



RIETI Special Seminar

Blockchain and Society 5.0

The Creation of a New Marketplace based on Distributed Consensus

Makoto Yano President and CRO, RIETI / Chris Dai CEO, LONGHASH Japan

RIETI-ANU-ERIA Symposium

Asia's Response to the Trade War

AI, IoT
and
Economy

Global
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What is RIETI Highlight?

RIETI's public relations magazine *RIETI Highlight* is published in Japanese on a quarterly basis, featuring RIETI's most recent activities with the objective of disseminating our research outcomes to a wider audience. This *RIETI Highlight Special Edition* is written in English and published annually as an overview of RIETI's undertakings for our international readers. We hope this special edition will be helpful not only in spreading information on our activities and research findings but also in deepening international readers' understanding of our mission as a leading Japanese policy think tank.

Message from the Chairman

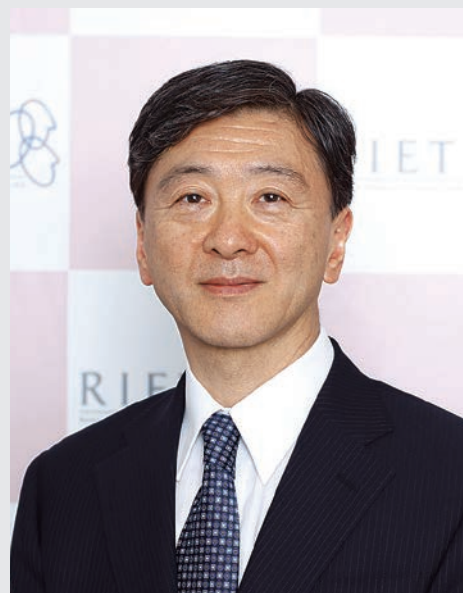
There is a slowdown in the growth of global trade and the global economy, which had been brisk until quite recently, as a result of factors including a deceleration of the Chinese economy and low crude oil prices. In addition, as a result of growing trade friction between the U.S. and China, as well as seeing increased opposition toward the globalization of the economy and growing income inequality, discovering methods of achieving balanced growth is becoming a major global challenge.

These global economic and trade trends and maintaining balanced growth also represent challenges for Japan. Improving productivity for sustainable growth and undertaking work style reforms are also major challenges for Japan as it faces declining birthrates and an aging population, and these are major research themes that RIETI is involved with as a policy think tank.

Looking back on 2018, RIETI continued to engage in a wide range of research activities, releasing numerous research papers in many fields, including economics and finance, trade policy, innovation, and energy and the environment. Over the last 12 months, we held or co-organized a number of symposiums, seminars and workshops covering a wide range of subjects, including the Japanese employment system, issues for small and medium-sized enterprises (SMEs) in Asia, blockchain technology and Society 5.0, partnerships in the Asia-Pacific region aimed at easing trade tensions, EBPM (evidence-based policy making) and corporate dynamics. Improving the productivity of industries, companies and human capital have also been major research themes, and research findings have been released as discussion papers that are available on RIETI's website.

This edition of RIETI Highlight introduces the main achievements of our research, symposiums and other events that occurred over the past 12 months. All of the content is relevant to the current conditions and immediate issues facing the Japanese and world economies, and should therefore help you deepen your understanding of these matters.

In FY2016, RIETI entered a new four-year medium-term plan. Under the plan, we employ the mid- and long-term economic and industrial policy perspectives of “cultivating Japan’s strength in the world economy,” “making Japan into an innovative nation,” and “overcoming population decline.” These are our key goals in our continued missions to engage in theoretical and empirical research that contributes to the formulation of economic and industrial policies, and in providing evidence-based policy recommendations in the fields of international economy, regional economy, labor economy, productivity and innovation. At the same time, we are committed to actively sharing the outcomes of such research activities in a timely fashion through symposiums and seminars. Your continued support is sincerely appreciated.



中島 厚志

Atsushi Nakajima

Chairman, RIETI

About RIETI

The Research Institute of Economy, Trade and Industry (RIETI) is a policy think tank established in 2001. Our mission is to conduct theoretical and empirical research, to maximize synergies with those engaged in policymaking, and to make policy proposals based on evidence derived from such research activities. RIETI has developed an excellent reputation both in Japan and abroad for its work in these areas.

RIETI Has Joined Think 20 (T20)



T20 kick-off
meeting held on
December 4, 2018

Japan will be hosting the next G20 meeting in Osaka in June, 2019. Taking advantage of this opportunity, RIETI will contribute to the G20 in the form of timely policy recommendations from the T20, one of the engagement groups of the G20 meeting. Specifically, until the T20 Summit in May, 2019, RIETI will be leading the Taskforces on Trade and Investment and SMEs, where RIETI can utilize its particular knowledge and expertise.

<https://t20japan.org>

Nobel Laureate Richard Thaler in Japan

In October 2018, the Nobel Prize-winning economist and authority on behavioral economics, Professor Richard Thaler of The University of Chicago Booth School of Business participated in a meeting at METI. Makoto Yano, the president and CRO of RIETI, who is an old friend of Professor Thaler since his time at graduate school in the U.S., also joined the meeting to exchange views on the possibility of applying knowledge of behavioral economics (e.g. nudge theory) to the social security system in Japan to increase employment among elderly people.



Professor Richard Thaler (left)
and Makoto Yano, the president
and CRO of RIETI (right).

Blockchain and Society 5.0

The Creation of a New Marketplace based on Distributed Consensus

Date: October 19, 2018
Venue: RIETI's seminar room

The Japanese government is aiming to realize Society 5.0, “a human-centered society that integrates cyberspace and physical space.” To realize such a society, the creation of “a human-friendly interface” connecting the two spaces will be indispensable. To this end, blockchain (a decentralized ledger) is expected to play a major role. Blockchain is a groundbreaking technology which enables the creation of records (ledgers) on the internet that cannot be falsified or copied and that are not centrally controlled. Blockchain has been making tremendous advances as a basic technology for building new industries on the internet. In this Special Seminar, we invited Chris Dai, CEO of LONGHASH Japan, to discuss with Makoto Yano, the president and CRO of RIETI, how to ensure the sound development of new industries.

Opening Speech

Atsushi Nakajima (Chairman, RIETI)

The Japanese government is promoting the policy of creating Society 5.0, embracing such elements as artificial intelligence (AI), the internet of things (IoT) and big data. In creating such a society, the crucial question is how we should handle the massive volumes of data. Many issues need to be addressed. Can data including personal information be handled safely? Can such data be utilized successfully in the first place?

Meanwhile, much attention has been focused on the use of blockchain technology in virtual currencies. Expectations are high for the possibility of creating Society 5.0, and the new industries and the new society envisioned by Society 5.0, through the use of this technology.



Today, we have welcomed experts to explain what exactly blockchain is and to share with us the concepts and perspectives which could provide hints for the utilization of blockchain technology.

Lecture 1: Blockchain and the IoT

Makoto Yano

(President and CRO, RIETI)

Japan is advocating Society 5.0 as a plan to integrate cyberspace and physical space. In specific terms, thoughts developed by humans in physical space are digitalized and accumulate in cyberspace, which are then used to create new value. Such developments are not limited to Japan but are beginning to appear around the world.

The purpose of Society 5.0 is to realize a pleasant, active and high-quality way of life. However, merely waiting for it will not ensure that such a society will come into existence. So then, what are we to do?

I believe that a market perspective is essential for the realization of Society 5.0. In other words, we need to improve the interface of market structures that connect physical space with cyberspace.

Recently, there have been heated discussions on the possibility of technology overtaking human knowledge, especially regarding AI and the singularity. The U.K. periodical, *The Economist*, ran an article titled, “How to tame the tech titans” with an illustration of “tech titans” attacking a city. Unless we address such issues, Society 5.0 will probably never come to pass.

Obstacles to the utilization of big data

The utilization of big data will become crucial to the realization of Society 5.0, which, in turn, will give rise to such concerns as information leaks when sharing data and the manipulation of information through data analysis.

A typical example is the mishandling of Facebook data by Cambridge Analytica lead by Steve Bannon. Cambridge Analytica, a political consulting firm that uses methods that combine data mining and data analysis, is said to have successfully created psychological profiles of 230 million Americans out of a total population of 325.7 million. Cambridge Analytica has become the center of controversy, as it is believed to have influenced the U.S. Presidential election and the outcome of the Brexit referendum.

The methods used by Cambridge Analytica were originally developed by the researchers at Cambridge University. The method involved conducting a psychological test online in which the user’s openness, conscience, social interactions, sense of collaboration and nervous tendencies, among others, were scored. At the end of the test, the site asked the user to provide information on their Facebook friends. To this request, nearly 40% of the respondents consented to provide information. In this way, Cambridge Analytica is thought to have collected volumes of data on Facebook users, analyzed the correlation of “likes” data of millions of users and conducted campaigns based on manipulating information.



Designing an awareness-shaping method based on data

Is it really possible to conduct such psychological manipulations? I would like to introduce a case study that has recently been reported by RIETI. A randomly-assigned cohort group was randomly divided into two groups, and each group was asked to read different articles. One article described how the Islamic State was infiltrating refugee camps with terrorists and sending them over to western countries; while the other article was titled “How many people have been killed by refugees in the U.S? None.” Interestingly, the second article hardly had any influence on the readers, whereas the first article moved the people reading it toward opposing the acceptance of refugees. In other words, it was scientifically proven that people were more impacted by negative articles than by positive articles.

Many similar research projects have been conducted in recent years, and as a result, we now know that we can manipulate the recipients’ behavior by being selective about the messages that we send them. This is a particularly effective method in influencing elections, and in fact, it is believed that Cambridge Analytica used this method to influence Brexit and Trump becoming President. There has been increasing concern worldwide over the use of such behavioral manipulation based on data.

Mandatory sharing of data

The aforementioned article in *The Economist* warns, “The dominance of Google, Facebook and Amazon is bad for consumers and competition.” As solutions, the article suggests granting ownership of information to individuals and making data-sharing by companies mandatory. However, these solutions are easier said than done.

As an economist, I believe that utilization of market mechanisms will become essential in addressing this issue. An important factor is the ownership of data. For example, there is the question of whether the information which is automatically accumulated by Google, belongs to Google. Furthermore, we must also think about the trading of data.

Data acquisition will eventually require micropayments and virtual currencies. These two points will become the two main issues, but today, due to time restrictions, we will focus on the ownership of data.

The theory of market quality

In my view, market quality declines as a result of industrial revolutions. And such deterioration of market quality has led to economic crises in the past. Typical examples are the exploitation of factory workers in the First Industrial Revolution; and the Great Depression beginning with information manipulation and the alienation that was a result of the automation in the Second Industrial Revolution. Today, nearly a century later, with the advent of the Third Industrial Revolution, problems including the financial crisis, data monopoly and singularity due to AI have emerged. Despite the growing scale of the problem, the substance remains the same, and the issues of ownership and trading methods continue to be discussed. Mankind has addressed these issues by establishing various laws including labor laws, anti-monopoly laws and securities laws. What we will need going forward are new data ownership and currency systems.

New data ownership system and blockchain

Once ownership has been set, the market will be formed (Coase Theorem). We will need to think about the type of environment that will need to be created in order to form a high-quality market.

Currently, a system is developing whereby a large variety of information is collected through the IoT and various analyses are being conducted using big data. One of the most crucial issues is the necessity for decentralized ownership

of the big data from IoT. In other words, the party who is the source of or who generates the data should own the data rather than the party who collects the data.

One of the reasons why it is so difficult to assign ownership to data is that standalone data points are not particularly valuable. For example, information on what kind of fertilizer was used to grow agricultural produce, what kind of tasks were executed at what timing—such information per se would not be so significant. However, if such information were to cover the entire country, it would become extremely useful for farmers who plan to grow the same produce. In many cases, this type of data on economic activities only acquires value once a certain volume of data has been gathered. Consequently, if a price is assigned to data from 100 people, then a system must be established to distribute that amount to the 100 people.

I believe that we will be able to solve this issue through blockchain technology (decentralized ledgers). The type of ledger that is required for the various markets must be discussed carefully. First of all, we need to build a clear consensus on the ownership of data, and also study the platform for the decentralized ownership of data. In addition, there is a multitude of issues that need to be addressed, including the establishment of a new method to calculate dispersion, building a contact point between the currency system developed for micropayment to purchase IoT big data and virtual currencies, and the transitioning from speculation opportunity to investment opportunity.

If we manage to build a new platform in the next few years by solving these issues, Japan will be able to lead the world in designing an economic model.

Lecture 2: Achieving Society 5.0 through blockchain

Chris Dai
(CEO, LONGHASH Japan)

Germany has a similar plan, which is referred to as “Industrie 4.0.” From a purely industrial revolution-oriented perspective, it focuses on maximizing economic value. I find it very interesting that Japan’s Society 5.0, on the other hand, rather than emphasizing industry, focuses on the individual and the individual’s happiness which lies beyond industry. Today, I would like to talk about the kind of changes that will need to take place and in which markets, in order to realize Society 5.0.

The major difference between Society 5.0 and the former Society 4.0 (information society) is that while under society



4.0, the internet was connected specifically to “computers,” under the society 5.0 paradigm, most modern devices will connect to the internet and each other, automatically sharing data and interacting, meaning that all the “things” that

people interact with at home and at work and production and use will be interactive in unprecedented ways. Therefore, all information will need to be consolidated as big data beyond the confines of individual servers and AI will need to provide suggestions in real time. To this end ubiquitous data will be essential.

Data silos in existing business environments

Various data silos have developed in the existing business environment. Lawson, Inc. utilized customer data from the Ponta card of its 65.31 million members to successfully develop a new beer product. Softbank, based on its 300 million per month location and connection data points, identified areas with bad connections and improved its connection environment. Honda Motor Co., Ltd. analyzed the driving data of the car navigation systems in its cars and proposed routes to avoid traffic congestion. Furthermore, Rakuten utilizes the consumer behavior analysis data from the Rakuten IDs of its 97 million members in distributing its advertisements.

In this way, entities have already begun gathering and utilizing big data. However, the problem lies in the fact that such data is not being shared across entities. It is a fact that gaining certain information such as marathon routes in specific regions and pedestrian data for small retailers is difficult and micropayment for such data is not being utilized. Unless these issues are resolved, the realization of Society 5.0 will remain highly challenging.

The overconcentration of such data among giant corporations including Facebook, Google and Amazon has become increasingly evident. Capitalism is at work here, as evidenced by the tendency among these entities to try to enhance their respective values by monopolizing information instead of sharing it. However, such corporate behavior has harmful effects. Data being monopolized by a single entity could inhibit innovation and lead to unauthorized use of our data, while our privacy and freedom of speech could also be sacrificed in the pursuit of maximized revenues.

Reasons why data is concentrated in giant corporations

Why does data become concentrated in these giant corporations? There are two main reasons. One is the centralized nature of the internet platform. In the current state of the internet, an individual cannot definitively authenticate their own identity and thus protecting the consistency and the safety of data is dependent on centralized control. On the other hand, in our capitalist society, it is logical and inevitable that entities that own large amounts of data would utilize it to enhance their own value.

The other reason is the low fluidity of data. Since data acts as a barrier to entry for other entities, data is rarely sold to another company. As a result, we are seeing a phenomenon

in which the value of data for society as a whole is not maximized. Nevertheless, the tenets of capitalism also dictate that entities focus on maximizing their own profits. As a result, data gathered by SMEs fails to scale and data ends up being over-concentrated in the giant corporations which have an abundance of capital.

Entities that believe data is a barrier to entry only enter markets that will maximize their own profits and never address social problems. This is the reason why, I believe, the utilization of blockchain technology will be particularly effective. A blockchain is capable of building a marketplace that reflects the values of each market participant, as well as the opinions of the centralized giant corporations.

The marketplace built with blockchain

The first task is to separate the data collectors from the data users, which can prevent data monopolies, and then make data accessible to many people (democratization of data). As put forward in the Coase Theorem, in areas with high transaction costs, there is a stronger tendency to keep transactions internal—within the corporation. Data collection and utilization illustrate this point. Therefore, I believe that if we were to utilize blockchain in data transactions and lower costs through micropayments, we should no longer be dependent on giant corporations for data collection and this would also raise the fluidity of data. As a result, the profitability of each data source would be assured at a low cost.

At the same time, by allowing universal access to data, we can expect more data analysis and utilization and greater diversification of the people who benefit from the data. This, in turn, should also lead to an increase in the services that utilize data. In such cases, it is essential that blockchain is used in data sharing including sharing between individuals who are the source of the data, rather than simply as an information bank for the sharing of data among firms.

Using blockchain to overcome data issues

Issues arising from data sharing include data security, ownership and data mobility, business partner risk, incentives for consumer participation, the lack of use cases and subsequent high costs, silo systems, and the lack of in-house expert knowledge. Blockchain has four characteristics that provide solutions to these issues. The first is its decentralized management model.

This model ensures that no individual or single entity will control the business eco-system and at the same time minimizes the threat of misuse due to the inherent transparency across all transactions. Furthermore, decentralized resources and services may be utilized in providing various services. For consumers, it will provide an incentive to capitalize on their own purchasing data.

The second is the sharing of open-source analysis

technology. By capturing the expertise of the open-source community and engineers from around the world, open data will provide analytical models dedicated to the analysis of purchasing data developed by professionals and at low cost to small and medium-sized operations without analytical capabilities.

Third, blockchains can provide safe encryption technology. The business eco-system surrounding blockchains is known to be extremely resistant to attacks and thus data will be securely protected, as required, and anonymity will be ensured. The ownership of data will be determined simply in a decentralized manner and reinforced through blockchain technology.

And finally, blockchain is a segmented resource. Blockchain encourages the release of unutilized resources, while at the same time separating the retention and processing of data, each time a payment is made.

Examples of the uses of blockchain technology

I would like to introduce “RECIKA,” an ongoing project that promotes the liberalization of purchasing information. Presenting ongoing research would normally be avoided out of concerns over whether the research will be copied or stolen; however, this project is free from such concerns because it utilizes blockchain technology and is in an open

platform format which allows everyone to access it.

This is a three-tiered project. In the technical, blockchain level, data is written; data use records are written; and token (point) remittance/exchange records are created in a decentralized manner to eliminate the possibility of falsification. On the application level, separate entities are developing their own apps, as required. The entities, then, share common data and acquire resources through transactions involving tokens and data. While this system may seem similar to the Android and iPhone app formats, the data sharing function across apps make this completely different. On the user level, the user may upload or download data using the app and engage in token transactions accordingly.

Finally, in order to realize Society 5.0, we will need to build infrastructures that will allow for the free utilization of data. To make this possible, democratization of data is essential and blockchain is a critical technology for ensuring the integrity of the system as a whole.



Demand for Automated Driving Technology



Shunsuke Managi Faculty Fellow, RIETI

In Japan, as in many other countries, manufacturers are testing automated driving technology, and policymakers are considering how to implement it. This column discusses the demand for the technology in Japan using a survey of consumers. Almost half intended to purchase automated vehicles or driving systems, but willingness to pay was below the likely additional cost.

Artificial intelligence (AI) has advanced exponentially in recent years. Many machines that consumers use daily now contain AI technology. It is also used in automotive industries to develop fully automated vehicles (FAVs), cars that people can use without having to drive.

In many countries, automated driving technology has already been tested or used in public transportation systems and on highways. In Japan, companies such as Toyota and Nissan have tested their automated driving technologies on freeways and local roads. The Japanese government plans to introduce FAVs on selected roads by 2020, and it is likely that drivers will begin to see FAVs on ordinary roads sooner than expected (Managi 2018).

Automated driving offers many benefits, including the reduction of both accidents and traffic congestion.

For example, 96% of traffic accidents on freeways in Japan are due to human errors (mishandling, carelessness, and misjudgments by drivers). It is expected that automated driving technology will eliminate these accidents. Furthermore, almost 40% of Japanese drivers are elderly, and their mishandling of vehicles frequently causes fatal accidents.

Financial loss from traffic congestion in Japan is estimated at approximately \$10.4 billion. FAVs are expected to contribute significantly to reductions in road congestion.

A study by Payre et al. (2014) is one of the few to have examined the factors affecting perceptions of automated driving technology. It found that consumers who owned cars with driving assistance systems, such as adaptive cruise control or a lane keeping system, were more likely to be positive about purchasing FAVs.

Purchase intention for automated driving

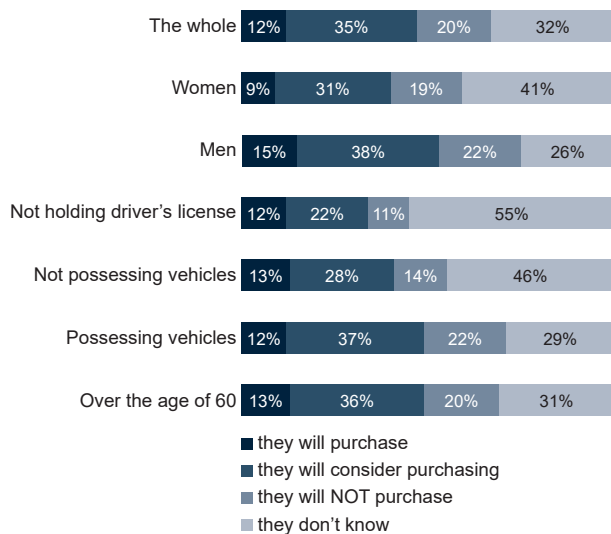
As automated driving technology advances rapidly and receives more media coverage, consumers are increasingly exposed to this new technology and develop expectations. Policymakers are assisting with the investment in both hard and soft technologies related to automated driving. They are also preparing for the full introduction of FAVs in the consumer market and on public roads by debating optimal regulatory policies. Nonetheless, as with any technology, understanding consumer demand and perception is essential to predicting the near-future market and to grasping the barriers to the introduction of fully automated driving systems (FADs) as common consumer goods.

Our study (Shin and Managi 2017) used an original individual survey that received 246,642 responses. On average, respondents anticipated that FAVs would be available for purchase in approximately 13 years. **Figure 1** shows that approximately 12% of respondents answered that they would purchase FAVs or FADs, and 35% of respondents answered that they would consider purchasing.

A near-majority of respondents were inclined to purchase FAVs or FADs, but approximately 20% of respondents answered that they would not purchase these technologies, and 32% of respondents answered that they did not know whether they would purchase. One of the reasons for this large agnostic group may be lack of interest and information about AD technology.

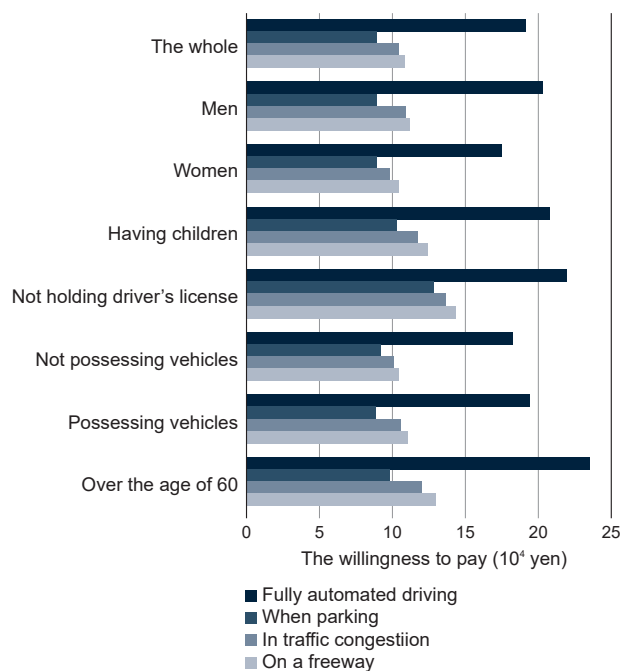
Men were more inclined to purchase, but the intention to

Figure 1. Purchase Intention for Fully Automated Driving Systems by Consumer Characteristics



[Source: Shin and Managi (2017).]

Figure 2. Willingness to Pay for FADs by Consumer Characteristics



[Source: Shin and Managi (2017).]

purchase did not significantly vary with age. Respondents who did not own a car or did not have a driving license had lower purchase intention than car owners, but more often responded that they did not know their purchase intention.

Figure 2 shows the result of willingness to pay for FADs by consumer characteristics.

While respondents without a driving license had a lower intention to purchase, they would be willing to pay more for FADs. This implies that respondents without a license were polarized: either they were uninterested in technology and unwilling to pay for it, or very interested in purchasing FADs and willing to pay much more than average drivers.

Men had a higher willingness to pay than women but, in contrast, to the purchase intention results, the willingness to pay of older respondents was significantly higher than average. This result may be partly due to this group's expectations of the benefits of AD technology, and their relatively high household incomes.

How much to buy?

Our survey data indicated that the majority of consumers expected to use automated driving technology on freeways and general roads. According to the survey data, willingness to pay for FADs as an additional function was approximately 190,000 yen (\$1,650).

We found a strong positive correlation between the intention to purchase and willingness to pay. The respondents who would purchase FADs when available had an average willingness to pay of 285,000 yen (\$2,480), and

respondents who would consider purchasing would pay 225,000 yen (\$1,960) on average. On the other hand, the willingness to pay of respondents who would not purchase FADs was 134,000 yen (\$1,165). Thus, consumers with the strongest purchase intention had a willingness to pay twice that of consumers with no interest in purchasing FADs.

Given the price of partial and fully automated driving vehicles, BCG (2015) estimated prices for partial automated driving vehicles and FADs at approximately \$2,000–\$5,700 and approximately \$9,800, respectively. So there is still a significant gap between the willingness to pay of consumers, and the forecasts of the prices they would pay.

The major merits of FADs are eliminating concerns of the elderly, automatic destination arrival and parking, reducing the burden of driving, and a reduction in traffic accidents. Therefore merits can be classified into three categories:

- reducing the burden of driving,
- getting in and out of the car at designated locations and automatic parking,
- not needing a driving license.

On the other hand, accidents due to malfunctions, unclear responsibility for accidents, and initial costs and maintenance costs are the majority demerits of FADs. These demerits can be classified into the following three categories:

- anxieties about the unfamiliarity of automated driving,
- leakage of information,
- restrictions on car availability.

Elderly people seemed to be highly interested in FADs—they selected more merit and demerit options than other groups.

Our results indicated that merits mainly affected

acceptability positively, and demerits mainly affected acceptability negatively. Considering that people who did not have cars or licenses were more willing to accept automated driving than people who did, we anticipate the expansion of usage will be for people without cars.

We also found that municipality-level variables such as average tax income, share of elderly people, and average ratings of municipal services, as well as average life satisfaction ratings, did not affect consumer demand for FADs. There were significant effects on both individual analysis and regional analysis related to traffic accidents. Furthermore, it is clear that inner-city areas, particularly in Tokyo, had a higher acceptability of automated driving technology than other areas.

In future studies, finding out more about several issues would further our understanding of consumer demand for automated driving technology:

- closing the gap between the price that firms expect and the price that consumers are willing to pay,
- addressing the issue of possible technical malfunction,
- information security.

The first problem may be resolved through subsidies either to the industry or to consumers, and also by the advent of inventions to reduce production costs. To solve the second and third issues, investment in technological development would be useful. Sharing information about technological advancements and the merits of automated driving technology with consumers may also be effective.

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The author's most recent book provides further insight into this critical topic.

The Economics of Artificial Intelligence: How our lives, our work and our society will change



Written and Edited by
Shunsuke Managi

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What's Next for Healthcare IT?

Date: October 10, 2018

Speaker:

John D. Halamka

International Healthcare Innovation Professor at Harvard Medical School, Chief Information Officer of the Beth Israel Deaconess Health System, and a Practicing Emergency Physician.

Moderator:

Kazumi Nishikawa

Director, Healthcare Industries Division, Commerce and Service Industry Policy Group, Commerce and Information Policy Bureau, METI.

As healthcare reimbursement moves from a fee for service (pay for quantity) to a value-based (pay for quality) system, the IT tools for patients and providers will need to change. The cloud, mobile apps, artificial intelligence (AI), the internet of things (IoT), and telecare will all become increasingly important.

We invited Dr. John D. Halamka, the foremost expert in U.S. healthcare IT, to lecture on the future of the healthcare system.

What are some requirements for healthcare ICT?

There are many countries, not only Japan, facing an aging society. Elderly people need new tools as they age. The aging societies are going to need caregivers that may or may not be members of the family, that support people as they age. There may be technologies in the home which could help people instead of in-home caregivers or living in a nursing home. In most countries, families do not have the tools they need to coordinate care. For example, in China, there are no general practitioners. The people decide what kind of care they need. Then, they visit the specialist that they think could help their condition. They are misdirected to a doctor and hospital that are not appropriate for their condition, because they do not have the electronic tools that help them get the appropriate care.

In Obamacare, there were hundreds of support people outlining the goals for digital health. So, it was decided to impose all of those goals at the same time on every doctor. As a result, doctors had a very short amount of time to see a patient, make decisions, and enter data from that visit into

a computer. This is not an effective method of healthcare, and doctors in the U.S. are not happy with their digital tools because they spend more time with their computers, not with the patients or their families. The point is as countries change regulation, too much of a burden should not be imposed on doctors and healthcare professionals.

In many countries, there may be advanced systems within hospitals, however, they lack ICT abilities. Also, every country has the problem of variation in quality. Our base requirements are safety, quality, total medical expense, and data gathering for many purposes.

How are countries solving this problem?

China

In China, every hospital has a different ICT system. Countries like China are in need of a country-wide single national data set that everyone can agree is good enough to meet the aforementioned requirements. The government can measure quality; industry can innovate with machine learning; academia can study variations in quality, etc. Over

the next year in China, the idea of a common data set will be tested in Shanghai for one million patients. An interesting thing about China is they have no privacy laws related to data.

New Zealand

New Zealand has solved the problem by creating a system with only one electronic health record for their population of five million people.

Europe: UK and Nordic countries

In Europe, the UK has advanced ICT in doctors' offices, but poor ICT in hospitals. Many hospitals are still using paper records. So, effort has been spent to work on hospital automation. The issue is the doctors do not have engineering skills to successfully work with the automation. Scotland's plan was to build a common database. The Nordic countries have unique policy because the medical care is provided by the government, and the citizens believe it is their role as patients in society to share their data because society is keeping them healthy. They accept sharing data to improve quality and/or research.

India

India has created four government services that help with innovation. The first is a national identity management platform. India has established one digital identity, biometric based, that can be used to track healthcare and other social system data. India has also created a national consent platform which can be used for healthcare and data sharing on Facebook or another platform. In addition, India has created a national pay infrastructure. Finally, India created a cloud-hosted mechanism to store data. Health records could be put into the cloud which would be available for doctors to review. Sets of policies like these make it much easier for

industry to innovate because the government has already solved the most difficult issues.

Israel

In Israel, there is a huge amount of innovation. The largest medical center in Israel has created a health innovation center. The first two floors are startup companies and the third floor is for sponsors of those startups. The sponsors fund the startups, but they also get a first look at the startups' technologies and innovations. The fourth floor is for talented IT professionals. Startups can buy these professionals' time, almost like renting office space or a vehicle. The fifth floor is a laboratory for demonstrating technology to customers. The sixth floor is administrative. The idea is that more innovation can occur in this facility because all the necessary elements are conveniently on site.

Africa

Africa has a different set of challenges than the rest of the world. In Africa, technological development has been impeded due to very slow internet speeds. Unreliable power infrastructure and inability to share data are major obstacles to progress. GSM cell phones and SMS are used in order to share data; very simple technologies are used to send information to patients.

U.S.

Every society has a different set of problems and cultural challenges which have to be addressed in the context of the requirements of the society. It is very important that there are societal goals that countries try to achieve. The four societal goals for the U.S. should be as follows. The first goal is to alleviate opioid abuse; technology is going to track every prescription of every painkiller for every patient throughout the entire country. Another goal is to create better ways for doctors to communicate with each other. As patients go from doctor to doctor, the data should follow them and their care should be coordinated between doctors and facilities. This would improve quality and reduce cost. The next goal would be for patients to receive data themselves. The last goal is public health; making sure we have the right databases in the government and industry monitoring population and public health.

The U.S. replaced an Obama-era program with the Promoting Interoperability Program which has fewer measures and objectives. Hospitals will be evaluated by a point system based on their performance. If they fall below the necessary level to "pass," then they lose 3% of their pay. So, it acts as a motivator to complete these projects. The objectives include e-prescribing, health information exchange which requires supporting electronic referral loops by sending and/or receiving health information, providing patients electronic access to their health information, and public health and clinical data exchange which involves



choosing from a selection of types of reporting. Providing patients electronic access to their health information provides the largest amount of points in the program.

Emerging trends

There is increasing movement towards cloud-based medical records and cloud services. The U.S. now has about five major electronic health record vendors which provide some kind of cloud service. Each country has different laws around data, healthcare, and the cloud, but the policies in the U.S. completely allow the use of the cloud for healthcare. So, much infrastructure is moving to the cloud, for example the Amazon cloud, because it is cheaper than a small company hosting it themselves, and Amazon has an army of employees working behind the technology which is better than the human resources of a small company.

Many societies are embracing mobile and the IoT. In an aging society, these are the kinds of things care givers could utilize in order to monitor their care receivers.

Google, Amazon, and Microsoft have shown that there are great applications for machine learning. However, caution must be taken because machine learning is not going to replace your doctor. Machine learning is going to help a doctor treat patients better, not replace them. For example, in the U.S., there is a cloud service available to dentists who can use it to detect cavities in x-rays of patients' teeth. So, the dentists still give care, but they use a new tool to better deliver that care.

Telemedicine and telecare could become the future, by providing care to people in their homes and on their phones. In a society like Japan with mountainous and rural areas, elderly people and fewer people being born, there are not enough doctors. So the idea of telemedicine and telecare will be increasingly important.

In the U.S., there is a blockchain frenzy. Blockchain technology could be utilized to build trust to show that data has not been changed and that the data is complete and accurate. This was shown when, in South Africa where there is no trust in the government due to corruption, blockchain technology was used that shows the users that the government has not changed their data.

How will healthcare across the world be delivered differently in aging societies?

An example is a woman with a thyroid issue that uses an app to help her communicate the signs and symptoms to her primary care doctor. They suspected a thyroid problem, and then ordered a blood test—all without a visit to the doctor's office. The blood test showed that in fact there was a thyroid problem.

Another example is a person with hypertension who uses



an IoT blood pressure cuff in their home to send data to their doctor. From there, the patient could complete a diagnosis and be prescribed accurate medication.

In addition to those examples, big data analytics could be used to create a treatment plan personalized to each person.

Patient and provider mobile apps, wearables and IoT

With apps, patients can be told about their daily self-care plans. They can be reminded to get exercise, take medication, eat the recommended diet, etc. Healthcare devices such as scales, blood pressure cuffs, etc., are quite affordable, and there are no longer barriers to avoiding hospitalization by providing a patient with such devices.

Machine learning projects

The things that are working quite well are figuring out how long we need to schedule the operating room procedure, how long you should stay in the hospital, figuring out who needs an ICU bed, figuring out who will go to their appointment or not—all based on data from millions of patients. Beneficial future machine learning projects include predicting the probability that a patient will be re-admitted within 30 days, reducing the amount of re-admitted patients, minimizing the overall length of stay at a hospital by studying the interactions between different departments, and applying methods in the area of personalized medicine for particular diseases.

A challenge for Japan would be if, through policy, you are able to aggregate the data on 125 million people, you could lead the world in machine learning because it is only as good as the data you train your algorithms with. Japan, being an advanced society with good technology, with the right policies, absolutely could lead the world.

Q&A

Q1. Has the American government become reluctant to give new approvals for AI?**Halamka**

The person who wrote all of the current Food and Drug Administration (FDA) regulations is a friend of mine. He thinks that the FDA is concerned about risk. They want to minimize risk of AI systems. In my examples, AI can figure out that a person needs X amount of hours in the operating room, but if it is wrong, who cares, we will just keep the person in the operating room longer. On the other hand, if an AI system is being used to make a diagnosis and it is wrong, the patient could die. What is very important at this stage of technology is that AI helps a doctor with decision making but does not make a change in therapy or treatment. It should advise a human and the human can decide to believe it or not. That is where the FDA has drawn the line. Currently coming out of the FDA, if it is just general technologies that help with decision support and the human makes the ultimate decision, then it is okay. However, if, for example, an ICU ventilator is changed by an AI system, that is very high risk. That is where the FDA is not ready to approve such a thing. Consider the Apple Watch, it is not approved; it is cleared, but not approved. In the formal Apple Watch FDA statement, the Apple Watch should be used along with other technologies only as a data point which a human can decide if it is useful or not.

Q2. How do you see the relationship changing between hospitals and businesses? Do you think the current data privacy rules and anti-kickback rules along with Health Insurance Portability and Accountability Act (HIPAA) are ready for this changing relationship?**Halamka**

In the U.S. and possibly across the world, there are innovation centers. Many innovation centers fail because they are run outside of the hospital. Hospitals need is to understand the problems to be solved and provide the data that is necessary for machine learning or other techniques. I run a center at Harvard which is a hospital-based innovation center using hospital data to solve hospital problems. I bring industry, from Google and Amazon, inside the hospital. About HIPAA, I have made them hospital employees. They are Google and Amazon employees, but they work for me inside the hospital, so I train them on HIPAA, and they have to abide by hospital policies. They are treated like one of us instead of an outsider and that has got around this problem. It

is vital that hospitals lead the way.

Q3. Who is going to pay for the services you mentioned today? What is the business model? Can patients and families get inexpensive services?**Halamka**

In the U.S., the patient will never pay for anything. Since 1945, the insurance system in the U.S. has been funded through the employer. Americans believe that insurance should pay for medical bills, not themselves. Sometimes the entrepreneur claims that the patient will pay for services. So, how does this get funded? The reimbursement method is value-based purchasing. Under this scheme, it is much cheaper to provide inexpensive pieces of equipment, such as a bathroom scale, in order to keep people out of expensive hospitalizations. In effect, it is realigning incentives. Hospitals would have never bought equipment for patients, but today they are. Hospitals are doing so because they get an allowance for people per year. If they do not spend that allowance on expensive hospital treatments for the people, then they can keep the money. So, hospitals are taking preventative measures to keep people healthy, which are cheaper than hospitalizations, and they can keep the remainder of the allowances.

Q4. If patients are forced to get electronic prescriptions in Japan, some would not like it since they do not want any history because they want more medicine, and they would have to pay additional points. How does that system work in the U.S.A.?**Halamka**

In 1984, everything was handwritten on paper and there was no data tracking. We changed regulation to require it. We had no choice. For example, today, if you walk into a pharmacy with a piece of paper, they will not give you the medication. The only way to improve quality, safety, and reduce cost was to require the use of electronic prescribing.

Q4. Patients do not have any choices?**Halamka**

They do not. For example, could a patient drive to Canada and buy a medication from a pharmacy in Canada? Possibly. In the U.S., unless doctors use electronic prescriptions, there will be penalties and their reimbursement will go down. We are not offering two kinds of care; paper and electronic.

Note: Titles and affiliations are as of the day of the event.

The Impact of Information Technologies Such as Artificial Intelligence on Worker Stress

Isamu Yamamoto Faculty Fellow, RIETI



The development and diffusion of new information technologies such as artificial intelligence (AI) continue apace, but how are these factors likely to change work styles and worker well-being? More than a few observers take the view that AI will deprive workers of their employment and constitute a threat to them. However, new information technologies such as AI might affect not simply employment and wages, but also the way workers approach their work, and could influence aspects of their well-being, such as job satisfaction, stress, and health, in a variety of ways.

Relationship between technological innovation, employment and wages

Ever since the Industrial Revolution, economists have raised the possibility of “technological unemployment,” in which employment is lost as a result of technological innovation. In addition, from the 1980s onward, findings of much research by labor economists have shown that the emergence of “skill-biased technological change,” the benefits of which accrue only to highly skilled workers, causes an increase in wage disparity. In recent years, there have been forecasts that new information technologies such as AI will deprive many of

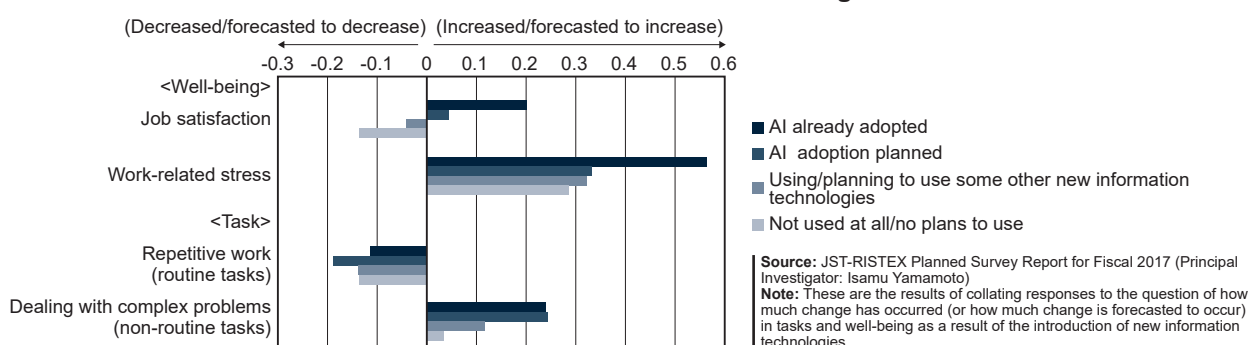
their work, and concerns that this will result in even more serious wage disparities have frequently been expressed.

However, the effects of technological innovation are not limited to employment, unemployment and wages, but a wider range of issues, for example, on the content of tasks in which workers are engaged, on the workplace environment, and on job satisfaction, stress and health. Since the range of tasks to which new information technologies can be applied is extraordinarily broad, there should be both positive and negative effects occurring in multiple directions.

Increased job satisfaction and stress caused by the diffusion of new information technologies

In the project of the Research Institute of Science and Technology for Society (RISTEX) of the Japan Science and Technology Agency, we implemented an original survey of approximately 10,000 workers, and analyzed the impact of new information technologies on approaches to work and on well-being. One interesting outcome of this analysis is that, as shown in the **Figure 1**, the more advanced the stage of adoption for new information technologies such as AI, the

Figure 1. Changes in Well-Being and Tasks as a Result of the Introduction of New Information Technologies (Subjective Impact)



larger is the increase in worker job satisfaction. Conversely, there is a tendency for work-related stress to also increase.

Increasing task complexity

It is likely that this is related to changes in the content of tasks in which workers are engaged. Because, as shown in the **Figure 1**, the more advanced the stage of adoption for information technologies, the greater is the shift in the nature of tasks performed by the worker from highly repetitive routine tasks to non-routine tasks that require complex problems to be resolved. This suggests that when AI technologies are adopted, there is a tendency for workers to move away from tasks that can be accomplished by such technologies, and instead use the time thus freed up to concentrate on more complex tasks that can only be performed by humans.

We interpret this as meaning that many of those workers who have experienced the introduction of new information technologies feel work-related stress as a consequence of increasing task complexity. At the same time, the more complex the work, the greater is the sense of satisfaction when it is accomplished, resulting in a rising trend for job satisfaction.

As shown in the figure, the influence of AI technologies on well-being and approaches to work is complex, it is important to conduct more analyses on the changes brought about by the emergence and subsequent diffusion of technological innovation.

Job demands-resources model

As shown in the example analysis presented above, the spread of new information technologies may have positive effects, such as an increase in job satisfaction, but it may also cause negative outcomes such as an increase in stress, and arguably it is necessary to find some way of dealing with this issue.

In such situations, the “job demands-resources model” developed in the occupational health studies provides a useful insight. According to this model, the stress on the worker rises as the demands of the job increase, whereas stress decreases when more resources are made available.

In this context, “job demands” includes the number and difficulty of tasks. This corresponds to the introduction of new information technologies, as a consequence of which task difficulty increases, and new skills and knowledge must be acquired to cope. In other words, the increase in stress shown above can be interpreted as an increase in job demands caused by the introduction of new information technologies.

On the other hand, “job resources” incorporates a range of factors, such as the support and leadership of line managers, assistance from and trust relationships with coworkers, and efforts made by human resource management. A variety

of measures and methods to reinforce those resources is theorized to exist at the firm, workplace, individual, and other levels (Shaufeli et alia (2009), Shimazu and Shaufeli (2009)).

“Job resources” mitigate increases in stress

We have also reviewed the nature of the influence of “job resources” on worker stress and mental health in the course of projects at RIETI. For example, in Kuroda and Yamamoto (2018a, 2018b, 2016), and Sato (2015), the panel data used made it clear that factors such as unambiguous work goals, the amount of individual discretion allowed, a low level of unscheduled work, a workplace culture not based on the assumption of long working hours, the volume of communication between line managers and their subordinates, and the level of ability of line managers all led to improvements in the state of worker mental health, even after controlling for wages, continuous years of service, and other individual attributes. Namely, it is precisely these factors that can be interpreted as “job resources.”

Since new information technologies such as AI generate a positive influence on work approach and individual well-being, it would seem reasonable to facilitate the maximum possible enjoyment of such benefits. However, negative side effects such as increases in work-related stress and deterioration in health may also occur. Extracting the maximum benefit from the positive aspects of new information technologies requires that “job resources” be strengthened, and that side effects be minimized.

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Asia's Response to the Trade War



Date: December 6, 2018

Venue: Tekko Executive Lounge & Conference Rooms

As trade disputes between the U.S. and China escalate due to rising protectionism, Japan, Australia and Southeast Asian countries are called to emphasize the importance of a rules-based free trade and investment environment. To respond to this development, RIETI, The Australia-Japan Research Centre at Australian National University (ANU) and The Economic Research Institute for ASEAN and East Asia (ERIA) jointly held a symposium for trade-policy experts in the region to meet and discuss strategies to improve the current international environment.

Opening Remarks



Atsushi Nakajima
Chairman, RIETI

Since the beginning of 2018, trade friction has intensified globally, especially related to the U.S. and China. Currently, the Asia-Pacific benefits greatly from the free trade and investment environment. Japan, Australia and Southeast Asian countries share views on maintaining and enhancing the rules-based free trade and investment environment that

is vital to the world economy; I believe we have entered a phase where we must send a powerful message to promote this value.

Based on this recognition, we have invited Ms. Mari Pangestu, the former Minister of Trade of the Republic of Indonesia, Mr. David Gruen, G20 Sherpa of the Australian Government, RIETI researchers and Ministry of Economy, Trade and Industry (METI) officials to discuss strategic responses to improving the current international environment. This symposium is an official event associated with Think 20 (T20) Japan, which provides policy advice to the G20.

It is a great honor to be holding this symposium at this perfect moment, thanks to the cooperation of various stakeholders. I sincerely hope that the discussion and the speeches will deepen our understanding of what is at stake and help keep the international trade and investment environment open.

Special Remarks



Takehiko Matsuo
Director-General for Trade Policy,
METI

Today, more than a few countries, including the U.S. and China, are implementing trade-restrictive measures. To find a solution to this problem, we need to address the root causes of the current situation.

We believe that one cause is the adoption of market-distortive policies by some countries, which created massive excess production capacity. Another cause which is mentioned by developing countries, is that their many domestic industries have struggled to join the global value chain in vain. The anti-globalization movement currently seen among developed countries is also a testament to the fact that international trade and investment has not benefitted everyone.

We need to make trade and investment more sustainable and inclusive. However, governments cannot provide unlimited support. Thus, an ideal situation is one where businesses can earn profits not just for themselves but also for the benefit of their community and international society. In Japan, there is an old saying among merchants, “Sanpo-yoshi,” which is the idea that a successful ongoing business can be built when all three parties, the seller, the buyer and the community, are satisfied. It is interesting how it fits our policy goals today.

Another method of promoting inclusive economic growth relates to digital trade. The internet and the growth of e-commerce made it easier for businesses in developing countries and small and medium businesses to participate in international trade. However, there are currently no international rules for e-commerce, and the proliferation of different national systems causes market fragmentation, which thwarts the growth of e-commerce.

Some of these issues should be resolved through the World Trade Organization (WTO). However, only a limited number of new rules have been agreed through the WTO framework in the last several decades, and some point out that there is no effective system for monitoring whether WTO rules are being properly implemented. We need to find solutions for individual problems and start implementing whatever solutions we can, as they become possible.

This is another area where it is important to gain correct understanding of the root cause of these problems and find appropriate solutions to them. I have great hopes that this symposium can provide us with meaningful suggestions for further consideration by G20 members.

Special Speech

Responding to the Trade War: An ASEAN perspective



Mari Pangestu
Former Minister of Trade, Republic
of Indonesia / Professor, Faculty
of Economics and Business,
University of Indonesia

The Trade War Landscape

The open and rules-based multilateral trading system has served the world well, especially in East Asia. In the last three decades, this has led to increased competitiveness, increased efficiency of resource allocation and millions being lifted out of poverty. Presently, there are challenges to openness; and protectionism and nationalism are on the rise. Causes include a worldwide increase in inequality, the rise of China and other emerging economies, and technological disruption.

The unaddressed problem of trade-induced inequality has also played a role. However, it is futile to speculate about President Trump's motivations which could be the U.S. trade deficits, or targeting China's non-market behavior, or it could be transactional in nature, simply intending to renegotiate better deals, but we should focus on what Asia should do. This trade war has been mainly with China, and the focus on China is obvious with specific sunset clauses that allow for partners to leave a partnership if other partners wish to deal with non-market entities. Some behaviors that China is being questioned on (such as state-owned enterprises (SOE) or investments) are not yet in the WTO rulebook. That is why reforming the WTO rules has become an issue. Geopolitical factors such as China's expansion of influence further complicate the issue.

Implications for U.S.-China Trade Conflicts

The U.S.-China trade war conflict is still in phase 1 with a current temporary peace clause. Contrary to Trump's argument, tariffs hit not only exporting countries but also U.S. consumers. Some argue that this trade war is only going to subside if it hits the U.S. economy and its consumers. This trade war is beginning to impact trade flows, the growth of trade and investment decisions. The growth projections for the world are being revised downward. It is also affecting small and poorer countries more. There has been a mixed effect on business. Some countries like Brazil are benefiting from diversion of trade, but in many other countries investments have been changed to jump the tariff wall.

What Should Asia's Response Be?

Asia should continue what it can to ensure an open and rules-based trade and investment regime. Simultaneously, it needs to find ways to continue to engage the U.S. and China. To achieve this, a three-pronged approach needs to be followed: (a) unilateral reforms, (b) regional economic integration and (c) upholding the multilateral trading system.

Unilateral reforms are still the key to continued development and increased competitiveness. Southeast Asia should be undertaking such reforms because it is important as part of its development strategy. Furthermore, regional agreements are important for bringing continued market expansion, shaping unilateral reforms and addressing issues not yet being addressed by the WTO. There are different regional pathways for regional economic integration. Deepening and broadening the Association of Southeast Asian Nations (ASEAN) Economic Community (AEC) is crucial. Completion of Regional Comprehensive Economic Partnership (RCEP; 10 ASEAN plus six free trade agreement (FTA) partners) by next year is a priority. The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), which is a more ambitious agreement, could be a potential benchmark for other regional agreements. The role of capacity building in regional cooperation is also important.

Lastly, the grand bargain is a renewed multilateral order. The U.S. has become the main threat after being the main supporter of the world economic order. Therefore, while endeavoring for regional integration, Asia should allow the rules to continue to work. While the recent G20 summit has provided a brief respite from the trade war escalation, the exit plan from this is unclear. Providing answers to the U.S.–China trade issues that are arising in a multilateral framework may be one exit pathway.

Here the window of opportunity is the recognition by the G20 leaders of the need for WTO reforms. Taking a pluralistic approach to the issues may be needed. Hopefully, Japan can play the leadership role that it has shown with CPTPP and in pursuing the RCEP completion, along with the EU and middle powers and small, open, like-minded countries. Finally, after the recent G20 summit, the hope is that the U.S. and China will be willing to engage.

Special Speech

Collective Animosities or Cooperation?



David Gruen

Deputy Secretary (Economic),
Department of the Prime Minister
and Cabinet / G20 Sherpa,
Australian Government

Why Trade Cooperation is Difficult: Some Standard Economic Reasoning?

Some recent tension over trade is a consequence of strong and sustained economic growth in our region. This has led regional economies to compete with more influential industries from advanced countries. In his last published paper, Paul Samuelson reveals that a positive technology shock in an industry in one country can sometimes lead to overall harm to another country that earns income from that industry. However, the positive income effect from the productivity shock in the first country will also raise national income of other countries. Hence, while some advanced country industries have undoubtedly been harmed by a rising Asia-Pacific, a rising Asia-Pacific means more demand for other goods and services from advanced countries.

Rather than an overall fall in national income, trade and technology are more likely to change the income distribution of advanced countries. Given the relative scarcity of factors, more income flows to capital owners and highly skilled workers, while some lower skilled workers' real incomes have stagnated or fallen.

Autor, Hanson and Dorn's paper found that the "China shock" resulted in a long-lived loss of over 2 million U.S. mid-western workers. However, it was silent on the additional jobs Chinese demand and supply created in other parts of the country. Such disruption is likely to continue as technology disrupts trade barriers across borders and Asia-Pacific economies become more sophisticated. However, politically influential opposition to free and open trade is also likely to rise.

Implication of the Economic Transformation of the Asia-Pacific

In free trade, each country has an incentive to shift the cost of maintaining it to others. The U.S. shouldered that burden when it was the world's largest economy, but now the logic of continuing to bear that burden is less compelling.

Small or medium-sized open economies with limited power in global markets, like Australia, benefit from free and open trade. On the contrary, large economies can sometimes

use tariffs to drive down their import prices improving their terms of trade and forcing other countries to pay some of the tariff. As a consequence, smaller countries with little bargaining power are negatively affected and so is the global economy. The fear is that we may move to a system of managed trade replacing open trade. That is why G20 leaders' commitments at the recent summit to improve the rules-based international order and acknowledge the need for WTO reforms are significant.

Some Poor Economic Reasoning behind Current Trade Tensions

Some current trade tensions are also due to poor economic reasoning. First, trade deficits are not a measure of a country's weakness or it being unfairly treated by other countries. The current account deficit implies an economy investing more than its domestic savings can fund. Further, an overall trade deficit cannot be "fixed" by tariffs. Bilateral trade deficits can shrink due to tariffs, but at the expense of higher cost imports from, and increasing bilateral trade deficits with, other countries.

Second, intellectual property (IP) protection potentially stimulates investment by granting monopoly rights to IP owners. However, it can also reduce investment and economic growth by requiring others to pay for using the IP. Finding answers to IP rules that maximize global economic growth requires the help of economists and IP lawyers.

Third, appropriate rules for SOE are complicated. When SOEs are used to subsidize exports, consumers in other countries benefit while other domestic producers can be harmed. Distortions from subsidies risk cascading globally as inefficient industries are allowed to flourish. In fact, the main beneficiary from restricting state-backed subsidies may be the countries providing the subsidies themselves. Similarly, restricting special and differential treatment for developing countries in the WTO is likely to benefit those developing countries themselves. The misconception that keeping tariffs higher for longer is beneficial is causing damage to emerging countries and to the WTO itself.

In conclusion, Australia and Japan share common interests in managing changing national and diverse economic views. Hence, bilateral cooperation between the two countries in support of an open and multilateral trading system may be the key to resolving some of the trade tensions.

Special Speech

Promoting the Rules-based Trade Regime: The role of Japan and East Asia



Fukunari Kimura

Chief Economist, ERIA /
Consulting Fellow, RIETI /
Professor, Faculty of Economics,
Keio University

Problematic Trade Policy by the U.S. Administration

The present U.S. trade policy by the Trump administration is problematic. First, there are re-negotiations of existing FTAs with many suspicious items in the agreement (new U.S.–Korea Free Trade Agreement (KORUS FTA) and U.S.–Mexico–Canada Agreement (USMCA)). Second, trade measures are inconsistent with WTO policy discipline. The tariff war between the U.S. and China is based on Section 301 of the Trade Act of 1974 which imposes material restrictions if counterparts are engaging in unfair trade practices. There is a concern of direct loss from trade shrinkage due to such trade measures. Third, retaliation or rebalancing measures by counterparts also need to be checked for WTO consistency. Possibly both sides are destroying the system of rule-based trade.

The Anachronism of a Tariff War

Japan and the U.S. talked about a bilateral trade balance repeatedly in the 1980s and early 1990s. However, Trump's mindset is still stuck in the 1980s and has not been updated. There are various issues that need to be addressed and factors that need to be taken into account; and a trade war distracts the global community from actually necessary reforms and improvements to international trade systems. Since the 1990s, the second unbundling, characterized by process-led or task-led international division of labor, has dominated, especially in East Asia, as seen in the global nature of current value chains, where it is observed that effects of interruption in value chains are unpredictable and wide-ranging. Moreover, new regulations for the digital economy, which has recently emerged, are critically lacking, and the issues related to the emergence of newly developed economies including China (with subsidies issues, SOE, Intellectual Property Rights (IPR), etc.) should be the issues being addressed instead of engaging in tariff wars.

Japan's Mega FTA Strategy

Since 2013, Japan has started mega-FTA negotiations to

push back against increasing protectionism. CPTPP and Japan–EU Economic Partnership Agreement (EPA) are ground-breaking mega-FTAs for Japan. Both agreements support the second unbundling, particularly the value chain in machinery industries and also represent the starting points for rule-making for the digital economy. They set standards for newly developed and developing economies. This could send a strong message in support of rules-based trading regimes and encourage the U.S. to come back on track.

The CPTPP covers 13% of the world's GDP. Tariff removal in terms of the number of tariff lines is 99–100%, but Japan is at 95% because of agriculture protection, and also incorporates services and investment with the negative listed approach as well as investment state dispute settlement (ISDS), both of which are not included in the Japan–EU EPA. The Japan–EU EPA covers 28% of the world's GDP, with high levels of market access, but does not include ISDS. The EU was concerned about “nontariff barriers” on automobiles and auto parts and government procurements, especially railways. Hence, additional agreements on those portions were completed.

Presently, it is important to bring RCEP to conclusion, particularly to support East Asian production networks.

However, negotiations have been slow. The initial ambition of the China–Japan–South Korea (CJK) FTA was to lead RCEP negotiation in terms of timing and content, but little progress has been made due to difficulties in tariff negotiations.

Negotiation with the U.S.

Japan has been successful in earning time for ratification of CPTPP and the Japan–EU EPA. It has negotiated with the U.S. in the CPTPP, but is trying to minimize the scope of negotiations. Agriculture and automobiles are the major issues. The production cost of automobiles in the U.S. is increasing because of the new North American Free Trade Agreement (new NAFTA, i.e. USMCA), which has not been ratified yet. There are also uncomfortable statements in “new NAFTA (USMCA)” on non-market economies.

In conclusion, the U.S. trade policy seems dangerous in terms of both direct economic damage and in displacing the rule-based trade regime. Meanwhile, Japan is engaging in its mega-FTA strategy as a way to stop rising protectionism. Further, newly developed economies have many trade issues, which must be solved by signing on to international rules rather than by imposing tariffs.

PANEL DISCUSSION

Presentation

How Should We Respond to Trade Wars



Yasuyuki Todo

Faculty Fellow, RIETI / Professor,
Faculty of Political Science and
Economics, Waseda University

A Cause of Trade Wars

Protectionism is rising recently. Although income inequality could be part of the reason, I would like to emphasize that it cannot fully explain the rise in protectionism. Based on a study looking at how people respond to globalization, in the U.S., Europe and Australia, 30–40% of the people responded that international trade creates jobs, whereas about 40% says it destroys jobs. In South Korea and Indonesia, more than 50% supported globalization. In Japan, only 20% responded that trade creates jobs, and more than 35% responded that trade destroys jobs. Looking at Japan in particular, although more than 20% of the people are benefitting from

globalization, they are still against globalization.

Studies have shown that one reason may be that people are intrinsically closed in nature. Ten thousand years ago, people were living in small groups of about a hundred or so. Within the group, people formed strong, trusting ties, and helped each other in order to survive. Beyond this small group, people were hostile to others and other groups, again, in order to survive. This history of closed behavior may now be somewhat intrinsic as a characteristic and this could be one major reason why people are against globalization outside its economic benefits.

Social Experiences Open Up Our Minds

Professor Yamamura from Seinan Gakuin University recently found that social experiences have profound effects on our minds. He found that people involved in team sports during childhood have improved non-cognitive skills, meaning that they tend to trust people more and value competition more, which actually leads to increased support for globalization and free trade principles. This study suggests that social experiences can enhance our recognition of the importance of globalization.

How to Respond to Trade Wars

Protectionism may lead to devastating consequences. If we look at what happened in the 1920's, many countries raised tariff rates after World War I, creating economic blocks.

This segregated the world economy, and had devastating consequences, eventually leading to World War II. To mitigate such devastating consequences, several policies should be put in place. Policy that reduces income inequality is necessary. This can be achieved by re-education of workers in traditional sectors, allowing them to work in more modern sectors. For this purpose we also need flexible labor markets. Policy that will promote open-mindedness is also necessary. For example, we need to educate people on the benefits of globalization and promote social experiences. Experiences gained from exchange programs of students, businesspersons, researchers and policy makers can increase support for globalization.

Panel Discussion



Moderator

Shiro Armstrong

Visiting Scholar, RIETI / Director,
Australia-Japan Research Centre,
ANU

ARMSTRONG

Has Japan been immune from the rising protectionism?

TODO

There is a strong protectionism especially in agriculture, and there is a need to open up the agriculture market in order to be a real leader in trade negotiation.

ARMSTRONG

Does Japan distribute gains from globalization and trade better than the U.S.? Does Japan have a better social safety net?

TODO

In the U.S., imports from China harmed value added production as well as employment, whereas in Japan, the Chinese imports increased production and employment. The difference is the structure of trade with China. Japan imports parts and components from China and assembles them to high value-added products and exports them to other countries. In Japan Chinese imports are largely beneficial, and China is not a huge economic threat to Japan.

ARMSTRONG

Are trade investment complaints from the U.S. against China valid?

CHEN

Personally, I do not think they are valid enough to be used as the reason/excuse to create trade wars or increase tensions.

China has achieved remarkable economic growth in the last 30 years. It has significantly reduced the percentage of the population in extreme poverty. On the other hand, I am not convinced that IPR violations and forced technical transfers are not at all happening. Anyway, there is room for improvement in further regulating the economic market, and China needs to improve their innovative capacity to support its long-term growth.



Lurong Chen

Economist, ERIA

ARMSTRONG

Regarding tariffs, is it just a matter of something affecting trade between the U.S. and China, or should we be more concerned?

ONODERA

Effects of trade measures are not limited to the U.S. and China, and it is a global problem. The International Monetary Fund (IMF) World Economic Outlook in October and the Organisation for Economic Co-operation and Development (OECD) Economic Outlook in November showed a decrease in GDP growth, mainly referencing trade tensions and changes in global environments.



Osamu Onodera

Deputy Director-General for Trade
Policy, METI

ARMSTRONG

Is there a risk that the two largest economies in the world being engaged in a trade war might be contagious?

TODO

Tariff wars and trade wars are contagious. In international economics, if a country has a higher tariff, other countries will want to have higher tariffs as well to increase their own country's welfare. The possible consequence of the current trade wars could potentially be very bad and we need to stop them.

ONODERA

Countermeasures to this point in time have been relatively restrained and there has been little spread. Once some countries start creating barriers, there will be a higher risk

of it spreading. The reliability of the trading system to this point and the fact that we agreed to WTO reforms shows that we all collectively continue to have trust in the system.

CHEN

The spread of U.S.–China trade tensions will depend on the behavior of the rest of the world, not just what the U.S. and China are doing. What is important is to push WTO Reform forward and improve the rule-based trading system globally. A comprehensive well-functioning trading system would be effective in stopping the current trade tensions.

ARMSTRONG

What should countries do when hit by tariffs? Do nothing, weather the storm, do a deal or retaliate?

CHEN

Doing nothing is certainly not an option. Determining the areas of common interest to the whole region and then making decisions based on the best outcomes for the region is important. We are in a new era of digitalization. The U.S. should understand that threats to employment and profitability will come from artificial intelligence (AI) and robots instead of from China, Japan or other nations. The global trend of technical progress should be a driving force for countries to work together in collaboration.

ARMSTRONG

What would Japan do if hit by tariffs on automobiles?

ONODERA

The case is yet to be seen, and we must consider what to do at that point in time. The scale of effects of such tariffs on the Japanese economy would be on a different order of magnitude from tariffs on steel and aluminum. We have been engaging with the U.S. and holding discussions to avoid tariffs. Negotiations start in January.

CHEN

My opinion is quite optimistic. In the past Japan dealt with tariffs by internationally fragmenting the production. In the near future, because of the changing nature of competition in the auto industry, which is now incorporating the internet of things (IoT) and connected vehicles that share information etc., even if tariffs were to increase, the effect on the price change of autos could be less than what we assume today, and in fact the greater threat will come from non-tariff measures, such as those related to national security, etc.

TODO

In terms of economic benefits and losses, the automobile industry is much bigger than agriculture, so we must avoid tariffs imposed on Japanese automobiles, but more could be done to open agricultural markets and perhaps Japan could benefit from such changes as it might improve overall efficiency.

ONODERA

It is not accurate to say that Japan is not open to agricultural imports, and Japan is one of the largest importers of agricultural products in the world. Japan does maintain subsidies related to the issue of the role of agriculture in the multi-functionality of the regional economies. In the process of Trans-Pacific Partnership (TPP), we have been opening up our markets gradually and need to continue to do so as part of an orderly transition which will include looking at agricultural exports as well.

ARMSTRONG

Japan's agricultural sector and protectionism in the past has hampered Japan's ability to sign liberalizing FTAs internationally. TPP-11 further opens this up in stages.

CHEN

In the automotive industry, new technology is driving the competitiveness. Japanese companies should accelerate innovation. Because of Japan's innovative advances in automobiles, if the U.S. imposes high automobile tariffs, it may in fact cut itself off from the technological frontier of the industry. This is a lesson for other developing countries to learn: innovative capacity could provide some ammunition in the event of trade tensions.

ARMSTRONG

What can individual countries do together in response? Should a few countries act together as a coalition to hold the line?

TODO

In addition to the previously mentioned efforts of FTAs and multilateral agreements, I would emphasize the importance of international exchanges among Asian Pacific countries. We could promote more exchanges of students. Actually, I would like to know what effect Chinese students may have had on Australian Universities.

Q&A

Q1: What impact do you expect on East Asia's intraregional trade and investment if the U.S. and China trade relations continue to worsen?

TODO

Asian countries could benefit from trade diversion. At the same time, the world economy as a whole may shrink due to the trade wars.

CHEN

On the one hand, there will be shrinking exports, and on the other hand tensions may create trade diversion which may positively affect other Asia-Pacific nations' balance sheets. But the larger effect of the trade tension is more about investment—in an uncertain environment, both the public

and private sector will hesitate to invest, causing greater damage worldwide in the long term.

ONODERA

With trade tensions, productivity may not be as high as before. The productivity advantages that Asia had in comparison to other regions may decrease somewhat. However, some state that those Asian countries with comparatively welcoming environments for investment may benefit from the situation.

Q2: What do American scholars think about free trade under the Trump administration? Does a cultural difference between the U.S. and Japan affect free trade, and the closeness of China and Japan affect free trade?

TODO

Educated people are more likely to be against President Trump. There is clear global evidence that educated people are more likely to support globalization than uneducated people, so most economists do not favor President Trump's initiatives. However, there are huge cultural differences between countries in terms of general openness, and even within the U.S. itself, so it is not universal and needs to be examined further. [later] However, many papers written by very famous economists in the U.S. examining Chinese imports find imports to have mostly negative impacts and actually seem to support protectionist measures.

ARMSTRONG

There is a shift in Washington where less people are advocating for economic engagement with China and supporting Trump. Is there a danger that the trade war will develop into a decoupling?

CHEN

Many Chinese scholars believe Washington's policy will not change even after President Trump at least in the short term. All the U.S. Presidents while running for election have had a strong stance against China, but the current President took it to the extreme. China has many issues that need to be resolved/improved, but the important point is to keep China on track and moving forward toward a fair and open market. Trade wars or trade tensions are not the solutions.

ARMSTRONG

If China strengthens IP laws, stops technology transfer policies and all the things the U.S. is worried about, will that calm tensions and attitudes in Washington, or is this also a part of fear of being overtaken as the number one economy internationally?

ONODERA

China and the U.S. have very extensive trade relations, and even with a barrier, a considerable amount of trade would

overcome tariff barriers. They are also interlinked with many other countries that have both the U.S. and China as major trading partners, and decoupling is not an easy task. Any decoupling would put significant strain on companies doing business with both U.S. and China, and therefore may increase costs and affect investment. Economically, due to the mutual stake that they have in each other, even with trade tensions, it would be difficult for the tensions to evolve into a decoupling.

Q3: Can Japan and the U.S. negotiate a win-win FTA, and what will Japan get out of it? Currently it is one sided and favoring the U.S.

ONODERA

Any agreement is a win-win agreement at the end of the day.

ARMSTRONG

The risk of agreement stalling is that Japan may get auto tariffs, but there is also a significant implication for Japanese security which relies on the security umbrella. Trump tends to integrate economics with security, and uses economic tools for security means. Is any deal a win-win because you avoid auto tariffs, even if it is a lop-sided, managed trade deal?

ONODERA

In terms of negotiating a trade deal, we come up with various objectives that we want to get and try to get the mid-ground in various issues and try to sell the deal to the constituents.

Q4: As the world works through tough issues such as trade wars, WTO reform and so forth, what are your expectations for China–Japan cooperation, which seems to be gaining momentum?

TODO

It is important for China and Japan to cooperate. The Asian Development Bank (ADB) and Asian Infrastructure Investment Bank (AIIB) are cooperating with each other over several infrastructure projects. This type of cooperation can promote mutual understanding and have positive impacts on bilateral cooperation.

ONODERA

The U.S. continues to be Japan's number one partner in terms of economy and security. However, China is a huge neighbor and we need to have good relationship. Historical issues were barriers to closer relationships, but even then, the economic relationship was relatively fine. Now, China seems to be open to more positive relationships in general. In essence, Japan needs to be friends with both sides, and it is not an issue of taking sides.

ARMSTRONG

The economic interdependence between China and Japan is remarkable.

CHEN

China is still a developing economy and needs support from countries like Japan and Australia for further domestic reform. It is very important for long-term cooperation bilaterally and regionally.

Q5: What are the priorities in Asia's interests in the WTO Reform?**ONODERA**

The lesson learned from Doha is that attempting to accomplish everything in a single undertaking is not possible. With the increased number of countries, the capacity to come to agreement on a consensus basis has decreased, and we have been unable to respond to critical changes in the trade environment. So moving forward, we must use the G20 and Asia Pacific Economic Cooperation (APEC) process in addition to work in Geneva to provide sufficient push to make incremental changes in a timely manner and advance specific areas with like-minded countries.

CHEN

We should set priorities for reaching agreements based on the most important goals rather than being too ambitious in attempting to accomplish package agreements. Also, increasing public awareness of the issues, i.e. by improving publishing or engaging on social media, may be useful in advancing political efforts.

ARMSTRONG

A lot of policy bandwidth has been taken up by negotiating bilateral or smaller agreements. We are approaching a big crisis in the international trading system, and with the G20, we can refocus more policy resources on easy, early wins on transparency, trade policy review and continue to work on other issues on the list.

ONODERA

Convincing China that it is in its own best interests to both undertake further significant internal-reform efforts and to contribute further to the maintenance of the system is key to moving forward with the WTO Reform.

Q6: Multilateral and unilateral solutions for trade wars—When we are seeking solutions, how will multilateral negotiations help or hinder these urgent issues? Also, regarding RCEP, is it important? How significant is it? Is it a lower standard? When seeking solutions, how will multilateral negotiations help or hinder the process?

ONODERA

If we get the sense of urgency across the board within the WTO, then progress should be possible with small groups

of countries working together, and we should be able to formulate something that is relatively balanced and can be implemented on a smaller basis, even if it only applies to a smaller group of major countries. Other countries would then be able to come on board after seeing how the rules are applied in practice. In terms of other reform, we hope RCEP will be a high level agreement going forward and will contribute to free and fair trade rules going forward.

CHEN

RCEP is important for the global trading system, in particular for ASEAN and East Asia. If the longer time taken for the negotiation allows for smoother implementation, then it is worth being more patient. With regards to WTO, I agree with what was mentioned before, which is known as the plurilateral approach to multilateralism—some member states moving ahead to sign the agreement on deeper liberalization or liberalization on new issues, and leaving the door open to later participants so that they can join in their own time. This could be a flexible and pragmatic alternative.

Q7: What if the U.S. and China do a deal? What kind of deal might that be? What kind of damage might that do to the international trading system if it has significant preferential elements to it? What can the rest of us do to address that and unfold any deals that U.S./China make in multilateral terms?

ONODERA

If there is an FTA, there are cases of tariff quotas, but if there is no FTA, managed trade in the form mentioned earlier is not permissible under the WTO. Whether we should use the WTO dispute settlement system in the current climate is something that policy makers will have to decide at that point in time.

ARMSTRONG

Countries like Japan and Australia should be encouraging China to look for multilateral solutions. The response from China has been promising, opening up to WTO consistent Most Favored Nation (MFN) basis treatment.

Summary

ARMSTRONG: We cannot lose sight of what we need to do at home in our various countries which is to address the very causes of rising protectionism. We need to make sure that gains from globalization are spread across society, to have functioning social safety nets, to educate the public on the benefits of globalization, and re-educate those that are not fortunate enough. Internationally, Japan has the presidency of G20 and will have to manage and navigate the temporary truce between the U.S. and China. Other middle powers of the world and especially in this region need to be mobilized and step up to the plate to help where they can.

GVC Journeys: When national and territorial comparative advantage differ



Date: December 11, 2018

Speaker:

Richard Baldwin

Professor of International Economics, Graduate Institute, Geneva

Commentator & Moderator:

Toshihiro Okubo

Professor, Keio University

Offshoring and participation in Global Value Chains (GVCs) are critical in understanding the rapid deindustrialization of G7 nations and the rapid industrialization of a handful of developing nations. This seminar is based on Richard Baldwin's recent paper in which he distinguishes between trade in final goods and trade in parts to track the shifting pattern of the knowledge flows from developed to developing economies, contrasting international and intra-firm knowledge flows. The research illustrates how the patterns of industrialization and deindustrialization—namely the “GVC journeys” of advanced and emerging economies, can be understood correctly in order to address the challenges that these realities present to economies.

Richard Baldwin

Introduction

The broad question I will address today is: was comparative advantage denationalized? I shall provide both empirical support for our conclusions, and other insights and thoughts for future directions.

The mindset for national trade policy is comparative advantage, whereby countries tend to specialize in their comparatively well-produced goods and services, and import from other countries which create other goods and services relatively well. This situation is mutually beneficial. In this scenario, wages adjust to technology. Therefore, countries

with poor technology may have low wages, which makes them competitive; whereas countries with good technology have higher wages, which makes them less competitive in certain areas.

For a country to benefit from trade, it should improve its comparative advantage at a national level. This improvement can be done through increases in productivity or technology, which will result in a rise in wages. Thus, these improvements for the betterment of a nation improve the workers' situation as well.

However, for comparative advantage seen at the company level, good technology could be used to exploit differences in labor across borders. National policies such as tax

subsidies for R&D spending may not necessarily contribute to the national comparative advantage due to companies' offshoring. Therefore, the benefit of comparative advantage may not be kept only within one nation's borders.

I do not approach the topic from an anti-offshoring perspective or one opposed to foreign direct investment. In truth, I think our approach should be more nuanced, but also open to discovering where that may be true. There are five facts which suggest this is taking place.

Denationalization of comparative advantage

In the period of what I call the 'second unbundling' from 1988–2008, emerging markets lowered their tariffs significantly, notably in manufactured goods as well as parts and components of manufacturing goods, whereas advanced economies did not liberalize their markets to any significant degree. While the tariffs were asymmetrically altered, the liberalization did not result in advanced economies increasing exports of manufactured goods as might be expected.

Since 1970, the sharing of manufacturing has rapidly shifted, with the G7 countries losing shares, and China and six others gaining shares. Therefore, the beneficial effects of globalization were, in fact, specific to a limited group of countries. Two-way trade in similar goods, which was previously limited to trade between advanced economies, spread to groupings of two-way trade between emerging and advanced economies from circa 1990. In this period, trade like that of France–Germany was also seen in U.S.–Mexico trade. France and Germany effectively had linked supply chains previously, while U.S.–Mexico and other similar relationships started becoming linked in the same way.

How comparative advantage was denationalized

Before the second unbundling gained traction in 1990, countries like Japan would export machine parts to the newly industrializing economies and the ASEAN-4. However, there was no reciprocal trade in parts because the newly emerging economies lacked the technology to produce appropriate parts or finished goods for the Japanese markets.

By 1998, the global value chain revolution had changed the direction of trade. This cannot be accounted for simply by a liberalization of tariffs, because that would not have led to a change in the direction of trade, only the volume of trade. Instead, a movement of knowhow and technology allowed countries to produce parts and components which had not previously been possible.

Prior to the 1990s, countries such as the newly emerging economies and the ASEAN-4 had not been improving their native technology. Indeed, companies from advanced

economies sought advantage by educating the manufacturing base to improve their supply chain. This process denationalizes comparative advantage. The consequences of this require reflection in national policy. National-level subsidies for R&D may not improve a nation's GDP when companies are inclined to exploit these technologies abroad.

Changes in comparative advantage

There was a major shift in the nature of globalization that allowed for a shift in comparative advantage. The first concept is the 'first unbundling,' or old globalization, where lower trade barriers allowed nations to exploit their existing comparative advantage; in other words, trade-led globalization.

The second unbundling, or new globalization, is where better information and communications technologies (ICT) permit flows of firm-specific knowhow, which changed existing comparative advantage. This can be considered 'knowledge-led' globalization. Improvements in ICT allowed for G7 firms to move technology to emerging economies, both in terms of protection of intellectual property and effective use. Previous trade was conducted through letters, faxes and telephone, which made it impossible to separate the production chain in practice. Only ICT provided for these changes because of its precise nature, speed and security.

Evidence for knowledge flows

There is weak direct evidence for knowledge flows in the net receipts for intellectual property. According to balance-of-payment statistics, the U.S. became a net exporter of intellectual property around 1990 on a steep trajectory. This suggests that American knowhow is being exported and is part of this second type of globalization. Factory economies like China begin becoming importers of intellectual property, as shown in their deficit for intellectual property payments. This indirect evidence is weak in part due to the difficulty of measuring the transfer of knowledge.

Identifying global value chain paradigms

The old paradigms of trade and development were inward-oriented and export-oriented development. These benefited governments' policy development for trade. Thailand successfully focused primarily on increasing its share in the global value chain of automobiles. The Philippines had a broader focus on manufacturing parts and components. Costa Rica focused mainly on services, notably firmware.

Can global value chain industrialization journeys be classified into categories? Many countries are focusing on whether there is a way to 'move up' in global value

chains, and yet, that has different meanings depending on the ‘journey’ in question. To identify the global value chain journeys or paradigms, we will look at parts-and-components trade versus final-goods trade.

First, we assume that exporting parts from the global South to the global North reflects Northern technology plus Southern wages. Firms aim to improve their supply chain through the efficiency of their suppliers, to become more competitive. To do this, firms move knowhow abroad. When Southern countries become a net exporter of parts, it reflects the technology that has been invested in them; however, the export of final goods does not, as the activity is simpler.

Empirical comparative advantage index

This index shows countries which lay on a spectrum regarding their industries and parts or goods produced, from a complete comparative disadvantage to a complete comparative advantage. As such, it measures territorial comparative advantage. A typical G7 country would have been situated in the positive final goods index and positive parts index quadrant in 1985 or 1990. A typical emerging market would have been negative on both parts and final goods indices before 1990. The other quadrants represent specialists in final goods and specialists in parts.

The direction of movement of a typical Northern country on the indices represents either reshoring (up vertically) or offshoring (down vertically) of assembly, or domestic (up horizontally) or global (down horizontally) sourcing.

The direction of movement of a typical Southern country represents increases or decreases in comparative advantage of final goods, as well as increases or decreases in comparative advantage of parts in the same directions as Northern countries, but from a different starting point.

Examples of Northern global value chain journeys

Germany’s journey for transportation equipment began by global sourcing parts but gained competitiveness in final goods. Whereas in electrical and optical equipment, it sourced parts but did not gain competitiveness. Overall, Germany remains in the positive-positive quadrant. It offshored in all sectors but gained competitive advantage in final goods for transportation.

The U.S. journey is different because it begins in the negative for final goods. For automotive, it moves from being a net exporter of parts to a net importer of parts. In other industries, there is movement towards offshoring.

Japan has a similar journey to Germany. It offshores transportation parts but increases slightly in final goods. Other industries show more global sourcing and less net export of final goods.

Examples of Southern global value chain journeys

China’s journey for other machinery shows general industrialization with increases in both final goods and parts. Its electrical and optical industry shows the same trajectory, but starting in the positive final goods quadrant. While the path is erratic, China gained competitiveness in automotive parts but is still a net importer of final goods.

Mexico’s journey for the electrical and optical industry shows increases in parts and final goods. Transportation shows non-uniform movement; however, Mexico signed the NAFTA agreement during this time period which led to drastic changes in its supply chain role.

Korea’s transport journey changed direction but resulted in it being a net exporter of both parts and final goods. Electrical and optical equipment lost competitiveness in final assembly but gained competitiveness in parts. And Korea’s machinery industry gained competitiveness in both parts and final goods.

Beginning in a typical position, Thailand became an assembler of final goods for the automotive industry, and now is an exporter of parts also. Its other industries have moved less drastically.

Toshihiro Okubo

Comments

The paper is fundamentally conceptual, so it is useful for both researchers and policymakers. Global value chain journeys are based on comparative advantage of parts and components and final products. However, comparative advantage can change over time by becoming denationalized. Technological transfer can evidently change comparative advantage.

The diagram of the journeys found only three major patterns. Japan, Germany and the U.S. show an offshoring pattern. Thailand showed successful industrialization to become a net exporter of both parts and components and final products. China and Korea industrialized, but also began offshoring, similar to developed countries, becoming a net importer.

There are three implications for Japan. Japanese technology trade has a surplus, which means the Japanese government needs to invest more in R&D and education. Japan’s comparative advantage has denationalized. Reshoring parts and components for transport may be a solution. There may be developments beyond the global value chain journeys through AI technology, automation and IT services. In addition, borderless production process, borderless industries and borderless production and tasks represent possible futures beyond the global value chain journeys.

Q&A

Q1. Are there any specific findings from this project that forced you to change your past thoughts on global value chains?

Baldwin

There have been no findings that do so yet. The real question was how to make global value chains work for development. I do not have the answer yet. The previous measures of global value chains were too blunt to identify the differences between countries. But, does the nature of the participation in the global value chain affect the nature of the development outcome? That second step would change my mind. If, for example, a nation which gained competitiveness in parts had better development outcomes than a nation focused on final products—those kinds of revelations would change my mind. However, the original goal was only to measure this on a micro-basis. The next step is to compare with actual outcomes with the data available. That being said, some personal anecdotes I held, did not match the data.

Q2. Is there any supporting evidence for the implication of a Japanese trade surplus?

Okubo

The key is microdata. Japanese technology trade data is completely different from usual trade data as it is difficult to capture details, especially for contracts and timing as they relate to destination and payment terms. If we could get good new microdata for technology trade and firm organization and form of contract, it would lead to a better understanding of the Japanese case. Trade and contract theory provides many kinds of firm boundary issues, which could be used with new data.

Q3. Trade protectionism denies the fact that global value chains are a fragmentation of production processes. This may lead to fragmentation of global value chains. What are your opinions on the protectionist measure of the U.S. and others?

Baldwin

Protectionism is more of a regionalization than fragmentation. The goal of protectionism is to repatriate the supply chains. However, as the new globalization is knowledge-led and not trade-led, it is not easily reversible and has unintended consequences. Moreover, automation is changing the nature of manufacturing by reducing labor input. If the labor cost share is low enough, the shipping costs would be more expensive comparatively, leading to

localized production. Additionally, quotas should be avoided for the obvious reasons.

Q4. How are you looking at the servicification of manufacturers in the comparison?

Baldwin

Embedded services are promising; however, the data on services is not good. To track the global value chains properly we should track services as well.

Note: Titles and affiliations are as of the day of the event.



RIETI-Hitotsubashi-Gakushuin-Toyo International Workshop on Firm Dynamics

Date : December 14, 2018

Venue : RIETI's seminar room

Jointly supported by: JSPS KAKENHI Grant Number 17H02526 Grant-in-Aid for Scientific Research (B) "Structural Reform, Aggregate Productivity and Resource Allocation"



In order to consider the role of firm growth in the Japanese economy, it is important to conduct analyses from various points of view, including: (1) the formation and restructuring of global inter-firm networks; (2) the accumulation of intangible assets and the effect of learning; (3) the efficiency of resource distribution among firms and industries; and (4) the tax system, which is dependent on firm size.

We held an international workshop to present and discuss research results, with the participation of a large number of overseas researchers from America and Asia who are working on the front lines of this field.

Morning Session: FDI and Agglomeration

Chair: **Tomohiko Inui** (RIETI / Gakushuin University)

Does Bank FDI Promote Firm FDI? Evidence from China's Outbound Multinational Activity

Presenter: **Davin Chor** (Dartmouth College)

We investigated whether outward foreign direct investment (FDI) in the banking sector promotes the same country's outward FDI in the non-banking sector. Under the prediction that bank FDI from the same source country decreases FDI costs and promotes manufacturing FDI, we conducted an analysis using Chinese manufacturing firm-level data for 1990 to 2014. We obtained the result that FDI from China's Big 5 banks at $t-1$ promotes FDI at t by Chinese firms (in manufacturing). Furthermore, even when a variety of sensitivity tests (e.g., changing the analysis timing, estimation using IV) were conducted, the results remained robust.

Discussant: **Toshihiro Okubo** (Keio University)

- The purposes of FDI are various (Greenfield FDI, diversification, etc.).
- Don't credit requirements also vary depending on the purpose?
- Aren't there also other means of financing (issuing bonds, etc.)?
- Isn't there sectoral heterogeneity (differences in dependency on external credit)?
- Don't Chinese government policies have an impact?

Matching and Agglomeration: Theory and Evidence from Japanese Firm-to-Firm Trade

Presenter: **Yuhei Miyauchi** (Stanford University / Boston University)

Why are economic activities geographically concentrated? Does the firm-to-firm matching rate increase with the number of suppliers due to increasing returns to scale? I conducted an analysis using firm-to-firm data from 2007 to 2016. The results showed that the re-matching rate following unanticipated supplier bankruptcies is higher for firms

located in regions of higher agglomeration. I also developed a structural model of firm-to-firm matching, confirming the importance of the mechanism that increases returns to scale.

Discussant: **Kenta Yamanouchi** (Keio University)

- In reduced-form estimation, wouldn't the effects of an earthquake be felt by both buyers and suppliers?
- Shouldn't instrumental variable robustness be checked?
- In structural estimation, isn't it possible that firms with high productivity are likely to relocate to denser cities?

Keynote Speech: Vending Out: Exports During Domestic Slumps

Presenter: **Pol Antras** (Harvard University)

We explain the 'Spanish export miracle.' Since the 2008 financial crisis, Spain's GDP has stagnated, but its exports have doubled. We used data on Spanish manufacturing firms from 2002 to 2013 to analyze the relationship between the slump in domestic demand (consumption) and exports. In OLS estimation, a positive correlation was seen between domestic demand and exports, but the results of estimation using instrumental variables showed that the slump in domestic demand led to the increase in exports.

Afternoon Session 1: Firm Dynamics

Chair: **Shoko Haneda** (Chuo University)

Shock to Supply Chain Network and Firm Dynamics: An Application of Double Machine Learning

Presenter: **Daisuke Miyakawa** (Hitotsubashi University)

I used machine learning to analyze firm bankruptcies and exits based on an enormous quantity of firm data. I also analyzed the effect (causal relationship) that variables in firms' supply chain network had on exits. The results showed firm bankruptcies and exits could be predicted very efficiently by using machine learning. Furthermore, in terms of causal relationships, I used double machine learning to confirm the effect that changes in the firm-to-firm networks have on firms' exits.

Discussant: **Yuta Takahashi** (Hitotsubashi University)

- Why did you focus on networks in terms of the effect on firms' exits? There should be many other factors as well.
- What is the decision mechanism for firms' exits?
- Could there be reverse causality?

Size Dependent VAT and Firm Growth

Presenter: **Masaki Hotei** (Daito Bunka University)

In Japan, firms with sales at or below 10 million JPY are exempted from paying sales VAT. For that reason, firms report sales at or below 10 million JPY. And for that reason, bunching occurs at the 10 million JPY line. We used TSR data from 2011 to 2014 to analyze what types of firms bunch just below the threshold. The results showed that firms with low productivity, and firms with low productivity and high compliance costs bunch just below the threshold.

Discussant: **Makoto Hasegawa** (Kyoto University)

- Could there be a problem with endogeneity?
- Using the median sales as a proxy for productivity, you conclude that a negative coefficient on the median sales implies that low-productivity firms are more likely to bunch. However, couldn't the negative coefficient be more extreme because sales correlate to firm size and thus many firms are affected by the threshold?
- I feel uncomfortable regarding the result that lack of knowledge about the VAT system alone has an effect on bunching.

Afternoon Session 2: Misallocation

Chair: **Ayako Obashi** (Aoyama Gakuin University)

Intangible Assets and Inter-firm Linkages over the Lifecycle of Firms: Theory and Firm-level Evidence

Presenter: **In Hwan Jo** (National University of Singapore)

We focus on intangible assets (organizational capital) as a source of firm growth. What is the role of the accumulation of intangible assets over firm lifecycle? We developed a model of the effect that the presence of intangible assets has on the distribution of resources and aggregate productivity and investigate qualitative impact. The results showed that intangible assets (inter-firm linkages) are correlated to growth and productivity, that they amplify the channel of aggregate productivity shocks, and that sudden deterioration of intangibles triggers recessions.

Discussant: **Kaoru Hosono** (RIETI / Gakushuin University)

- Can inter-firm linkages be interpreted as organizational capital?

- What are the maintenance costs of organizational capital (linkage)?
- What are the roles of inter-firm linkages in business cycles?
- Why is external finance for investment in physical capital not accounted for in the model?
- Why does total factor of productivity (TFP) increase with age even after controlling for intangibles?

Matching Frictions in Firm-to-Firm Trade: A Proposed Field Experiment Design

Presenter: **Jie Bai** (Harvard University)

Are there matching frictions in firm-to-firm trade? What is

the aggregate loss as a result of these frictions? Could policy interventions facilitate efficient matches? In this study, we conduct an intervention experiment to see whether providing information to suppliers on networks of existing suppliers and buyers leads to higher probability of trade. At present, we are at the stage of preparing the intervention experiment.

Discussant: **Kentaro Nakajima** (Hitotsubashi University)

- Are p and σ identifiable?
- You are saying private information, but can it be bought from TSR? (In other words, isn't this a monetary cost issue?)

RIETI International Workshop

Frontiers in Research on Offshoring

Date : August 3, 2018
 Venue : RIETI's seminar room
 Host : RIETI
 Co-hosts : Hitotsubashi Institute for Advanced Study / JSPS KAKENHI (Grant Number 26220503)



On August 3, 2018, the “Frontiers in Research on Offshoring” workshop was held as a part of the Analyses of Offshoring project led by Jota Ishikawa (RIETI Faculty Fellow) (top left). In the workshop, four distinguished scholars in the field of international trade—Arnaud Costinot (MIT), Ngo Van Long (McGill University), Wolfgang Keller (University of Colorado Boulder), and Andres Rodriguez-Clare (University of California at Berkeley) (also pictured above), and two project members introduced and discussed their papers.

Arnaud Costinot presented the paper entitled “Robots, Trade and Luddism.” This paper investigates how the government should respond to productivity shocks caused by an increase in import penetration from low-income countries and by an increase in the share of robots in the economy, using tax instruments. They show a novel envelope result that generalizes the evaluation of productivity shocks in a distorted economy. They also analyze Pareto efficient tax rates imposed on firms employing new technologies and those employing old technologies under various conditions. Furthermore, they offer equations linking the theoretical Pareto efficient tax rates and observables and provide numerical results. A counterintuitive result is that the government has incentive to reduce the tax rate imposed on

new technology firms when there is a positive productivity shock due to an increase in imports from other countries and an increase in the share of robots in the economy. These considerations are invaluable when we consider how the government should respond to deepening globalization and the rising share of robots when we care about income distribution.

Ngo Van Long presented the paper entitled “Offshoring and Reshoring: The roles of incomplete contracts and relative bargaining power.” This paper investigates offshoring and reshoring by extending Antras (2005). By introducing endogenous bargaining power under incomplete contracts, they find the possibility of offshoring as well as reshoring. Some specific conditions for wage rates and bargaining

power determine whether offshoring or reshoring would happen. This could explain the offshoring and reshoring currently underway in the world.

Wolfgang Keller presented the paper entitled “Globalization, Gender and the Family.” The paper uses the abolition of Multi-Fiber Agreement as a quasi-natural experiment to study the impact of import competition on workers in textile and apparel industries in Denmark based on employer-employee matched data. They find that marriage and child birth rates increased, largely driven by women. This finding of gender-biased adjustment has an important implication especially for Japan, where the gender gap has been debated.

Tomohiro Ara presented the paper entitled “Tariffs, Vertical Oligopoly and Market Structure.” This paper investigates the impact of tariffs on intermediate-input trade by explicitly decomposing the trade volume into the intensive margin and the extensive margin, and examines how this decomposition affects the characterization of the optimal tariff for input trade. In contrast to final-goods trade, the paper finds theoretically and empirically that even unilateral tariff reductions in input trade induce entry of firms in both liberalized and liberalizing countries, and contribute to

a new welfare gain from trade that arises only in vertical specialization.

Hiroshi Mukunoki presented the paper entitled “Tariff Elimination versus Tax Avoidance: Free trade agreements and transfer pricing.” If multinational firms manipulate their transfer prices to comply with the rules of origin of free trade agreements (FTA), a case arises where the formation of an FTA reduces the profits of all exporting firms. FTAs may also hurt consumers in the FTA countries. The paper points out that the welfare effect of an FTA critically depends on how countries control transfer pricing, and it provides important policy implications.

Andres Rodriguez-Clare presented the paper entitled “External Economies of Scale and Industry Policy: A view from trade.” The paper develops a new method of estimating external economies of scale in manufacturing industries by using only bilateral trade data across countries. Estimates are reasonable, e.g., heavy manufacturing industries such as automobile show greater economies of scale than light manufacturing such as apparel. The authors estimate welfare gains from optimal industrial policies for several countries and find only negligible gains.

RIETI International Workshop

Uncertainty, Trade and Firms

Date : April 18, 2018

Venue : RIETI's seminar room

Hosts : RIETI / JSPS KAKENHI (B)
(Grant Number: 17H02531)



Steven Davis (University of Chicago)

Recently, the unpredictability and uncertainty of the future of the global economy have raised the concerns of both policymakers and researchers. Focusing on the relationship between uncertainty and firms, we held an international workshop with overseas researchers. Using various firm- and plant-level surveys and keywords from newspapers and selected documents, the presented studies construct micro-level measures and indexes of uncertainty and examine the impacts of uncertainty on firm activities and performance.

Business Level Expectations and Uncertainty

Nicholas Bloom (Stanford University)

Presentation of cutting-edge research results regarding expectation formation, future predictions and uncertainty by American manufacturing plants, based on the Management

and Organizational Practices Survey (MOPS) carried out as part of the U.S. census in 2015. The underlying survey was an attempt to measure the uncertainty faced by plants by asking them about sales, capital investment, employment, materials and other costs, and about the subjective probability of five future scenarios, and the presentation is a cross-section of business-level data analysis regarding

the validity of the survey's methods, the robustness of its results, as well as measurement errors. In particular, the positive correlation between recent sales growth rates and future sales expectations and the positive correlation between past sales volatility and the distribution of future sales expectations were pointed out, followed by debate on the validity of the methods employed by the survey and its usefulness.

A lively Q&A and discussion included questions from the floor regarding the occupation of the respondents questioned in the survey and about the applicability of the survey to the service sector, a large part of the economy.

Policy Uncertainty in Japan

Steven Davis (University of Chicago)

Uncertainty regarding policy, based on factors such as the repeated delay in raising the consumption tax rate and the inauguration of the Trump administration in the United States, has garnered much interest. Steven Davis reports on research that measures policy uncertainty in Japan based on newspaper reporting. Davis compiled a policy uncertainty index by using articles published in four major newspapers, such as the Nikkei and Yomiuri Shimbun, specifically articles that mention the "economy," "economic environment," "opacity," "uncertainty," "anxiety" and "concern," and containing other vocabulary pertaining to policy (e.g. "government debt," "Bank of Japan" and "regulations"). The three following points have primarily become obvious from the index. First, when comparing this index with the political instability index created using the approval ratings of political parties from opinion surveys, one notices the trend that policy uncertainty is low when politics is stable. Second, the majority of policy uncertainty arises from matters pertaining to fiscal and monetary policy. Third, when estimating a VAR model that includes the policy uncertainty index, macroeconomic performance worsens when a positive uncertainty shock occurs. However, there are multiple interpretations of this result.

After the presentation there was a question regarding how appropriate it is to use newspaper articles to quantify policy uncertainty and a proposal to include exchange rates in the VAR model. There was lively debate regarding the research.

The Effects of Firm Uncertainty on Economic Activity: New evidence from one million documents

Kyle Handley (University of Michigan)

Companies face various uncertainties (policy, macro-level risks, firm-specific risks), which influence their investment and employment, but measuring firm-level uncertainty is difficult. The present research has constructed a firm-level uncertainty index using business documents of approximately 40,000 firms obligated to report to the United States' Securities and Exchange Commission (SEC) between 1994 and 2016. The index is the rate of terms like uncertainty and ambiguity as a portion of the overall number of terms in the documents. The researcher, Kyle Handley, then conducted an empirical analysis of the relationship of this rate to investment activity of these firms. Based on the results of this analysis, a firm's investment rate drops by approximately 0.5 percentage points for each standard deviation increase in the firm-level uncertainty index. It also became apparent that uncertainty, aggregated chronologically, negatively correlates to macro-level variables (investment, GDP, employment, etc.).

After the presentation there were comments regarding details such as whether the regression analysis should include firms' fixed effects.

Uncertainty over Working Schedules and Compensating Wage Differentials: From the viewpoint of labor management

Masayuki Morikawa (RIETI)

Much research has been done on long work hours, but there is little research dealing with the uncertainty of work hours due to unexpected overtime and the like. Masayuki Morikawa's research uses original individual survey data to present observational evidence regarding the uncertainty of work schedules in Japan. According to Morikawa's results, about 50% of workers have experienced unanticipated overtime work, while about 30% are occasionally forced to cancel scheduled holidays due to sudden work issues. Such uncertainty in work schedules is prevalent among full-time regular employees and those working long hours. For workers, the cost of this uncertainty is large, with unscheduled overtime equivalent to 150% or more of scheduled overtime amount. In addition, the negative effect of the uncertainty on work satisfaction is much greater than the negative effects of increased working hours or decreases in wages. Although the existence of wage premium compensation for the uncertainty of overtime can be observed in the real labor market, its quantity is small.

The presentation was followed by productive comments for future improvement of the survey, including the possibility



of utilizing more objective terminology, for instance using “how many times a year,” in place of the subjective terminology of whether uncertain labor happens “frequently” or “occasionally,” that the survey should consider the relationship to the glass ceiling for women, or that the survey could be combined with one aimed at companies.

Using Newspaper Text to Quantify Geopolitical Uncertainty

Arata Ito (RIETI)

Among factors such as the inauguration of the Trump administration in the United States or rising military tensions between the United States and North Korea, geopolitical risks have recently garnered attention. However, there is no established index for measuring such risks. Because of this, policymakers are unable to quantitatively evaluate geopolitical risk. This presentation reports on research quantifying the opacity of future economic developments arising from political or military events and tensions happening in the world, based on newspaper reporting. A newly created index (called an “index of geopolitical-related economic uncertainty” in the research paper) is based on articles published in four major newspapers, including the Nikkei and Yomiuri Shimbun, especially articles containing terms relating to the “economy” or “economic environment,” “anxiety,” “uncertainty” or “concern,” as well as vocabulary directly indicating political and military events and rising tensions (e. g. “air strike,” “growing tension” and “presidential election”). Based on this index, it can first be said that the index rose substantially during the Gulf War, the Iraq War, the 2016 U.S. presidential election, and the 2017 U.S. airstrikes against Syria as well as the rising tensions between the U.S. and North Korea, and that, second, based on the estimations of a VAR model including the index, macroeconomic performance falls when positive uncertainty shocks occur.

After the presentation it was pointed out that it was unclear what the index seeks to capture and that the concept should be made clearer. There were also proposals to randomly sample articles containing vocabulary related to the two categories of economics and unpredictability and to create a list of base terms that indicate political and military events and rising tensions based on the results of carefully studying such articles, and to include exchange rates in the VAR model.

Business Plans and Expectations Survey: First results

Tatsuro Senga

(RIETI / Queen Mary University of London)

Analysis results of the Business Plans and Expectations Survey, conducted at RIETI in 2017, were presented. The survey was supported by KAKENHI (Grant-in-Aid for Scientific Research) and attempted to measure

the uncertainty faced by Japanese businesses, utilizing the Management and Organizational Practices Survey (MOPS), whose results were introduced during Nicholas Bloom’s presentation, as a reference. Like MOPS, this survey compiled a subjective probability distribution of answers regarding five future scenarios and their respective probability of occurrence according to the survey subjects. As a new approach, questions using the Likert scale to measure uncertainty faced by firms and questions about firms’ positive or negative outlooks were added to the survey. The interim analysis results that were observed included the fact that uncertainty, as measured by the Likert scale, has a negative impact on capital investment and hiring plans of businesses, and that even when prediction center values are level, businesses that indicated more pessimistic predictions of the future had lower hiring plans than ones that indicated more optimistic future predictions.

Audience members pointed out that the possibility of measuring uncertainty utilizing the Likert scale was beneficial for future survey design in light of its simplicity. It was also pointed out that additional examination of the findings and methodology is necessary due to the fact that in terms of the survey items that were used to measure the optimism or pessimism of the respondents, there was the possibility of a discrepancy between what the survey is really attempting to measure and what the responding firms actually meant through their answers.

Uncertainty, Imperfect Information and Learning in the International Market

Cheng Chen (University of Hong Kong)

Among circumstances such as the Trump administration’s U.S. trade policy and Britain’s withdrawal from the European Union, uncertainty regarding the future of the global economy is rising. However, there is little research on the impact of the uncertainty that is affecting foreign markets on the exports and foreign direct investment by Japanese companies; and policy proposals founded on empirical analyses based on data are equally rare. The present research uses data on Japanese multinational corporations that includes information on sales predictions for foreign subsidiaries (the Ministry of Economy, Trade and Industry’s “Basic Survey on Overseas Business Activities” and “Basic Survey of Japanese Business Structure and Activities”) to offer four new facts regarding the uncertainty faced by companies in foreign markets. First, there is a positive correlation between uncertainty faced by foreign subsidiaries and macro-level uncertainty in the countries in which they are located. Second, foreign subsidiaries predict sales more accurately the more years they have been operating. Third, when first expanding to a foreign country through direct investment, compared to foreign subsidiaries of companies with no experience in exporting to the region (Asia, Europe, North America, etc.) that the country is located in, foreign subsidiaries of companies that do have

experience in exporting to that region are able to more accurately predict local demand. Fourth, there is a positive correlation between prediction errors for the present term and for the following term and this correlation increases proportionally to the distance from Japan. These discoveries are direct evidence that companies learn about foreign demand uncertainty through subsidiaries' sales and exports. Furthermore, starting with a dynamic model of corporate growth, the present research expanded this model to have companies provide goods to foreign markets by choosing exports or direct investment. The calibrated model not only incorporates the four above-mentioned observed facts, but can also reproduce characteristics of the dynamics of exports and direct investment. In addition, analysis results of counterfactual experiments imply that when analyzing the impact of changes in foreign demand uncertainty or trade liberalization on international trade and the activities of multinational corporations, it is important to consider companies' predictions and learning.

One comment mentioned that because maritime data contain various industries (all manufacturing industries and some service industries), it would be interesting to examine how the above-mentioned observed facts change based on the industry in question. There was also a question regarding how the average and distribution of companies' prediction errors changes based on the time period (e.g. during the global financial crisis and the Southeast Asian financial crisis). The presenter plans to make this question a research topic in a future project.

Factor-biased Multinational Production and the Labor Share

Chang Sun (University of Hong Kong)

The present research uses a dataset of global companies (i.e. multinational corporations) to provide two new observed facts regarding capital intensity and wage structures of multinational corporations. First, multinational corporations are firms of a large scale and employ capital-intensive technology. Compared with non-multinational corporations, multinational corporations are more capital-intensive and have a lower wage-capital ratio. Second, multinational corporations with parent companies in capital-rich countries use more capital-intensive technology than multinational corporations where this is not the case, and transfer more of this technology from the parent company to subsidiaries. Furthermore, the present research expands the traditional multinational corporation model to include in the model the possibility that multinational corporations choose technology of different capital intensity in different countries. The research also discusses how the liberalization of direct investment affects the global wage distribution (the ratio of wages to capital). The calibrated model reproduces not only the two above-mentioned observed facts, but also patterns of decreases in the global wage-capital ratio. Analysis results from counterfactual experiments suggest that expansions of activities by multinational corporations lead to a falling global wage-capital ratio.

Responding to a question from the floor regarding whether in the model multinational corporations' capital can move across national borders, Chang Sun explained a case in which he considered both possibilities that capital could and could not move across national borders. Someone also pointed out that there is a strong chance that subsidiaries of multinational corporations may have lifecycle dynamics and with time use more local capital. Sun responded that he should incorporate this point into his model for a future paper.

Production Chains, Exchange Rate Shocks and Firm Performance

Hongyong Zhang (RIETI)

Although large fluctuations in exchange rates not only substantially impact exporters' performance, but through ripple effects, can also cause macroeconomic fluctuations, there is extremely little research dealing with the ripple effects of exchange rate fluctuations. The present research uses data on domestic production networks of Japanese companies and data on international trade to investigate ripple effects of exchange rate fluctuations on production and companies upstream and downstream via supply chain networks between companies. As an exchange rate shock, the research used corporate level import and export data to calculate individual companies' effective exchange rate exposure. Based on results of empirical analyses, it found that the statistically significant effect of importers' exchange rate exposures on the sales or profit ratios of their buyers (indirect importers which do not themselves import) is small, but that exporters' exchange rate exposures had an extremely large impact on the sales and profit ratios of suppliers (indirect exporters which do not themselves export). When the yen is weak, the sales and profit ratios of indirect importers do not fall significantly, but the sales and profit ratios of indirect exporters increase substantially. In particular, small and medium-sized enterprises supplying goods to exporters are easily affected by large exporting companies' exchange rate exposure. Our research suggests that, viewed from the perspective of the domestic supply chain, a stabilization of exchange rates is extremely important for the performance of Japanese companies, in particular for small and medium-sized enterprises engaging in indirect export.

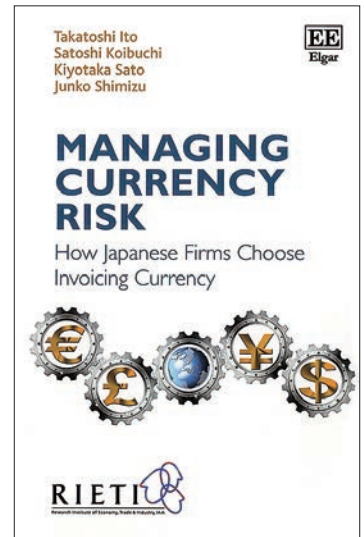
After the presentation, there were many fruitful comments and questions regarding the definition of ripple effects upstream and downstream and the interpretation of results, the creation of exchange rate exposure variables and export amounts, and whether there aren't also companies engaging in parallel importation.

Managing Currency Risk: How Japanese Firms Choose Invoicing Currency

Written by:

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Publisher: Edward Elgar Publishing, July 2018



Reviewed by:

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The joint research of four project members (Professor Takatoshi Ito, Professor Satoshi Koibuchi, Professor Kiyotaka Sato and Professor Junko Shimizu) of the Exchange Rates and International Currency project by RIETI has been released under the title *Managing Currency Risk: How Japanese Firms Choose Invoicing Currency*. The book contains an analysis of how Japanese exporters actually manage currency risk based on a new database of companies from data collected through interview- and questionnaire-based surveys by the four authors.

The book states that currency risk consists of transaction risk, conversion risk and economic risk, and that companies manage currency risk by using various currency hedging strategies (natural hedges, financial hedges including derivatives, invoice currency choice and passing on the exchange rates through pricing). Interview surveys and questionnaire surveys on the management of these currency risks were separated into different categories based on scale including the scale of the company, the industry, the export destination company, and headquarters and overseas subsidiaries. The book summarizes the research conducted into the form of a database that is full of novel findings previously unseen in research in this field.

The fact that Japanese exporters invoice in the currency of the importing country in trade with developed countries and more frequently invoice in the U.S. dollar rather than the yen in trade with Asia is presented as a puzzling observation.

In the book, an empirical analysis was conducted on the invoicing currency choice and currency risk management through logit and probit estimates based on the database mentioned above. As a result of this analysis, it was found that the invoice currency is selected depending on the competitiveness of the exported product, whether trade was within the company, between companies, or through a general

trading company and the production network. Meanwhile, in terms of currency risk management, it was found that currency risk is more actively managed the higher the level of dependence on foreign markets, and both natural hedges and financial hedges are being used in a complementary manner. Furthermore, Japanese overseas subsidiaries use the U.S. dollar in the U.S. the Euro in Europe, and yen or the U.S. dollar in Asia as the invoice currency. It was found that yen-denominated invoicing is increasing in trade within companies as production networks have been built up in Asia. The results of this empirical analysis are extremely interesting and thought-provoking as they indicate the true conditions for Japanese exporters.

This book discusses several policy implications based on this analysis. It argues that it is important to increase production and exports of products with a high market share that are competitive on a global level in order to increase the ratio of yen-denominated trade so that Japanese companies can avoid currency risk. Additionally, it would be more reasonable for the parent companies of major corporations that are diversifying export destinations to manage currency risk on a global level rather than having subsidiaries individually manage currency risk and therefore in that case it is also reasonable for trade between a parent company and subsidiary to be denominated in the U.S. dollar, meaning that trade denominated in yen may not actually increase as the global supply chain expands.

Given this argument and as discussed in Chapter 7 of this book, the internationalization of a currency (such as the yen or Chinese yuan) can have different significance in terms of the abolition of controls on its use as an international currency and in terms of use as an international currency based on economic rationality by private sector companies. Even if governments pursue the internationalization of a currency in the former sense, whether or not the currency will actually be used on a global basis in the latter sense is another issue. In particular, under the current international monetary system in which the U.S. dollar is the dominant international currency, the internationalization of currencies has not advanced much in the latter sense.

The Dynamics of Inter-firm Networks and Firm Growth



Daisuke Fujii Research Associate, RIETI / **Yukiko Saito** Senior Fellow, RIETI
Tatsuro Senga Fellow, RIETI

Firms develop inter-firm networks throughout their lifecycles, continually adding and dropping trading partners. This column examines the role that the dynamics of these networks play in firm growth. The findings point to the importance of searching for potential trading partners and learning match-specific productivity for younger firms. Surviving older firms, in contrast, tend to enjoy a stable set of customers and suppliers that maintain their operations.

Japan stands out among developed countries for its fast-declining business dynamism. For example, the number of small and medium-sized enterprises (SMEs) dropped by 23% between 1999 and 2014, reflecting the increase in retirement of ageing business owners and weak entrepreneurial activities (Small and Medium Enterprise Agency 2017). This has created concern among policymakers as existing inter-firm networks, which are vital to productivity and sustained economic growth, are being lost.

Firms form production networks through selling and buying goods and services to and from each other. Such buyer-supplier relationships are important for both short-run sales and profits, but also for long-run growth for firms. For example, Toyota Motor Corporation would share its business knowledge with suppliers, which would allow them to learn how to improve efficiency and performance. This, in turn, would help reduce costs and improve the quality of products made by Toyota. Firms can benefit from these intangible assets by building long-term relationships with buyers and sellers. Recent literature has highlighted the importance of such intangible capital accumulation over the lifecycle dynamics of firms and establishments (Atkeson and Kehoe 2005, Hsieh and Klenow 2014).

Development of buyer-supplier networks

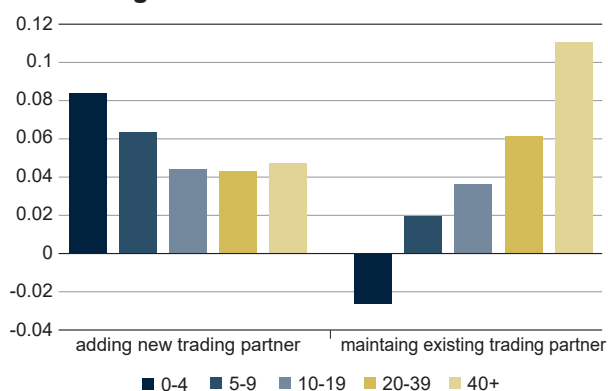
In recent work, we constructed panel data of Japanese firms using supplier-customer information (Fujii et al. 2017).

The sample includes about one million firms over 10 years, provided by Tokyo Shoko Research Ltd. Using these panel data, we studied creation and destruction of buyer-supplier relationships at the firm level, focusing on firm age.

Firms accumulate trading partners as they age, and the number of buyers and suppliers becomes large. In the development of their relationships, younger firms tend to add and drop trading partners more frequently. Examination of the survival rate of links between buyers and sellers reveals that links of younger firms survive less on both sides (buyers and suppliers) and that link survival rate increases with the duration of active relationships. A trading relationship which has existed for a long time is likely to continue in the next period. These results may support the ‘noisy selection’ mechanism of inter-firm links. As Jovanovic (1982) noted in the context of firm-employee match survival patterns, the learning process of link-specific match quality between buyers and sellers may drive this age-dependence of link creation and deletion patterns across different firm stages.

Buyer-supplier networks and firm growth

We next examined how such development of buyer-supplier relationships affects firm growth at different stages of the firm lifecycle. To this end, firms are divided into five age groups: 0-4, 5-9, 10-19, 20-39, and 40+ years old. We looked at how the relationship between inter-firm networks and firm growth varies across different firm age groups (**Figure**

Figure 1. Effect on Firm Growth

1). We find that the benefits from adding new relationships decrease and those from maintaining exiting relationships increase as firms age. More precisely, younger firms that successfully find new trading partners exhibit a greater rate of sales growth, and, for older firms, the stability of inter-firm relationships and intangible capital accumulation with existing trading partners becomes more important.

Policy implications

To grow, firms need to find and build good customer-supplier relationships. It is vital to have a set of good customers to increase sales and profit. It is also important to have a set of good suppliers, since the access to low-cost intermediate materials and services reduces marginal costs, leading to enhanced productivity. This productivity improvement is

amplified when a firm operates on a large scale or faces a high demand elasticity. For both customers and suppliers, stable relationships reduce uncertainty regarding match-specific productivity and help firms to invest in improving firm performance. The relative importance of supplier and customer relationships changes over the firm lifecycle.

Our research suggests the importance of searching for potential trading partners and learning match-specific productivity for younger firms. In contrast, older firms, conditional on surviving, seem to enjoy a stable set of customers and suppliers that maintain their operations. These findings suggest that obtaining new trading partners is important for younger companies, and that there may be room for policy intervention in this area.

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COLUMN

Market Quality Laws and Economics:

Sound development and growth of the economy by raising market quality



Yuichi Furukawa Faculty Fellow, RIETI

Why does innovation not lead to prosperity in Japan?

Throughout history, innovations have appeared, revolutionized the world's economic and social activities and made our lives more prosperous. The development

and spread in the 20th century of automobiles, computers, the internet, etc.—examples of such innovations are too numerous to count here.

In recent years, innovation efforts in Japan appear to be robust. For example, Japan ranked fifth in the World Economic Forum's innovation ranking (2015–2016). Moreover, in the ranking of Nobel laureates by country

(2016), Japan came in fifth in the natural sciences field, following the U.S., UK, Germany and France. While some have pointed out the recent decline in Japan's international presence in such specific areas as innovation capabilities and business-academia collaboration (White Paper on International Economy and Trade 2017, page 223), it is safe to say that Japan has been playing a crucial part in the world's innovation.

On the other hand, what about prosperity? In terms of the levels of per capita GDP, Japan has continued to lag behind the U.S. and the industrialized countries of Europe. In various surveys measuring happiness, including the World Values Survey, Japan's happiness index has been low across the board in comparison to other industrialized countries. These phenomena strongly point to the fact that many Japanese people are not fully experiencing prosperity.

Why is it that innovation in modern Japan has not sufficiently led to prosperity?

The answer lies in the poor quality of the market.

According to the theory of market quality (Yano 2005, Yano and Nakazawa 2015), the main reason why innovation does not lead to prosperity may be attributed to "poor market quality." Just as there are high and low quality products, there are markets with different levels of quality. This concept is at the core of the theory of market quality. With this understanding, what kind of market is considered to be a high-quality market?

To answer this question, let us first of all imagine a low-quality market. Markets dominated by coercive selling or fraudulent practices may, no doubt, be characterized as markets of low quality. Furthermore, markets with low-quality products and poor variety; and markets with an excessive mix of inferior and superior quality products can also be described as low-quality markets. Therefore, if we define a market that does not have these unhealthy elements as a high-quality market, the answer to the above question becomes clearer.

A good market is "one where you can trade better products at a more appropriate prices and to which better products are constantly introduced." (Yano 2005)

Additionally, in order to continue enjoying good products and services at appropriate prices, it is essential that the quality of the market is improved. Consequently, the next thing that we need to consider is the method by which we can improve the quality of the market.

Market infrastructures that support market functions and raising market quality

One of the fundamental propositions of the theory of market quality is that "appropriate coordination of market infrastructure is indispensable for a high-quality market" (Yano 2009). The term market infrastructure referred to

here is a composite concept that includes various factors surrounding the activities of market participants such as legal systems, culture, local customs and values. From the standpoint of the theory of market quality, the problems facing the Japanese economy can be expressed as follows.

How should the various market infrastructures including legal systems, culture, local customs and values be coordinated to create a **high-quality market**? Will it then be possible to realize the sound development and growth of the Japanese economy?

Centered on this theme, in March 2018, a research group led by the author embarked on a new project, "Evidence-based Policy Study on the Law and Economics of Market Quality."

New laws and economics based on the roundabout approach

In order to achieve a given goal, formulating strategies that directly approach the goal is not always the best method. If you want to catch fish, it is preferable that you make a net first rather than jumping into the ocean. If you collected wood, built a ship and cast a large net, it would be even better. This is the example, which Wilhelm Roscher, the 19th century economist of the historical school, set forth to illustrate the roundabout approach to production.

The theory of market quality is strongly rooted in the roundabout approach. To achieve the goal of raising market quality, rather than limiting the approach directly to a product's quality, price and production volume through standalone political measures such as granting subsidies, the theory aims to explore basic remedies and fundamental solution methods to the problem. In other words, the major goal of the theory of market quality is, through observation of the entire network of market infrastructures—including culture, local customs and values, as well as legal systems, policies and rules—to consider the desirable coordination of such elements and to design an economic system that will raise market quality. This type of approach, in a broader sense, may be said to be an extension of the major trends in 20th century social sciences that have succeeded in refining the roundabout approach, such as the legislation theory in the study of law, governance in political science and the study of business administration and mechanisms and design in economics.

Nevertheless, even if we were to enact roundabout processes rather than taking the direct approach, it would be meaningless to simply proceed blindly in a roundabout way. Unless they are based on sufficient evidence and refined theories, it would be difficult to pursue appropriate roundabout strategies. Having become aware of such problems, our project set out to theoretically clarify the mechanisms required to raise market quality, and at the same time, to validate our theory based on the evidence that we have collected. To this end, it will be necessary to accurately measure and quantify market quality based

on data and to understand the causal relationship between market infrastructures such as legal systems and economic phenomena.

Currently, the project, being undertaken with the cooperation of Japanese and overseas researchers, is focusing on market infrastructures, which had not been fully analyzed in the past, including the relationship of trust in society, elements of life science (e.g. genome information and medicine), culture, trading systems and information systems; and building theories, as well as accumulating evidence. Once we have findings based on a sufficient amount of data, we hope to take the further step of proposing the design of desirable legal systems which will enable sound development and growth by raising market quality. By doing so, we hope to eventually explore the possibilities for a new field of law and economics that would be called the laws and economics of market quality, which would strictly be based on the roundabout approach.

Understanding the national character of “desiring novelty” as market infrastructure

Finally, in concluding this column, I would like to present one of the various research themes of this project, which is being led by the author.

The more the people “desire novelty”—that is, the stronger the trait for people to prefer new ideas and products—the greater the number of innovations that will be created in a society. This is generally accepted as true. There are people who think that given that innovation is the source of economic growth, this trait of preferring new things—the so-called “novelty-seeking traits”—is central to economic growth and development.

However, results of recent empirical studies have shown that, contrary to this accepted truth, people’s novelty-seeking traits do not necessarily impact economic growth in a positive way. According to the project’s first paper, the Discussion Paper titled Novelty-Seeking Traits and Innovation (Furukawa, Lai and Sato, 2018), the national character of “desiring novelty” could have the opposite effect of restricting innovation in the economy as a whole. In his article (Gören, 2017) published in the *Journal of Development Economics*, the foremost periodical on development economics, Erkan Gören pointed out that excessive novelty-seeking traits could have the effect of inhibiting economic growth.

The national character of “desiring novelty” may not necessarily have a positive effect on innovation and economic development. These results point to the fact that when deliberating policies and systems, the culture and national character represented by the novelty-seeking trait should be taken into account as significant market infrastructure. This also suggests that

even if policy and institutional designs which have successfully survived in foreign countries with different cultures and national characteristics are exactly adopted in Japan, they would not function properly.

“Novelty-seeking” and “non-novelty-seeking” societies must coordinate their market infrastructures differently and thus must have different designs for desirable legal systems and economic policies that can raise market quality. This perspective is unique to the project and the author believes that such a perspective will provide a new point for discussion on innovation policies.

Looking towards the future

The concept of market quality, upheld by Yano (2005) and others, is a relatively new concept in economics. Although a number of dissertations have been written that form the core of this concept, research is still in the development phase and in terms of the role of market infrastructure, many issues remain to be clarified. Going forward, the project will clarify the role played by each piece of market infrastructure in the quality of the market. We plan to comprehensively consider the evidence obtained from this research and to clarify the design of the market infrastructure such as laws, policies and systems that will enable sound development and growth. Through this process, we hope to ultimately explore the possibility of developing a new legal and economics discipline based on the theory of market quality.

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RIETI's Fourth Medium- term Plan

Lineup of Research Programs

FY2016 to FY2019

In the Fourth Medium-term Plan, RIETI has been promoting research activities under three new medium- to long-term perspectives on economic and industrial policies with consideration for related government policies such as the “Japan Revitalization Strategy” and the “mid/long-term and structural issues and policy directions relevant to the formulation of economic and industrial policies” (April 2015, Industrial Structure Council).

Research themes under the Fourth Medium-term Plan invariably set these perspectives as basic principles, and we have put in place nine programs covering policy research areas consisting of similar individual research topics. Leading experts in respective fields serve as program directors and supervise multiple projects conducted by fellows under the program. If necessary, these programs will be changed or added to respond to needs for new research depending on the progress and the changes in economic situations.


Macroeconomy and
Low Birthrate / Aging
Population

I

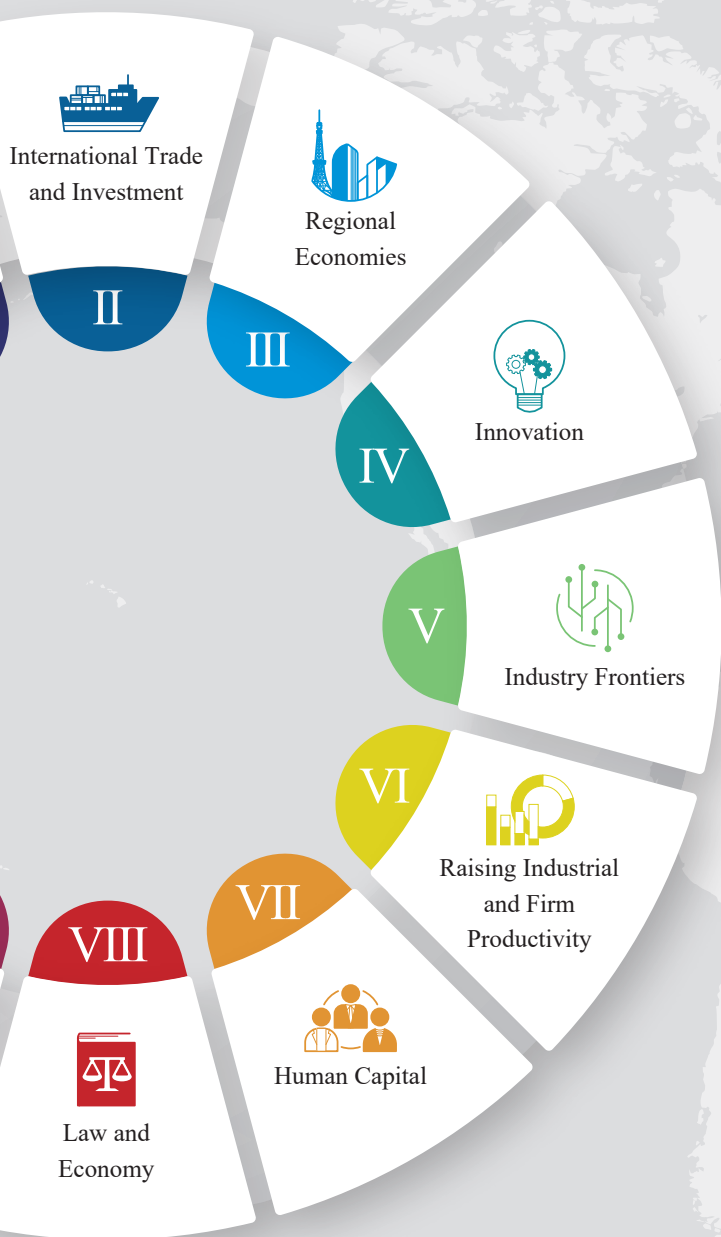

Policy History and
Policy Assessment

IX

Three Medium- to Long-term and Industrial Policies

1 Cultivating
Japan's
strength in the
world economy

2



Research Process

To further improve the quality of research, RIETI ensures that discussions are organized for each research project through brainstorming workshops and discussion paper (DP) / policy discussion paper (PDP) seminars, in which Japanese and foreign experts and policymakers participate to deepen the research.

Brainstorming Workshops

Launching of a new research project

Discussion Paper and Policy Discussion Paper Seminars

Deepening the analysis of individual papers

Symposiums, Workshops, Seminars, Publication of DPs and PDPs, Book Publication

Dissemination of research findings

Perspectives on Economic

Making Japan into an innovative nation

3

Overcoming population decline

Introduction of the Nine Research Programs

Program

I

Macroeconomy and Low Birthrate / Aging Population



Program Director: **Keiichiro Kobayashi**

Faculty Fellow, RIETI / Professor, Faculty of Economics, Keio University /
Research Director, Canon Institute for Global Studies

Maintaining long-term growth has been a challenge for economies around the world, and Japan is facing a rapidly aging population ahead of that of other nations. We will conduct research that contributes to policies to maintain Japan's economic vitality as well as to the development of the global economy. Specifically, we will consider system infrastructure, such as the role of Asian currency baskets, and analyze trends in international finance and the global economy, and long-term deflation mechanisms, etc. Furthermore, we will conduct multifaceted and integrated research on the analysis of comprehensive panel data on the elderly, direction of the comprehensive reform of the social security and taxation systems, policy proposals for economic recovery, fiscal consolidation, etc.

Program

II

International Trade and Investment



Program Director: **Eiichi Tomiura**

Faculty Fellow, RIETI /
Professor, Faculty of Economics, Hitotsubashi University

When considering Japan's economic policies in the midst of globalization, an understanding of international trade and foreign direct investment is even more important now than in the past. This program, focusing on the globalization of firm activities (i.e., exports and overseas production), will study the international trading networks of firms from theoretical and empirical perspectives, while also studying trade policies and international trade and investment rules from empirical and legal perspectives.

Program

III

Regional Economies



Program Director: **Nobuaki Hamaguchi**

Faculty Fellow, RIETI / Professor, Research Institute for Economics and Business Administration (RIEB), Kobe University

This program will study the effect of international trade, movement of capital and labor, and changes in technology on urban and rural areas and industries, while viewing the regions of Japan in the context of the global economy and using this to develop proposals, etc. on such important policy issues as the aging population and regional revitalization. Specifically, we will consider policies to promote the features of export industries in regional areas and regional economic circulation, strengthen functions of regional financial institutions, create social institutions that utilize cutting-edge information technology and transport infrastructure, and utilize and strengthen international production networks (value chains), as well as create statistical indicators that conform with the structure of economic spaces, form policymaking frameworks, etc.

Exchange Rates and International Currency

Project Leader: Eiji Ogawa (Faculty Fellow)

Economic Analysis of the Development of the Nursing Care Industry in China and Japan

Project Leader: Ting Yin (Fellow)

Exploring Inhibition of Medical Expenditure Expansion and Health-oriented Business Management Based on Evidence-based Medicine

Project Leader: Kazumitsu Nawata (Faculty Fellow)

Microeconomics, Macroeconomics, and Political Philosophy toward Economic Growth

Project Leader: Keiichiro Kobayashi (Faculty Fellow)

Empirical Analysis of Corporate Global Activities in the Digital Economy

Project Leader: Eiichi Tomiura (Faculty Fellow)

Research on Global Inter-firm Networks and Related Policies

Project Leader: Yasuyuki Todo (Faculty Fellow)

A Study of the Effects of Trade Policy: A microdata analysis of Japan from the 1990s to 2010s

Project Leader: Shujiro Urata (Faculty Fellow)

Analyses of Offshoring

Project Leader: Jota Ishikawa (Faculty Fellow)

An Empirical Study on Compact City: Evaluating place-based policies in Japan

Project Leader: Keisuke Kondo (Fellow)

Spatial Economic Analysis on Intracity Economic Activities and Interregional Economic Activities

Project Leader: Takatoshi Tabuchi (Faculty Fellow)

Innovation Enhancing Regional Economic Structure and Evolution of Cities

Project Leader: Ryohei Nakamura (Faculty Fellow)

Stable Development of Regional Economies under a Declining Population

Project Leader: Nobuaki Hamaguchi (Faculty Fellow)

East Asian Production Networks, Trade, Exchange Rates, and Global Imbalances

Project Leader: Willem Thorbecke (Senior Fellow)

Individuals' Lifecycle Behavior and Macroeconomic Analysis under Demographic Aging: Effects of fiscal and social security policies

Project Leader: Sagiri Kitao (Faculty Fellow)

Comprehensive Research on the Current International Trade/Investment System (pt. IV)

Project Leader: Tsuyoshi Kawase (Faculty Fellow)

Studies on Foreign Direct Investment and Trade in Relation to FDI

Project Leader: Naoto Jinji (Faculty Fellow)

Studies on the Impact of Uncertainty and Structural Change in Overseas Markets on Japanese Firms

Project Leader: Hongyong Zhang (Fellow)

The Role of Regional Financial Institutions as the Core of the Local Economy and Regional Cooperation

Project Leader: Nobuyoshi Yamori (Faculty Fellow)

Dynamics of Inter-organizational Network and Firm Lifecycle

Project Leader: Yukiko Saito (Senior Fellow (Specially Appointed))

Agglomeration-based Framework for Empirical and Policy Analyses of Regional Economies

Project Leader: Tomoya Mori (Faculty Fellow)



Program Director: **Sadao Nagaoka**

Faculty Fellow, RIETI /

Professor, Tokyo Keizai University

The creation of new knowledge and its exploitation to resolve problems which we face is the main source of innovation. This program will develop original data to understand the innovation processes, and will conduct research from an international perspective, so as to contribute to evidence-based policy formation. Specifically, the program will analyze the innovation capabilities of industries, the economic impact of artificial intelligence, intellectual property systems, open innovation, knowledge transfer and the mobility of human resources across organizations, university-industry cooperation, technical standards, and business and industrial organizations that promote innovation.



Program Director: **Hiroshi Ohashi**

Faculty Fellow, RIETI /

Professor, Faculty of Economics, The University of Tokyo

Through innovation in the key technological areas of sophistication of data processing and evolution of telecommunication networks, signs of changes in the industrial structure have begun to be seen in Japan as well as in other leading nations. Via the Internet of Things (IoT) using sensor technology, large quantities of unstructured data have now become accessible, and artificial intelligence (AI) technology is being gradually put into practical use. In Japan, new industrial frontiers are opening. As such, this program will venture on research as to how policies should be instituted to overcome the challenges facing the Japanese economy, taking cross-industry policies into perspective, in addition to conventional policies intended for individual industries.



Program Director: **Kyoji Fukao**

Faculty Fellow, RIETI /

Professor, Institute of Economic Research, Hitotsubashi University

The aim of this program is to measure industry- and firm-level productivity and its determinants for Japan and other East Asian countries and to conduct research on policies aimed at raising productivity. At the industry level, in addition to updating and expanding the Japan Industrial Productivity (JIP) and China Industrial Productivity (CIP) databases in collaboration with Hitotsubashi University, we will construct an industrial productivity database by prefecture for Japan and examine the total factor productivity (TFP) disparity between regions and the factors behind it, etc. At the firm or establishment level, employing micro-data from government statistics and corporate financial data in Japan and abroad, we will research the following: determinants of productivity gaps among firms; the impact of globalization and changes in demand affecting corporate performance; policies for raising productivity in the service sector; productivity

gaps between firms in Japan, China and Korea; and international comparison of productivity dynamics. We will also measure investment in intangible assets such as research and development, software, in-house training, and organizational structure, all of which are important sources of innovation and productivity growth at both industry and firm levels, and examine the economic effects of such investments.

Empirical Analysis of Innovation Ecosystems in Advancement of the Internet of Things (IoT)

Project Leader: Kazuyuki Motohashi (Faculty Fellow)

Frontiers of Innovation Policy: Evidence from micro data

Project Leader: Sadao Nagaoka (Faculty Fellow)

Creation and Development of High-tech Startups

Project Leader: Yuji Honjo (Faculty Fellow)

Heterogeneity across Agents and Economic Growth

Project Leader: Hiroshi Yoshikawa (Faculty Fellow)

Study Group on Corporate Finance and Firm Dynamics

Project Leader: Iichiro Uesugi (Faculty Fellow)

Policy Analyses on Industrial Organization

Project Leader: Hiroshi Ohashi (Faculty Fellow)

Productivity Gaps and Industrial Competitiveness

Project Leader: Koji Nomura (Faculty Fellow)

Development of New Indicators for Service Sector Analysis and EBPM

Project Leader: Yoko Konishi (Senior Fellow)

East Asian Industrial Productivity

Project Leader: Kyoji Fukao (Faculty Fellow)

Microeconomic Analysis of Firm and Industry Growth

Project Leader: Kaoru Hosono (Faculty Fellow)

Analysis of the Regional-Level Industrial Productivity and Regional Production Networks

Project Leader: Joji Tokui (Faculty Fellow)

Research on the Improvement in Resource Allocation and Productivity among the Healthcare and Education Service Industries

Project Leader: Tomohiko Inui (Faculty Fellow)

Globalization, Innovation, and Competition Policy

Project Leader: Noboru Kawahama (Faculty Fellow)

Japan's History of Thought on Agricultural Policy and Structural Reform of Agriculture

Project Leader: Kazuhito Yamashita (Senior Fellow (Specially Appointed))

Macro & Micro Economics of Artificial Intelligence

Project Leader: Shunsuke Managi (Faculty Fellow)

Dynamics of Economy and Finance from the Economic Network Point of View

Project Leader: Hideaki Aoyama (Faculty Fellow)

Policy Issues on the Electricity Market Reform after 2020

Project Leader: Tatsuo Hatta (Faculty Fellow)

Research on Productivity-improving Capital Investment

Project Leader: Tsutomu Miyagawa (Faculty Fellow)

Program

VII

Human Capital

Program Director: **Kotaro Tsuru**

Faculty Fellow, RIETI /

Professor, Graduate School of Business & Commerce, Keio University

For Japan, a nation with scarce resources, to maintain and strengthen economic vitality and innovation and increase its growth potential by using its advantages amid a declining population resulting from a rapidly aging society and intensifying global competition among other factors, a significant key is how to utilize its human resources. We will conduct multifaceted, comprehensive research on ideal labor market systems to increase worker incentive and capability; reconstruction of employment institutions and systems from a full life-cycle perspective from early childhood education through higher education; human resources development in employment years; and utilization of elderly as human resources as well as from the perspective of promoting diversity including increased women's participation.

Program

VIII

Law and Economy

Acting Program Director: **Makoto Yano**

President and Chief Research Officer, RIETI /

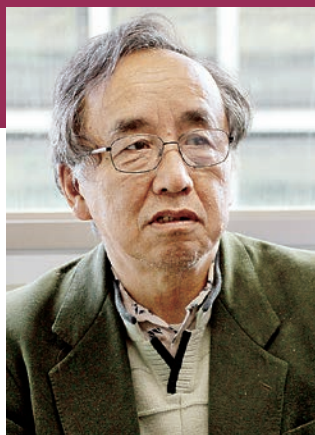
Professor Emeritus, Kyoto University

Technological innovation is expected to accelerate in many fields such as financial services, information/communications, and life sciences. In such an environment, what can a nation do to build an economy that leads the world in innovation? Many cases have been observed that important innovation is born in a market in which free entry and free enterprise are guaranteed. In order to foster such a market, various rules and institutional arrangements need to be built into the economy. From this viewpoint, in the present program, the design of new types of economic and industrial policies is investigated.

Program

IX

Policy History and Policy Assessment

Program Director: **Haruhito Takeda**

Faculty Fellow, RIETI /

Professor Emeritus, The University of Tokyo

This program aims to review and assess policy shifts, chiefly during the period 1980–2000, as we look at the roles played by Japan's economy and society as well as its trade and economic industrial policies at the end of the 20th century. While the final two decades of the 20th century were a time of significant changes in Japan's economy and society, they also represent an important point of comparison when considering the development of policy after the creation of the Ministry of Economy, Trade and Industry from a historical perspective. We will attempt to clarify how changes in trade and industrial policy at the turn of the century were affected, based on the recognition of policy issues over the preceding quarter-century, choice of policy responses, and evaluation on their results.

Employment System Reform to Use Human Resources More Efficiently

Project Leader: Hideo Owan (Faculty Fellow)

Fundamental Research for Economic Growth and Productivity Improvement in Japan

Project Leader: Kazuo Nishimura (Faculty Fellow)

Empirical Studies on Employment, Migration, and Family Issues of Foreigners in Japan

Project Leader: Yang Liu (Fellow)

Reform of Labor Market Institutions

Project Leader: Kotaro Tsuru (Faculty Fellow)

Frontiers in Corporate Governance Analysis

Project Leader: Hideaki Miyajima (Faculty Fellow)

Evidence-based Policy Study on the Law and Economics of Market Quality

Project Leader: Yuichi Furukawa (Faculty Fellow)

Research on Political Behavior and Decision Making: Searching for evidence-based solutions to political challenges in the economy and industry

Project Leader: Yoshikuni Ono (Faculty Fellow)

Historical Evaluation of Industrial Policy

Project Leader: Tetsuji Okazaki (Faculty Fellow)

The Industrial Revitalization and the Role of Finance: The history of Japanese economic policies in the 1990s-2000s

Project Leader: Haruhito Takeda (Faculty Fellow)



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