



Transdisciplinary Research for Building a System toward Global Peace

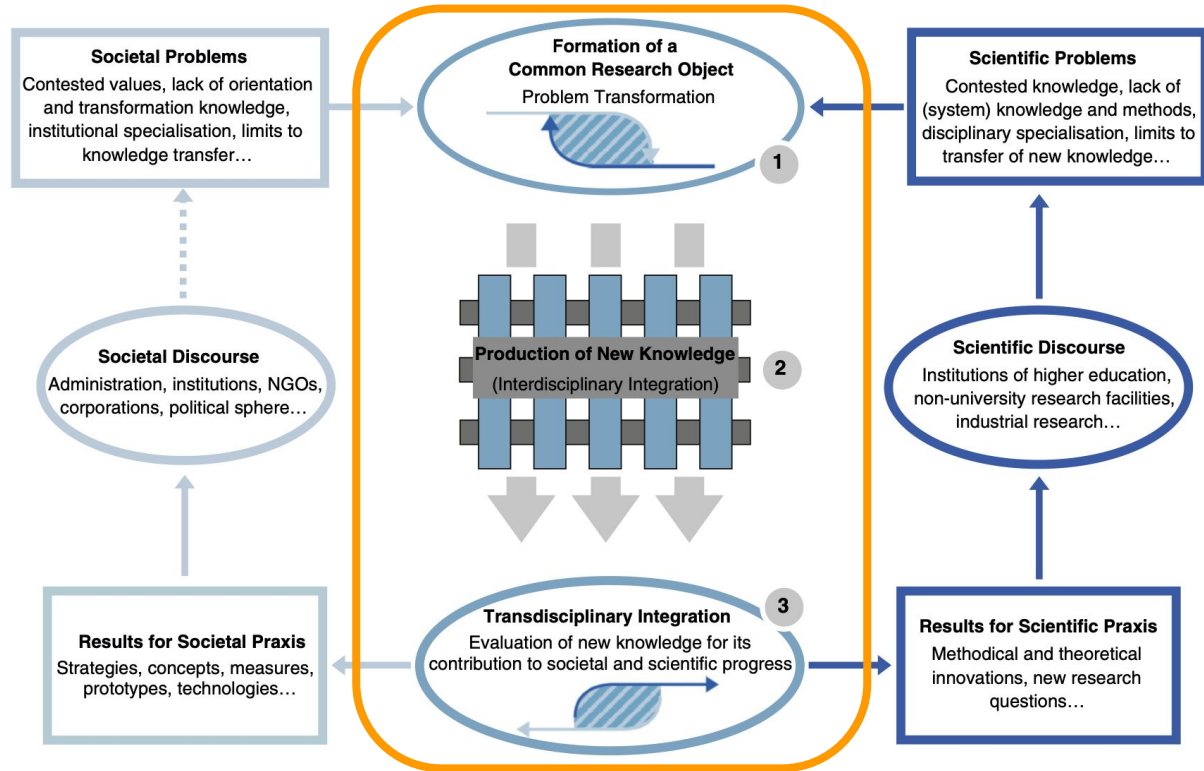
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November 4, 2022

Model of transdisciplinarity

Jahn, T., Bergmann, M., & Keil, F. (2012).
Transdisciplinarity: Between mainstreaming and
marginalization. Ecological economics, 79, 1-10.

This is a well-known model of transdisciplinarity. This model has two flows and three steps of transdisciplinary study.

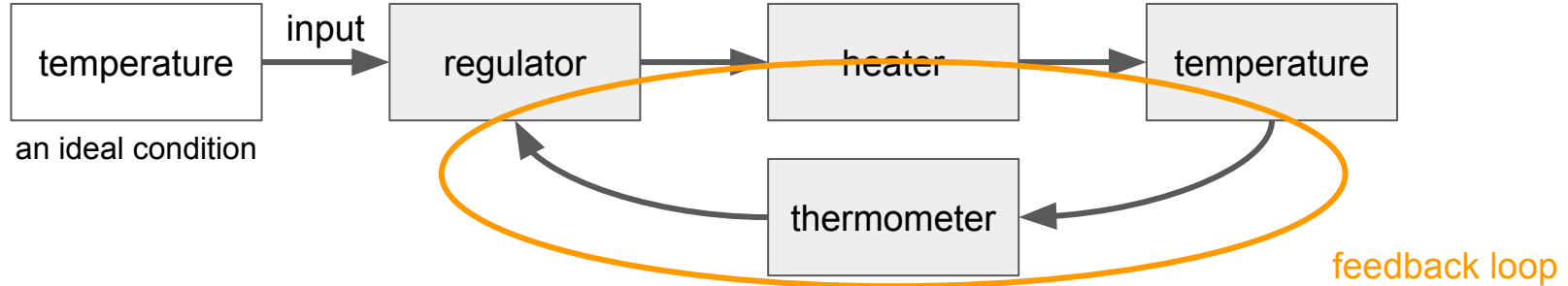
Today I present my case of three stages of transdisciplinary research from “Problem Transformation” to an early stage of “Transdisciplinary Integration”.



A model of transdisciplinarity (Source: Jahn et al. (2012))

Problem transformation from societal problems

A controllable (or/and sustainable) system requires a **feedback loop**.
Simple example: a thermostat system



However, in terms of building/keeping global peace, feedback loops within the system of our society are still not enough:

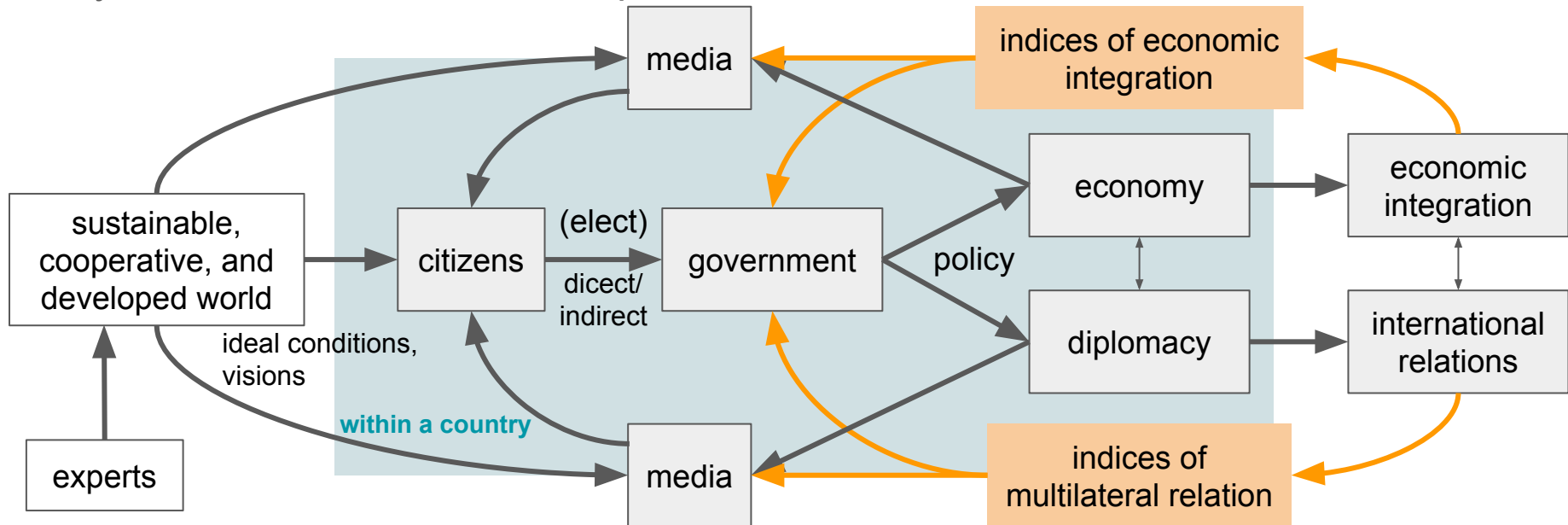
- some pages published on the Internet observing conflicts and protest events
- not enough information about **positive acts** like **economic integration** and **international cooperation to avoid conflicts**.

Aim

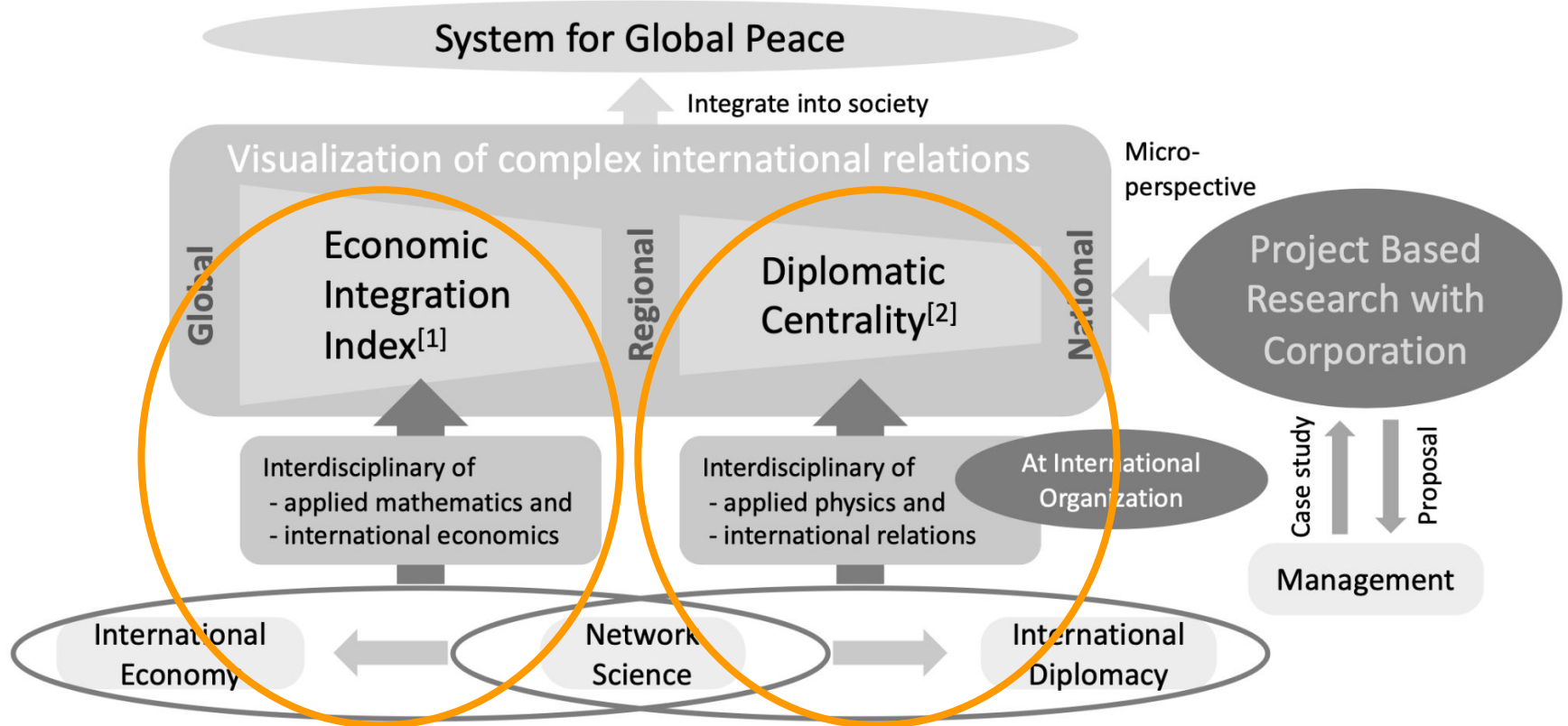
I aim to build **feedback loops** for sustainable, cooperative, and developed world*.

The feedback needs to demonstrate complicated international situations as an easy way to understand them for the public.

*This is a definition of peace in this study.



Research concept figure



[1] Sada S, Ikeda Y. Regional economic integration via detection of circular flow in international value-added network. Plos one. 2021 Aug 20;16(8):e0255698.

[2] Sada S, Oikawa K, Iwasaki F, Ikeda Y. International cooperation analysis of Asian political distance network constructed using event data. Front. Phys. 2022 Oct. 13; 10:1007796.

[Related result] Sada S, Ikeda Y. Regional and Sectoral Change of Global Value-Added Network Around the 2009 Economic Crisis. In Big Data Analysis on Global Community Formation and Isolation 2021 (pp. 217-247). Springer, Singapore.

Summary of my two interdisciplinary studies

Economic integration analysis

with prof. Ikeda (physicist)

- applied methods of these domains
 - macroeconomics
 - network science
 - fluid dynamics
- detected regional communities from global data
 - Europe and Asia-Pacific
- quantified the extent of economic integration
 - after the economic crisis in 2009, European index became unstable; Asia-Pacific's one had stably developed.

International cooperation analysis

with an economist, political scientist, and physicist

- applied methods of these domains
 - international relations
 - network science
 - applied physics
- compared national contributions from regional data (ASEAN+6+USA)
 - Japan: all periods (1985–2020)
 - China: from 1994
 - ASEAN: 1989–1994, 2012–2020
- quantified the extent of regional cooperation
 - after the economic crisis, Asia-Pacific tended to cooperate regionally.

Economic integration analysis

Sada, S, Ikeda, Y. (2021). Regional and Sectoral Change of Global Value-Added Network Around the 2009 Economic Crisis. Springer.
 Sada, S, Ikeda, Y. (2021). Regional economic integration via detection of circular flow in international value-added network. *PLOS ONE*, 16(8), e0255698.

Macroeconomics + Network Science + Fluid Dynamics -> evaluate the integrations

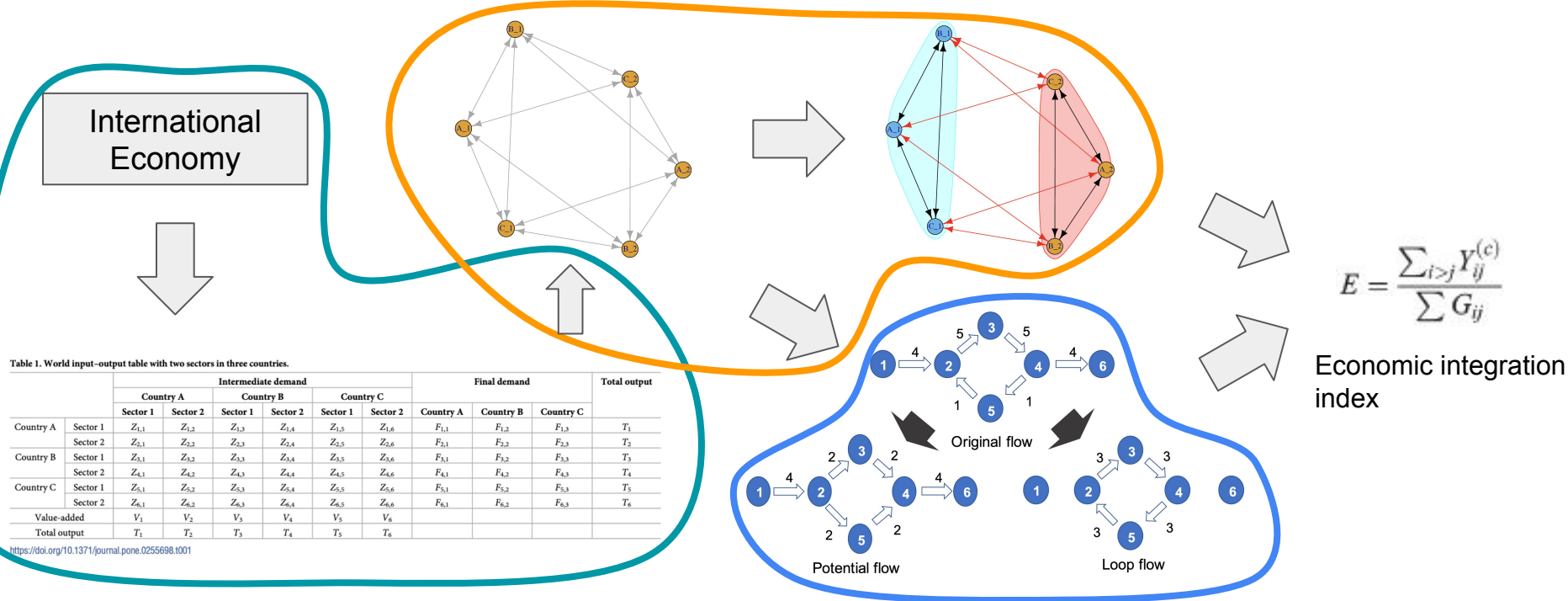


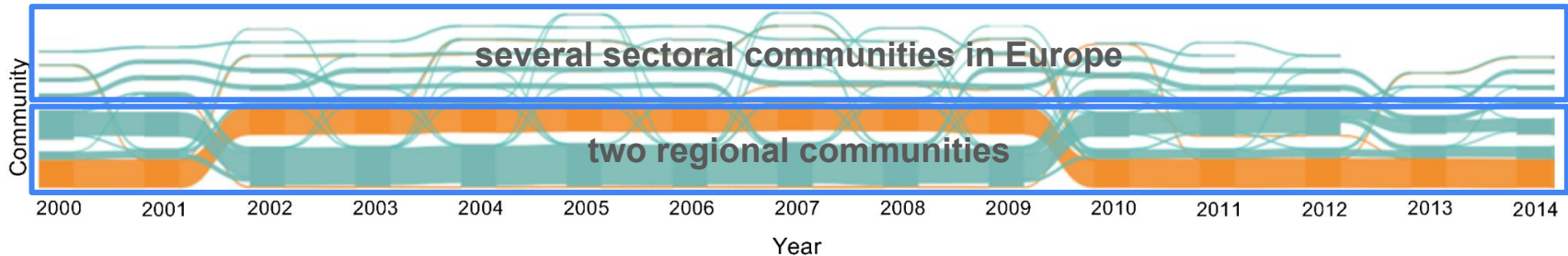
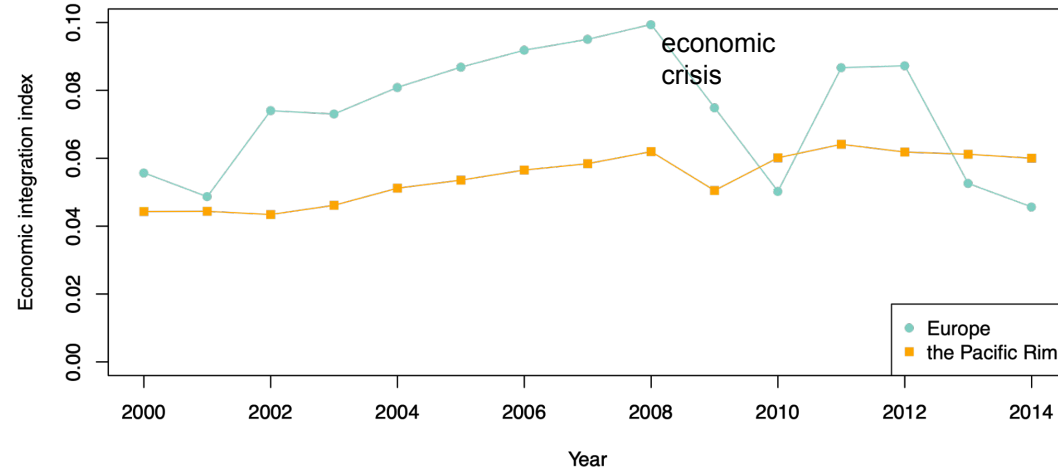
Table 1. World input-output table with two sectors in three countries.

		Intermediate demand						Final demand			Total output
		Country A		Country B		Country C		Country A	Country B	Country C	
Country	Sector	Sector 1	Sector 2	Sector 1	Sector 2	Sector 1	Sector 2				
Country A	Sector 1	Z _{1,1}	Z _{1,2}	Z _{1,3}	Z _{1,4}	Z _{1,5}	Z _{1,6}	F _{1,1}	F _{1,2}	F _{1,3}	T ₁
	Sector 2	Z _{2,1}	Z _{2,2}	Z _{2,3}	Z _{2,4}	Z _{2,5}	Z _{2,6}	F _{2,1}	F _{2,2}	F _{2,3}	T ₂
Country B	Sector 1	Z _{3,1}	Z _{3,2}	Z _{3,3}	Z _{3,4}	Z _{3,5}	Z _{3,6}	F _{3,1}	F _{3,2}	F _{3,3}	T ₃
	Sector 2	Z _{4,1}	Z _{4,2}	Z _{4,3}	Z _{4,4}	Z _{4,5}	Z _{4,6}	F _{4,1}	F _{4,2}	F _{4,3}	T ₄
Country C	Sector 1	Z _{5,1}	Z _{5,2}	Z _{5,3}	Z _{5,4}	Z _{5,5}	Z _{5,6}	F _{5,1}	F _{5,2}	F _{5,3}	T ₅
	Sector 2	Z _{6,1}	Z _{6,2}	Z _{6,3}	Z _{6,4}	Z _{6,5}	Z _{6,6}	F _{6,1}	F _{6,2}	F _{6,3}	T ₆
Value-added		V ₁	V ₂	V ₃	V ₄	V ₅	V ₆				
Total output		T ₁	T ₂	T ₃	T ₄	T ₅	T ₆				

<https://doi.org/10.1371/journal.pone.0255698.t001>

Economic integration analysis: results

Detected communities (Europe and Asia-Pacific) and compared the extent of economic integration in Europe with in Asia-Pacific.



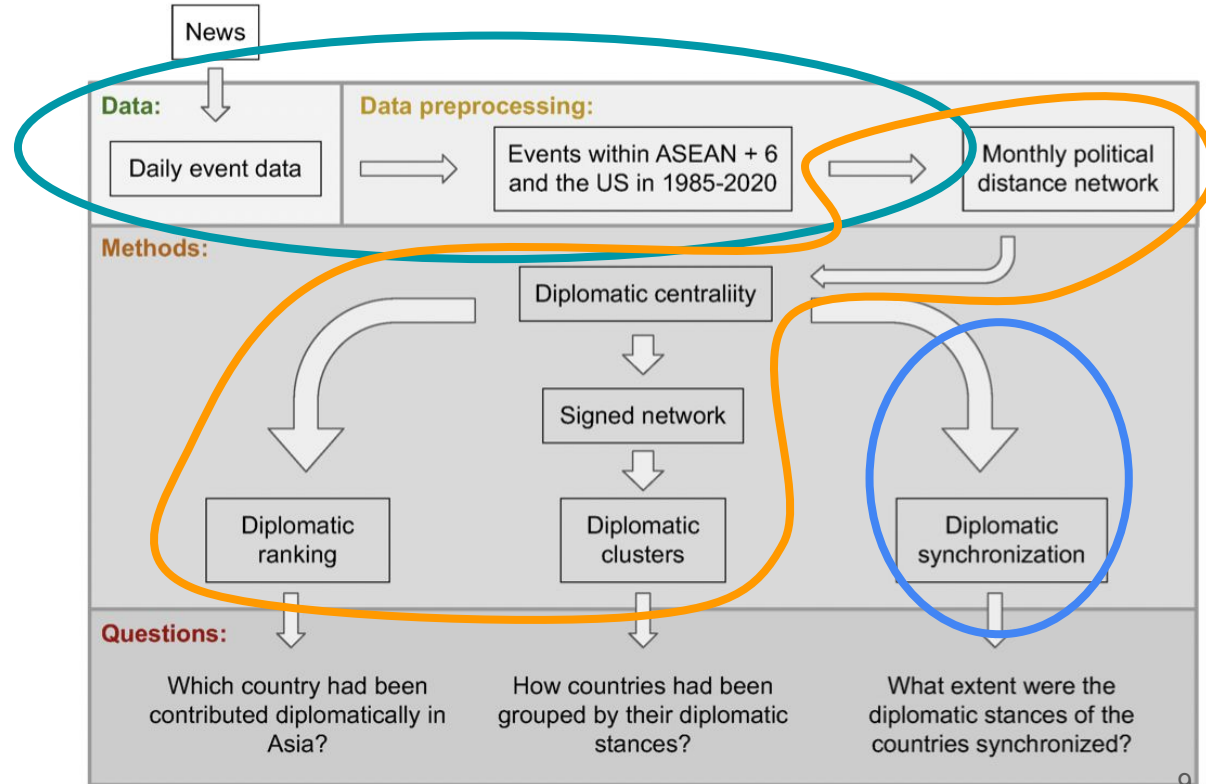
International cooperation analysis

Sada et al. (2022). International cooperation analysis of Asian political distance network constructed using event data. *Front. Phys.* 10:1007796.

International Relations +
Network Science +
Applied Physics

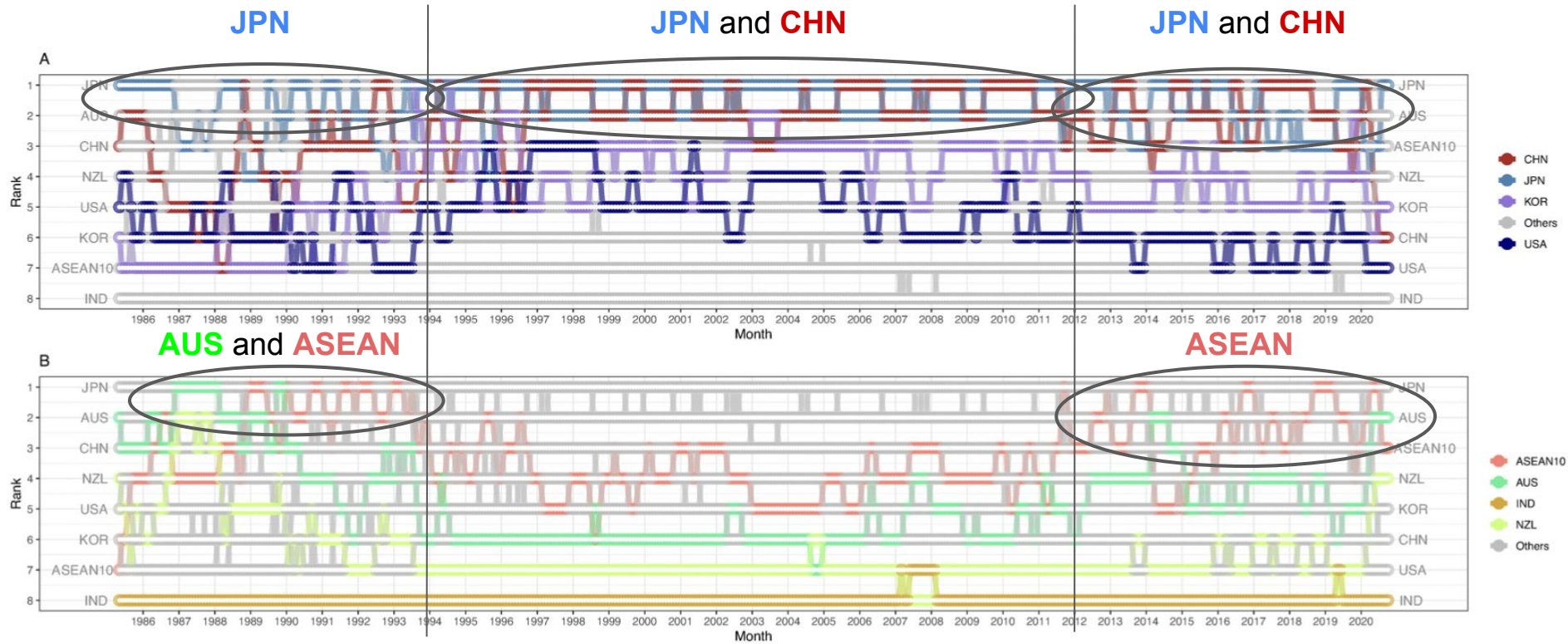
-> evaluate multilateral relations

I did this study as an intern of an international organization, ERIA (Economic Research Institute for ASEAN and East Asia) with an economist and researcher of politics.



International cooperation analysis: result 1

Sada et al. (2022). International cooperation analysis of Asian political distance network constructed using event data. Front. Phys. 10:1007796.



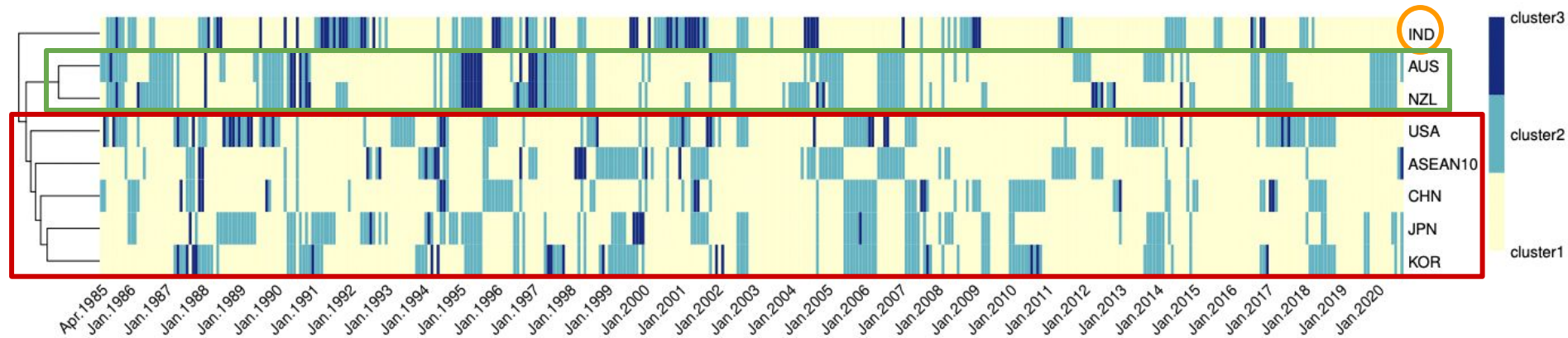
1994

2012

International cooperation analysis: result 2

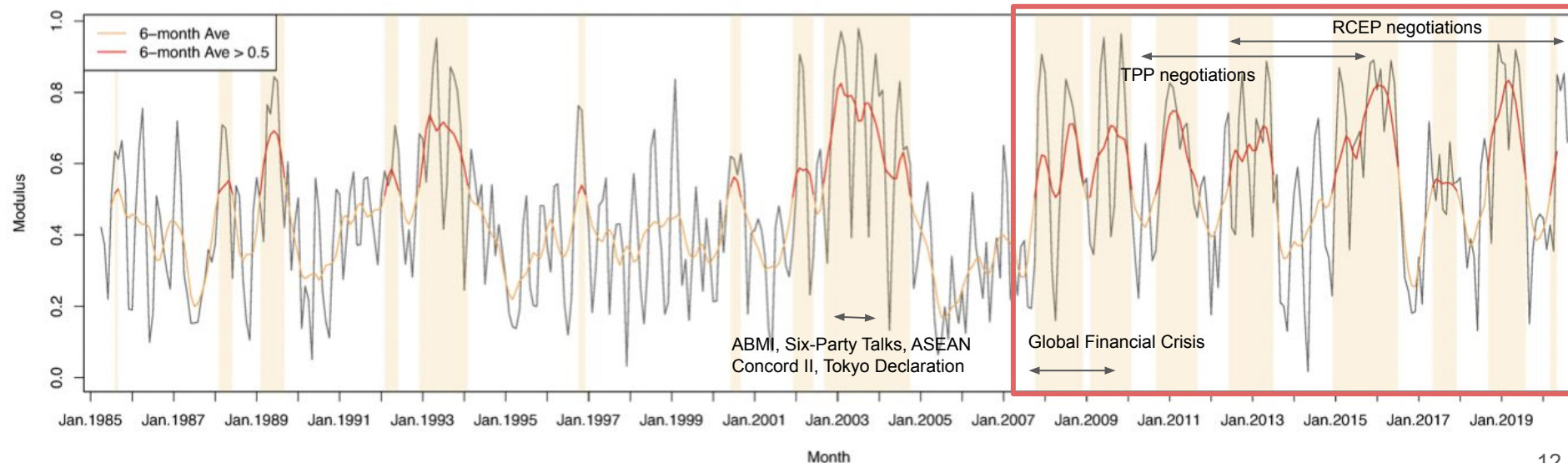
Detected clusters of countries by their diplomatic stances. For 36 years,

- **Australia and New Zealand** had similar stances;
- **South Korea, Japan, China, ASEAN, and the US** had been similar, respectively;
- **India** had been unique.

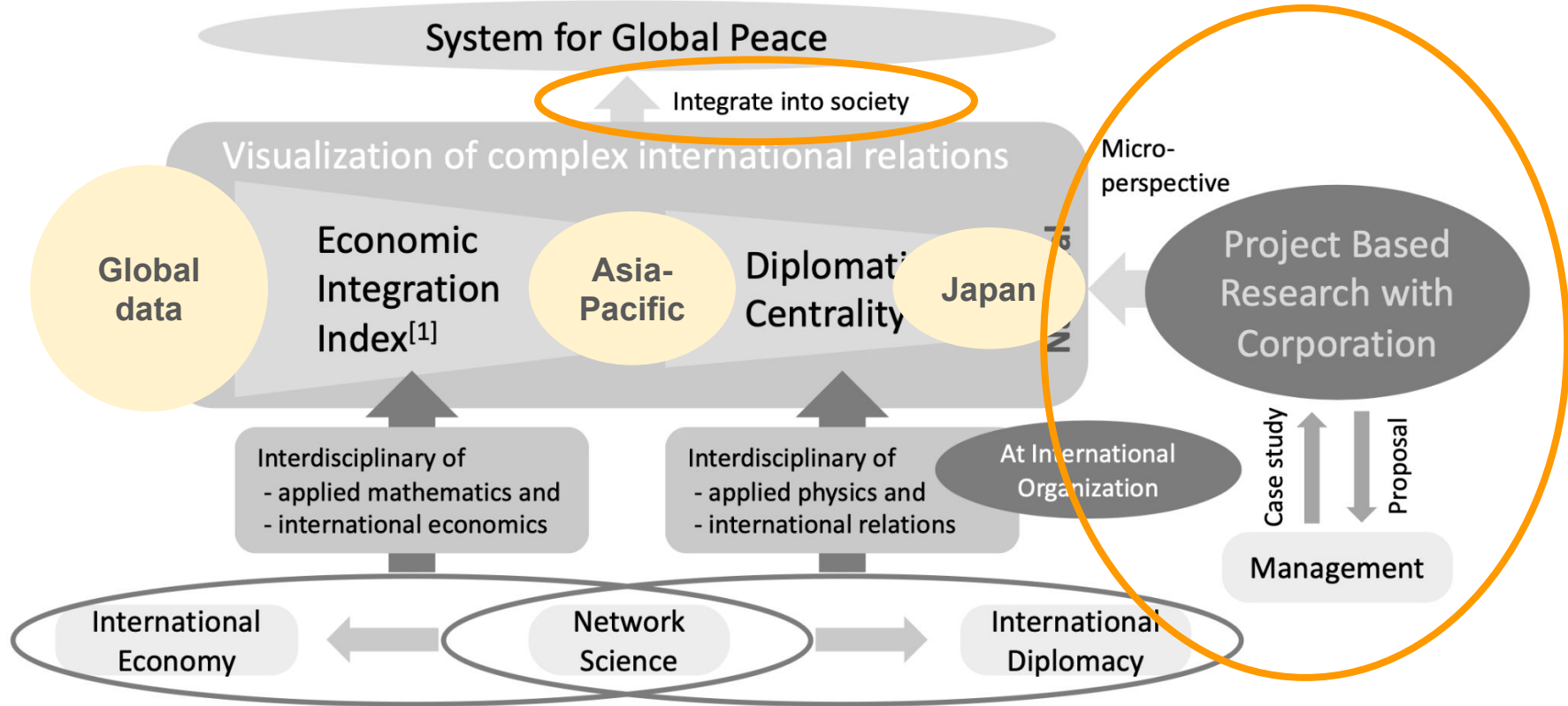


International cooperation analysis: result 3

Detected periods when most of the countries had conducted their diplomacy cooperatively by calculating the extent of synchronization of diplomatic centralities.



Research concept figure (again)



[1] Sada S, Ikeda Y. Regional economic integration via detection of circular flow in international value-added network. Plos one. 2021 Aug 20;16(8):e0255698.

[2] Sada S, Oikawa K, Iwasaki F, Ikeda Y. International cooperation analysis of Asian political distance network constructed using event data. Front. Phys. 2022 Oct. 13; 10:1007796.

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Project-based research (in progress)

Now conducting a project with an electric corporation (Kansai Electric Power Co., Inc) to make a roadmap of international expansion. I'm studying the case of Japanese enterprise in energy sector.

- Background

- the economic integration analysis revealed
 - steady development in the **Asia-Pacific** region
 - high contribution to the economic integration index of **natural resources sector**
- the international cooperation analysis revealed
 - **Japan's** contribution of international cooperation in the Asia-Pacific region
 - a recent trend of cooperative relations
- **climate issues** (and Russian invasion) have been dramatically changing international resource dependency

- Aims

- for the corporation: propose an example of the **roadmap**
- for me: **case study** in an energy sector, Japan, and enterprise
 - to understand past, current, and future **situations of international expansion** of a large company
 - to **connect** the company to **international perspectives** as a global actor

Another project (in progress)

Now planning a social implementation of diplomatic indices introduced/used by my paper with a non-profit organization (NPO) that works on electoral issues using digital technology.

- Background
 - international relations are an important issue for societies, however, there is **little attention to diplomatic policies as an electoral topic**
 - there are limited ways to easily understand complex situations of international relations
- Aim
 - propose a **new, easy way to understand international relations**
- Task
 - **develop a web page** for the Japanese to understand international relations using indices
 - **collaborate with the news media**, especially of newspaper

Summary of my transdisciplinary research

Step 1: **Problem Transformation**

- from societal problems
 - lack of feedback loops for global peace
- from scientific problems
 - lack of quantitative indices of regional economic integration and multilateral relation

Step 3: **Transdisciplinary Integration**

- project-based research with a corporation
 - qualitative study of international economic activities
 - linking economic actor and international perspectives
- social implementation with a NPO
 - application of the indices

Step 2: **Interdisciplinary Integration**

- 1st research used methods from
 - macroeconomics, network science, and fluid dynamics
 - with physicist
- 2nd research used methods from
 - international relations, network science, and physics
 - at international org.
 - with physicist and economist

If you are interested in my research, please give me a comment or question in **Miro**. My figure is in the right bottom space.
Thank you for your attention.