010

No.	Date	Title	Speaker
10-01	Jan 21	Aftermath of the 'Crisis': US and Global Prospects, Legacies, and Policies	Allen Sinai

No.	Date	Title	Speaker
10-02	Apr 8	Japan and Korea in Globalization and its Backlash: Challenges and Prospects	Yukiko Fukagawa
10-03	Apr 22	Emerging Markets and New Frontiers	Mark Mobius
10-04	May 18	An Overview of China: Economic Prospects and Challenges	Danny Leipziger
10-05	Jul 13	Asia in the Global Economy	Dominique Strauss-Kahn
10-06	Aug 31	The Global Economy: Where Do We Stand?	Anne O. Krueger
10-07	Oct 15	How Close Are We to a Double-Dip and Deflation?	SungWon Sohn
10-08	Nov 5	Rebalancing the World Economy	Paul A. Volcker

2011

No.	Date	Title	Speaker
11-01	Jan 20	After the Crisis: What Next in 2011 and 2012?	Allen Sinai
11-02	Feb 24	Economic Outlook and Future Challenges in Developing Asia	Haruhiko Kuroda
11-03	Mar 23	Europe's Financial Woes	Richard N. Cooper
11-04	Apr 28	Safety and Economics of Nuclear Power	SoonHeung Chang
11-05	May 24	Can the G20 Save Globalization and Multilateralism?	Danny Leipziger
11-06	Jun 29	Markets, Economic Changes, and Political Stability in North Korea	Marcus Noland
11-07	Aug 30	A Special Lecture on the Rebalancing of the Chinese Economy	Yu Yongding
11-08	Dec 31	Global Economic Turbulence and Investment Implications	SungWon Sohn

2012

No.	Date	Title	Speaker
12-01	Jan 19	US and Global Economy and Markets Turmoil: What Lies Ahead?	Allen Sinai
12-02	Mar 13	The US Elections in 2012 and the Future of US Asia-Pacific Policy	Charles Morrison

No.	Date	Title	Speaker
12-03	Jun 22	Advancement and Education of Science and Technology University and Economic Growth	NamPyo Suh
12-04	Jul 17	Prospects of the Eurozone Crisis and its Implications for the Global Economy	Hans Martens
12-05	Sep 14	Current Economic Affairs and the Financial Market	Charles Dallara
12-06	Sep 18	An Optimist View on the Global Economy	Guy Sorman
12-07	Oct 11	FTAs, Asia-Pacific Integration and Korea	Peter A. Petri
12-08	Oct 29	The Eurozone Crisis: Update and Outlook	Nicolas Veron
12-09	Nov 21	China's New Leadership and Economic Policy Challenges	Andrew Sheng
12-10	Dec 7	Can the WTO Be Resuscitated? Implications for Korea and the Asia Pacific	Jean-Pierre Lehmann

2013

No.	Date	Title	Speaker
13-01	Jan 10	The US and Global Economies after the US Election and in the New Year	Allen Sinai
13-02	Jan 17	The Eurozone Crisis and its Impact on the Global Economy	Guntram B. Wolff
13-03	Feb 8	The European Sovereign Debt Crisis: Challenges and How to Solve Them	Andreas Dombret
13-04	Mar 22	The Global Outlook: Grounds for Optimism, but Risks Remain Relevant	John Lipsky
13-05	Apr 3	The State and Outlook of the US and Chinese Economy	David Hale
13-06	Apr 9	Japan's Abenomics and Foreign Policy	Hugh Patrick/ Gerald Curtis
13-07	Apr 30	The Creative Economy and Culture in Korea	Guy Sorman
13-08	May 21	The Japanese Economy and Trans-Pacific Partnership (TPP)	Yukiko Fukagawa/ Jeffrey Schott
13-09	Jun 27	Unified Germany in Europe: An Economic Perspective	Karl-Heinz Paqué
13-10	Jul 19	Chinese Economic Policymaking: A Foreigner's Perspective	Bob Davis
13-11	Sep 27	Japanese Politics and Abenomics Implications for Korea and the World	David Asher

No.	Date	Title	Speaker
13-12	Nov 15	Korea-China-Japan Economic and Political Relations: Wither to?	David Philling

2014

No.	Date	Title	Speaker
14-01	Jan 7	U.S. and Global Economies - Poised for Better Times?	Allen Sinai
14-02	Jan 14	Swiss Made	R. James Breiding
14-03	Feb 20	Abe in the Driver's Seat: Where is the Road Leading?	Gerald Curtis
14-04	Feb 26	The Secret of Germany's Performance: The Mittlestand Economy	Peter Friedrich
14-05	Mar 5	The Eurozone Economy: Out of Doldrums?	Karl-Heinz Paqué
14-06	Mar 17	The Global Economy 2014	Martin Feldstein
14-07	Apr 3	Philanthropy and Welfare	Guy Sorman
14-08	May 16	Global Trade Environment and the Future of the World Economy	Roberto Azevedo
14-09	May 23	From BRICs to America	SungWon Sohn
14-10	Jul 24	Risks and Opportunities in the Global Economic Recovery	Charles Dallara
14-11	Sep 12	Abe's Labor Reform and Innovative Strategies	Yukiko Fukagawa
14-12	Sep 26	a's Economy and Anti-Corruption Drive	Bob Davis
14-13	Oct 17	US Fed's QE Ending & Asian Financial Markets	Anoop Singh
14-14	Nov 14	China's New Economic Strategy and the Korea-China FTA	Zhang Yunlingng

2015

No.	Date	Title	Speaker
15-01	Jan 15	The EU Economy in 2015: Will It Take Off?	Jeroen Dijsselbloem
15-02	Jan 20	Will the Global Economy Normalize in 2015?	Allen Sinai
15-03	Apr 24	What Makes China Grow?	Lawrence Lau
15-04	Apr 28	U.S.-Korea Economic Relations: Partnership for Shared Economic Prosperity	Mark W. Lippert
15-05	May 5	The Hartz Labor Reforms of Germany and the Implications for Korea	Peter Hartz
15-06	Jun 2	What can Korea Learn from Europe's Slow Growth?	Guy Sorman

No.	Date	Title	Speaker
15-07	Jul 9	Global Energy and Environmental Issues and Switzerland	Doris Leuthard
15-08	Sep 11	The Emerging New Asian Economic Disorder	David L. Asher
15-09	Sep 21	The Chinese Economy: Transition towards the New Normal	Huang Yiping
15-10	Oct 13	Germany's Industry 4.0: Hamessing the Potential of Digitization	Matthias Machnig
15-11	Oct 29	Four Global Forces Changing the World	Dominic Barton
15-12	Nov 12	Turbulence in Emerging Markets and Impact on Korea	Sung-won Sohn
15-13	Nov 17	Observations on the Korean Economy and North Korea's Economic Potential	Thomas Byrne
15-14	Dec 10	Perspectives on China's Economy and Economic Reform	Huang Haizhou
15-15	Dec 15	Population Aging and Economic Growth in the East Asia and Pacific Region	Sudhir Shetty Philip O'Keefe

2016

No.	Date	Title	Speaker
16-01	Jan 12	The U.S. and Global Prospects and Markets in 2016: A Look Ahead	Allen Sinai
16-02	Feb 23	The Key Themes and Risks of the Global Economy in 2016	Hung Tran
16-03	Mar 2	The U.S. in the Global Economy	Anne Krueger
16-04	May 16	The Prospects and Impact of the U.S. Election and Economy	Martin Feldstein
16-05	May 24	he US and Northeast Asia in a Turbulent Time	Gerald Curtis
16-06	Jun 1	Allies in Business: The Future of the U.S.-ROK Economic Relationship	Mark Lippert
16-07	Sep 20	How Ready Are We for the Fourth Industrial Revolution?	Doh-Yeon Kim
16-08	Oct 21	The World Economy at a Time of Monetary Experimentation and Political Fracture	Charles Dallara
16-09	Nov 10	The U.S. Presidential Election and Its Economic and Security Implications	Marcus Noland & Sung-won Sohn

2017

	Title		Author
17-01	Jan 19	Big Changes, Big Effects - U.S. and Global Economic and Financial Prospects 2017	Allen Sinai

Specialist's Diagnosis

2004

	Title	Author
04-01	A Critical Assessment of Korea's FTA Policy	Chong-hyun Nam
04-02	A Foreign Businessman's Observation on the Korean Economy and Other Things	William C. Oberlin

2005

	Title	Author
05-01	Korea in the World Economy: Challenges and Prospects	Il SaKong

세계경제연구원 간행물

Occasional Paper Series

1993

연 번	제 목	저 자
93-01	Clintonomics and the New World Order: Implications for Korea-US Relations	C. Fred Bergsten
93-02	The Uruguay Round, NAFTA, and US-Korea Economic Relations	Jeffrey Schott

1994

연 번	제 목	저 자
94-01	21세기 준비 어떻게 할 것인가	Paul Kennedy
94-02	미국과 일본 간의 기술경쟁과 한국에 미칠 영향	Ronald A. Morse
94-03	일본경제, 무엇이 문제인가	Toyoo Gyohten
94-04	미국경제와 세계경제: 현황과 전망	Allen Sinai
94-05	국제환율제도 이대로 좋은가	John Williamson
94-06	The Promises of the WTO for the Trading Community	Arthur Dunkel

1995

연 번	제 목	저 자
95-01	멕시코 페소화 위기와 세계금융시장 동향	Charles Dallara
95-02	세계경제 동향과 미국경제 전망	Allen Sinai
95-03	새로운 게임, 새로운 규칙과 새로운 전략	Lester Thurow
95-04	미국 · 북한관계 전망	Robert Scalapino
95-05	미국의 동아시아 정책과 한반도	James A. Baker Ⅲ
95-06	미일 무역마찰과 한국	Anne O. Krueger
95-07	동북아경제권 개발 전망: 일본의 시각	Hisao Kanamori

1996

연 번	제 목	저 자
96-01	Trends of International Financial Market and Prospects of Global Economy in 1996	Allen Sinai
96-02	유럽연합(EU)의 앞날과 세계경제	Jørgen Ørstrøm Møller
96-03	세계경제와 OECD의 역할	Donald Johnston
96-04	동아시아 경제성장의 정치적 배경과 영향	Francis Fukuyama

연 번	제 목	저 자
96-05	국제사회에서의 한국의 새 역할	A. W. Clausen

1997

연 번	제 목	저 자
97-01	다국적기업과 동아시아 경제통합	Wendy Dobson
97-02	아태 지역에 대한 미국의 안보정책	William J. Perry
97-03	뉴질랜드의 공공부문 개혁	Donald Hunn

1998

연 번	제 목	저 자
98-01	범세계적 기업과 다자간 투자협정	Edward M. Graham
98-02	변화 속의 안정: 새로운 한미 관계의 모색	W. Anthony Lake
98-03	한국: 동북아의 새로운 협력 중심으로	Donald P. Gregg
98-04	경제적 측면에서 본 독일 통일의 교훈	Juergen B. Donges
98-05	세계화와 종족화: 20세기 말의 딜레마	Guy Sorman

1999

연 번	제 목	저 자
99-01	북한의 정치 · 경제 상황과 동북아 안보	Marcus Noland
99-02	엔-달러 환율과 국제금융시장	Kenneth S. Courtis
99-03	한국과 아시아 경제: 전망과 정책대응	Donald Johnston/ Hubert Neiss
99-04	미국과 일본경제의 비교평가	Hugh Patrick
99-05	세계경제: 도전과 전망	Rudiger Dornbusch

2000

연 번	제 목	저 자
00-01	한미관계: 번영과 안보의 동반자	Stephen W. Bosworth
00-02	글로벌 뉴 이코노미: 도전과 한국의 활로	양수길
00-03	금융감독의 세계적 조류	이용근
00-04	성장하는 아시아와 침체 속의 일본	Kenneth S. Courtis
00-05	세계금융체제의 미래와 우리의 대응	Morris Goldstein
00-06	시애틀 이후의 WTO와 한미FTA전망	Jeffrey Schott/ 최인범
00-07	다자간 국제경제기구의 미래와 전망	Anne O. Krueger
00-08	남북한 관계: 현황과 전망	Marcus Noland

연 번	제 목	저 자
00-09	Knowledge 시대의 외국인 직접투자 유치	Andrew Fraser
00-10	미국 新행정부 및 의회의 대외 · 경제정책방향	C. Fred Bergsten
00-11	한미관계: 번영과 안보의 동반자	Stephen W. Bosworth
00-12	2000년 국제금융 및 신흥시장 전망	Charles Dallara/ Robert Hormats
00-13	기업 · 금융 관계: 현황과 전망	이용근
00-14	금융세계화, 어떻게 대처하나	James P. Rooney

2001

연 번	제 목	저 자
01-01	2001년 미국, 일본경제와 아시아	Kenneth S. Courtis
01-02	부시행정부의 對韓 경제정책과 한국의 대응	Marcus Noland
01-03	3C를 극복하자	Jeffrey D. Jones
01-04	하이테크와 비즈니스, 그리고 세계경제	John Naisbitt
01-05	한국과 IMF	Stanley Fischer
01-06	한국경제의 향후 10년	Dominic Barton
01-07	세계 달러본위제도와 동아시아 환율딜레마	Ronald McKinnon
01-08	新국제질서 속의 유럽과 한국	Pierre Jacquet

2002

연 번	제 목	저 자
02-01	금융위기 再發 어떻게 막나: 칠레의 경험을 중심으로	Carlos Massad
02-02	세계경제의 기회와 위험	Martin Wolf
02-03	美 · 日 경제현황과 한국의 대응	Marcus Noland
02-04	미국경제와 세계경제: 회복가능성과 위험	Allen Sinai
02-05	세계화: 혜택의 원동력	Patricia Hewitt
02-06	9 · 11테러사태 이후의 세계질서: 문명의 충돌인가?	Francis Fukuyama
02-07	아시아지역의 통화 · 금융 협력	Barry Eichengreen
02-08	세계경제, 회복되나?	Kenneth S. Courtis
02-09	미국경제와 달러의 장래	Marcus Noland
02-10	도하라운드: 문제점과 전망	Jagdish Bhagwati
02-11	2003 한국경제와 세계경제 전망	Paul F. Gruenwald
02-12	미국경제 현황과 세계경제의 앞날	John B. Taylor
02-13	9 · 11사태와 미국의 한반도정책	Thomas C. Hubbard
02-14	미국 경제, 달러 및 대외통상정책 방향	C. Fred Bergsten
02-15	미국의 IT산업 관련 정책과 한국	Peter F. Cowhey

2003

연 번	제 목	저 자
03-01	이라크전 이후의 미국경제와 세계경제	Allen Sinai
03-02	OECD가 본 한국경제	Donald Johnston
03-03	아태 지역에서의 미국의 새 역할	Charles Morrison
03-04	세계경제 전망과 부시행정부의 경기부양책	Phil Gramm
03-05	침체된 독일 · 유럽 경제가 주는 정책적 교훈과 시사	Hans Tietmeyer
03-06	동아시아 금융협력과 한국	Eisuke Sakakibara
03-07	세계환율체제 개편과 동아시아 경제	John Williamson

2004

연 번	제 목	저 자
04-01	2004 미국경제와 세계경제 전망	Allen Sinai
04-02	김정일 이후의 한반도	Marcus Noland
04-03	미국 대통령 선거와 韓 · 美 · 日관계	Hugh Patrick/ Gerald Curtis
04-04	중국경제의 부상과 동북아 지역경제	Zhang Yunling
04-05	아시아 화폐단일화, 가능한가?	Robert Mundell
04-06	외국기업인의 눈에 비친 한국경제	William C. Oberlin

2005

연 번	제 목	저 자
05-01	대통령선거 이후의 미국 통상정책, 어떻게 되나	Peter F. Cowhey
05-02	아시아 경제 · 무역환경, 어떻게 전개되나?	Dominic Barton
05-03	제2기 부시 행정부의 경제정책과 세계경제 및 시장 전망	Allen Sinai
05-04	일본의 시각에서 본 한국경제의 활로	Yukiko Fukagawa
05-05	세계경제, 무엇이 문제인가	Barry Eichengreen
05-06	세계 속의 한국경제: 역할과 전망	Anne O. Krueger
05-07	중국과 인도가 세계경제에 미치는 영향	Wendy Dobson
05-08	동아시아와 아태지역 경제통합	Robert Scollay
05-09	국제신용평가기관이 보는 한국	Thomas Byrne

2006

연 번	제 목	저 자
06-01	고유가와 세계경제의 앞날	Philip K. Verleger
06-02	2006년 미국경제/세계경제와 금융시장 전망	Allen Sinai
06-03	한미FTA: 지속성장의 활로	Alexander Vershbow
06-04	일본의 대외경제정책과 한일 FTA	Oshima Shotaro
06-05	일본경제 회생과 한국경제	Yukiko Fukagawa
06-06	세계 M&A시장 현황과 전망: 우리의 대응	Robert F. Bruner
06-07	세계인이 보는 한국경제는?	Charles Dallara
06-08	아시아 공통통화와 아시아 경제통합	Eisuke Sakakibara
06-09	미국의 힘은 얼마나 강하며, 중국의 부상은 어떻게 보아야 하는가?	Paul Kennedy/ Bernard Gordon
06-10	– 20년 후의 중국, 어떤 모습일까? – 세계 IT 리더십 경쟁: 승자와 패자	- Richard N. Cooper - George Scalise

2007

연 번	제 목	저 자
07-01	한미관계: 새로운 동반자 시대를 지향하며	Edwin J. Feulner
07-02	통일 이후 독일: 경제침체의 교훈	Juergen B. Donges
07-03	2007년 세계경제와 금융시장의 지각변동	Allen Sinai
07-04	급변하는 세계경제환경, 어떻게 대처해야 하나	Angel Gurría
07-05	동아시아 FTA 가능한가?: 중국의 시각	Zhang Yunling
07-06	구조적 변화 맞고 있는 세계석유시장과 한국	Fereidun Fesharaki
07-07	변모하는 세계경제와 한국	Anne O. Krueger
07-08	되살아나는 일본경제: 전망과 과제	Yukiko Fukagawa
07-09	디지털 네트워크 경제와 글로벌 기업 전략	Ben Verwaayen
07-10	한미FTA: 미국의 시각	Jeffrey Schott
07-11	한미FTA와 한국경제의 미래	Barry Eichengreen
07-12	– 동아시아 경제통합, 어떻게 보나 – 한국경제 및 동아시아경제 전망	- David Hale - Jerald Schiff
07-13	– 21세기는 여전히 미국의 세기가 될 것인가? – 인도경제 전망과 한국 기업	- Guy Sorman - Tarun Das

2008

연 번	제 목	저 자
08-01	국가 미래를 위한 한국의 세계화 전략	Anne O. Krueger
08-02	2008년 미국경제와 세계금융시장 동향	Allen Sinai
08-03	유럽의 경제침체: 우리에게 주는 시사점	Guy Sorman
08-04	차기 미국 대통령이 풀어야할 세계적 도전	James A. Baker Ⅲ
08-05	일본 자본시장의 현재와 전망	Atsushi Saito
08-06	대선 이후 미국의 정치 · 경제, 어떻게 전개되나?	Phil Gramm
08-07	세계 및 아시아 경제 · 금융 전망	Charles Dallara
08-08	한국경제의 경쟁력 강화, 어떻게 하나?	Guy Sorman
08-09	– 국부펀드: 인식과 현실 – 긴장 속의 세계금융시장, 어떻게 되나?	- Robert C. Pozen - Jeffrey R. Shafer

2009

연 번	제 목	저 자
09-01	2009년 한국경제와 세계 및 아시아 경제 전망	Subir Lall
09-02	혼란과 전환기의 경쟁력 강화: 과제와 전망	Deborah Wince-Smith
09-03	위기 속의 미국 및 세계 경제와 금융: 전망과 정책대응	Allen Sinai
09-04	미국 오바마 행정부의 통상정책	Jeffrey Schott
09-05	하강하는 세계경제와 케인지언 정책 처방의 실효성	Justin Yifu Lin
09-06	– 세계금융위기가 개도국에 미치는 여파와 대응 – 최근 세계경제위기의 교훈과 전망	- Danny Leipziger - Anne O. Krueger
09-07	– 미국 오바마 행정부의 경제 및 대외정책, 어떻게 되나? – 한미 경제 파트너십: 세계적 위기에 어떻게 협력할 것인가	- Guy Sorman - Jeffrey Schott

2010

연 번	제 목	저 자
10-01	새로운 세계질서 속에 변화하는 EU: 한국의 기회는?	Jean-Pierre Lehmann
10-02	위기 이후 미국 및 세계경제 전망, 그리고 유산과 정책 과제	Allen Sinai
10-03	세계경제, 어떻게 볼 것인가?: 진단과 전망	Anne O. Krueger
10-04	– 세계화 파고 속의 한국과 일본경제: 도전과 전망 – 중국 경제의 虛와 實	- Yukiko Fukagawa - Danny Leipziger
10-05	– 신흥국 자본시장과 뉴 프런티어 – 세계경제와 아시아의 역할	- Mark Mobius - Dominique Strauss-Kahn
10-06	세계경제의 재균형	Paul A. Volcker

2011

연 번	제 목	저 자
11-01	위기 이후의 세계경제와 한국경제: 2011년 및 2012년 전망	Allen Sinai
11-02	원자력 발전의 안전성과 경제성: 한국의 선택은?	장순흥
11-03	중국 경제의 재(再)균형	Yu Yongding
11-04	세계금융질서의 개편: 아시아의 시각	세계경제연구원
11-05	– 아시아 경제의 발전전망과 도전과제 – 유럽의 국가채무위기: 평가와 전망	- Haruhiko Kuroda - Richard N. Cooper
11-06	– 기로에 선 세계화와 다자주의, 그리고 G-20 – 북한의 시장과 경제, 그리고 정치적 안정성, 어떻게 변화하고 있나?	- Danny Leipziger - Marcus Noland

2012

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12-01	혼돈 속의 세계경제와 금융시장: 분석과 2012년 전망	Allen Sinai
12-02	– 카이스트의 혁신 – 유로위기 해결책은 없나	– 서남표 – Hans Martens
12-03	– 2012년 미국의 대선과 향후 아태정책 전망 – 세계경제 및 금융시장 현황 – 그래도 세계경제의 미래는 밝다	- Charles Morrison - Charles Dallara - Guy Sorman
12-04	– FTA와 아태지역 통합 그리고 한국 – 유로위기 언제 끝나나?	- Peter A. Petri - Nicolas Véron
12-05	– 중국의 새 리더십과 경제정책 – 국제통상질서의 현황과 WTO의 미래	- Andrew Sheng - Jean-Pierre Lehmann

2013

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13-01	2013년 세계경제와 미국경제 전망	Allen Sinai
13-02	유로존, 올해는 위기에서 벗어날 수 있나?	Guntram B. Wolff
13-03	– 유럽국채위기: 과제와 해결책 – 세계경제, 언제 회복되나?	- Andreas Dombret - John Lipsky
13-04	– 미국과 중국경제 현황과 전망 – 일본의 아베노믹스와 외교정책	- David Hale - Hugh Patrick/Gerald Curtis
13-05	– 한국의 창조경제와 문화 – 아베노믹스와 일본 경제의 미래, 그리고 TPP	- Guy Sorman - Yukiko Fukagawa/ Jeffrey Schott
13-06	– 통일 독일의 경제 · 정치적 위상: 한국에 대한 시사점 – 외국인이 바라본 중국의 경제정책	- Karl-Heinz Paqué - Bob Davis

2014

연 번	제 목	저 자
14-01	2014년 세계경제, 나아질 것인가?	Allen Sinai
14-02	– 아베정권은 어디로 가고 있나? – 중견기업: 순항하는 독일경제의 비결	- Gerald Curtis - Peter Friedrich
14-03	– 유럽경제, 살아날 것인가? – 2014년 세계 경제의 향방은?	- Karl-Heinz Paqué - Martin Feldstein
14-04	복지향상과 기부문화	Guy Sorman
14-05	– 세계무역 환경과 세계경제의 미래 – 브릭스(BRICs)에서 미국으로	- Roberto Azevêdo - Sung Won Sohn
14-06	– 세계경제 회복, 위기인가 기회인가 – 아베 정권의 노동개혁과 혁신전략은 성공할 것인가	- Charles Dallara - Yukiko Fukagawa
14-07	– 중국경제 현황과 시진핑의 반부패운동 – 다가올 미 연준의 QE종료가 아시아 금융시장에 미칠 영향 – 중국의 신경제 전략과 한-중 FTA	- Bob Davis - Anoop Singh - Zhang Yunling

2015

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15-01	2015년 세계경제, 정상화될 것인가	Allen Sinai
15-02	– 2015년 유럽경제, 회복될 것인가? – 공동 번영을 위한 한미 경제 파트너십 – 독일 하르츠 노동개혁과 한국에 대한 시사점	- Jeroen Dijsselbloem - Mark W. Lippert - Peter Hartz
15-03	– 중국 경제의 앞날을 내다보며 – 유럽의 저성장에서 우리는 무엇을 배워야 하는가?	- Lawrence Lau - Guy Sorman
15-04	– 글로벌 에너지(중점)환경 이슈와 스위스의 경험 – 혼돈의 아시아 경제, 어디로 가는가	- H.E. Doris Leuthard - David L. Asher
15-05	– 중국 경제의 신창타이(新常態)는 무엇인가 – 디지털화를 활용한 독일의 산업혁명 4.0	- Huang Yiping - Matthias Machnig
15-06	– 세상을 바꾸는 네 가지 글로벌 흐름 – 격변하는 신흥시장과 한국에 미칠 영향	- Dominic Barton - Sung-won Sohn
15-07	– 내가 본 한국, 한국 경제, 그리고 북한 경제의 잠재력 – 중국의 경제개혁과 향후 전망	- Thomas Byrne - Huang Haizhou

2016

연 번	제 목	저 자
16-01	2016년 세계경제 및 금융시장 전망	- Allen Sinai
16-02	– 2016년 세계 경제의 주요 이슈와 리스크 – 미국의 경제 · 정치 상황이 세계 경제에 미치는 영향	- Hung Tran - Anne Krueger
16-03	– 미국 경제와 대선이 세계 경제에 미칠 영향 – 미국 대통령 선거가 동북아에 미칠 지정학적 영향과 전망	- Martin Feldstein - Gerald Curtis

연 번	제 목	저 자
16-04	– 미국 새 행정부의 경제와 안보 정책 – 통화정책 실험과 정치 분열기의 세계 경제 – 한미 경제 협력: 현황과 전망	- Marcus Noland & Sung-won Sohn - Charles Dallara - Mark Lippert

2017

연 번	제 목	저 자
17-01	대변혁 속의 2017 – 미국과 세계 경제 금융 전망	- Allen Sinai

보고서 (책자)

연 번	제 목	저 자
94-01	The Global Economy and Korea	사공 일
94-02	탈냉전시대 韓美 정치 · 경제 협력 관계	사공 일/ C. Fred Bergsten
95-01	International Next Generation Leaders' Forum [Ⅰ]	세계경제연구원
95-02	International Next Generation Leaders' Forum [Ⅱ]	세계경제연구원
95-03	새로운 韓美 협력체제의 모색	사공 일/ C. Fred Bergsten
96-01	The Multilateral Trading and Financial System	사공 일
96-02	세계화시대의 韓 · 美관계	사공 일/ C. Fred Bergsten
96-03	International Next Generation Leaders' Forum [Ⅲ]	세계경제연구원
96-04	세계 반도체산업의 발전전망과 한국의 대응전략	세계경제연구원
97-01	Major Issues for the Global Trade and Financial System	사공 일
97-02	한국의 금융개혁	세계경제연구원
98-01	International Next Generation Leaders' Forum [Ⅳ]	세계경제연구원
98-02	한반도 통일 및 韓美관계의 현황과 과제	사공 일
98-03	Policy Priorities for the Unified Korean Economy	사공 일/김광석
98-04	The Fifty Years of the GATT/WTO: Past Performance and Future Challenges	사공 일/김광석
99-01	아시아 금융위기의 원인과 대책	사공 일/구영훈
99-02	아시아 금융위기와 한미 관계	세계경제연구원
99-03	For A Better Tomorrow: Asia-Europe Partnership in the 21st Century	ASEM Vision Group
00-01	Reforming the International Financial Architecture: Emerging Market Perspectives	사공 일/왕윤종

연 번	제 목	저 자
00-02	동북아시아포럼 2000	세계경제연구원
00-03	제6차 한미 21세기 위원회 보고서	세계경제연구원
01-01	세계 자유무역 의제를 위한 여건조성	세계경제연구원
01-02	Rebuilding the International Financial Architecture (EMEPG 서울보고서)	Emerging Markets Eminent Persons Group
03-01	새로운 국제질서와 한국의 대응(Ⅰ) – 새로운 세계질서: 기회와 도전	세계경제연구원
03-01	새로운 국제질서와 한국의 대응(Ⅱ) – 세계경제 및 주요국 경제의 앞날	세계경제연구원
03-01	새로운 국제질서와 한국의 대응(Ⅲ) – 한국경제의 진로	세계경제연구원
03-02	세계경제연구원 개원 10주년 국제회의	세계경제연구원
04-01	창업활성화, 어떻게 하나	세계경제연구원
08-01	세계화 시대의 한국 금융산업	세계경제연구원
09-01	최근 세계금융위기, 어떻게 대처할 것인가?	세계경제연구원
10-01	G20 개혁과제: 향후 금융감독 및 규제방향	세계경제연구원
10-02	G20 서울정상회의와 개발의제	세계경제연구원
12-01	새로운 글로벌 금융규제체제: 아시아 금융시장 및 금융기관에 미치는 영향	세계경제연구원
12-02	문화와 한국경제, 그리고 한류	세계경제연구원
12-03	새로운 글로벌 금융시대, 아시아의 미래	세계경제연구원
13-01	중견기업 육성: 독일의 경험에서 배운다	세계경제연구원
13-02	통일과 한국경제	세계경제연구원
13-03	세계 속의 한국 경제 길잡이	세계경제연구원
14-01	리더십과 정책의 우선순위	세계경제연구원
15-01	여성과 성장잠재력	세계경제연구원
17-01	제4차 산업혁명과 한국경제의 미래	세계경제연구원

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2012

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12-01	문화산업과 서비스교역 그리고 한국경제	남종현
12-02	한일 간 하나의 경제권 형성과 그 추진방향	이종윤
12-03	유럽 경제위기와 한국의 과제	현정택
12-04	이번 대통령 선거, 왜 더욱 중요한가	사공 일

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12-05	금융소비자 보호 정책과 금융 옴부즈맨 제도	이재웅
12-06	통일 준비 해둬야	사공 일

2013

연 번	제 목	저 자
13-01	새로운 세계경제 질서와 미래지향적 한일관계	사공 일
13-02	금융개혁과 중국의 정치경제	조윤제

2014

연 번	제 목	저 자
14-01	경찰관이 폭행당해도 놀라지 않는 사회는 미래 없다	사공 일
14-02	경제개혁 3개년 계획 성공하려면	사공 일
14-03	품격 있는 나라를 향한 정부개조	사공 일
14-04	중국의 재부상과 한국: 도전과 기회	사공 일

2016

연 번	제 목	저 자
16-01	세계와 주변 여건은 급변하는데...	사공 일

세계경제지평

1994

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94-01	유목적 세계의 도전	Jacques Attali
94-02	세계주의와 지역주의 混在	이영선
94-03	기회와 위협으로서의 中國	김완순
94-04	21세기 준비, 어떻게 할 것인가	Paul Kennedy
94-05	화폐의 종말/자본주의 이후의 사회	홍기택/주한광
94-06	UR 이후 아태 경제협력의 과제와 한국의 선택	유재원
94-07	환경과 무역	나성린/김승진
94-08	円高에 따른 일본의 산업구조 조정과 한국경제의 대응	이종윤
94-09	세계경제환경 변화와 우리의 선택	사공 일
94-10	개방화에 따른 기업정책의 방향	김종석

1995

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95-01	한국경제의 위상에 걸맞은 국제적 역할: 도전과 기회	사공 일
95-02	기업의 세계화와 경쟁 규범	김완순
95-03	무엇이 세계화인가	김병주
95-04	한국과 미국: 2000년의 세계경제	James Laney
95-05	세계경제는 좌초할 것인가	김적교
95-06	엔화강세 지속가능성과 우리의 대응	박진근
95-07	세계화와 한국경제: 호황인가 거품인가	구본호
95-08	확산되는 특혜무역협정과 정책과제	남종현
95-09	역사인식과 한일 관계	홍원탁
95-10	일본산업의 네트워크 구조와 그 효율성	이종윤
95-11	국제경쟁력의 갈등	이재웅
95-12	해방 후 우리 경제 반세기의 회고와 전망	김광석

1996

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96-01	국내 선물시장의 구상과 전망	이 선
96-02	중소기업시대 열릴 것인가	류동길
96-03	단체교섭제도 有感	배무기
96-04	세계화와 기업의 변신	지 청
96-05	우리나라 금융시장개방의 추진방향	박영철
96-06	다변주의 對 지역주의, 兩立은 가능한가?	김세원
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96-08	최근 경제위기감의 실체와 대응방향	김광석
96-09	경제발전, 제도개혁, 경쟁질서의 확립	이성섭
96-10	轉機를 맞이한 정부의 기능	김병주
96-11	WTO의 새로운 협상의제	김완순

1997

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97-01	노동법개정 難局의 해법: 교섭창구 단일화를 前提한 複數勞組허용	김수곤
97-02	감속성장, 왜 바람직한가	김적교
97-03	韓寶사태의 敎訓	이재웅
97-04	세계화 시대의 경제운영	남덕우
97-05	기업성장의 虛實: 韓寶事態에서 얻는 敎訓	지 청

연 번	제 목	저 자
97-06	북한의 식량난과 집단농장체제	문팔용
97-07	한국의 금융개혁	윤계섭
97-08	高齡化社會의 도래와 財政危機	박종기
97-09	外換危機의 일반모형을 감안한 우리의 대응 방향	박진근
97-10	벤처기업시대를 열어가려면	유동길

1998

연 번	제 목	저 자
98-01	한국의 經濟奇籍은 끝난 것인가?	남종현
98-02	패러다임의 대전환 없이는 위기 극복이 불가능하다	송대희
98-03	기업구조조정과 바람직한 은행-기업관계	남상우
98-04	새로운 기업지배구조의 모색과 사외이사의 역할	이영기
98-05	고투자-고저축 고리의 단절을 위한 제언	이영탁

1999

연 번	제 목	저 자
99-01	연금개혁의 전망과 과제	박종기
99-02	지하철파업과 다시 보는 노조전임자 문제	김수곤
99-03	금융구조조정과 중소기업금융	박준경
99-04	21세기를 향한 환경정책과제	김종기
99-05	소득분배 문제의 실상과 대응방향	김광석
99-06	"생산적 복지" 정책의 허와 실	최 광
99-07	세계화시대의 韓中日 經濟協力 强化 方案	사공 일
99-08	시애틀 WTO 각료회의의 결렬과 향후전망	박태호

2000

연 번	제 목	저 자
00-01	2000년 경제전망 및 향후 과제	김준경
00-02	세계금융체제에 관한 논의, 어떻게 되고 있나	사공 일
00-03	아시아 금융위기와 한국경제의 미래	사공 일
00-04	高비용 低능률구조의 부활	이종윤
00-05	아시아 경제회복, 지속될 것인가?	사공 일
00-06	국제경제환경과 한국경제	조윤제
00-07	기업경영 감시를 위한 기관투자가의 역할	이재웅
00-08	미국의 구조조정 경험과 교훈	이영세

2001

연 번	제 목	저 자
01-01	한국산업의 경쟁력 위기와 향후 진로	김도훈
01-02	주 5일 근무제 도입 신중해야	박영범

연구보고서 (세계경제 시리즈)

1994

연 번	제 목	저 자
94-01	UR이후 아태 경제협력의 과제와 한국의 선택	유재원
94-02	환경-무역관계가 한국 무역에 미치는 영향	김승진/나성린
94-03	円高에 따른 일본의 산업구조조정과 한국경제의 대응	이종윤
94-04	개방화에 따른 기업정책의 방향	김종석

1995

연 번	제 목	저 자
95-01	국내 외국인직접투자 현황과 정책대응	주한광/김승진
95-02	비즈니스 리엔지니어링 기업: 한·일 기업의 수용 가능성 비교	이재규
95-03	WTO 체제와 우리의 대응	김지홍

1996

연 번	제 목	저 자
96-01	국내 선물시장에 대한 구상과 전망	이 선
96-02	일본 산업의 네트워크구조와 그 효율성	이종윤

1997

연 번	제 목	저 자
97-01	루마니아의 경제현황과 주요개혁과제	김광석/김병주/고일동

1998

연 번	제 목	저 자
98-01	우리 경제의 成長要因과 成長潛在力 展望	김광석
98-02	한국과 ASEAN 諸國 間 무역구조의 변화 추이와 대응방향	김승진

연 번	제 목	저 자
98-03	국제무역체계의 도전과제	김완순/최낙균
98-04	정보화의 세계적 추세와 우리의 대응방안	박종국

2000

연 번	제 목	저 자
00-01	한국의 금융 위기와 산업 정책	이영세/정용승

2001

연 번	제 목	저 자
01-01	우리나라의 산업 · 무역 정책 전개 과정	김광석
01-02	한국에서의 기술이전과 정보의 역할	이영세

전문가 진단

2004

연 번	제 목	저 자
04-01	한국 FTA정책의 虛와 實	남종현
04-02	외국 기업인의 눈에 비친 한국경제	William C. Oberlin

2005

연 번	제 목	저 자
05-01	세계 속의 한국경제: 과제와 전망	사공 일

세계경제연구원 특별강연

1993

연 번	제 목	연 사
93-01	클린턴 행정부의 경제정책과 한미 경제관계	C. Fred Bergsten
93-02	UR 및 NAFTA의 장래와 한국의 대응	Jeffrey Schott
93-03	국제환경 변화와 세계경제 장 · 단기 전망	Allen Sinai
93-04	태평양지역 경제전망과 한국의 대응	Lawrence Krauss
93-05	21세기 세계구도 변화와 한국	Jacques Attali

1994

연 번	제 목	연 사
94-01	21세기 준비 어떻게 할 것인가?	Paul Kennedy
94-02	미국과 일본 간의 기술경쟁과 한국에 미칠 영향	Ronald A. Morse
94-03	일본경제 무엇이 문제인가?	Toyoo Gyohten
94-04	미국경제와 세계경제 현황과 전망	Allen Sinai
94-05	동구권 경제전망과 한국의 진출방안	Ronald Freeman
94-06	국제환율제도 이대로 좋은가?	John Williamson
94-07	새로운 국제무역질서와 한국의 대응	Arthur Dunkel
94-08	新경제의 금융개혁: 평가와 전망	박재윤

1995

연 번	제 목	연 사
95-01	세계화 전략과 앞으로의 경제운용방향	홍재형
95-02	멕시코 페소화 위기와 세계 금융시장 동향	Charles Dallara
95-03	세계경제 동향과 미국경제 전망	Allen Sinai
95-04	한국과 미국: 2000년의 세계경제	James Laney
95-05	새로운 게임, 새로운 규칙과 새로운 전략	Lester Thurow
95-06	미국-북한 관계 전망	Robert Scalapino
95-07	미국의 동아시아 정책과 한반도	James A. Baker Ⅲ
95-08	미일 무역마찰과 한국	Anne O. Krueger
95-09	국제금융제도 무엇이 문제인가?	Stanley Fischer
95-10	세계무역기구 – 새로운 도전	Jagdish Bhagwati
95-11	동북아 경제권 개발 전망	Kanamori Hisao
95-12	러시아 정보제도의 현황과 변화 전망	Vadim Kirpitchenko
95-13	최근의 국제금융시장 동향과 96년도 세계경제 전망	Allen Sinai
95-14	최근 미국 정치동향과 한미 관계	Thomas Foley
95-15	APEC과 세계무역체제	C. Fred Bergsten
95-16	국제금융제도의 현황과 향후 전망	Toyoo Gyohten
95-17	WTO와 세계무역체제	Anne O. Krueger

1996

연 번	제 목	연 사
96-01	세계경제의 도전과 한국	Robert Lawrence
96-02	新경제의 통상정책	박재윤
96-03	다자간 무역체제 하의 기술협약과 한국	Sylvia Ostry

연 번	제 목	연 사
96-04	정보화 시대: 한국의 대응	이석채
96-05	EU의 앞날과 세계경제	Jørgen Ørstrøm Møller
96-06	세계경제와 OECD의 역할	Donald Johnston
96-07	다자간 무역체제 하의 새로운 과제	김철수
96-08	금융세계화와 세계경제	Paul A. Volcker
96-09	세계경제와 동아시아경제: 협력인가, 갈등인가?	Martin Wolf
96-10	다국적 기업의 세계화 전략과 동아시아 경제통합	Wendy Dobson
96-11	위기에 처한 일본의 은행부문: 원인과 시사점	Hugh Patrick
96-12	동아시아 경제성장의 정치적 배경과 영향	Francis Fukuyama
96-13	클린턴 행정부의 업적과 재선 전망 및 한국에 미칠 영향	Robert Warne
96-14	세계무역 – 21세기 비전	C. Fred Bergsten
96-15	국제사회에서의 한국의 새 역할	A. W. Clausen
96-16	제2기 클린턴 행정부의 통상정책	Richard Feinberg

1997

연 번	제 목	연 사
97-01	세계화 시대의 경제운용	남덕우
97-02	경제적 측면에서 본 통독의 교훈	Juergen B. Donges
97-03	아태 지역에 대한 미국의 안보정책	William Perry
97-04	범세계적 기업과 다자간 투자협정	Edward Graham
97-05	뉴질랜드의 공공부문 개혁	Donald Hunn
97-06	한미 관계: 변화 속의 안정	W. Anthony Lake
97-07	한국: 동북아의 새로운 협력 중심으로	Donald P. Gregg
97-08	일본의 경제침체와 동아시아 통화위기	Ronald McKinnon

1998

연 번	제 목	연 사
98-01	세계화와 국가의 주체성	Guy Sorman
98-02	아시아 통화위기와 일본의 역할	Takatoshi Kato
98-03	한국의 통화 · 금융위기: 미국의 시각	Charles Dallara
98-04	유럽 단일통화(Euro)와 세계금융 질서	Tue Rohsted
98-05	아시아 통화위기: 원인과 전망	Anne O. Krueger
98-06	국가경영혁신, 어떻게 할 것인가?	진 념
98-07	99년의 아시아와 한국경제 전망	Hubert Neiss
98-08	최근 북한 경제상황과 향후 전망	Marcus Noland

1999

연 번	제 목	연 사
99-01	세계 속의 한국경제와 OECD	Donald Johnston
99-02	미국의 경제현황과 주식시장 전망	Richard A. Grasso
99-03	국제금융시장과 달러/엔 환율 전망	Kenneth S. Courtis
99-04	미국과 일본 경제의 비교평가	Hugh Patrick
99-05	세계경제: 도전과 전망	Rudiger Dornbusch
99-06	한국의 금융세계화, 어떻게 해야 하나?	James P. Rooney
99-07	국제금융시장 전망: 미국경제와 금융시장을 중심으로	Robert Hormats
99-08	한미관계: 번영과 안보의 동반자	Stephen W. Bosworth

2000

연 번	제 목	연 사
00-01	2000년도 아시아 및 신흥시장 전망	Charles Dallara
00-02	글로벌 뉴 이코노미: 도전과 한국의 활로	양수길
00-03	성장하는 아시아와 침체 속의 일본	Kenneth S. Courtis
00-04	세계금융체제의 미래와 우리의 대응	Morris Goldstein
00-05	기업 · 금융 구조조정의 향후 정책방향	이용근
00-06	시애틀 이후 WTO와 한미FTA 전망	Jeffrey Schott
00-07	세계경제체제 변화: 전망과 정책대응	Anne O. Krueger
00-08	남북한 관계: 현황과 전망	Marcus Noland
00-09	지식시대의 외국인 직접투자 유치	Andrew Fraser
00-10	미국 新행정부 및 의회의 경제 · 대외 정책방향	C. Fred Bergsten

2001

연 번	제 목	연 사
01-01	2001년 미국, 일본 경제와 아시아	Kenneth S. Courtis
01-02	부시행정부의 對韓정책과 한국의 대응	Marcus Noland
01-03	내가 본 한국기업과 한국경제: 3C를 극복하자	Jeffrey D. Jones
01-04	하이테크와 비즈니스, 그리고 세계경제	John Naisbitt
01-05	한국과 IMF	Stanley Fischer
01-06	한국경제의 향후 10년	Dominic Barton
01-07	세계 달러본위제도와 동아시아 환율딜레마	Ronald McKinnon
01-08	新국제질서 속의 유럽과 한국	Pierre Jacquet
01-09	세계경제의 기회와 위협: 긴급진단	Martin Wolf
01-10	금융위기 再發, 어떻게 막나: 칠레의 경험을 중심으로	Carlos Massad
01-11	21세기 미일 경제관계 전망과 한국의 대응과제	Marcus Noland

2002

연 번	제 목	연 사
02-01	세계화: 혜택의 원동력	Patricia Hewitt
02-02	9 · 11 테러사태 이후의 세계질서: 문명의 충돌인가?	Francis Fukuyama
02-03	아시아 지역의 통화 · 금융 협력	Barry Eichengreen
02-04	미국경제와 세계경제: 회복가능성과 위험	Allen Sinai
02-05	세계경제, 회복되고 있나?	Kenneth S. Courtis
02-06	미국경제와 달러의 장래	Marcus Noland
02-07	도하라운드: 문제점과 전망	Jagdish Bhagwati
02-08	2003년 한국경제와 세계경제	Paul F. Gruenwald
02-09	미국경제, 달러 및 대외통상 정책 방향	C. Fred Bergsten
02-10	9 · 11 사태 1주년과 미국의 한반도 정책	Thomas C. Hubbard
02-11	미국경제 현황과 세계경제의 앞날	John B. Taylor
02-12	미국의 IT산업 관련정책과 한국	Peter F. Cowhey

2003

연 번	제 목	연 사
03-01	이라크전 이후의 미국경제와 세계경제	Allen Sinai
03-02	2003 세계경제와 한국: OECD의 시각	Donald Johnston
03-03	亞太지역에서의 미국의 새 역할	Charles Morrison
03-04	세계경제 전망과 부시행정부의 경기부양책	Phil Gramm
03-05	세계환율체제 개편과 동아시아 경제	John Williamson
03-06	침체된 독일 · 유럽경제가 주는 교훈과 정책적 시사	Hans Tietmeyer
03-07	동아시아 금융협력과 한국	Eisuke Sakakibara

2004

연 번	제 목	연 사
04-01	2004년 미국경제와 세계경제 전망	Allen Sinai
04-02	김정일 이후의 한반도	Marcus Noland
04-03	외국기업인의 눈에 비친 한국경제	William C. Oberlin
04-04	미국 대통령선거와 韓美日 관계 – 미국 대통령선거와 韓美, 韓日 관계 – 미국 경제와 일본경제, 그리고 한국경제	- Gerald Curtis - Hugh Patrick
04-05	중국경제의 부상과 동북아 지역경제	Zhang Yunling
04-06	아시아 화폐 단일화, 가능한가?	Robert Mundell
04-07	대통령선거 이후의 미국 통상정책, 어떻게 되나	Peter F. Cowhey
04-08	아시아 세계무역환경, 어떻게 전개되나?	Dominic Barton

2005

연 번	제 목	연 사
05-01	제2기 부시행정부의 경제정책과 세계경제 및 시장 전망	Allen Sinai
05-02	일본의 시각에서 본 한국경제의 활로	Yukiko Fukagawa
05-03	국제신용평가기관이 보는 한국	Thomas Byrne
05-04	급부상하는 중국과 인도 경제	Wendy Dobson
05-05	동아시아와 아태지역 경제통합	Robert Scollay
05-06	세계 속의 한국경제: 역할과 전망	Anne O. Krueger
05-07	세계경제, 무엇이 문제인가	Barry Eichengreen
05-08	미국의 힘은 얼마나 강한가?	Paul Kennedy
05-09	중국의 부상, 어떻게 보아야 하나	Bernard Gordon
05-10	고유가와 세계경제의 앞날	Philip K. Verleger

2006

연 번	제 목	연 사
06-01	2006년 미국경제/세계경제와 금융시장 전망	Allen Sinai
06-02	한미FTA: 지속성장의 활로	Alexander Vershbow
06-03	일본 경제회생과 한국경제	Yukiko Fukagawa
06-04	세계 IT 리더십 경쟁: 승자와 패자	George Scalise
06-05	세계인이 보는 한국경제는?	Charles Dallara
06-06	일본의 대외경제정책과 한일 FTA	Oshima Shotaro
06-07	20년 후의 중국, 어떻게 될까?	Richard N. Cooper
06-08	세계 M&A 시장 현황과 전망: 우리의 대응	Robert F. Bruner
06-09	한미 관계: 새로운 동반자 시대를 지향하며	Edwin J. Feulner
06-10	아시아 공동통화와 아시아 경제통합	Eisuke Sakakibara
06-11	통일 이후 독일: 경제침체의 교훈	Juergen B. Donges
06-12	급변하는 세계경제환경, 어떻게 대처해야 하나?	Angel Gurría
06-13	동아시아 FTA, 가능한가?: 중국의 시각	Zhang Yunling
06-14	구조적 변화 맞고 있는 세계석유시장과 한국	Fereidun Fesharaki
06-15	변모하는 세계경제와 한국	Anne O. Krueger

2007

연 번	제 목	연 사
07-01	2007년 세계경제와 금융시장의 지각변동	Allen Sinai
07-02	되살아나는 일본경제: 전망과 과제	Yukiko Fukagawa
07-03	디지털 네트워크 경제와 글로벌 기업전략	Ben Verwaayen
07-04	동아시아 경제, 어디로 갈 것인가?	David Hale

연 번	제 목	연 사
07-05	2008년 미국 대통령선거, 어떻게 될 것인가?	Stephen J. Yates
07-06	세계 속의 한국경제, 위상강화 어떻게 하나?	Charles Dallara
07-07	한미FTA: 미국의 시각	Jeffrey Schott
07-08	한미FTA와 한국경제의 미래	Barry Eichengreen
07-09	왜 21세기에도 미국의 세기가 될 것인가?	Guy Sorman
07-10	인도경제 전망과 한국기업	Tarun Das
07-11	세계화시대의 기업 인재 확보	Ben Verwaayen
07-12	2008년 한국경제와 동아시아 경제 전망	Jerald Schiff
07-13	국가 미래를 위한 한국의 세계화 전략	Anne O. Krueger

2008

연 번	제 목	연 사
08-01	2008년 미국경제와 세계금융시장 전망	Allen Sinai
08-02	국부펀드(Sovereign Wealth Funds): 인식과 현실	Robert C. Pozen
08-03	유럽의 경제침체: 우리에게 주는 시사점	Guy Sorman
08-04	차기 미국대통령이 풀어야 할 세계적 도전	James A. Baker Ⅲ
08-05	일본 자본시장의 현재와 전망	Atsushi Saito
08-06	대선 이후 미국의 정치 · 경제, 어떻게 전개되나?	Phil Gramm
08-07	세계 및 아시아 경제 · 금융, 어떻게 되나?	Charles Dallara
08-08	한국경제의 경쟁력 강화, 어떻게 하나?	Guy Sorman
08-09	긴장 속의 세계금융시장, 어떻게 되나?	Jeffrey Shafer
08-10	세계금융위기, 달러, 그리고 유가	Martin Feldstein
08-11	09년 한국경제와 세계 및 아시아경제 전망	Subir Lall

2009

연 번	제 목	연 사
09-01	혼란과 전환기의 경쟁력 강화: 과제와 전망	Deborah Wince-Smith
09-02	위기 속의 미국 및 세계경제와 금융: 전망과 정책대응	Allen Sinai
09-03	세계금융위기가 개도국에 미치는 여파와 우리의 대응	Danny Leipziger
09-04	미국 오바마 행정부의 통상정책	Jeffrey Schott
09-05	미국 오바마 행정부의 경제 및 대외정책, 어떻게 되나?	Guy Sorman
09-06	최근 세계경제위기와 우리의 교훈	Anne O. Krueger
09-07	하강하는 세계경제와 케인지언 정책처방의 실효성	Justin Yifu Lin
09-08	최근 세계경제위기와 한미 협력관계: 과제와 전망	Jeffrey Schott
09-09	경제위기 이후 세계의 투자 전망: IFC와 개도국의 역할	Lars H. Thunell

연 번	제 목	연 사
09-10	과연 더블딥 경제침체는 올 것인가?	손성원
09-11	새로운 세계 질서 속에서 변화하는 EU: 한국의 기회는?	Jean-Pierre Lehmann

2010

연 번	제 목	연 사
10-01	위기 이후의 미국 및 세계경제 전망, 그리고 유산과 정책과제	Allen Sinai
10-02	세계화 파고 속의 한국과 일본경제: 도전과 전망	Yukiko Fukagawa
10-03	신흥국 자본시장과 뉴 프론티어	Mark Mobius
10-04	중국 경제의 虛와 實: 과제와 전망	Danny Leipziger
10-05	세계경제와 아시아의 역할	Dominique Strauss-Kahn
10-06	세계경제, 어떻게 볼 것인가?: 진단과 전망	Anne O. Krueger
10-07	더블딥과 디플레이션의 가능성은 얼마나 될까?	손성원
10-08	세계경제의 재균형	Paul A. Volcker

2011

연 번	제 목	연 사
11-01	위기 이후의 세계경제와 한국경제: 2011년 및 2012년 전망	Allen Sinai
11-02	아시아 경제의 발전전망과 도전과제	Haruhiko Kuroda
11-03	유럽국가의 채무위기: 평가와 전망	Richard N. Cooper
11-04	원자력발전의 안전성과 경제성: 한국의 선택은?	장순흥
11-05	기로에 선 세계화와 다자주의, 그리고 G20	Danny Leipziger
11-06	북한의 시장과 경제, 그리고 정치적 안정성, 어떻게 변화하고 있나?	Marcus Noland
11-07	중국경제 재균형에 관한 특강	Yu Yongding
11-08	격동 속의 세계경제: 전망과 투자전략	손성원

2012

연 번	제 목	연 사
12-01	혼돈 속의 미국경제와 세계경제 그리고 금융시장, 어떻게 되나?	Allen Sinai
12-02	12년 미국의 대선과 향후 아태 정책 전망	Charles Morrison
12-03	과학기술 연구대학의 발전과 교육, 경제성장	서남표
12-04	유로 위기: 해결책은 없나?	Hans Martens
12-05	세계경제 및 금융시장 현황	Charles Dallara

연 번	제 목	연 사
12-06	그래도 세계경제의 미래는 밝다	Guy Sorman
12-07	FTA와 아태지역통합, 그리고 한국	Peter A. Petri
12-08	유로 위기: 언제 끝나나?	Nicolas Véron
12-09	중국의 새 리더십과 경제정책	Andrew Sheng
12-10	국제통상질서의 현황과 WTO의 미래	Jean-Pierre Lehmann

2013

연 번	제 목	연 사
13-01	2013년 세계경제와 미국경제 전망	Allen Sinai
13-02	유로존, 올해는 위기에서 벗어날 수 있나?	Guntram B. Wolff
13-03	유럽국채위기: 과제와 해결책	Andreas Dombret
13-04	세계경제, 언제 회복되나?	John Lipsky
13-05	미국과 중국경제 현황과 전망	David Hale
13-06	일본의 아베노믹스와 외교정책	Hugh Patrick, Gerald Curtis
13-07	한국의 창조경제와 문화	Guy Sorman
13-08	아베노믹스와 일본경제의 미래, 그리고 TPP	Yukiko Fukagawa, Jeffrey Schott
13-09	통일 독일의 경제 · 정치적 위상: 한국에 대한 시사점	Karl-Heinz Paqué
13-10	외국인이 바라본 중국의 경제정책	Bob Davis
13-11	일본 아베정권의 정치 · 경제정책이 우리에게 미칠 영향은?	David Asher
13-12	한중일 정치 · 경제 관계 어디로 가고 있나?	David Philling

2014

연 번	제 목	연 사
14-01	2014년 세계경제, 나아질 것인가	Allen Sinai
14-02	스위스 메이드	R. James Breiding
14-03	아베정권은 어디로 가고 있나	Gerald Curtis
14-04	중견기업: 순항하는 독일 경제의 비결	Peter Friedrich
14-05	유럽경제, 살아날 것인가?	Karl-Heinz Paqué
14-06	2014년 세계경제의 향방은?	Martin Feldstein
14-07	복지향상과 기부문화	Guy Sorman
14-08	세계무역 환경 변화와 세계경제의 미래	Roberto Azevêdo
14-09	브릭스(BRICs)에서 미국으로	Sung Won Sohn
14-10	세계경제 회복, 위기인가 기회인가	Charles Dallara
14-11	아베의 노동개혁과 혁신전략은 성공할 것인가	Yukiko Fukagawa

연 번	제 목	연 사
14-12	중국경제 현황과 시진핑의 반부패운동	Bob Davis
14-13	다가올 미 연준의 QE 종료가 아시아 금융시장에 미칠 영향	Anoop Singh
14-14	중국의 신경제전략과 한중 FTA	Zhang Yunling

2015

연 번	제 목	연 사
15-01	2015년 유럽경제, 회복될 것인가	Jeroen Dijsselbloem
15-02	2015년 세계경제, 정상화될 것인가	Allen Sinai
15-03	중국 경제의 앞날을 내다보며	Lawrence Lau
15-04	공동 번영을 위한 한미 경제 파트너십	Mark W. Lippert
15-05	독일 하르츠 노동개혁과 한국에 대한 시사점	Peter Hartz
15-06	유럽의 저성장에서 우리는 무엇을 배워야 하는가?	Guy Sorman
15-07	글로벌 에너지 · 환경 이슈와 스위스의 경험	Doris Leuthard
15-08	혼돈의 아시아 경제, 어디로 가는가	David L. Asher
15-09	중국 경제의 신창타이(新常態)는 무엇인가	Huang Yiping
15-10	디지털화를 활용한 독일의 산업혁명 4.0	Matthias Machnig
15-11	세상을 바꾸는 네 가지 글로벌 흐름	Dominic Barton
15-12	격변하는 신흥시장과 한국에 미칠 영향	Sung-won Sohn
15-13	내가 본 한국, 한국 경제, 그리고 북한 경제의 잠재력	Thomas Byrne
15-14	중국의 경제개혁과 향후 전망	Huang Haizhou
15-15	동아태지역 국가의 인구 노령화 문제와 경제성장 전망	Sudhir Shetty Philip O'Keefe

2016

연 번	제 목	연 사
16-01	2016년 세계경제 및 금융시장 전망	Allen Sinai
16-02	2016년 세계 경제의 주요 이슈와 리스크	Hung Tran
16-03	미국의 경제 · 정치 상황이 세계 경제에 미치는 영향	Anne Krueger
16-04	미국 경제와 대선이 세계 경제에 미칠 영향	Martin Feldstein
16-05	미국 대통령 선거가 동북아에 미칠 지정학적 영향과 전망	Gerald Curtis
16-06	한미 경제 협력: 현황과 전망	Mark Lippert
16-07	제4차 산업혁명, 우리의 준비는	Doh-Yeon Kim
16-08	통화정책 실험과 정치 분열기의 세계 경제	Charles Dallara
16-09	미국 새 행정부의 경제와 안보 정책	Marcus Noland & Sung-won Sohn

2017

연 번	제 목	연 사
17-01	대변혁 속의 2017 – 미국과 세계 경제 금융 전망	Allen Sinai