

# **2022 KIET-RIETI-TIER Workshop**

## **Economic Security Strategy and Cooperation in East Asia amid the Reorganization of GVCs**

**Date | 10:00-17:20, October 25 (Tue), 2022**

**Venue | The Plaza Hotel, Seoul, South Korea**







# Contents

## » Program

### ❖ Session I: TIER Session ..... 1

- **Presentation 1. *Balancing Economic Security and Cooperation in East Asia amid the Multilateral Institutions***  
Grace CHUNG, Director, Department of International Affairs, TIER ..... 3  
    **Discussant 1 (RIETI)**  
    Mark SABURI, Director, Int'l Coordination & PR Strategy Department ..... 9
- **Presentation 2. *The Trend of Reshoring Critical Supply Chains and Challenges to Taiwan***  
Ko-Hsiung LIEN, Director, Research Division VIII, TIER ..... 11  
    **Discussant 2 (KIET)**  
    Kyung In HWANG, Associate Research Fellow, Center for Growth Engine Industries ..... 21

### ❖ Session II: RIETI Session ..... 25

- **Presentation 1. *RIETI's EBPM Initiative in Searching for Better Supply Chain Management***  
Mark SABURI, Director, Int'l Coordination & PR Strategy Department, RIETI ..... 27  
    **Discussant 1 (KIET)**  
    Soo-Dong KIM, Research Fellow, Center for International Industry and Trade ..... 39
- **Presentation 2. *Transmission of Foreign Shocks in East Asia: A Review***  
Kozo KIYOTA, Research Associate (Professor, Keio University), RIETI ..... 41  
    **Discussant 2 (TIER)**  
    Grace CHUNG, Director, Department of International Affairs ..... 53

### ❖ Session III: KIET session ..... 57

- **Presentation 1. *Foreign Firm Entry under Domestic Rivals***  
Kyung In HWANG, Associate Research Fellow, Center for Growth Engine Industries, KIET ..... 59  
    **Discussant 1 (RIETI)**  
    Kozo KIYOTA, Research Associate (Professor, Keio University) ..... 69
- **Presentation 2. *An Analysis of Supply Chain Management and Business Performance of Four Leading Industries***  
Soo-Dong KIM, Research Fellow, Center for International Industry and Trade, KIET ..... 75  
    **Discussant 2 (TIER)**  
    Ko-Hsiung LIEN, Director, Research Division VIII ..... 85

# Program

❖ Date : October 25 (Tue), 2022

❖ Time : 10:00-17:20

❖ Program

Time		Program
10:00-10:05	5 min	<b>Opening Remarks</b> Hyeon JU, President, KIET
10:05-10:10	5 min	<b>Opening Remarks</b> Chien-Yi CHANG, President, TIER
10:10-10:15	5 min	<b>Opening Remarks</b> Shigetoshi IKEYAMA, Executive Officer, RIETI
10:15-10:20	5 min	Photo Session
<b>Session I</b>		<b>TIER Session chaired by Shigetoshi IKEYAMA, Executive Officer, RIETI</b>
10:20-10:40	20 min	<b>Presentation 1 (TIER)</b> <i>Balancing Economic Security and Cooperation in East Asia amid the Multilateral Institutions</i> Grace CHUNG, Director, Department of International Affairs
10:40-10:50	10 min	Discussant 1 (RIETI) Mark SABURI, Director, Int'l Coordination & PR Strategy Department
10:50-11:10	20 min	Q & A
11:10-11:30	20 min	<b>Presentation 2 (TIER)</b> <i>The Trend of Reshoring Critical Supply Chains and Challenges to Taiwan</i> Ko-Hsiung LIEN, Director, Research Division VIII
11:30-11:40	10 min	Discussant 2 (KIET) Kyung In HWANG, Associate Research Fellow, Center for Growth Engine Industries
11:40-12:00	20 min	Q & A
12:00-13:30	90 min	Lunch
<b>Session II</b>		<b>RIETI Session chaired by Hyeon JU, President, KIET</b>
13:30-13:50	20 min	<b>Presentation 1 (RIETI)</b> <i>RIETI's EBPM Initiative in Searching for Better Supply Chain Management</i> Mark SABURI, Director, Int'l Coordination & PR Strategy Department
13:50-14:00	10 min	Discussant 1 (KIET) Soo-Dong KIM, Research Fellow, Center for International Industry and Trade
14:00-14:20	20 min	Q & A

[2022 KIET-RIETI-TIER Workshop]

Economic Security Strategy and Cooperation in East Asia amid the Reorganization of GVCs

Time		Program
<b>Session II</b>		<b>RIETI Session chaired by Hyeon JU, President, KIET</b>
14:20-14:40	20 min	<b><u>Presentation 2 (RIETI)</u></b> <i>Transmission of Foreign Shocks in East Asia: A Review</i> Kozo KIYOTA, Research Associate (Professor, Keio University)
14:40-14:50	10 min	Discussant 2 (TIER) Grace CHUNG, Director, Department of International Affairs
14:50-15:10	20 min	Q & A
15:10-15:25	5 min	Coffee Break
<b>Session III</b>		<b>KIET session chaired by Chien-Yi CHANG, President, TIER</b>
15:25-15:45	20 min	<b><u>Presentation 1 (KIET)</u></b> <i>Foreign Firm Entry under Domestic Rivals</i> Kyung In HWANG, Associate Research Fellow, Center for Growth Engine Industries
15:45-15:55	10 min	Discussant 1 (RIETI) Kozo KIYOTA, Research Associate (Professor, Keio University)
15:55-16:15	20 min	Q & A
16:15-16:35	20 min	<b><u>Presentation 2 (KIET)</u></b> <i>An Analysis of Supply Chain Management and Business Performance of Four Leading Industries</i> Soo-Dong KIM, Research Fellow, Center for International Industry and Trade
16:35-16:45	10 min	Discussant 2 (TIER) Ko-Hsiung LIEN, Director, Research Division VIII
16:45-17:05	20 min	Q & A
17:05-17:10	5 min	<b>Closing Remarks</b> Chien-Yi CHANG, President, TIER
17:10-17:15	5 min	<b>Closing Remarks</b> Shigetoshi IKEYAMA, Executive Officer, RIETI
17:15-17:20	5 min	<b>Closing Remarks</b> Hyeon JU, President, KIET



Session

I

# TIER Session







# Balancing Economic Security and Cooperation in East Asia amid the Multilateral Institutions

Grace CHUNG, PhD  
Director, Department of International Affairs, TIER  
2022 KIET-RIETI-TIER Workshop  
October 25, 2022



- ★ Paradox facing economic security and cooperation-  
protection vs. integration
- ★ Multilateral institution matters-  
moving forward together
- ★ Beware of hidden trap ahead-  
adversity makes strange bedfellows



2



## Economic security

The condition of having stable resources through supply and demand to support a standard of living now and in the foreseeable future.

East Asia has been the main engine of world economic growth for decades, but COVID-19 caused impacts on the engine, hindering economic security in the region.

East Asian countries can work together under two multilateral institutions- **APEC and IPEF**, to balance and enhance economic security and cooperation.

1



## Cooperation under APEC and IPEF

### *APEC*

Many international projects were initiated. They are mainly to resolve regional issues that hinder economic security.

APEC members also co-sponsor projects among themselves as means of cooperation.

### *IPEF*

As agendas and priorities are still under negotiation, members are able to suggest and propose feasible themes, while explore ways of cooperation to promote economic security.

**U.S.-Taiwan Initiative on 21st Century Trade**

2



## GDP Growth (%) of APEC Economies

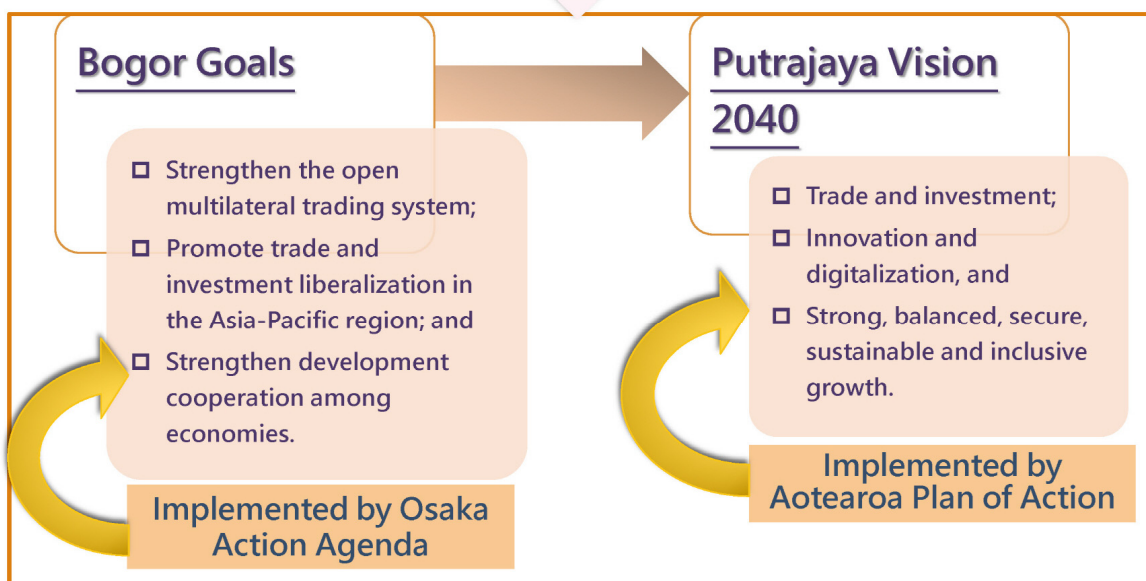


Source: IHS Markit, September 15, 2022

3

## APEC Goals

Voluntary and Non-binding



4

## APEC Process



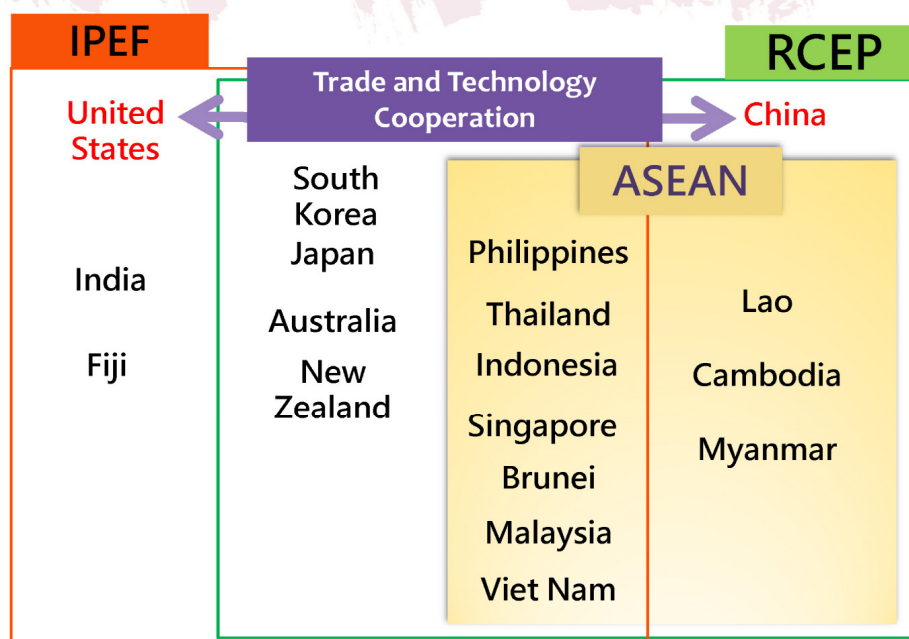
It is a process of dynamic optimization. The derivation of optimal decisions vary with change of external impacts.

Design and shaping of the Putrajaya Vision 2040 and the Aotearoa Plan of Action has gone beyond the scope of the Bogor Goals and the Osaka Action Plan. Main functions of APEC has been recalibrated to respond to more severe and dynamic external constraints.

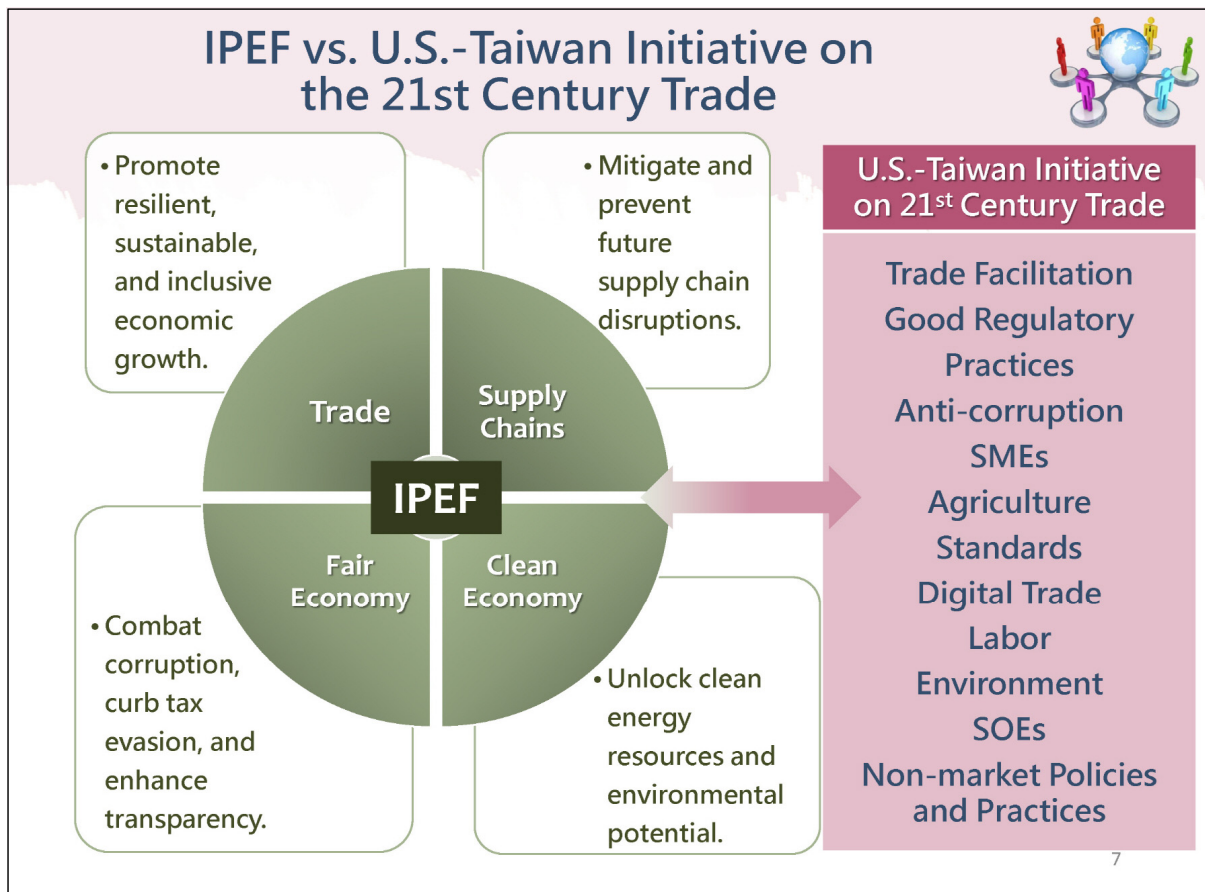
APEC host country will integrate its concerned issues into the realization of the Putrajaya Vision 2040 and the Aotearoa Plan of Action.

5

## IPEF vs. RCEP



6



## Conclusion

There is more room for economic cooperation to promote economic security in APEC and IPEF.

- ★ Non-binding
- ★ Cooperative consensus
- ★ Shared values

8



## Areas for Cooperation (Korea, Japan and Taiwan)

### Regional Economic Integration

- Digital economy, labor issues, environment, trade, SOEs

### Supply Chain Resilience

- Information sharing
- Jointly deal with relevant regulations of human rights (including prevent the use of forced labor)

11



Thank you for your attention.

### **Comments on Dr. Grace Chung's**

### **“Balancing Economic Security and Cooperation in East Asia amid the Multilateral Institutions”**

Mark SABURI

#### Comments and Questions

Dr. Chung's presentation analyzed the problems facing the current multilateral trade regime, touching on the conflict between protectionism and globalism and the impact of COVID-19, and you proposed to ensure economic security through the use and strengthening of multilateral agreements such as APEC and IPEF. I think this is a very important. In addition, as a representative of TIER, you also explained “U.S.-Taiwan Initiative on 21Century Trade” between the United States and Taiwan, which was very helpful in deepening our understanding.

I have three questions.

1. Economic security is risk management, and its frame is defined by ISO. Specifically, it generally consists of “risk assessment”, “risk control”, and “risk communication and monitoring”. The World Economic Forum’s “Global Risks Report” is well-known for analyzing the various risks around the world, but what kind of specific risks are in your mind?
2. What are the risks for Taiwan and what are the risks for the East Asia region? What functions do you think APEC and IPEF will play in easing these risks? If APEC and IPEF cannot sufficiently mitigate these risks, what kind of preparations would be necessary?
3. The last slide, deepening specific cooperation among the three countries, is truly significant, and I think it is a theme that runs throughout today's all discussion. However,

there is a possibility that promoting economic integration may conversely weaken resilience. I would appreciate your advice on what specific projects and in what areas we should start, and I believe that TSMC's investment in Japan is a successful example of a concrete project in this sense, but if there are other projects that should be promoted, I would be happy to make suggestions to METI, relevant ministries, and private companies.



# The Trend of Reshoring Critical Supply Chains and Challenges to Taiwan

Ko-Hsiung LIEN  
TIER  
October 24, 2022

## Disruption: global sourcing v.s. reshoring

### ➤ Global sourcing

- goods and services sourcing from the global market across geographic and industrial border.
- Driving forces
  - Constant return to scale: comparative advantage from endowment(H-O Model)
  - Increasing return to scale : Home market effect and core-periphery pattern



### ➤ Reshoring

- the process of returning the production and manufacturing of goods back to the company's original country
- EU : Open strategic autonomy
  - EU strategy of shaping the new system of global economic governance and developing mutually beneficial bilateral relations
- USA : Buy America, Made in All of America

## Critical supply chains designated by key economies

Economies	Projects/Plans	Critical supply chains/core components
United States	2021: 100 Days Supply Chains Review 2022: The Biden-Harris Plan to Revitalize American Manufacturing and Secure Critical Supply Chains in 2022	Semiconductor manufacturing and advanced packaging Large capacity batteries Critical minerals and materials Pharmaceuticals and active pharmaceutical ingredients(API)
European Union	European industrial strategy European Critical Raw Materials Act	Semiconductors Active pharmaceutical ingredients(API) Lithium battery and rare earths Hydrogen energy Cloud and edge computing
China	14 <sup>th</sup> Five-Year Planning Cut-throat critical technology and components	Cutting-edge chips, aeronautical, robotics, advanced railway transportation equipment, engineering mechanics, advanced CNC machines, pharmaceuticals
Japan	Supplementary budget for supply chain reform Economic security legislation Guideline for protecting critical supply chains	¥220 billion (US\$2 billion) was allocated to companies reshoring supply chains back to Japan and another ¥23.5 billion (US\$214 million) for companies looking to move production to other countries in Southeast Asia Semiconductor, medicines, large capacity battery, rare earths

## Reshoring strategy-United States

### Trade measures

#### Trade Act of 1974

- **Section 232**-national security
- **Section 301**-unfair foreign trade

#### Foreign Direct Product Rule

- "direct product" of specified "technology" or "software" from US.
- Foreign-produced items located outside the US are subject to the Export Administration Regulations

### Technology protection

- **Foreign Investment Risk Review Modernization Act** : M&A, technology cooperation °
- **Export Control Reform Act** : critical infrastructure °
- **Entity list** : restriction of specific foreign firms °
- **Foreign Direct Product Rule** : Export Administration Regulations

### Supporting measures

- **Subsidy and preferential loans**
- **Public-private partnership**
- **Federal procurement of domestic products**
- **Research funding**
- **Sustainable criteria**



## Reshoring strategy-European Union

### • Domestic measures

#### 1. Supply chain stability

- Cross-country partnership of industrial and trade policy

#### 2. New industrial alliance

- Detecting the potential capacity of critical domain

#### 3. IPCEI

- “Important Projects of Common European Interests”
- Fostering the development of strategic industries by absolving the restriction on the national aid

#### 4. Capability of building industrial standard

- Standardization, governance, experts

#### 5. Framework of monitoring key industries

- EU Battery Regulation
- EU Chips Act

#### 6. Research funding

### • Foreign measures

#### 1. Cooperation with the U.S. -TTC

- EU-US Trade and Technology Council
- Semiconductor supply chain cooperation
- Focus on the non-market behavior of China and tech giants

#### 2. International cooperation of industry policy

- Platform of cross-country industrial clusters

#### 3. Rule of level playing fields

- Carbon border adjustment mechanism(CBAM)
- Responsible business conducts

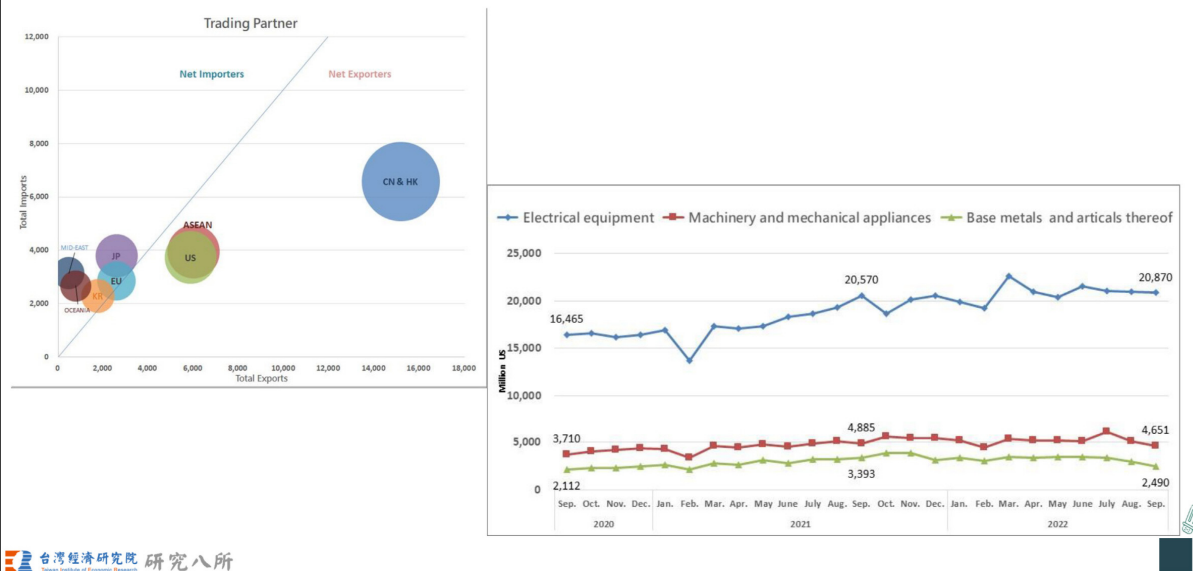
#### 4. International strategic partnership

- With the resource-abundant third countries

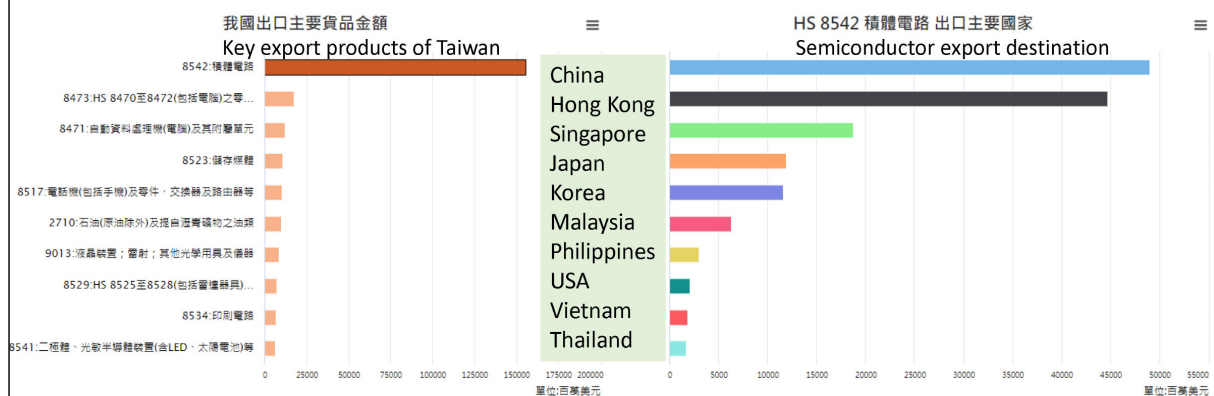
## Overview of Taiwan export structure(1/2)

Product domains	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
LIVE ANIMALS; ANIMAL PRODUCTS	0.68%	0.66%	0.63%	0.64%	0.64%	0.65%	0.63%	0.47%	0.41%	0.36%
VEGETABLE PRODUCTS	0.18%	0.19%	0.24%	0.24%	0.22%	0.23%	0.26%	0.24%	0.19%	0.15%
ANIMAL OR VEGETABLE FATS AND OILS AND THEIR CLEAVAGE PRODUCTS; PREPARED EDIBLE FATS; ANIMAL OR VEGETABLE WAXES	0.04%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%
PREPARED FOODSTUFFS; BEVERAGES, SPIRITS AND VINEGAR; TOBACCO AND MANUFACTURED TOBACCO SUBSTITUTES	0.53%	0.55%	0.63%	0.69%	0.70%	0.74%	0.79%	0.73%	0.68%	0.55%
MINERAL PRODUCTS	7.76%	6.52%	4.25%	3.93%	3.74%	4.35%	4.26%	2.12%	2.72%	4.39%
PRODUCTS OF THE CHEMICAL OR ALLIED INDUSTRIES	6.97%	6.91%	6.38%	6.14%	6.14%	6.63%	5.67%	4.83%	5.24%	5.06%
PLASTICS AND ARTICLES THEREOF; RUBBER AND ARTICLES THEREOF	8.12%	7.68%	7.49%	7.14%	7.28%	7.57%	6.86%	6.16%	6.69%	5.62%
RAW HIDES AND SKINS, LEATHER, FURSKINS AND ARTICLES THEREOF; SADDLERY AND HARNESS; TRAVEL GOODS, HANDBAGS AND SIMILAR CONTAINERS; ARTICLES OF ANIMAL GUT (OTHER THAN SILK WORM GUT)	0.31%	0.32%	0.30%	0.24%	0.20%	0.18%	0.17%	0.12%	0.11%	0.11%
WOOD AND ARTICLES OF WOOD; WOOD CHARCOAL; CORK AND ARTICLES OF CORK; MANUFACTURES OF STRAW, OF ESPARTO OR OF OTHER PLAITING MATERIALS; BASKETWARE AND WICKERWORK	0.07%	0.07%	0.06%	0.06%	0.06%	0.05%	0.05%	0.04%	0.04%	0.03%
PULP OF WOOD OR OF OTHER FIBROUS CELLULOSIC MATERIAL; RECOVERED(WASTE AND SCRAP) PAPER OR PAPERBOARD; PAPER AND PAPERBOARD AND ARTICLES THEREOF	0.62%	0.58%	0.58%	0.61%	0.62%	0.64%	0.62%	0.54%	0.48%	0.46%
TEXTILES AND TEXTILE ARTICLES	3.83%	3.69%	3.85%	3.56%	3.19%	3.02%	2.79%	2.18%	2.02%	1.91%
FOOTWEAR, HEADGEAR, UMBRELLAS, SUN UMBRELLAS, WALKING-STICKS, SEAT-STICKS, WHIPS, RIDING-CROPS AND PARTS THEREOF; PREPARED FEATHERS AND ARTICLES MADE THEREWITH; ARTIFICIAL FLOWERS; ARTICLES OF HUMAN HAIR	0.14%	0.14%	0.14%	0.14%	0.12%	0.11%	0.11%	0.09%	0.10%	0.10%
ARTICLES OF STONE, PLASTER, CEMENT, ASBESTOS, MICA OR SIMILAR MATERIALS; CERAMIC PRODUCTS; GLASS AND GLASSWARE	0.85%	0.80%	0.81%	0.81%	0.75%	0.73%	0.69%	0.70%	0.60%	0.49%
NATURAL OR CULTURED PEARLS, PRECIOUS OR SEMI-PRECIOUS STONES, PRECIOUS METALS, METALS CLAD WITH PRECIOUS METAL AND ARTICLES THEREOF; IMITATION JEWELLERY; COIN	0.74%	0.76%	0.80%	0.48%	0.36%	0.42%	0.45%	0.88%	0.59%	0.57%
BASE METALS AND ARTICLES OF BASE METAL	9.05%	9.23%	8.97%	8.79%	9.21%	9.46%	8.46%	7.38%	8.25%	7.86%
MACHINERY AND MECHANICAL APPLIANCES; ELECTRICAL EQUIPMENT; PARTS THEREOF; SOUND RECORDERS AND REPRODUCERS, TELEVISION IMAGE AND SOUND RECORDERS AND REPRODUCERS, AND PARTS AND ACCESSORIES OF SUCH ARTICLES	47.08%	49.36%	52.48%	54.85%	55.84%	54.81%	57.71%	63.18%	61.88%	63.67%
VEHICLES, AIRCRAFT, VESSELS AND ASSOCIATED TRANSPORT EQUIPMENT	3.60%	3.71%	4.19%	3.87%	3.45%	3.37%	3.42%	3.18%	3.27%	3.51%
OPTICAL, PHOTOGRAPHIC, CINEMATOGRAPHIC, MEASURING, CHECKING, PRECISION, MEDICAL OR SURGICAL INSTRUMENTS AND APPARATUS; CLOCKS AND WATCHES; MUSICAL INSTRUMENTS; PARTS AND ACCESSORIES THEREOF	7.40%	6.66%	5.80%	5.46%	5.31%	4.95%	4.88%	4.92%	4.50%	3.51%
ARMS AND AMMUNITION; PARTS AND ACCESSORIES THEREOF	0.01%	0.02%	0.03%	0.03%	0.03%	0.03%	0.03%	0.05%	0.06%	0.04%
MISCELLANEOUS MANUFACTURED ARTICLES	1.53%	1.60%	1.72%	1.70%	1.54%	1.50%	1.59%	1.62%	1.69%	1.21%
WORKS OF ART, COLLECTORS' PIECES AND ANTIQUES	0.51%	0.51%	0.60%	0.59%	0.57%	0.53%	0.54%	0.55%	0.46%	0.36%

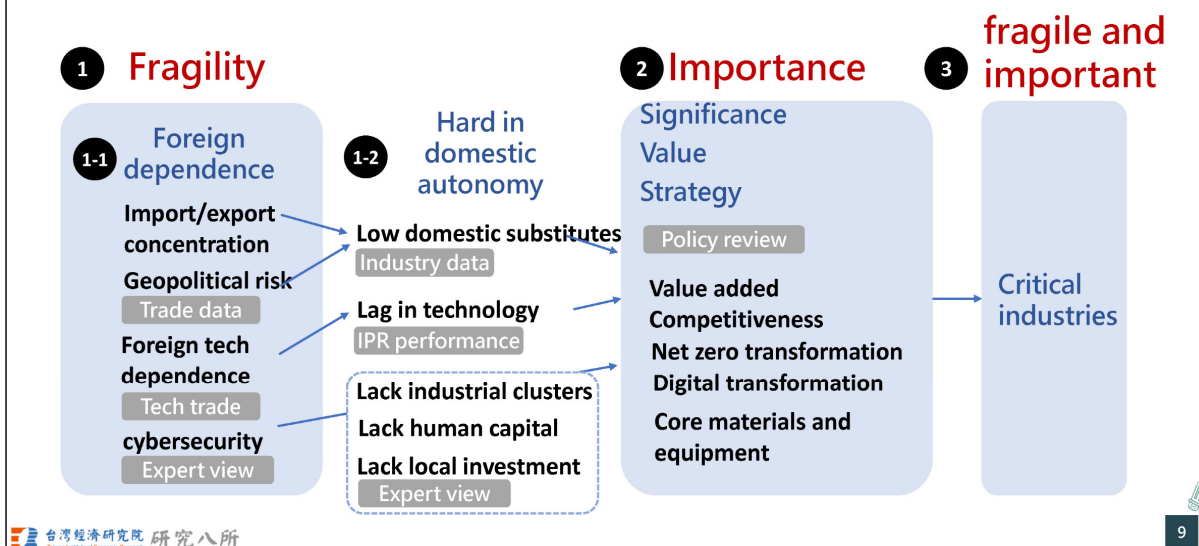
## Overview of Taiwan export structure(2/2)



## Semiconductor is top export product of Taiwan



## To find the critical industries in Taiwan



## Analyses of Taiwan data(1/2)



- Data source : HS codes, 4 digits, import and export data
- Methodology : EU Strategic dependencies and capacities, core dependency indicators(CDIs)
- Import share of these 130 products is about 7.87%, about 28 billion USD.

## Analyses of Taiwan data(2/2)

### Examples of fragile components for Taiwan

Products	HS codes
Advanced machine tools and services	8457 · 8459 · 8467 · 8468 · 8470
Lightweight ultra strength metal for bicycles	8712
Composite materials for aeronautical products	8709 · 8714 · 9401
Connected TV and OTT devices/services	8521 · 8522 · 8528
Next generation broadband telecommunication devices/services	8517 · 8529
Smart handsets	8471 · 8473 8517
Industrial textiles	5603 5103 · 5107 · 5205 · 6701 5807 · 5901 · 5904
Own-brand textiles	6501 · 6502
Bio-plastics	3918 · 3924 · 3925 · 5903
Digital hand tools	8210
Specialty metal/smart bathroom device	5809 · 7210 · 7313 · 7314 · 7317 · 7321 · 7324 · 7325 · 8201 · 8204 · 8205 · 8213 · 8214 · 8302 · 8304 · 8305 · 8306 · 8308 · 8480 · 9305

## Challenges- views from industries(1/5)



- Established in 1973, the leading technology research institute in Taiwan.
- Spinoff companies in semiconductor : UMC(1980), TSMC(1986)...

- Taiwan also established several research centers through public-private partnership in 1990s to address the challenges of technological autonomy, including
  - Development Center for Biotechnology
  - Metal industries R&D Center
  - Automotive Research & Testing Center
  - Plastics Industry Development Center
  - Precision Machinery Research Development Center
  - Stone & Resource Industry R&D Center

## Challenges- views from industries(2/5)

### Competition of Ecosystems-Semiconductor

- Complementary strength of Taiwan, Korea, Japan, USA and EU.
- Business model of Taiwan is contract manufacturing for the IC design companies, not for its own brands
- Many other peripheral companies undertake the related tasks of manufacturing process optimization. For example, specialty gas, chemicals, metals and green electricity.

### Mutual Dependence

- Huge investment expenditure of advanced foundries is not cost-effective for the IDM(integrated design and manufacture) firms. Rotational shiftwork are also not acceptable to most US and EU workers.
- The more clients, the lower marginal costs. Strong together with clients. Non-rival cooperation.

## Challenges- views from industries(3/5)

### Advantage from cost pressure-LCD/LED equipment

- Taiwan was once the largest producer.
- Due to the enormous investment of Chinese firms about 15 years ago, the profit margin became extreme low or negative.
- To save cost, Taiwanese firms collaborated with local machinery firms to replace the imported equipment.
- Now, the LCD/LED manufacturing equipment is the main export of machinery to China.

### Core capacity for niche markets-Battery

- EV battery market is dominated by CATL, Panasonic and LG.
- Taiwanese firms own limited capacity and focus on specific demand from home appliance (ex. Dyson vacuum cleaner) and high performance cars(ex. Porsche)

## Challenges- views from industries(4/5)

### Supply chains transformation- automobile

- Traditional car firms : long chain and highly automated smart manufacturing
- New car firms : short chain and highly modularized fabrication
  - Leading firm : TESLA once prototyped its original design car in Taiwan
  - Startups : Lucid(USA), NIO and Xiaopeng(CN). Innovative components are acceptable.
  - Tech giants : Google and Apple. Products from outsourcing.

### Net zero trends

- RE100 requirements in the supply chains. For example, Apple requires TSMC to use green electricity, while the whole supplies of green electricity in Taiwan are consumed by TSMC.
- Circular economy in the products. Materials of new generation products come from old generation products.

## Challenges- views from industries(5/5)

### Geo-political risks

- To find the substitutes of current materials. For example, to replace some metal parts of airplanes or weapons by fiber reinforced plastics.
- Strategic reserves of key materials

### Industrial holding companies

- Emerging trend for SMEs to partnering with each other and grow together.



Thank you for listening.







# The Trend of Reshoring Critical Supply Chains and Challenges Facing Taiwan

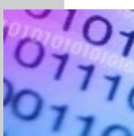
**Ko-Hsiung LIEN**

*Taiwan Institute of Economic Research*

**Discussion by Kyung In Hwang**

*KIET, Associate Research Fellow*

**2022 KIET-RIETI-TIER Workshop, Oct 25, 2022**



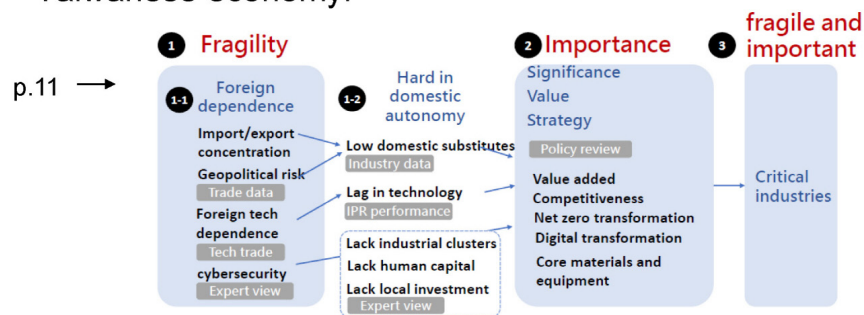
## Summary

- **This paper**
  - Summarizes key strategies of major countries for critical supply chains and reshoring.
  - Describes Taiwan export structure and introduces method for detecting fragile components and critical industries in Taiwan.
  - Discusses challenges of Taiwanese key industries (e.g. semiconductors, LCD/LED equipment, etc.)
- **Policy agenda of common concern**
  - Taiwan and Korea similar in that both experienced spectacular growth, relying on export prowess based on global value chain
  - But, as this paper stresses, the reliability of GVC was impaired by the COVID-19 pandemic, economic conflict between USA and China, etc.
  - It is essential for Korea (as well as Japan) to build robust and resilient supply chains, too.
  - In this regard, I want to ask you some questions about how Taiwan views the current status quo and how it might respond going forward

## Questions/Comments (1)

### • Examples of Taiwan's critical industries

- There are criteria for determining critical industries (p.9)
  - : ① Fragility (foreign dependence, Hard in domestic autonomy)
  - ② Importance
- It seems that products on p.11 only meet criterion ①
- (If possible) Let us know some examples of critical industries that pass both ① and ②, and why they are important to Taiwanese economy.

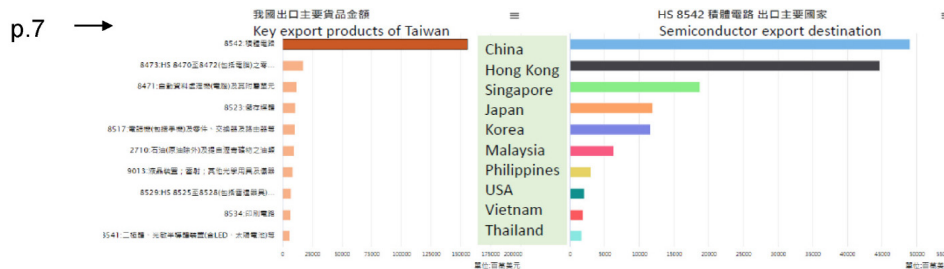


3

## Questions/Comments (2)

### • Export dependency on China/semiconductors

- High export dependency on China for semiconductors (p.7)
- China is now driving for self-sufficiency in semiconductors (e.g. National Integrated Circuit Industry Investment Fund ("big fund"))
- Will China's industrial policy for semiconductors affect Taiwanese economy/export? By what channel and to what extent?



4



## Questions/Comments (3)

- **Reshoring in Taiwan**
  - While this paper starts with reshoring of critical supply chains, there is little mention of reshoring manufacturing back to Taiwan.
  - Curious about whether there are reshoring-promoting policies in Taiwan and how successful they are.
  - Also, (if possible) introduce good examples of reshoring overseas businesses in Taiwan, which has (had) an impact on Taiwanese economy/industry.





Session

II

RIETI Session



# **RIETI's EBPM Initiative in Searching for Better Supply Chain Management**

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Advisor to the Minister, Ministry of Economy, Trade and Industry (METI) , Japan

## Structure

- 1 Why EBPM? What is EBPM?
- 2 Supply Chain Issues
  - Prior Studies
  - Policies
  - Analysis
- 3 Policy Recommendations

## References

## 1 Why EBPM? What is EBPM?

- EBPM(Evidence-Based Policy Making) or PBEM(Policy-Based Evidence Making) ?
- Increasing complexity of economic and social problems
  - You can build a kennel by imitation, but you can't build a skyscraper.
  - Symptomatic therapy is not good enough, but causal therapy is required.
- Which science can control complex systems ?
  - Medicine can control even if the system is a black box.

3

## What is EBM?

EBM(Evidence Based Medicine) is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients". (Sackett et al., 1997)

1938 John Paul proposed "Clinical Epidemiology" (American Society for Clinical Research)

1958 John Paul publishes "Clinical Epidemiology" (2nd edition: 1966)

1967 D. Sackett establishes the Department of Clinical Epidemiology at McMaster University School of Medicine.

1968 A. Feinstein redefines "Clinical Epidemiology" (clinical research → clinical epidemiology)

1980 Weinstein, Feinstein, "Clinical Decision Analysis"

1982 INCLIN (International Clinical Epidemiology Network) established

1989 Preventive Service Task Force (USA), Guide to Clinical Preventive Services

1991 Gordon Guyatt advocate EBM

1992 Cochrane Collaborating Center established

1995 Jenicek publishes "Epidemiology: the logic of modern medicine"

1997 Sackett publishes "EBM"

4



## Useful PICO framework

The PICO process (or framework) is a mnemonic used in evidence-based medicine to frame and answer a clinical or health care related question.

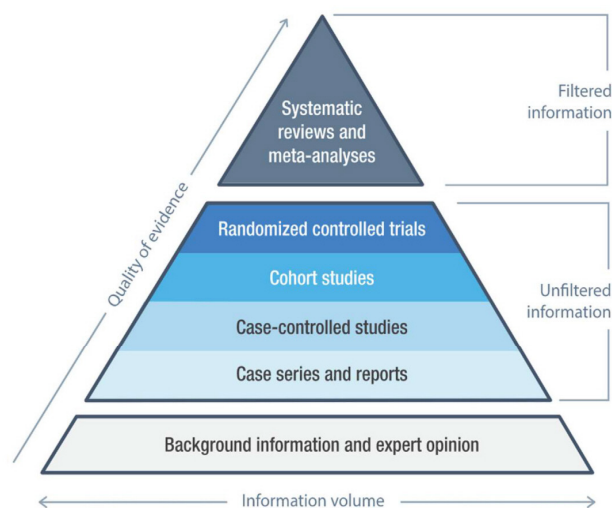
- P – Patient, problem or population
- I – Intervention
- C – Comparison, control or comparator
- O – Outcome(s) (e.g. pain, fatigue, nausea, infections, death)

**Juxtaposing PICO with universal components of all research endeavors**

PICO component	Abstract component inherent to all research designs
Problem	Research object
Intervention	Application of a theory or method
Comparison	Alternative theories or methods (or, in their absence, the null hypothesis)
Outcome	Knowledge generation

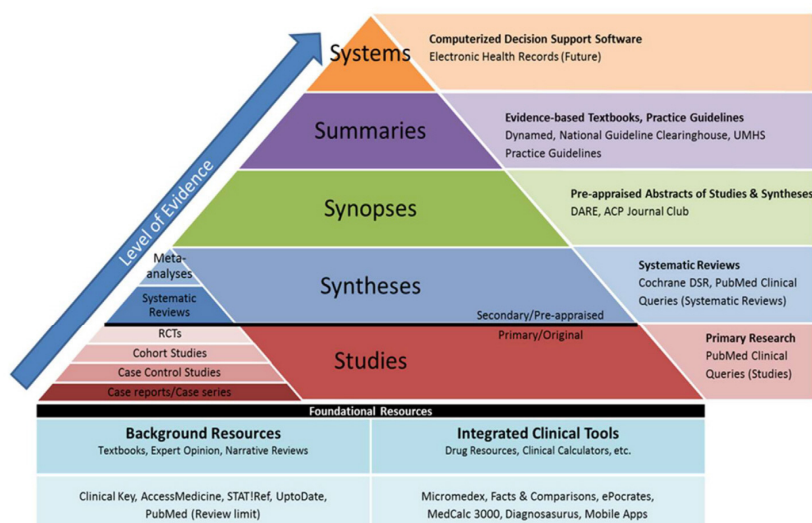
5

## Levels of Evidence (LOE)



6

## Integrated "5S" Levels of Organization of Evidence Pyramid



7

## What is EBPM in Japanese Policy ?

- EBPM (evidence-based policy making) means that policy planning should be based on rational grounds (evidence) with clear policy objectives, rather than relying on ad hoc episodes. (Cabinet Office)
- The government clearly stated the promotion of EBPM in the "Basic Policy on Economic and Fiscal Management and Reform 2017" (June 2017). The promotion of EBPM has been described in "Basic Policy" every year since then.
- In August 2017, the EBPM Promotion Committee was established in the Cabinet Office to promote EBPM in each ministry and agency.

8

## EBPM Initiatives at RIETI

- At the time of its inception, RIETI's "Medium-Term Plan" (FY2001-) specified that the organization would "conduct objective policy research and advocacy activities based on theoretical and analytical frameworks." Although the term EBPM was not used, the basic concept is the same as it is today.
- In 2006, RIETI began "evidence-based" research projects in the areas of social security and development assistance.
- RIETI's "Third Medium-Term Plan" (FY2011-) clearly states that "the implementation of 'evidence-based policy research' based on objective and neutral analysis shall be the principle of our research".

9

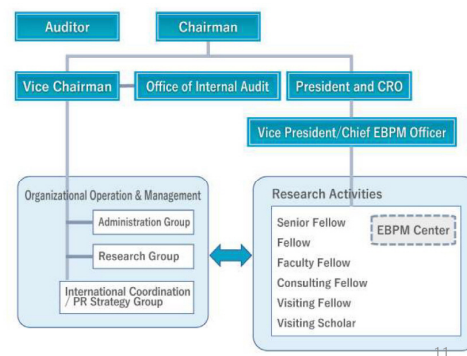
## EBPM Initiatives at RIETI

- In February 2017, the "Promotion of Evidence-Based Policy in Japan" (project leader: Prof. Kazuo Yamaguchi, University of Chicago) was launched to begin research and dissemination of EBPM in Japan.
- Since 2017, EBPM symposiums have been held annually to deepen EBPM research and introduce best practices in Japan and abroad, etc., to promote the establishment and dissemination of EBPM in Japan.
- RIETI inaugurated a new RIETI EBPM Center on April 1, 2022.

10

## RIETI EBPM Center

- In collaboration with domestic and overseas researchers and policymakers, the Center will strengthen retrospective policy assessments and develop new analytical tools to facilitate the prospective assessment of the economic effects of large-scale projects considered for implementation through public-private partnership, including, for example, decarbonization, and to propose the data design necessary to evaluate each potential project.
- Through these efforts, RIETI aims to evolve evidence-based policy making (EBPM) and to play a core role as a policy research institute that supports the advancement of economic and industrial policies through effective analysis and recommendations.



## 2 Supply Chain Issues

- In Japan, the Great Hanshin-Awaji Earthquake(1997), the Chuetsu Earthquake(2004), and the Great East Japan Earthquake caused serious supply chain shocks.
- One of the biggest is the 1973 oil shock (energy supply chain shock).
- Most recently, a supply chain shock occurred due to the spread of COVID-19.

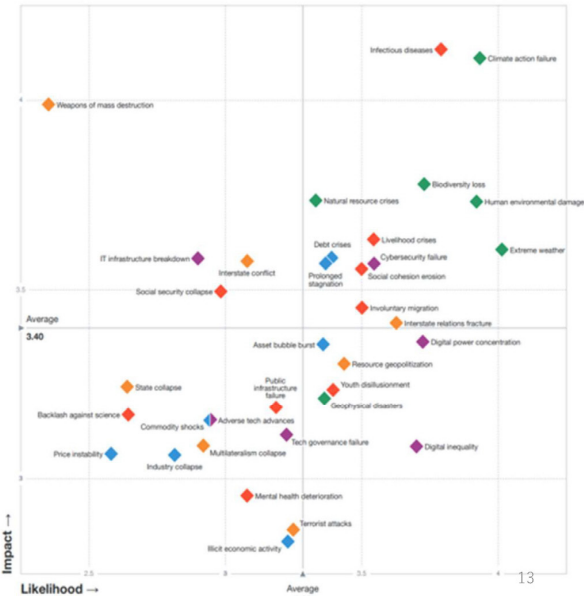


People flock to supermarkets to buy toilet paper (1973)

New risks are emerging in the world, including pandemics and large-scale disasters

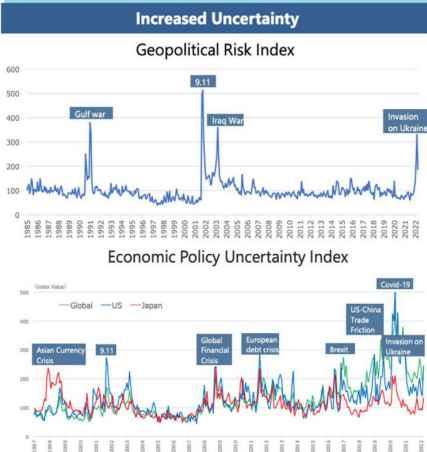
Global Risks Landscape

How do respondents perceive the impact ↑ and likelihood → of global risks?



WEF : The Global Risks Report 2021

- **Geopolitical risks and global uncertainty have increased significantly with Russian aggression against Ukraine, prolonged pandemic and intensifying U.S.-China conflict.**
- **It is important to formulate international rules based on the differences in the positions of each country, while keeping a close watch on growing geopolitical risks and economic security needs. Companies are required to develop resilient supply chain strategies that make rapid and flexible response to sudden changes in circumstances.**



Source: Economic Policy Uncertainty

Major regulations related to US-China technology competition

Strengthening export control (Direct Product Rule)

- In May 2020, regulatory measures were put in place to prevent Huawei and its global affiliates from acquiring dedicated (application-specific) semiconductors, etc., using U.S. technology via third countries.

Strengthening export control (Entity List)

- After June 2020, 257 China-related companies and individuals were added to the list. Expanded transactions subject to export control for Huawei, etc.

Tightening investment regulations (FIRRMA)

- CFIUS's jurisdiction to review FDI from a national security perspective was expanded, and the scope subject to its review was broadened to include (1) sensitive technology, (2) critical infrastructure, (3) non-passive and non-controlling investments, and (4) real estate transactions. Definitions of the scopes and details of the procedures were clarified

Economic Security Law

- Establishment of basic guidelines for securing supplies of key materials
- Designation of key materials
- Formulation of supply security plans by private sectors and support measures, etc.



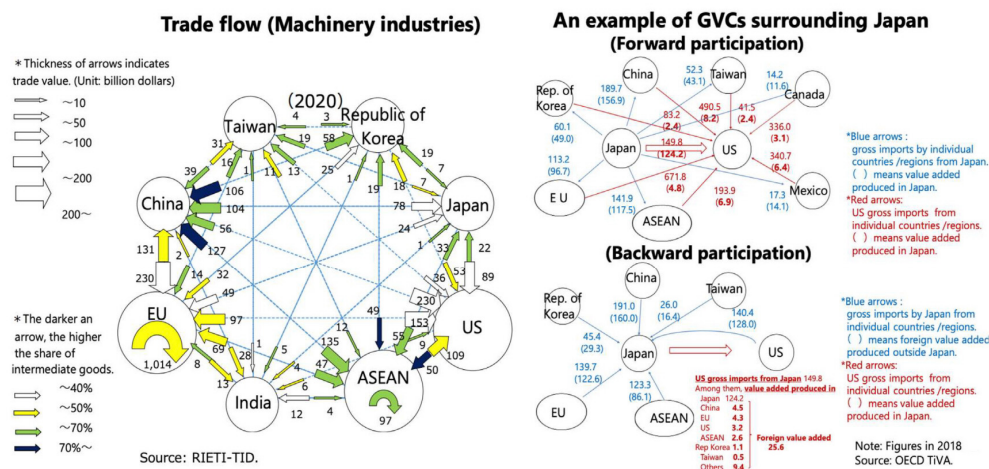
- **Major countries are developing proactive industrial policies and focusing on strengthening industrial competitiveness** to respond to intensifying technological competition in advanced fields and competition arising from social and economic challenges and geopolitical risks.
- Based on government policy trends and engagement policies, **it is important for companies to develop corporate strategies with a view to capturing the market created by government initiatives through government procurement and investment.**

#### Industrial Policy Shifts in Countries and Regions

		
<p><b>Supply chain resilience</b></p> <ul style="list-style-type: none"> <li>■ <b>Executive Order on Ensuring the Future Is Made in All of America by All of America's Workers</b></li> <li>* Strengthening of U.S. products in government procurement</li> <li>■ <b>Executive Order on America's Supply Chains</b></li> <li>* Report on vulnerability and policy recommendations for four key products (semiconductors, storage batteries, critical minerals, pharmaceuticals) and six categories (including defense, telecommunications, energy, transportation)</li> <li>■ <b>Creating helpful Incentives for the Production of Semiconductors (CHIPS) for America Act</b></li> <li>* promotion of factory location, equipment installation support and R&amp;D in US</li> </ul>	<p><b>Updated Industrial Strategy (May 2021)</b></p> <ol style="list-style-type: none"> <li>(1) Strengthen single market resilience</li> <li>(2) Deal with the EU's strategic dependencies</li> <li>(3) Accelerate twin transitions</li> </ol> <p><b>European Industrial Alliance</b></p> <ul style="list-style-type: none"> <li>■ European Battery Alliance (Oct. 2017)</li> <li>■ European Clean Hydrogen Alliance (July 2020)</li> <li>■ European Raw Materials Alliance (September 2020)</li> <li>■ Alliance on Processors and Semiconductor Technologies (July 2021)</li> <li>■ European Alliance for Industrial Data, Edge and Cloud (July 2021)</li> </ul>	<p><b>Made in China 2025</b></p> <ul style="list-style-type: none"> <li>■ Established ten focus areas and achieve 70% self-sufficiency by 2025</li> <li>⇒ Eliminate choke points in the supply chain</li> </ul> <p><b>Step 1 (2025):</b> Become a major manufacturing power</p> <p><b>Step 2 (2035):</b> Become a mid-tier global manufacturing power</p> <p><b>Step 3 (2049):</b> Join the top class of global manufacturing powers through innovation leadership</p>

#### Japan's participation in global value chains: machinery industries in Asia

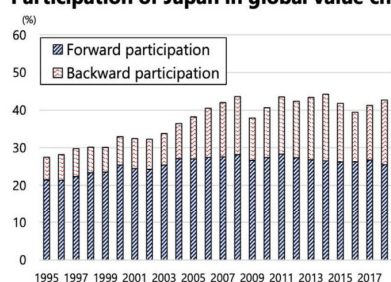
- The exports of intermediate goods from Japan, the Republic of Korea and Taiwan to China and ASEAN, imply an international division of production in Asia. On the other hand, final goods are main export items from China and ASEAN to Europe and the United States.
- China's gross exports to the United States include foreign value added created overseas, including Japan (**forward participation**), and Japan's exports to the United States also include foreign value added created in China and other economies (**backward participation**).



### Japan's participation in global value chains: backward participation rate has increased with increasing imports of intermediates from China

- As for Japan's participation in global value chains, the degree of forward participation rate, supplying intermediates to other countries' exports, remains stable, while the backward participation rate, receiving foreign intermediates, increases rapidly.
- Looking at the value added of Japan's exports to the United States, the share of China increases rapidly, with growing presence as a supplier of intermediates.

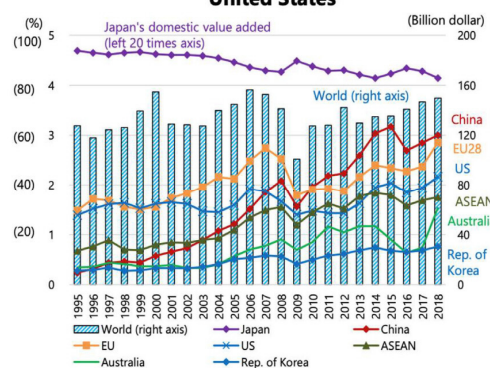
Participation of Japan in global value chains



Note: 1. Forward participation rate = the domestic value added from own country, embodied in the gross exports of foreign countries / own country's total gross exports  
2. Backward participation rate = the foreign value added from partner countries embodied in the gross exports of own country / own country's total gross exports

Source: OECD TIVA.

The value added of Japan's exports to the United States



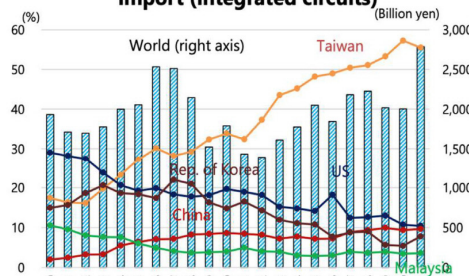
Source: OECD TIVA.

17

### Japan's import of semiconductors and automobile parts: Taiwan and China have large shares

- In recent years, Taiwan covers more than 50% of Japan's imports of high-tech integrated circuits, with rising demand. In the long run, the share of Taiwan is expected to continue to rise, and the dependence on Taiwan remains significant.
- China covers about 40% of Japan's imports of auto parts. Although its share seemed to reach a peak, we can see a sign of rising again in these few years.

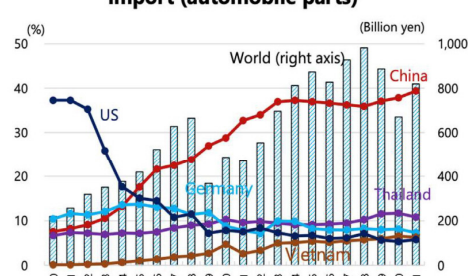
Major partner countries and regions in Japan's import (integrated circuits)



Note: HS8542.

Source: Global Trade Atlas.

Major partner countries and regions in Japan's import (automobile parts)



Note: HS8708.

Source: Global Trade Atlas.

18



## Economic security on highly import-dependent and essential products and emerging and sensitive technologies

- As uncertainty is heightened by geopolitical risks and pandemics, **economic security demands, including supply chain resilience** (such as development of domestic supply system of highly import-dependent and essential products and diversification of import countries) **and prevention of leakage of emerging and sensitive technologies by strengthening export control and investment regulations, are extremely high. Japan needs to develop domestic energy resources from the perspective of stable energy supply.**

Foreign dependency / substitutability on essential products in 2020

	domestic production (A) (hundred million JPY)	export value (B) (hundred million JPY)	import value (C) (hundred million JPY)	foreign dependency C/(A+C) (%)	Substitutability C/B :
Semiconductor devices	8,108	7,474	4,007	33.1	0.54
Integrated circuits	41,939	27,246	23,460	35.9	0.86
Batteries	10,651	4,627	1,845	14.8	0.40
Other non-ferrous metals (%)	14,066	9,528	11,888	45.8	1.25
Medicaments	70,370	5,919	28,548	28.9	4.82

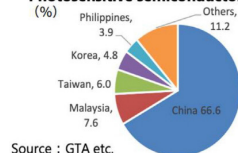
(※) gold, silver, platinum, palladium, nickel, tin, cobalt, silicon, etc.

Trade control and foreign investment regulations concerning emerging and sensitive technologies

	Japan	USA	EU	China
Trade control	● In May 2022, provisions on clarification of the scope of the "deemed export" began.	● In October 2021, "biotechnology-related software" was added to the regulated items list of EAR as emerging technology.	● In September 2021, EU regulations on export controls of emerging and sensitive technologies have been strengthened.	● China's Export Control Law went into effect in December 2020.
Inward Direct Investment	● The threshold for prior screening was lowered from 10% to 1% under the revised Foreign Exchange and Foreign Trade Act in 2019.	● FIRRMA (Foreign Investment Risk Review Modernization Act) was passed in August 2018.	● The EU's first rules for screening foreign direct investment entered into force in April 2019.	● In December 2020, the Measures for the Security Review of Foreign Investment has regulated investments in critical items, sensitive technologies, etc.

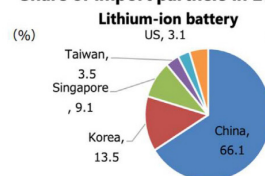
Source : media reports

Photosensitive semiconductor devices (%)

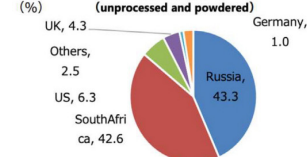


Source : GTA etc.

Share of import partners in 2020



Palladium (unprocessed and powdered) (%)



19

## Toward visibility for shared values and the creation of sustainable global value chains

- As actions are needed to achieve decarbonization, **Japanese firms actively participate in the international initiatives to disclose information and set goals.** To promote decarbonization, **GHG emissions should be measured throughout the whole supply chain.**
- In addition to decarbonization, various issues need to be considered and disclosed, which makes supply chain management more complicated. Digital technologies are useful for collecting, managing, and analyzing large amounts of information related to sustainability.**
- Supply chain management using data linkage, which is advancing in Europe, is expected to spread through Japan and Asia.**

Companies striving for decarbonization administration (Country : Area ratio)



Note : As of March 2022  
Source : Created by METI referring to the website of Ministry of the Environment

GHG emissions should be accounted for throughout the supply chain

GHG protocol standards  
Scope 1, 2, 3 = "Supply-chain emissions"

Upstream (Scope 3)  
● raw materials  
● transportation and distribution  
● employee commuting  
● others

Own company  
● fuel combustion (Scope 1)  
● electricity usage (Scope 2)

Downstream (Scope 3)  
● use of sold products  
● end-of life treatment of sold products  
● others

Scope 1 : Direct emissions by own company (fuel combustion, manufacturing process)  
Scope 2 : Indirect emissions from purchased electricity, heating, steam for own use  
Scope 3 : Indirect emissions other than Scope 1, Scope 2 (other companies' emissions related to the activities of own company)

Source : Created by METI referring to the website of Ministry of the Environment, GHG Protocol

Various issues need to be considered and disclosed



Digital technologies are useful in securing sustainability in supply chains (Use-cases of Japanese companies)

● Demand forecasting for production and supply in proper amount: SNS image analyses by AI, current trends of clothing are predictable.

● Management of all production-related information: process management by each individual staff using a tablet device, management of machine condition using IoT technology in the plant, digitalizing communication with other companies in the supply chain.

(METI "The report by the Study Group on Sustainability of Textile and Apparel Industry", July 2021)

Europe is advanced in data linkage.

- IDS
- GAIA-X
- CATENA-X

Using a platform that provides safety, trust, data sovereignty and through which large amounts and variety of data for supply chains (e.g. production site data) are accessible.

● A business use case

NTT (Japan) and SIEMENS (Germany) are participating in a data linkage verification project to reduce CO2 emission and realize a circular economy.

Value creation through an Asia-wide data sharing platform

(Creation of 100 good practices over the next five years is announced in "ASIA-Japan Investing for the Future Initiative")

20



## Projects and Outlook of RIETI EBPM Center

### Research Candidate

- Large-scale advanced R&D initiatives
- Public-private partnerships
- Two projects in 2022, more expected in the future

**Green  
Innovation Fund**  
- 2021-2030  
- 2 trillion yen  
(14 billion euros)

**Advanced  
Semiconductor Grant**  
- 2021-  
- 617 billion yen  
(4.4 billion euros)

### Outlook

- Accumulate professional knowledge in prospective assessment
- Build a network among domestic and overseas researchers and policymakers
- Play a core role and act as a hub in this area

21

## Policy Implications

Supply chain risk measures can be win-win or win-lose.

- Preventing the spread of infection can be a win-win situation (Wooden Barrel Theory)
- Food issues are win-lose (game of musical chairs)
- Energy issues, earthquake response, factory relocation, etc. can be win-win or win-lose (diffusion of energy-saving technologies and support for restoration are win-win, while securing energy in one's own country is win-lose.)

22

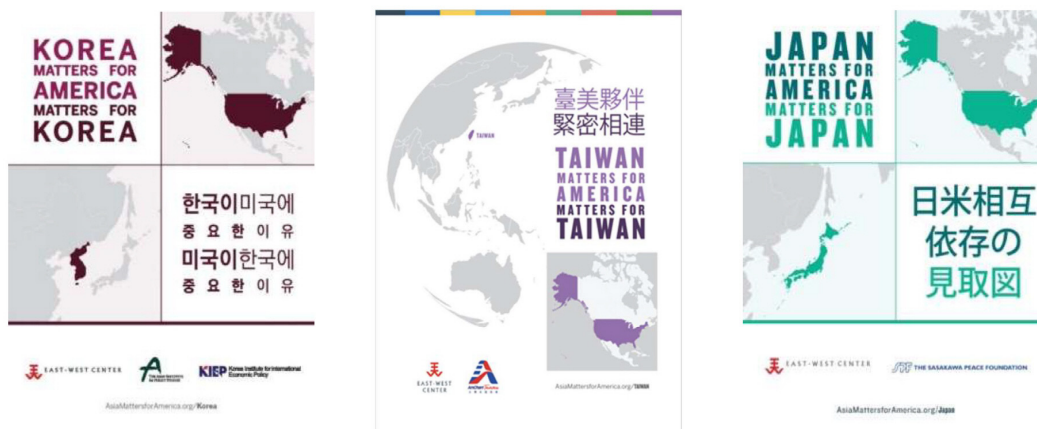
## Policy Implications

Korea, Taiwan, and Japan should work together to address the following measures

- Sharing risk assessment
- Coordinated risk response  
(joint stockpiling system, request to the U.S. and China, etc.)
- Shift from win-lose to win-win (mutual investment in likeminded countries)

23

## Good Practice



24

## Panel Discussion

Soo-dong Kim (KIET)

Japan and Korea (JK) have been competing and cooperating in many fields such as material, parts and equipment industries due to their geographical proximity and similarity in industrial structure. Industries in which Japan occupies an overwhelming position in the global export market are machinery, semiconductor (e.g. integrated circuits and devices), battery, automobile (including parts), etc.

In addition, the backward linkage effect of those industries in JK economy was deepened significantly during the recent years, leading to a meaningful change in GVC from the perspective of production technology. The globalization of the JK economy is having a powerful impact on the GVCs change in the various industries. JK show deeper GVCs linkage of production technology, focusing on key export products such as electrical equipment and electronic parts, primary metals and metal processing products, general machinery parts and equipment, and transportation machinery parts.

Meanwhile, considering the pace of development in China's manufacturing industries over the past 20 years, the gap in competitiveness of these industries compared to the JK is greatly reduced. And the GVCs of China-centered materials, parts and equipment industries are expected to show significant advances.

The importance of JK as trading partners is very high, and there is low possibility of changing sources of procurement among two countries. Despite many restrictions due to non-economic issues, JK remain important partners for numerous companies in two economies. Therefore, each government needs to

take this situation into account with regard to the supply chain management and mutual investment for a win-win strategy.

As the economic security and the supply chain resilience of the core industries are strengthened, it is necessary to move away from monopolistic or unstable supply chains. The Japan and Korea should pursue a strategy for multi-polarization of the supply chain, and reasonable decoupling from countries where potential risks exist.

The East Asia including China, Japan, and Korea represent one of the most sensitive regions related to the conflicts between the United States and China. Therefore, it is necessary to shift from the existing cost- and efficiency-based global value chains (GVC) management to a rational GVC management based on supply chain stabilization.

Finally, alternative import sources or domestic production should be promoted in fields with high foreign dependence, such as the materials, parts and equipment industries. Also, most companies in the materials, parts and equipment industries are small and medium-sized enterprises (SMEs) greatly lacking in terms of technology development and market dominance, meaning that measures are urgently needed to address this concern.

Introduction  
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Trade shocks  
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COVID-19 pandemic  
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Policy implications  
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References  
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Transmission of Foreign Shocks in East and Southeast Asia:  
Lessons from Recent Studies

Kozo Kiyota

Keio University, RIETI, and TCER

October 25, 2022

Kozo Kiyota (Keio, RIETI & TCER)

KIET-RIETI-TIER Workshop 2022

1 / 23

Introduction  
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Trade shocks  
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COVID-19 pandemic  
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Policy implications  
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References  
○○

1 Introduction

2 Trade shocks

3 COVID-19 pandemic

4 Policy implications

5 References

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2 / 23

Introduction ○○●	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○○○○○	Policy implications ○○○	References ○○
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## Introduction

- As the supply chain becomes global, the domestic economy is more likely to be affected by foreign shocks
  - The effect of the global financial crisis in 2008–09 was initially expected to be rather small but turned out to be quite large in East and Southeast Asian countries due to the drop in global demand
  - When severe flooding affected the Thai economy in 2011, Honda needed to halve production in its Japanese and North American plants because the affected plants in Thailand disrupted its global supply of parts and components

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Introduction ○○●	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○○○○○	Policy implications ○○○	References ○○
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## Introduction

- In this presentation, we focus on the studies on the following two aspects:
  - ① Trade shocks
  - ② COVID-19 pandemic

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Introduction ○○○	Trade shocks ●○○○○○○○	COVID-19 pandemic ○○○○○	Policy implications ○○○	References ○○
<div> <div>1 Introduction</div> <div>2 Trade shocks</div> <div>3 COVID-19 pandemic</div> <div>4 Policy implications</div> <div>5 References</div> </div>				
Kozo Kiyota (Keio, RIETI & TCER)		KIET-RIETI-TIER Workshop 2022		5 / 23

Introduction ○○○	Trade shocks ●○○○○○○○	COVID-19 pandemic ○○○○○	Policy implications ○○○	References ○○
<h2>Trade shocks</h2> <ul style="list-style-type: none"> <li>There are two types of trade shocks:           <ol style="list-style-type: none"> <li>A sharp increase in imports (import surge)               <ul style="list-style-type: none"> <li>The rapid increase in the imports from China is called the 'China shock'</li> </ul> </li> <li>A sharp drop in exports (due to the decline in foreign demand)               <ul style="list-style-type: none"> <li>Exports in East and Southeast Asia plummeted as a result of the global financial crisis in 2008–2009</li> </ul> </li> </ol> </li> </ul>				
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Introduction ○○○	Trade shocks ○○●○○○○○	COVID-19 pandemic ○○○○○○○	Policy implications ○○○	References ○○
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## The 'China shock' and US manufacturing employment

- Autor, Dorn, and Hanson (2013) examined the impacts of the rapid increases in imports from China, which they call the 'China shock', on US manufacturing employment between 1990 and 2007
- This study sheds light on the local labor market: employment at the commuting zone level
  - "Mobility responses to labor demand shocks across US cities and states are slow and incomplete" (p.2124)
- Combining trade data and commuting zone-level employment data, they found that import competition explains one-quarter of the contemporaneous aggregate decline in US manufacturing employment
- Based on this study, Acemoglu, Autor, Dorn, Hanson, and Price (2016) estimated that job losses from rising Chinese import competition from 1999 to 2011 was in the range of 2.0–2.4 million

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Introduction ○○○	Trade shocks ○○●○○○○○	COVID-19 pandemic ○○○○○○○	Policy implications ○○○	References ○○
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## Are all the imports a 'shock' for manufacturing employment?

- Imports consist of final goods and intermediate inputs
- Increases in the imports of intermediate inputs contribute to domestic production of final goods and thereby could have positive effects
- Also, the effects of the 'China shock' could be different across countries, depending upon the volume and the composition of the products

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Introduction  
○○○Trade shocks  
○○○○●○○○COVID-19 pandemic  
○○○○○○Policy implications  
○○○References  
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## The distinction between final goods and intermediate inputs matters

- Kiyota, Maruyama, and Taniguchi (2021) examined the effects of the 'China shock' on manufacturing employment in six countries: United States, Japan, Germany, United Kingdom, France, and Korea from 2000 to 2015
- We distinguish between imports of final goods and those of intermediate inputs, using a world input–output table
- Main findings:
  - ① For the United Kingdom and the United States, the negative effects of the imports of final goods outweigh the positive effects of the imports of intermediate inputs and exports
  - ② For France and Japan, the negative effects of the imports of final goods offset the positive effects of the imports of intermediate inputs and exports
  - ③ For South Korea and Germany, the positive effects outweigh the negative effects
- These results together suggest the importance of the distinction between final goods and intermediate inputs, and the heterogeneous impact of the 'China shock' across countries

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KIET-RIETI-TIER Workshop 2022

9 / 23

Introduction  
○○○Trade shocks  
○○○○●○○○COVID-19 pandemic  
○○○○○○Policy implications  
○○○References  
○○

## Effects of exports on employment go beyond manufacturing

- Exports in East and Southeast Asia plummeted as a result of the global financial crisis in 2008–2009
- Kiyota (2016) examined the effects of exports on employment in China, Indonesia, Japan, and Korea from 1995 to 2009, using a world input–output table
- One of the major findings is that, although more than 80% of exports in these countries are from manufacturing industries, a significant number of workers in non-manufacturing industries depend upon manufacturing exports through vertical inter-industry linkages
- Producers need to be aware not only of the export dependence of their industry but also of the export dependence of their upstream producers and downstream customers in different industries
- Even non-exporters can be significantly affected by external shocks through inter-industry linkages

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KIET-RIETI-TIER Workshop 2022

10 / 23

Introduction ○○○	Trade shocks ○○○○○○●○	COVID-19 pandemic ○○○○○○	Policy implications ○○○	References ○○
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## Value-added content matters

- Similar to Kiyota (2016), Sasahara (2019) examined the effects of exports on employment in China, Japan, and the US, using world input-output table
- His study found that exports from sectors with higher domestic value-added contents lead to a greater employment effect
  - Value-added contents of exports mean that the value added embodied in exports
- This implies that a greater value of gross exports does not necessarily mean a greater employment effect

Kozo Kiyota (Keio, RIETI & TCER)      KIET-RIETI-TIER Workshop 2022      11 / 23

Introduction ○○○	Trade shocks ○○○○○○●○	COVID-19 pandemic ○○○○○○	Policy implications ○○○	References ○○
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## Trade shocks: Key takeaways

- In analyzing the impacts of import surges, the distinction between final goods and intermediate inputs matters
- It is important to note that the shocks are transmitted through inter-industry linkages
- It is also critical to distinguish between high quality (high value-added content) and low quality (low value-added content) goods

⇒ Because these studies utilize input-output tables, within industry linkages such as the relationships between parts/components and final goods are beyond the scope of these analyses

Kozo Kiyota (Keio, RIETI & TCER)      KIET-RIETI-TIER Workshop 2022      12 / 23

Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ●○○○○○	Policy implications ○○○	References ○○
<div> <div>1 Introduction</div> <div>2 Trade shocks</div> <div>3 COVID-19 pandemic</div> <div>4 Policy implications</div> <div>5 References</div> </div>				
Kozo Kiyota (Keio, RIETI & TCER)		KIET-RIETI-TIER Workshop 2022		13 / 23

Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ○●○○○○	Policy implications ○○○	References ○○
<h2>How the COVID-19 pandemic affects machinery trade</h2> <ul style="list-style-type: none"> <li>Some studies on the COVID-19 pandemic have examined the relationship between parts/components and final goods</li> <li>Hayakawa and Mukunoki (2021) examined the impact of COVID-19 on machinery trade</li> <li>Using detailed trade data, their analysis distinguishes final machinery products and machinery parts/components</li> <li>They found that the impacts of COVID-19 are primarily on the supply side while the impacts on demand play a less significant role <ul style="list-style-type: none"> <li>Supply-side effect: Effects of COVID-19 on exports</li> <li>Demand-side effect: Effects of COVID-19 on imports</li> </ul> </li> </ul>				
Kozo Kiyota (Keio, RIETI & TCER)		KIET-RIETI-TIER Workshop 2022		14 / 23

Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○●○○○	Policy implications ○○○	References ○○
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## Diversification could mitigate shock

- Ando and Hayakawa (2021) examined the impact of COVID-19 on machinery trade, focusing on the import diversity of inputs
- Their analysis distinguishes final machinery products and machinery parts/components
- They found that the import diversity of inputs had significant influence in mitigating the harmful supply-side effects of COVID-19
- Based on a similar framework, Hayakawa, Mukunoki, and Urata (2021) found that E-commerce development in importing countries contributed to mitigating negative effects of COVID-19

Kozo Kiyota (Keio, RIETI & TCER)      KIET-RIETI-TIER Workshop 2022      15 / 23

Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○●○○○	Policy implications ○○○	References ○○
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## The COVID-19 pandemic: Key takeaways from trade data analyses

- A series of study by Hayakawa and his colleagues found, although COVID-19 had negative effects on machinery exporters, it could be mitigated by the diversification of source country and e-commerce development
- These results have important implications for preparing for the spread of new future infectious diseases

⇒ Nonetheless, because these studies utilized trade data, the actual firm-to-firm relationships are beyond the scope of their analyses

Kozo Kiyota (Keio, RIETI & TCER)      KIET-RIETI-TIER Workshop 2022      16 / 23

Introduction  
○○○Trade shocks  
○○○○○○○○COVID-19 pandemic  
○○○○●○Policy implications  
○○○References  
○○

## Why some supply chain links were disrupted and others were maintained?

- Todo, Oikawa, Ambashi, Kimura, and Urata (2021) utilized the questionnaire survey data for 1,400 firms in the Association of Southeast Asian Nations (ASEAN) and India
- They examined how the robustness and resilience of supply chain links were determined when firms faced economic shocks due to the COVID-19 pandemic
  - Robustness: Maintaining links
  - Resilience: Substituting another for a disrupted partner

Kozo Kiyota (Keio, RIETI &amp; TCER)

KIET-RIETI-TIER Workshop 2022

17 / 23

Introduction  
○○○Trade shocks  
○○○○○○○○COVID-19 pandemic  
○○○○●○Policy implications  
○○○References  
○○

## Why some supply chain links were disrupted and others were maintained?

- The supply chain link between a supplier and its customer was less likely to be disrupted during the COVID-19 pandemic if they were similar in firm size and when foreign-owned firm was linked with a supplier or customer in its home country
- A firm was more likely to substitute other partners for partners delinked by COVID-19 if the firm was linked with suppliers and customers that were diversified across countries

Kozo Kiyota (Keio, RIETI &amp; TCER)

KIET-RIETI-TIER Workshop 2022

18 / 23



Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○○○○○	Policy implications ●○○	References ○○
<div> <div>1 Introduction</div> <div>2 Trade shocks</div> <div>3 COVID-19 pandemic</div> <div>4 Policy implications</div> <div>5 References</div> </div>				
<div> <div>Kozo Kiyota (Keio, RIETI &amp; TCER)</div> <div>KIET-RIETI-TIER Workshop 2022</div> <div>19 / 23</div> </div>				

Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○○○○○	Policy implications ●○○	References ○○
<h2>Policy implications</h2> <ul style="list-style-type: none"> <li>● We briefly review the recent studies on the transmission of foreign shocks</li> <li>● An interesting finding is that the diversification of suppliers and customers may be able to mitigate the foreign shocks</li> <li>● In this context, Caselli, Koren, Lisicky, and Tenreyro (2020) assessed the importance of cross-country diversification and found that international trade leads to lower income volatility because countries can diversify their sources of demand and supply across countries</li> <li>● Ahn, Greaney, and Kiyota (2022) found that the impact of Korean consumer boycott, due to political conflict between Japan and Korea, was more severe in regions with higher dependency on exports to Korea</li> </ul>				
<div> <div>Kozo Kiyota (Keio, RIETI &amp; TCER)</div> <div>KIET-RIETI-TIER Workshop 2022</div> <div>20 / 23</div> </div>				

Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○○○○○	Policy implications ○○●	References ○○
<h2>Policy implications</h2>				
<ul style="list-style-type: none"> <li>● To diversify the export and import destinations, it may be helpful if the export promotion agencies (e.g., JETRO, KOTRA) support the elimination of information asymmetry (between Japanese firms and foreign firms)</li> <li>● In this connection, the sharp decline in exports and imports may come from political conflicts (Ahn, Greaney, and Kiyota, 2022; Kiyota, 2022)</li> <li>● Because mobility responses to labor demand shocks across regions are slow and incomplete, it is important for policy makers to take into account regional impacts as a consequence of political conflict at national level</li> </ul>				
Kozo Kiyota (Keio, RIETI & TCER)		KIET-RIETI-TIER Workshop 2022		21 / 23

Introduction ○○○	Trade shocks ○○○○○○○○	COVID-19 pandemic ○○○○○○	Policy implications ○○○	References ●○
<ol style="list-style-type: none"> <li>1 Introduction</li> <li>2 Trade shocks</li> <li>3 COVID-19 pandemic</li> <li>4 Policy implications</li> <li>5 References</li> </ol>				
Kozo Kiyota (Keio, RIETI & TCER)		KIET-RIETI-TIER Workshop 2022		22 / 23

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## **Comments on Dr. Kozo Kiyota's "Transmission of Foreign Shocks in East and Southeast Asia: Lessons from Recent Studies"**

Grace Chung

### **Comments on Introduction**

1. On the introduction, Dr. Kiyota mentioned that "the effect of the global financial crisis in 2008-2009 was initially expected to be rather small but turned out to be quite large in East and Southeast Asian countries due to drop in global demand", I agree with your point. The global financial crisis was triggered by the US sub-prime financial crisis first and caused impacts on the US, European economy, and Japan in 2008, since they were financially connected through highly leveraged derivative financial products. However, because of the drop in end-product market demands, the follow-up impacts were on the world through trade channel in 2009.
2. Dr. Kiyota also mentioned that Honda had to cut half of its production in its Japanese and North American plants due to a natural disaster taking place in Thailand. Certainly, given the growing concern that the global production networks have become increasingly vulnerable to disruptions triggered by natural disasters, there are numbers of studies and researches that attempt to explore the available options and strategies for businesses to manage and mitigate such risks through building up the supply chains that are resilient to such uncertainties. It is true to say this is not easy to make swift shifts or restructuring. Shifting in supply chains is only workable when the relevant capacity is replaceable. In the case of Honda, moving auto manufacturing back to Japan could boost Japan's employment and exports; however, the input costs for Honda would be much higher. In addition, Fukushima earthquake on March 11<sup>th</sup> 2011 did cause serious disruptions in high tech supply chains in our region, and shifting in manufacturing has never happened in this case, because the capacity is irreplaceable.

### **Comments on Trade Shocks**

3. Regarding trade shocks, as Dr. Kiyota defined, there are two types: a) a sharp increase in imports and b) a sharp drop in exports. The example for the former is

China shock, and for the latter is sharp decline in foreign demand as a result of the financial crisis. This is rather a question for Dr. Kiyota. My question is that the period for the China shock to happen is a gradual process, when you said to be between the period of 1997 and 2007. The shock has taken years to take shape in this context. However, the decline in demand due to external impacts can happen in a very short period of time. Therefore, I guess my question would be why do we consider China shock to be an example for the “sharp” increase in imports?

4. Another area relating to the China shock since you have raised here. The so-called China shock took place when China was recognized as the world factory. As China has been losing its advantages now due to its zero-COVID and common prosperity policies, increasing input costs, and stricter environmental regulations, I wonder if the first type of trade shock, China shock, will go on.
5. Please also elaborate the findings of Kiyota, Maruyama, and Taniguchi (2021), as the US, Germany, UK, and France are more of end-product markets for Asian supply chains, meaning they are mainly importing final goods. Japan, Korea, and China are supply chain partners meaning they have been trading mostly in intermediate goods. Therefore, I am curious about placing Japan and Korea in different categories, or different findings in this context. (P.9)
6. The studies of Kiyota (2016) and Sasahara (2019) found that sectors with higher domestic value-added contents lead to a greater employment effect, and then it was suggested that it implies a greater value of gross exports does not mean a greater employment effect. Usually, labor-intensive content, which would be considered less of value-added content exports, tends to be the fastest way to increase employment? Would you kindly explain a bit more about how the conclusion was made regarding high domestic value-added content and greater value of gross products for the different outcome on employment effect? (P.11)

#### Comments on Policy Implications

7. Policy implications are very sensible, and I fully agree with your conclusions. International trade is the game of comparative advantage; therefore, in theory,

countries should be able and freely diversify their sources of demand and supply to maximize producers' and consumers' surpluses. Political conflicts could cause more damages on economic welfare than high tariffs and unreasonable regulations.

8. Finally, I appreciate you sharing your points and some findings on this important issue of coping with shocks for a resilient supply chain. I wonder if you are planning to take this into further study in the future. If so, what would be your possible hypotheses or research questions? Thank you.



Session

III

KIET session





Introduction ○○○	Background and Data ○○	Reduced-Form Evidence ○○○	Structural Estimation ○○○○○○○	Conclusion ○	Appendix ○○○
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# Foreign Retail Entry under Domestic Rivals

Kyung In Hwang

Korea Institute for Industrial Economics and Trade

2022 KIET-RIETI-TIER Workshop

Introduction ●○○	Background and Data ○○	Reduced-Form Evidence ○○○	Structural Estimation ○○○○○○○	Conclusion ○	Appendix ○○○
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## Motivation

- How do strategic interactions affect FDI market entry?
  - ▶ What if there are *rivals* in host-country markets?
- From the FDI literature, the answer is not clear.
  - ▶ FDI theories generally assume that host-country markets are perfectly competitive.
  - ▶ We have seen many oligopolistic industries (e.g. banking, retail) where multinationals are major players.
- Under imperfectly competitive market, multinational enterprises (MNEs) can't act in a vacuum.
  - ▶ Domestic rival's presence will have a profound impact on FDI entry decision.

Introduction	Background and Data	Reduced-Form Evidence	Structural Estimation	Conclusion	Appendix
000	00	000	0000000	0	000

## Motivation

- The importance of this topic with regard to **Economic Security**
  - ▶ Many high-tech industries (e.g. semi-conductors, batteries, etc.) are under oligopolistic competitive markets.
  - ▶ Firms in those industries and states for those industries do act strategically.
  - ▶ It can link academic analyses to real-world phenomena.

Rank	Name	Battery usage (GWh)	MS(%)
1	CATL (CHN)	34.4	24.0
2	LG Energy Solution (KOR)	33.5	23.5
3	Panasonic (JPN)	26.5	18.5
4	BYD (CHN)	9.6	6.7
5	Samsung SDI (KOR)	8.2	5.8
6	SK on (KOR)	7.7	5.4

Introduction	Background and Data	Reduced-Form Evidence	Structural Estimation	Conclusion	Appendix
000	00	000	0000000	0	000

## This paper in a nutshell

- 1 Reduced-Form Estimation
  - ▶ Using an empirical context of **Korean retail industry** with **two dominant** (FDI vs domestic) retailers competing each other,
  - ▶ This paper finds **negative and causal impacts** of domestic competitor's presence on foreign market entry. (IV strategy)
- 2 Structural Model Estimation
  - ▶ This paper builds an **entry game model** where **strategic interactions** are fully incorporated.
  - ▶ Structural model estimation provides the corresponding results to reduced-form estimation.
  - ▶ This paper finds **asymmetric information** plays a key role in FDI strategic market entry.

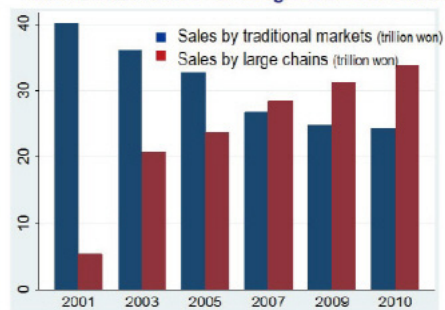


Introduction  
oooBackground and Data  
●oReduced-Form Evidence  
oooStructural Estimation  
oooooooConclusion  
oAppendix  
ooo

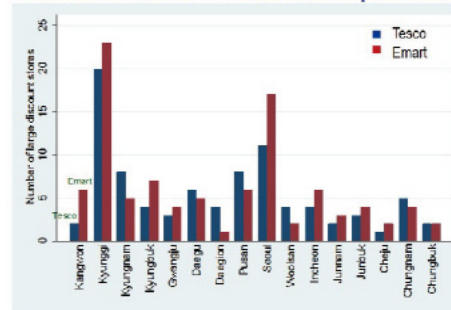
## Background

- FDI liberalization in the Korean retail industry ('96-)
  - ▶ *Tesco* has long been the only FDI
    - \* *Carrefour*(exited, 06), *Walmart*(exited, 06)
- Two dominant Retailers: *Emart*(Korean) vs *Tesco*(FDI)
  - ▶ 1st and the 2nd biggest retailers: 12.4 vs 10.9 (sales)
  - ▶ Two firms account for 73.1% in total sales of the discount retailing industry.
  - ▶ They operate multiple *large discount stores*: 130 vs 120

Traditional markets vs. Large Discount Stores



Number of Two Firm's Stores across provinces

Introduction  
oooBackground and Data  
●oReduced-Form Evidence  
oooStructural Estimation  
oooooooConclusion  
oAppendix  
ooo

## Data

- A market is defined as a county (251)
- Data on large discount stores (KOCA)
  - ▶ Entry status of *Emart* and *Tesco* stores across counties
- County-level market characteristics (KOSTAT)
  - ▶ Korea's retail census (5-year interval) → aggregate key variables at the county level (PCM, productivity, wage, floor space, etc.)
  - ▶ We also use demographical data (population, etc.)
- We construct county-level panel data for 1996, 2001, 2005 & 2010.

Introduction ooo	Background and Data oo	Reduced-Form Evidence ●oo	Structural Estimation ooooooo	Conclusion o	Appendix ooo
---------------------	---------------------------	------------------------------	----------------------------------	-----------------	-----------------

## Reduced-Form Estimation

- The regression specification is as the following:
 
$$FDI_{mt} = \alpha + \beta Home_{mt} + \gamma' X_{mt} + \mu_m + \mu_t + \varepsilon_{mt}$$
- where:
  - ▶  $FDI_{mt}$ ,  $Home_{mt}$  are foreign and domestic indicators ( $\in \{0, 1\}$ ).
  - ▶  $X_{mt}$  is market( $m$ )-year( $t$ ) specific controls.
  - ▶  $\mu_m$  and  $\mu_t$  are time-invariant unobservables.
- To estimate it,
  - ▶ Linear probability model (LPM) with fixed effects
  - ▶ Probit model with random effects

Introduction ooo	Background and Data oo	Reduced-Form Evidence ●oo	Structural Estimation ooooooo	Conclusion o	Appendix ooo
---------------------	---------------------------	------------------------------	----------------------------------	-----------------	-----------------

## Endogeneity and IV

- $Home_{mt}$  is endogenous
  - ▶ Despite adding a number of controls, there could still exist unobserved factors affecting both foreign and domestic entries.
  - ▶ *Adverse causality* arises if both firms make strategic entry choices.
- We exploit the instrument variable (IV) strategy.
  - ▶ IV: distances from Emart( $Home_{mt}$ ) stores to the closest Emart distribution center (Holmes, 2011)
  - ▶ Standard IV approach(2SLS) for linear prob. model
  - ▶ Bivariate probit model for binary choice model with *dummy* endogenous variable (Heckman(1977), Maddala(1986))

Introduction  
ooo

Background and Data  
oo

Reduced-Form Evidence  
oo●

Structural Estimation  
ooooooo

Conclusion  
o

Appendix  
ooo

Reduced-Form Evidences

The impact of domestic(Emart) presence on Foreign(Tesco) entry

	(1) OLS	(2) OLS	(3) IV	(4) IV (2010)	(5) Probit	(6) Probit	(7) BPM	(8) BPM (2010)
Home	-0.0626 (0.0504)	0.001 (0.0598)	-0.00855 (0.157)	-0.335*** (0.120)	-0.496*** (0.190)	-1.110** (0.490)	-1.400** (0.711)	-1.443*** (0.538)
Pop	0.0441 (0.0744)	0.501** (0.226)	0.507* (0.239)	1.919*** (0.404)	-1.022* (0.613)	-2.595* (1.477)	-1.333 (0.823)	-0.608 (0.832)
PCRS	-0.0148** (0.00619)	-0.00440 (0.00397)	-0.00428 (0.00454)	-0.0211 (0.0266)	-0.323*** (0.0789)	-0.679*** (0.227)	-0.296*** (0.0981)	-0.260** (0.103)
PCM	-1.205*** (0.440)	0.0619 (0.437)	0.0717 (0.479)	0.323 (0.493)	-13.01*** (2.849)	-17.35** (7.044)	-8.066** (3.324)	-10.670*** (3.974)
Prod	0.0120 (0.0335)	-0.0195 (0.0390)	-0.0201 (0.0425)	0.0515 (0.0479)	0.0281 (0.189)	0.213 (0.584)	0.0461 (0.235)	0.878* (0.375)
Wage	-0.00614 (0.0404)	0.0395 (0.0485)	0.0404 (0.0525)	0.0181 (0.0535)	0.462* (0.268)	1.355* (0.759)	0.562* (0.307)	-0.446 (0.497)
NER	0.436*** (0.106)	0.377*** (0.127)	0.376*** (0.128)	0.203 (0.152)	2.086*** (0.566)	4.199*** (1.595)	1.671** (0.702)	2.368** (1.012)
FS	0.0337 (0.0784)	-0.0258 (0.0606)	-0.0252 (0.0628)	0.132 (0.141)	0.595 (0.375)	1.525 (0.944)	1.251*** (0.397)	2.352** (0.713)
C-FE		Y	Y	Y		Y	Y	Y
Y-FE		Y	Y	Y		Y	Y	Y
N	655	655	625	404	655	655	655	417
R2	0.30	0.75	0.75	0.81	0.30	0.75		
LL							-400.01	-197.63
1st F			7.08	4.50				

Introduction ooo	Background and Data oo	Reduced-Form Evidence ooo	Structural Estimation ●oooooo	Conclusion o	Appendix ooo
Empirical model of the market entry					
Outline of the model					
<ul style="list-style-type: none"> <li>Why structural model estimation?           <ul style="list-style-type: none"> <li>It aims to fully account for strategic interactions by estimating a entry game.</li> <li>It also intends to evaluate whether asymmetric information affects FDI's strategic interactions.</li> </ul> </li> <li>We model a <math>2 \times 2</math> game (Ciliberto and Tamer '09)           <ul style="list-style-type: none"> <li>Players <math>\in \{FDI, Home\}</math>, Action <math>\in \{Enter, Don't Entry\}</math></li> <li>It's an one-shot game to focus on simultaneous moves.</li> <li>Firms compete only within a market. (it's not a network game)</li> <li>Profit functions follows the IO literature.</li> </ul> </li> </ul>					
$\pi_{im} = \alpha_i + X'_m \beta + Z'_{im} \gamma_i + \delta_i Y_{-im} + \varepsilon_{im}, \quad i \in \{F, H\}$					
<ul style="list-style-type: none"> <li>Incomplete information: <math>i</math> doesn't know <math>\varepsilon_{-i}</math> but knows <math>F(\varepsilon_{-i})</math> <ul style="list-style-type: none"> <li>Foreign retailers know little of the local demand.</li> <li>Domestic retailers have inferior managerial know-how.</li> </ul> </li> </ul>					



Introduction ooo	Background and Data oo	Reduced-Form Evidence ooo	Structural Estimation ●ooooo	Conclusion o	Appendix ooo
---------------------	---------------------------	------------------------------	---------------------------------	-----------------	-----------------

## Empirical model of the market entry

### Bayesian Nash Equilibrium

- Each retailer forms a belief about its competitor's action
- Then firm chooses an action that maximizes expected profits given the belief, yielding
 
$$Y_{Fm} = 1(\alpha_F + X'_m\beta + Z'_{Fm}\gamma_F + \delta_F P_{Hm} + \varepsilon_{Fm} \geq 0)$$

$$Y_{Hm} = 1(\alpha_H + X'_m\beta + Z'_{Hm}\gamma_H + \delta_H P_{Fm} + \varepsilon_{Hm} \geq 0)$$
 where  $P_{-im}$  implies  $i$ 's belief over firm  $-i$ 's action
- The conditional choice probability represents each firm's strategy.
- Bayesian Nash Equilibrium (BNE) should satisfy the system of the equations below:
 
$$P_{Fm}^* = \phi(\alpha_F + X'_m\beta + Z'_{Fm}\gamma_F + \delta_F P_{Hm}^*)$$

$$P_{Hm}^* = \phi(\alpha_H + X'_m\beta + Z'_{Hm}\gamma_H + \delta_H P_{Fm}^*)$$
 where  $\phi(\cdot)$  depends on  $F(\cdot)$

Introduction ooo	Background and Data oo	Reduced-Form Evidence ooo	Structural Estimation ●ooooo	Conclusion o	Appendix ooo
---------------------	---------------------------	------------------------------	---------------------------------	-----------------	-----------------

## Structural Estimation

### Two-step Approach (1st Step)

- To estimate the structural parameters in the model,
  - I exploit the two-step approach by Hotz and Miller (1993)
  - This method exploits the structure of incomplete information.
- The first step is to obtain firm's belief(expectation) about the competitor's action.  $(\hat{P}_{Hm}, \hat{P}_{Fm})$ 
  - This is based on the assumption that, at the true equilibrium, the beliefs are simply functions of covariates.
  - Obtain the predicted beliefs by regressing with the data.
  - We don't know the functions (no economic primitives) → use non-parametric regression.(Kernel estimation)

\* (Kernel estimation)

Let  $W_m^i \equiv (X_m, Z_{im})$ . The first-step Kernel estimator is

$$\hat{P}_{im}(W_m^i) = \frac{\sum_{s=1}^M Y_{is} K(\frac{W_m^i - W_s^i}{b})}{\sum_{s=1}^M K(\frac{W_m^i - W_s^i}{b})}$$

where  $K(\cdot)$  is a kernel function,  $b$  is the bandwidth.

Introduction  
oooBackground and Data  
ooReduced-Form Evidence  
oooStructural Estimation  
ooo●oooConclusion  
oAppendix  
ooo

## Structural Estimation

### Two-step Approach (2nd Step)

- The 2nd stage is to construct MLE which is nested by the estimated beliefs ( $\hat{P}_{Hm}, \hat{P}_{Fm}$ ) from the 1st stage.
  - I plug the estimated beliefs into the RHS of BNE equations like,

$$P_{im}^* = \phi(\alpha_i + X_m' \beta + Z_{im}' \gamma_i + \delta_i \hat{P}_{im}),$$

- The MLE is defined as

$$\hat{\theta}_{MLE} = \arg \max_{\theta} \sum_{m=1}^M \sum_{i \in \{F, K\}} Y_{im} \ln(P_{im}^*) + (1 - Y_{im}) \ln(1 - P_{im}^*)$$

Introduction  
oooBackground and Data  
ooReduced-Form Evidence  
oooStructural Estimation  
oooo●ooConclusion  
oAppendix  
ooo

## Structural Model Estimation Results

	2010 Census (1)	2005 Census (2)
The Effect of Domestic Entry on Foreign Entry	-0.811*** (0.251)	-0.603* (0.347)
The Effect of Foreign Entry on Domestic Entry	-0.939*** (0.288)	-1.258** (0.538)
Log Population	-0.324 (0.595)	-0.382 (0.588)
Per-Capita Retail Sale	-0.0645 (0.0729)	-0.182*** (0.0642)
Price-Cost Margin	-2.812 (3.764)	-4.097 (2.673)
Log Labour Productivity	-0.240 (0.274)	-0.746 (0.554)
Log Wage	0.143 (0.412)	-0.267 (0.638)
Net Entry Rate	1.092 (0.921)	0.761 (1.208)
Log Store Floor Space	0.109 (0.335)	1.259* (0.663)
Distance From Foreign (Tesco) Distribution Centre	-0.000624 (0.00239)	-0.00351 (0.00349)
Distance From Foreign (Tesco) Distribution Centre	0.00123 (0.00197)	0.00126 (0.00199)
N	238	215
Log Likelihood	203.509	130.037

Introduction ooo	Background and Data oo	Reduced-Form Evidence ooo	Structural Estimation ooooo●o	Conclusion o	Appendix ooo
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## Role of Asymmetric Information

- So far, this paper provides evidence on FDI's strategic entry
  - ▶ Reduced-form evidence (IV approach)
  - ▶ Structural estimation (Incomplete information game)
- We hypothesize asymmetric information plays a role in the strategic entry
  - ▶ If two firms completely know each other, they have no need to care for the other's action.
- To investigate the role of asymmetric information,
  - ▶ We estimate the same entry game model where information is now completely known, using Berry (1992)
  - ▶ This paper predicts that estimation results of complete information game provides no significant empirical evidence on FDI's strategic entry

Introduction ooo	Background and Data oo	Reduced-Form Evidence ooo	Structural Estimation ooooo●o	Conclusion o	Appendix ooo
---------------------	---------------------------	------------------------------	----------------------------------	-----------------	-----------------

## Role of asymmetric information

### Estimation results of incomplete information game

	2010 Census (1)	2005 Census (2)
The Effect of Domestic Entry on Foreign Entry	-0.523* (0.295)	5.732 (12.909)
The Effect of Foreign Entry on Domestic Entry	-0.272 (0.332)	-1.377*** (0.236)
Log Population	-0.274 (0.407)	-0.590 (0.599)
Per-Capita Retail Sale	-0.0524** (0.0265)	-0.218*** (0.0815)
Price-Cost Margin	-2.294 (4.096)	-5.576* (2.873)
Log Labour Productivity	-0.173 (0.219)	0.936* (0.516)
Log Wage	0.071 (0.408)	-0.509 (0.596)
Net Entry Rate	0.918 (0.818)	1.103 (1.237)
Log Store Floor Space	0.126 (0.318)	1.164** (0.568)
Distance From Foreign (Tesco) Distribution Centre	-0.00105 (0.00198)	-0.00575* (0.00314)
Distance From Foreign (Tesco) Distribution Centre	0.00144 (0.00194)	0.000402 (0.00186)
N	238	215
Log Likelihood	214.470	130.924

Introduction ooo	Background and Data oo	Reduced-Form Evidence ooo	Structural Estimation ooooooo	Conclusion ●	Appendix ooo
---------------------	---------------------------	------------------------------	----------------------------------	-----------------	-----------------

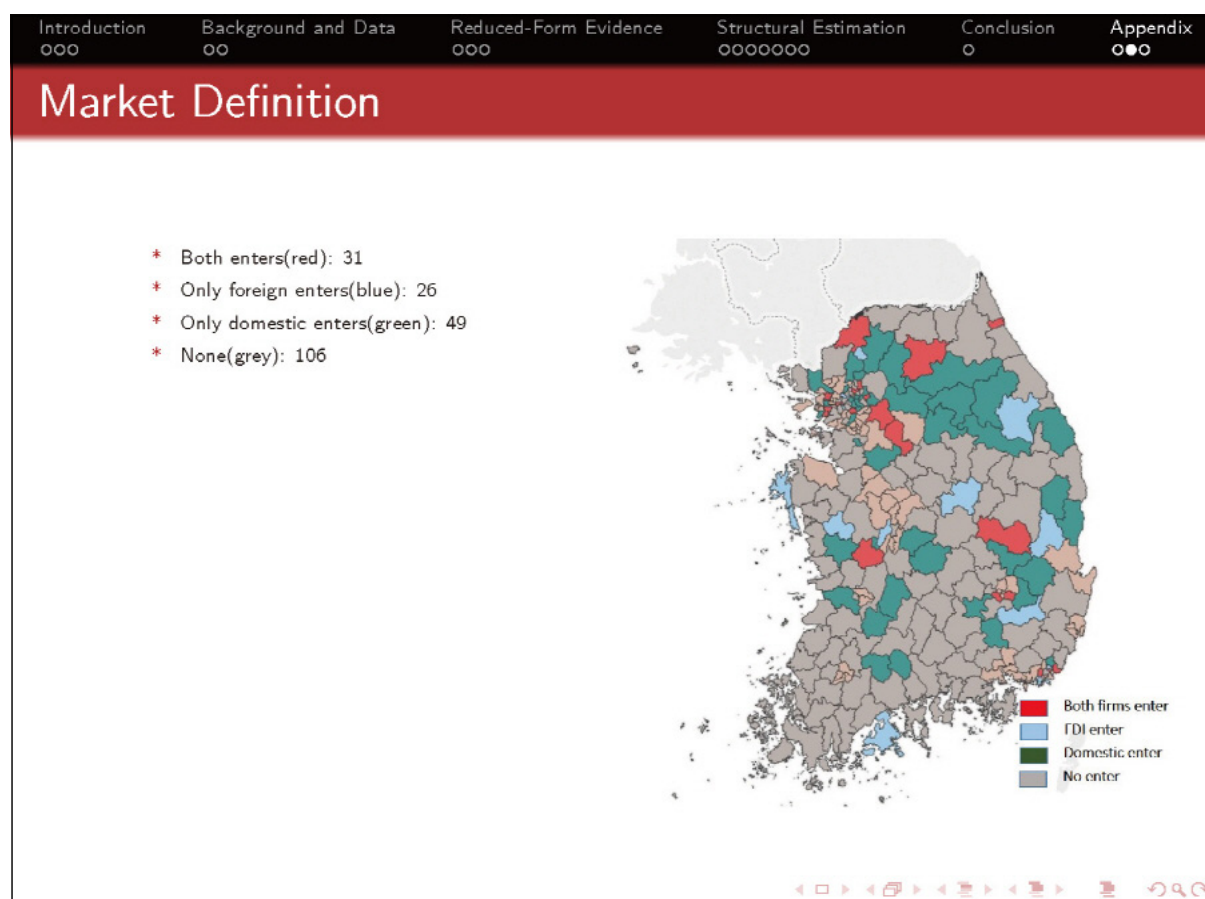
## Concluding Remarks

- Summary
  - ▶ Strategic interactions matters in foreign retail entry.
  - ▶ Asymmetric info plays a key role in FDI's strategic entry.
- Contribution
  - ▶ IO (entry game estimation) literature + FDI literature
  - ▶ Evidence from both reduced-form and structural estimation
  - ▶ Entry determinants of Service FDI + within-country factors
- Further to work
  - ▶ Dynamic entry game
  - ▶ Exploit store-level data
  - ▶ Counterfactual analysis

Introduction ooo	Background and Data oo	Reduced-Form Evidence ooo	Structural Estimation ooooooo	Conclusion o	Appendix ●oo
---------------------	---------------------------	------------------------------	----------------------------------	-----------------	-----------------

# APPENDIX





Introduction 000 Background and Data 00 Reduced-Form Evidence 000 Structural Estimation 0000000 Conclusion 0 Appendix 000

## Bivariate Probit Model

- In principle, IV (2SLS) is based on linear specifications
- Instead, two-step GMM or minimum chi-square estimators can be used in binary choice models.
- Yet, these methods are useless in the binary choice model with dummy endogenous variables.
- In this paper, I adopt Bivariate Probit Model methodology proposed by Heckman(1977) and Maddala(1986)

$$FDI_{mt} = 1(\alpha_1 + \beta_1 Home_{mt} + \gamma_1' X_{mt} + \varepsilon_{1mt} \geq 0)$$

$$Home_{mt} = 1(\alpha_2 + \delta IV_{mt} + \gamma_2' X_{mt} + \varepsilon_{2mt} \geq 0)$$

- where  $IV_{mt}$  is the instrument variable.



## Comments on Kyung In Hwang “Foreign Retail Entry under Domestic Rivals”

KOZO KIYOTA

KEIO UNIVERSITY

1

## Summary

- Research question
  - How do strategic interactions affect FDI's market entry?
- Model
  - The 2 players x 2 action game, building upon Ciliberto and Tamer (2009, ECTA)
- Empirical analysis
  - Data: Korean data on large discount stores (county level for 1996, 2001, 2005, 2010)
  - Reduced-form estimation
  - Structural model estimation
- Main finding
  - Negative and causal impacts of competitor's presence on foreign market entry

2

## General Remarks

- This paper examines the foreign entry in market  $m$  year  $t$  in Korea, given the presence of domestic firms
- ➔ The main interest of this paper is basically the same as the location choice of multinational firms in domestic regions
- However, the paper sheds light on the strategic interactions between foreign and domestic firms
- This paper finds the negative impacts of a competitor's presence on foreign market entry, which is interesting to me
- I have only four comments, mainly for clarification

3

- This paper finds **negative and causal impacts** of domestic competitor's presence on foreign market entry. (IV strategy)

	2010 Census (1)	2005 Census (2)
The Effect of Domestic Entry on Foreign Entry	-0.811*** (0.251)	-0.603* (0.347)
The Effect of Foreign Entry on Domestic Entry	-0.939*** (0.288)	-1.258** (0.538)
Log Population	-0.324 (0.595)	-0.382 (0.588)
Per-Capita Retail Sale	-0.0645 (0.0729)	-0.182*** (0.0642)

## Comment #1

- Entry or presence?
- p.3: The impacts of a domestic competitor's presence
- p.14: The effect of domestic (foreign) entry on foreign (domestic) entry (simultaneous entry?)
- ➔ Because the entry and presence have different meanings, I would suggest the author clarifies this point

4

	2010 Census (1)	2005 Census (2)
The Effect of Domestic Entry on Foreign Entry	-0.811*** (0.251)	-0.603* (0.347)
<u>The Effect of Foreign Entry on Domestic Entry</u>	-0.939*** (0.288)	-1.258** (0.538)
Log Population	-0.324 (0.595)	-0.382 (0.588)
Per-Capita Retail Sale	-0.0645 (0.0729)	-0.182*** (0.0642)

- Incomplete information:  $i$  doesn't know  $\varepsilon_{-i}$  but knows  $F(\varepsilon_{-i})$ 
  - ▶ Foreign retailers little know the local demand.
  - ▶ Domestic retailers have inferior managerial know-how.

## Comment #2

- If foreign retailers have already located in market  $m$ , can domestic retailers enter the market under the setting of this model?
- The model assumes that foreign retailers know **little** regarding the local demand while they have superior managerial know-how

5

## Comment #2

- Incomplete information:  $i$  doesn't know  $\varepsilon_{-i}$  but knows  $F(\varepsilon_{-i})$ 
  - ▶ Foreign retailers little know the local demand.
  - ▶ Domestic retailers have inferior managerial know-how.

- If foreign retailers have already located in market  $m$ , it **would seem that they understand** local demand, having superior managerial know-how

- In this context, I wonder whether the model of Ciliberto and Tamer (2009, ECTA) can be applicable to the entry game between foreign and domestic firms

6

## Comment #3

	2010 Census (1)	2005 Census (2)
The Effect of Domestic Entry on Foreign Entry	-0.811*** (0.251)	-0.603* (0.347)
The Effect of Foreign Entry on Domestic Entry	-0.939*** (0.288)	-1.258** (0.538)
Log Population	-0.324 (0.595)	0.382 (0.588)
Per-Capita Retail Sale	-0.0645 (0.0729)	-0.182*** (0.0642)

- In the structural model, the following two variables are included:
  - The effects of foreign entry on domestic entry
  - The effects of domestic entry on foreign entry
- Is the dependent variable foreign entry?
- If so, are the names of these variables appropriate?
  - If the dependent variable is foreign entry, I wonder if the analysis examines:
    - The effects of "the effects of foreign entry on domestic entry" on foreign entry
    - The effects of "the effects of domestic entry on foreign entry" on foreign entry

7

## Comment #4

- This paper finds that the presence (entry?) of domestic firms negatively affects the entry of foreign firms
- However, in the location choice literature, some studies found the agglomeration effect
  - Head, Ries, and Swenson (1995, JIE): "Recent theories of economic geography suggest that firms in the same industry may be drawn to the same locations because proximity generates positive externalities or 'agglomeration effects'" (p.223)
  - Guimaraes, Figueredo, and Woodward (2000, JUE): "Agglomeration economies result from industry-specific localization, obtained when firms in the same industry draw on a shared pool of skilled labor and specialized input suppliers" (p.122)
- ➔ I am interested in the external validity of this analysis
  - I wonder whether the results of this study is applicable only to some specific industries

8

## Minor comments

- In the structural estimation, why do per-capita retail sales have a negative relationship with the entry of domestic and foreign firms?
- Measurement of entry: Only greenfield? Any M&As?
  - Foreign firms may enter through M&A to acquire good knowledge about local markets
- Any policy implications?
  - If there is no presence of domestic rival firms, this may imply that such county has either a strong potential or no market potential (i.e., remotely located from anywhere)...
- Please add the slide number...

9

## Concluding Remarks

- This paper presents interesting findings
- I am sorry if I misunderstand because I only have slides...
- But some more clarification on the following points may be helpful
  1. The difference between entry and presence
  2. The applicability of the model of Ciliberto and Tamer (2009, ECTA) to the entry game between foreign and domestic firms
  3. The name of the variables
  4. Agglomeration benefit and external validity

10



2022 KIET-RIETI-TIER Workshop

# Supply Chain Management and Firm Performance

SOO-DONG KIM

2022. 10. 25.

## Table of Contents

- 01.** Introduction
- 02.** Previous Studies
- 03.** Proxy Variable
- 04.** Data and Methodology
- 05.** Results and Interpretation
- 06.** Conclusion



## 1. Introduction

### ✓ Definitions of Supply Chain

#### Supply Chain

- Traditional business functions as a whole, aimed at improving the long-term performance of individual companies and the greater supply chain (Mentzer et al., 2001)

#### Supply chain management

- Supply chain management is defined as coordination within and between organizations and performance of both transformative and supporting functions.

## 2. Previous studies

### ✓ The effect of supply chain management

- Excellence in supply chain management is directly related to superior organizational performance (D'Avanzo et al.(2004), Christopher(2005)).
- The impact of supply chain management extends beyond cost savings (Lambert and Cooper(2000), Ellram and Liu(2002), Farris and Hutchison(2002)).
- Frohlich and Westbrook(2001) argued that while the importance of supply chain management is recognized, the impact on an organization's financial performance is less clear.
- Christopher (1988) found that three key areas in which supply chain management can affect an organization's financial performance are profitability, liquidity, and productivity (asset utilization).

## 2. Previous studies

### ✓ Supply chain management and corporate performance

- Many studies analyzed the relationship between good supply chain management and corporate performance (Christopher and Ryals(1999) LaLonde(2000), Lambert and Burduglu(2000), Elram and Liu(2002)).
- A representative study that empirically quantifies this relationship is Johnson and Templar (2011).
- The reduction of production processes within the Japanese automobile supply chain has led to an increase in productivity in the Japanese automobile supply chain (Lieberman and Demeester(1999)).
- Allied Market Research (AMR) quantifies supply chain performance using return on assets (ROA), inventory turnover, company growth, and subjective opinions of AMR experts (Frischia et al.(2005)).
- D'Avanzo et al. (2003) argued that the top companies in supply chain performance also ranked high in financial performance.
- A Disruptions or shocks in the supply chain lead to a decrease in short- and long-term shareholder value (Hendricks and Singhal, 2003, 2005a). Also leads to lower sales growth, higher costs, and an increase in the number of current assets (Hendricks and Singhal, 2005b).

## 3. Proxy Variable

### ✓ Proxy for supply chain management

Two proxy  
variables for  
supply chain  
management

- This study uses traditional financial ratios as suggested by Johnson and Templar(2011).
- Two advantages; first it uses publicly available data constructed using the verified accounting principles. Second, allows to examine the effect using the language of senior management.
- Following two ratios are taken to construct the proxy.
- The net inflow of cash generated from operations is used as the numerator.
- Total assets required to manage the supply chain is used as the denominator.
- This ratio is defined as a proxy variable for supply chain management.
  - **Cash generation ratio:** calculated by dividing net cash inflows by sales for a given period.
  - **Asset efficiency ratio:** defined as an organization's revenue divided by its total assets and liabilities.

## 4. Data and Methodology

### ✓ Empirical Method

#### The purpose of modeling

- The analysis is performed using two models for supply chain proxy testing.
- The first model is to identify the link between the traditional variable of effective supply chain management and the proxy.
- The second model is to examine the link between corporate performance and supply chain management.

#### Data

- Firm level data from the Kis-value database.
- Period: 2015-2020
- 4 industries: Mining and minerals, Semiconductor, Pharmaceutical, and Battery
- Other variables : total assets and liabilities, sales, cost expenses, net income, etc. total output price index, consumer price index, and domestic supply price index from the KOSIS National Statistics Portal of Statistics Korea.

## 4. Data and Methodology

### ✓ Empirical Method

#### Model specification

- Panel OLS regression is used.
- Model (1) is the regression model using the supply chain management as a dependent variable.

$$pxy_{it} = \alpha + \beta_2 cpi_{it} + \beta_3 spi_{it} + \beta_4 opi_{it} + \sum_{i=5}^{i=9} \beta_i X \quad (1)$$

- Model (2) performs a regression analysis using return on assets (ROA) and return on equity (ROE) which represent a firm's performance.

$$ROA = \alpha + \beta_1 pxy_{it} + \beta_2 cpi_{it} + \beta_3 spi_{it} + \beta_4 opi_{it} + \sum_{i=5}^{i=8} \beta_i X_{it} + u_{it} \quad (2)$$

## 4. Data and Methodology

### ✓ Empirical Method

#### Variables

- $pxy_{it}$  is the proxy of firm  $i$  in period  $t$ .
- $cpig_t$  is the rate of change in the consumer price index in period  $t$ .
- $spig_t$  is the rate of change in the aggregate output price index in period  $t$ .
- $opig_t$  is the rate of change in the domestic supply price index in period  $t$ .
- $lasset$  is the logarithm of the total assets of the firm in period  $t$ .
- $roce$  is the return on capital of firm  $i$  in period  $t$ .
- $ccc$  is the rate of change in the cash conversion cycle of firm  $i$  in period  $t$ .
- $sale - asset$  is the ratio of sales to the total assets of firm  $i$  in period  $t$ .
- $debt - asset$  is the ratio of debts to the total assets of firm  $i$  in period  $t$ .
- $u$  is the general residual term.

## 5. Results and Interpretation

### ✓ 1. Mining and minerals industry

Table 1. Supply Chain Management Effect on the Mining and Mineral

D. var.	Model (1)		Model (2)			
	Proxy		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	-	-	0.155***	(0.017)	0.526***	(0.142)
cpig	-0.196	(0.153)	0.064***	(0.010)	0.056	(0.086)
spig	0.016	(0.060)	-0.004	(0.004)	-0.004	(0.033)
opig	0.005	(0.094)	-0.004	(0.006)	-0.004	(0.051)
lasset	-0.027	(0.034)	0.011***	(0.002)	-0.009	(0.018)
roce	2.658***	(0.700)	-	-	-	-
ccc	-0.001*	(0.001)	0.0001***	(0.00004)	0.000	(0.000)
sale_asset	-0.138	(0.109)	0.068***	(0.007)	0.170***	(0.060)
debt_asset	0.657***	(0.203)	-0.283***	(0.017)	-0.939***	(0.142)
constant	0.570	(0.377)	-0.134***	(0.025)	0.095	(0.205)
obs.	728		729		729	
R <sup>2</sup>	0.0422		0.3306		0.061	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Model (1)

- The return on capital (roce) has a significant positive value.
- The longer the cash conversion cycle, the more negatively the effect on supply chain management.
- The debt-to-total asset ratio has a positive value and is found to have a positive effect on supply chain management.

#### Model (2)

- In the ROA and ROE models, the coefficient estimates of the supply chain proxy variables are 0.155 and 0.526, respectively.
- Supply chain management has a positive effect on corporate performance in the mining and minerals industry.

## 5. Results and Interpretation

### ✓ 1. Mining and minerals industry

Table 2. The Effect before and during COVID-19 on the Mining and Mineral

D. var.	2015-2018(Before)				2019-2020(During)			
	ROA		ROE		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	1.015***	(0.174)	2.165*	(1.181)	0.123***	(0.017)	0.493***	(0.179)
cpig	-0.020	(0.164)	-0.217	(1.113)	-	-	-	-
spig	0.007	(0.008)	0.024	(0.057)	-0.011**	(0.004)	-0.038	(0.046)
opig	0.002	(0.033)	0.013	(0.227)	-	-	-	-
ltasset	-0.006*	(0.003)	-0.041*	(0.022)	0.023***	(0.004)	0.016	(0.040)
ccc	0.0001	(0.001)	0.001	(0.000)	0.0003***	(0.001)	0.000	(0.001)
sl_asset	-0.018	(0.013)	0.101	(0.090)	0.107***	(0.014)	0.104	(0.146)
dbt_asset	-0.178***	(0.016)	-1.05***	(0.110)	-0.464***	(0.039)	-0.846**	(0.405)
constant	0.076	(0.215)	0.617	(1.458)	-0.181***	(0.040)	-0.088	(0.421)
obs.	485		485		244		244	
R <sup>2</sup>	0.2353		0.1585		0.4815		0.1587	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Results

- ROA and ROE are significant with values of 1.015 and 2.165, respectively, before the pandemic.
- ROA and ROE for 2019 to 2020 are significant with values of 0.123 and 0.493, respectively.
- Comparing the size of the estimates, the effect of supply chain management on business performance during the pandemic period is still positive, but the size of the effect has decreased significantly.

## 5. Results and Interpretation

### ✓ 2. Semiconductor Industry

Table 3. Supply Chain Management Effect on the Semiconductor Industry

D. var.	Model (1)		Model (2)			
	Proxy		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	-	-	0.046	(0.032)	0.043	(1.450)
cpig	0.014	(0.036)	0.004	(0.004)	0.005	(0.006)
spig	-0.008	(0.014)	0.001	(0.002)	0.001	(0.002)
opig	0.005	(0.022)	-0.002	(0.002)	-0.002	(0.003)
ltasset	0.036***	(0.008)	-0.001	(0.001)	-0.001	(0.002)
roce	0.352***	(0.048)	-	-	-	-
ccc	-0.001**	(0.004)	0.000	(0.000)	0.000	(0.000)
sale_asset	0.028	(0.024)	0.004	(0.003)	0.007	(0.004)
debt_asset	0.660*	(0.394)	-0.035	(0.046)	-0.014	(0.063)
constant	-0.232***	(0.076)	0.006	(0.012)	0.013	(0.016)
obs.	536		252		252	
R <sup>2</sup>	0.1734		0.0469		0.0613	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Model (1)

- The total assets (ltasset) and the return on investment (roce) shows significant positive values.
- The cash conversion cycle (ccc) is a significant negative value.
- The debt-to-total asset ratio is a positive value, which is found to have a positive effect on supply chain management.

#### Model (2)

- The coefficient estimates of the supply chain management proxy variables are 0.046 and 0.043 for the ROA and ROE models, respectively, but are found to be not statistically significant.

## 5. Results and Interpretation

### ✓ 2. Semiconductor Industry

Table 4. The Effect before and during COVID-19 on the Semiconductor

D. var.	2015-2018				2019-2020			
	ROA		ROE		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	0.047	(0.043)	0.063	(0.058)	0.070**	(0.032)	0.104***	(0.040)
cpig	0.101	(0.089)	0.160	(0.122)	-	-	-	-
spig	0.006	(0.004)	0.009	(0.006)	-0.001	(0.001)	-0.002*	(0.001)
opig	-0.022	(0.018)	-0.035	(0.025)	-	-	-	-
ltasset	-0.001	(0.002)	-0.002	(0.003)	0.000	(0.001)	0.000	(0.001)
ccc	0.000	(0.000)	0.000	(0.000)	0.01***	(0.000)	0.001***	(0.003)
sl_asset	0.001	(0.005)	0.002	(0.006)	0.08***	(0.002)	0.013***	(0.003)
dbt_asset	-0.051	(0.069)	-0.047	(0.094)	-0.014	(0.055)	0.054	(0.066)
constant	-0.109	(0.119)	-0.172	(0.163)	-0.015*	(0.008)	-0.018*	(0.010)
obs.	168		168		84		84	
R <sup>2</sup>	0.6589		0.052		0.2796		0.3479	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Results

- ROA and ROE show positive values of 0.047 and 0.063, respectively, for the period from 2015 to 2018, but are not statistically significant.
- For the period from 2019 to 2020, they are still positive and significant values of 0.070 and 0.104, respectively.
- Comparing the size of the estimates, the impact of supply chain management on firm performance during the COVID-19 period has increased.

## 5. Results and Interpretation

### ✓ 3. Pharmaceutical Industry

Table 5. Supply Chain Management Effect on the Pharmaceutical Industry

D. var.	Model (1)		Model (2)			
	proxy		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	-	-	0.067	(0.084)	0.266	(0.272)
cpig	-0.030	(0.076)	0.000	(0.003)	0.000	(0.010)
spig	-0.007	(0.030)	-0.001	(0.001)	0.000	(0.003)
opig	0.014	(0.047)	0.001	(0.002)	0.000	(0.005)
ltasset	0.004	(0.017)	-0.002***	(0.001)	-0.003	(0.002)
roce	0.977***	(0.107)	-	-	-	-
ccc	0.002	(0.000)	0.000	(0.000)	0.000	(0.000)
sale_asset	0.244***	(0.090)	-0.011	(0.021)	-0.109	(0.068)
debt_asset	-0.151**	(0.065)	-0.005	(0.016)	0.016	(0.053)
constant	-0.161	(0.152)	0.040***	(0.015)	0.107***	(0.047)
obs.	1,282		436		436	
R <sup>2</sup>	0.0726		0.114		0.1648	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Model (1)

- The return on investment capital (roce) and the ratio of sales to total assets are significant and positive values.
- The debt-to-total asset ratio is a significant negative value.
- The higher the debt-to-total asset ratio, the more negatively it affects supply chain management.

#### Model (2)

- The coefficient estimates of the supply chain proxy variables are 0.067 and 0.266 in the ROA and ROE models, respectively, but are found to be not statistically significant.

## 5. Results and Interpretation

### ✓ 3. Pharmaceutical Industry

Table 6. Effect before and during COVID-19 on the Pharmaceutical Industry

D. var.	2015-2018				2019-2020			
	ROA		ROE		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	0.023	(0.02)	0.163***	(0.054)	-0.005	(0.132)	-0.447	(0.530)
cpig	-0.055	(0.04)	-0.314***	(0.115)	-	-	-	-
spig	-0.003	(0.02)	-0.013**	(0.005)	0.000	(0.004)	0.014	(0.018)
opig	0.012	(0.09)	0.062***	(0.023)	-	-	-	-
ltasset	-0.02***	(0.01)	-0.001	(0.002)	0.000	(0.002)	0.009	(0.007)
ccc	0.000	(0.01)	0.843***	(0.225)	0.000	(0.000)	0.000	(0.000)
sl_asset	0.005	(0.05)	-0.059***	(0.013)	0.005	(0.042)	0.089	(0.166)
dbt_asset	-0.008	(0.05)	0.022	(0.014)	-0.027	(0.025)	-0.162	(0.099)
constant	0.100*	(0.07)	0.461***	(0.150)	0.020	(0.031)	-0.064	(0.126)
obs.	263		263		173		173	
R <sup>2</sup>	0.1201		0.2249		0.159		0.2072	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Results

- The supply chain management proxy are positive values of 0.023 and 0.163 for ROA and ROE models, respectively, for the period from 2015 to 2018.
- However, only the effect on the ROE model is statistically significant.
- On the other hand, in the ROA and ROE models for the period from 2019 to 2020, coefficients have negative values of -0.005 and -0.447, respectively, and are not statistically significant.
- The impact of supply chain management proxies only had a positive impact before COVID-19 and no impact thereafter.

## 5. Results and Interpretation

### ✓ 4. Battery Industry

Table 7. Supply Chain Management Effect on the Battery Industry

D. var.	Model (1)		Model (2)			
	proxy		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	-	-	0.731***	(0.031)	2.467***	(0.450)
cpig	0.001	(0.019)	0.027***	(0.008)	0.066	(0.119)
spig	-0.010	(0.008)	0.007**	(0.003)	0.033	(0.047)
opig	0.009	(0.012)	-0.014***	(0.005)	-0.056	(0.073)
ltasset	0.009**	(0.004)	-0.003	(0.002)	-0.023	(0.024)
roce	55.9***	(4.385)	-	-	-	-
ccc	0.003***	(0.0001)	0.0004***	(0.000)	0.000	(0.001)
sl_asset	0.021	(0.012)	0.019***	(0.005)	0.052	(0.078)
dbt_asset	0.005	(0.028)	-0.150***	(0.012)	-0.217	(0.168)
constant	0.025	(0.046)	-0.056***	(0.019)	-0.077	(0.280)
obs.	712		714		714	
R <sup>2</sup>	0.2709		0.5728		0.0589	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Model (1)

- The total assets, the return on investment (roce), and the ratio of sales to total assets are significant positive values.
- In other words, the higher the total assets, the return on investment, and the ratio of sales to total assets, the more positive the effect on supply chain management

#### Model (2)

- The supply chain proxy variables are estimated to be 0.731 and 2.467 in the ROA and ROE models, respectively, and are statistically significant.



## 5. Results and Interpretation

### ✓ 4. Battery Industry

Table 8. The Effect before and during COVID-19 on the Battery Industry

D. var.	2015-2018				2019-2020			
	ROA		ROE		ROA		ROE	
E. var.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
proxy	1.354***	(0.047)	2.481***	(0.322)	0.341***	(0.042)	2.295***	(0.799)
cpig	-0.168	(0.108)	-0.921	(0.734)	-	-	-	-
spig	-0.002	(0.006)	-0.050	(0.038)	0.007*	(0.004)	0.063	(0.074)
opig	0.027	(0.022)	0.189	(0.151)	-	-	-	-
ltasset	-0.011***	(0.002)	-0.021*	(0.011)	0.004	(0.004)	-0.032	(0.068)
ccc	0.004***	(0.004)	0.001**	(0.000)	0.003***	(0.001)	0.000	(0.002)
sl_asset	-0.032***	(0.006)	-0.095**	(0.038)	0.046***	(0.011)	0.356	(0.219)
dbt_asset	-0.087***	(0.012)	-0.024	(0.079)	-0.223***	(0.023)	-0.547	(0.443)
constant	0.233*	(0.139)	1.189	(0.951)	-0.030	(0.037)	0.050	(0.700)
obs.	472		472		242		242	
R <sup>2</sup>	0.7125		0.1471		0.451		0.0674	

Note: \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

#### Results

- The supply chain proxies are statistically significant and positive values of 1.354 and 2.481 in the ROA and ROE models for the period from 2015 to 2018, respectively.
- ROA and ROE for 2019 to 2020 are statistically significant and positive values of 0.341 and 2.295, respectively.
- The battery industry's supply chain management proxy has a positive impact on corporate performance both before and during the COVID-19 pandemic.
- However, during the pandemic, the impact has decreased relatively.

## 6. Conclusion

### ✓ 1. Mining and minerals industry

- It is confirmed that supply chain management has a positive effect on corporate performance.
- And before and during the pandemic, effective supply chain management has a positive influence on firm performance.
- Comparing the size of the estimates, the effect of supply chain management on business performance during the pandemic is seen to decrease significantly.

### ✓ 2. Semiconductor Industry

- It is clear that the impact of supply chain management on business performance is positive during the pandemic.
- The magnitude of the impact has increased compared to the results of pre-pandemic period.

## 6. Conclusion

### ✓ 3. Pharmaceutical Industry

- The results provide limited evidence.
- That is, supply chain management was found to influence firm performance positively only before the pandemic period.

### ✓ 4. Battery Industry

- The battery industry's supply chain management was found to have a positive impact on corporate performance both before and during COVID-19.
- However, during the pandemic, the impact decreased relatively.

**Thank You**

## 2022 KIET-RIETI-TIER Workshop

# Supply Chain Management and Firm Performance

Comment by Ko-Hsiung LIEN

October 25, 2022

## Methodology of Dr. Kim(1/3)

- To find the relationship between **supply chain management** and **corporate performance**, while
  - Proxy for supply chain management : ROA and ROE
  - Proxy variables can also be explained by
    - Macro variables, such as
      - Consumer price index  $cpi_{it}$
      - Aggregate output price index  $opi_{it}$
      - Domestic supply price index  $spi_{it}$
    - Firm-specific variables
      - Logarithm of the total assets  $lta_{it}$
      - Return on capital  $roce_i$
      - Cash conversion cycle  $ccc_i$
      - Sales/total assets  $sales/a_{sset_i}$
      - Debts/total assets  $debt/a_{sset_i}$

## Methodology of Dr. Kim(2/3)

### • Two-step analysis

- First step : regress proxy on macro and firm-specific variables

$$pxy_{it} = \alpha + \beta_2 cpi_{it} + \beta_3 spi_{it} + \beta_4 opi_{it} + \sum_{i=5}^{i=9} \beta_i X \quad (1)$$

- Second step : regress ROA and ROE on proxy, macro and firm-specific variables

$$ROA = \alpha + \beta_1 pxy_{it} + \beta_2 cpi_{it} + \beta_3 spi_{it} + \beta_4 opi_{it} + \sum_{i=5}^{i=9} \beta_i X_{it} + u_{it} \quad (2)$$

### • Two-period comparison

- Before pandemic : 2015-2018
- During pandemic : 2019-2020

### • Four critical industries

- Mining and minerals
- Semiconductor
- Pharmaceutical
- Battery

## Methodology of Dr. Kim(3/3)

### • Results

- Clear evidence in semiconductor industry that SCM has positive effect on corporate performance and increase the resilience of firms about shocks.

Regression coefficient of proxy variable(SCM) and R<sup>2</sup> of model specification

Dependent var.	Mining and minerals		semiconductor		pharmaceutical		battery	
ROA								
2015-2018	1.105	R <sup>2</sup> =0.235	0.0047	R <sup>2</sup> =0.659	0.023	R <sup>2</sup> =0.120	1.354	R <sup>2</sup> =0.713
2019-2020	0.123(+)	R <sup>2</sup> =0.481	0.070(+)	R <sup>2</sup> =0.280	-0.005(-)	R <sup>2</sup> =0.159	0.341(-)	R <sup>2</sup> =0.451
ROE								
2015-2018	2.615	R <sup>2</sup> =0.159	0.063	R <sup>2</sup> =0.052	0.163	R <sup>2</sup> =0.225	2.481	R <sup>2</sup> =0.147
2019-2020	0.493(-)	R <sup>2</sup> =0.159	0.104(+)	R <sup>2</sup> =0.348	-0.447(-)	R <sup>2</sup> =0.207	2.295(-)	R <sup>2</sup> =0.067
Effect of SCM	positive		positive				Positive	
Dominance of SCM	ROA: increase ROE: decrease		increase		decrease		decrease	

Source : Kim(2022), Supply chain management and firm performance.

## Comments(1/2)

- A excellent analysis to clarify the empirical relationship between SCM and corporate performance by different industries.
- Mathematical thinking

$$\hat{x} \equiv \frac{x - \bar{x}}{\bar{x}} \approx \log x - \log \bar{x}$$

$$Y = F_1(X_1, \dots, X_n) \Rightarrow \hat{y} = \alpha_1 \hat{x}_1 + \dots + \alpha_n \hat{x}_n$$

$$W = F_2(Y, X_1, \dots, X_n) \Rightarrow \hat{w} = \delta_0 \hat{y} + \delta_1 \hat{x}_1 + \dots + \delta_n \hat{x}_n$$

$\frac{\delta_0 \hat{y}}{\hat{w}}$  means the variation of W that can be explained by the variation of Y,  
or the contribution of Y in the variation of W

- Econometrical method
  - Please also list the contribution of proxy variable in variation of ROA and ROE

## Comments(2/2)

- If we evaluate the model specification by  $R^2$ , it seems that regress ROA on SCM and other macro as well as firm-specific variables will have better explanatory power, not ROE. How about your evaluation ?
- By definition of accounting
  - $ROE = (\text{after-tax profit}) / (\text{shareholders' equity})$ ,  
where  $\text{shareholders' equity} = \text{total assets} - \text{total liabilities}$
  - $ROA = (\text{after-tax profit}) / (\text{total assets})$
  - The regression coefficient of SCM to the ROE is much more negative than it is to the ROA, does this reflect that the pharmaceutical industry in the Korea is also in high debt-to-equity ratio, such that the pandemic shocks deteriorate their corporate performance ?
- To keep the supply chain of the four critical industries being thriving and resilient in the Korea, what direction will you suggest your government agencies ?



Thank You For Listening

## 2022 KIET-RIETI-TIER Workshop Itinerary

Date	Time	RIETI	TIER	Remarks
	Flight info.	<b>Kumagai</b> (Oct. 21, ET673): NRT (21:10) – ICN (23:50)	<b>Chang, Chung, Lien</b> (Oct. 23, BR160): TPE (15:15) – ICN (18:45)	<b>TIER: Oct. 23</b> <b>RIETI: Oct. 24</b> (Ms. Kumagai is to arrive and stay in Seoul independently)
		<b>Ikeyama, Kiyota, Saburi</b> (Oct. 24, OZ1075): HND (12:05) – GMP (14:20)		
	Pick Up & Hotel	<b>Airport – Hotel (Oct. 24)</b> Pick-up standby (GMP, 14:50)	<b>Airport – Hotel (Oct. 23)</b> Pick-up standby (ICN, 19:15)	PCR not required
		<b>Hotel check-in (Oct. 24)</b> The Plaza Hotel, 3 persons 2 nights (24~26),	<b>Hotel check-in (Oct. 23)</b> The Plaza Hotel, 3 persons 3 nights (23~26)	About USD 170 per night, breakfast buffet included
<b>Oct. 24</b>	18:00	<b>Welcome dinner</b>		Seoulgaon (Korean), Gwanghwamoon
<b>Oct. 25</b>	10:00 ~ 12:00	<b>2022 KIET-RIETI-TIER Workshop</b>		Oak room (4F), The Plaza Hotel
	12:00 ~ 13:30	<b>Lunch</b>		At the venue (Korean)
	13:30 ~ 17:20	<b>2022 KIET-RIETI-TIER Workshop (cont.)</b>		Oak room (4F), The Plaza Hotel
	18:00	<b>Dinner</b>		Modam Dining (Korean), Gwanghwamoon
<b>Oct. 26</b>	09:00	<b>Hotel check-out</b>		Dr. Kiyota is to depart (GMP)
	09:00 ~ 10:00	<b>Hotel – Trade Tower Gangnam</b> Transportation to be provided		1 hour
	10:00 ~ 11:30	<b>Meeting with a related institute:</b> <b>Korean Security Agency of Trade and Industry (KOSTI)</b>		KOSTI, Trade Tower
	12:00 ~ 13:00	<b>Lunch</b>		(TBD), COEX, Gangnam area
	13:00 ~	<b>Gangnam – Airport</b> Transportation to be provided		1 hour
	Flight info.	<b>RIETI</b>	<b>TIER</b>	All participants
		<b>Kiyota</b> (JL5234): GMP (09:00) – HND (11:10) <b>Ikeyama, Saburi, Kumagai</b> (ET672): ICN (17:25) – NRT (20:15)	<b>Chang, Chung, Lien</b> (BR159): ICN (19:45) – TPE (21:45)	



# 2022 KIET-RIETI-TIER Workshop

## List of Participants

No.	Affiliation	Name	Position
1	KIET	Hyeon JU	President
2		Donghee LEE	Director
3		Soo-Dong KIM	Research Fellow
4		Kyung In HWANG	Associate Research Fellow
5		Kiho KIM	Coordinator
6		Aaron CROSSEN	Coordinator
7	RIETI	Shigetoshi IKEYAMA	Executive Officer
8		Kozo KIYOTA	Research Associate
9		Mark SABURI	Director
10		Akiko KUMAGAI	Coordinator
11	TIER	Chien-Yi CHANG	President
12		Grace CHUNG	Director
13		Ko-Hsiung LIEN	Director

MEMO

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