Trade policy issues –

Network analysis of

Multiregional Input-Output Tables

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Plan of presentation Katya

- SDGs and trade. Problem… Extractivism
- Trade through a Multiregional Input-Output Table?
- Trade as a network
Quiz… Trade and SDGs?
Give one example of how trade relates to each SDG

1. No Poverty
2. Zero Hunger
3. Good Health and Well-being
4. Quality Education
5. Gender Equality
6. Clean Water and Sanitation
7. Affordable and Clean Energy
8. Decent Work and Economic Growth
9. Industry, Innovation and Infrastructure
10. Reduced Inequalities
11. Sustainable Cities and Communities
12. Responsible Consumption and Production
13. Climate Action
14. Life Below Water
15. Life on Land
16. Peace, Justice and Strong Institutions
17. Partnerships for the Goals
INPUTS?
- Where do they come from?
- How is cellular produced? Who produces inputs?

OUTPUTS?
- Where do they go?
- Who consumes goods of Company X?
Companies in global value chains

Decomposition of gross exports

Final consumption
Final assembly
Trade in inputs (first tier suppliers)
Trade in inputs (second tier suppliers)
Trade in final goods

Value added by second tier suppliers
Value added by first tier suppliers
Value added in the country of final production
Trade Justice: Who exports most inputs to global production? Who benefits with the most value?
Trade through a World Input-Output Matrix?
Welcome to the Matrix, Neo.
Wassily Leontief

1973

for the development of the input-output method and for its application to important economic problems

Soviet Union/U.S.A.
Value added – Trade dynamic
## Input Output Tables, units $ $

**Exercise**

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<th>To</th>
<th>Wood</th>
<th>Paper</th>
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<td>Total Output</td>
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### Interindustry Table for 1995

#### Industry-by-Industry

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**Note:**
- 40 Countries
- 35 Sectors
- 4 environmental satellite accounts
- 1400 Links
## Environmentally Extended Input Output Tables

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<td><strong>Forest biomass</strong></td>
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<td><strong>Water</strong></td>
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<td>??</td>
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<tr>
<td><strong>Soil</strong></td>
<td>??</td>
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</tr>
</tbody>
</table>
Network analysis

Basics

Node
or vertex

Edge
or link

Node
or vertex

Edge
or link
How can we measure differences in nodes/edges? Centralities

$$C_b(n) = \sum_{s \neq n \neq t} (\sigma_{st}(n) / \sigma_{st}),$$

$$C_c(n) = 1 / \text{avg}(L(n,m)),$$

$$C_n = 2e_n/(k_n(k_n-1)),$$

http://med.bioinf.mpi-inf.mpg.de/netanalyzer/help/2.7/index.html#settings
Captain Albanese, I thought Free Trade was "unsinkable..."

It can be adjusted downwards.
Resilience Research – Empirical Applications for Social, Environmental, & Economic Systems

Ali Kharrazi
Advanced Systems Analysis Program, International Institute for Applied Systems Analysis (IIASA)

U-Tokyo University Students visit to ASA-IIASA
March, 2018
What is resilience and how does it influence sustainability?
Sustainable Development Goals (SDGs)
Sustainable Development Goals (SDGs)

Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Make cities and human settlements inclusive, safe, resilient and sustainable.
re·sil·i·ence

Function: n

1: the power or ability to return to the original form, position, etc., after being bent, compressed, or stretched; elasticity.

2: ability to recover readily from illness, depression, adversity, or the like; buoyancy.

Collins English Dictionary
Misconceptions to Concept of Resilience
Resilience is NOT always good

• Not good or bad—depends on human values
• resilient but not desirable:
  – Poverty
  – Dictatorships
  – Eutrophic lakes

Highly resilient systems – not desirable :-/
Resilience NOT always a return to equilibrium
Adaptability of economic-environmental systems

multiple basins or equilibrium, each different dynamics but continuity of system functions

VS

Engineering Resilience
Resilience – ** TANSTAAFL **

- TANSTAAFL: There ain't no such thing as a free lunch

- Trade-offs in resilience and growth
Resilience Literature

• The study of resilience has developed independently in discrete fields
  – Engineering resilience
  – Socio-psychological resilience
  – Ecological/environmental resilience

... AND Everyone has a definition or index
Characteristics of resilience

- Thresholds
- Redundancy / Diversity
- Feedback
- Modularity
Thresholds: boundary of new stable states

Lake: amount of Phosphorous in sediments

Rangeland: amount of grazing pressure, rainfall & fire frequency
Redundancy/Diversity

Physical redundancy - Moscow metro

Functional diversity

Response diversity

- Kasolid (11026)
- Ngacheik (11038)
- Macan/Elon-elon (11107)
- Pilit (11022)
- Malagaya (11035)
- Pirurutong (10876)
- Dinorado (11036)
- Metao (11015)
- Dinorado (11020)
Modularity: communities with dense internal & sparse external connections

Quarantines are based on the idea of modularity
‘no plan ever survives contact with the enemy’

Need for quick response to changing conditions

Sun Tzu, Art of War
Category: Economic Networks
Description: World Trade network, 1992
Fig1. Global trade of cotton (HS 52) in 2009; only 49 countries with trade above $100 million USD are depicted.
Climate Change Impact on Global Food Networks

- Climate change threatens security of staple foods
- By 2030, lower growth + higher price for 9/10 staples

<table>
<thead>
<tr>
<th>Crops</th>
<th>Growth Rate Decrease</th>
<th>Price Increase</th>
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<tbody>
<tr>
<td>Maize</td>
<td>12%</td>
<td>90%</td>
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<tr>
<td>Rice</td>
<td>23%</td>
<td>89%</td>
</tr>
<tr>
<td>Wheat</td>
<td>13%</td>
<td>75%</td>
</tr>
<tr>
<td>Other Crops</td>
<td>8%</td>
<td>83%</td>
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</table>
Previous focus on agricultural adaptation

Projected impact of climate change on agricultural yields

* A key culprit in climate change – carbon emissions – can also help agriculture by enhancing photosynthesis in many important (...) crops such as wheat, rice, and soybeans. The science, however, is far from certain on the benefits of carbon fertilisation.*

This map represents the case of beneficial carbon fertilisation processes.

Change in agricultural productivity between 2003 and the 2080s

Source: Cline W., 2007, Global Warming and Agriculture.
Opportunities & threats of trade have been less explored.
Thank You
Questions & Answers