Network Analysis of The Global Supply chain using Gephi

Introduction

The comprehensive insight on the structure of international trade from **network indicators analysis** and the **comparison of the centrality indices** of the countries in the electronic and automotive industry, the two significant and world's important economics sector, can be beneficial to obtain more detail about the industries and connectivity between each industry.

Furthermore, we suggest that it can help identify the **solutions or preparations** to deal with the future crises such as chip shortage (2020-2021) which will be useful for many parties such as government, trans-firms, etc.

Sources of data

- World Input-Output Database (2000-2014) from www.wiod.org

Methodologies

Gephi

Excel

- Network analysis using **Gephi centrality index**
- Create graph for network indicators analysis and centrality indices comparison by using **Excel**

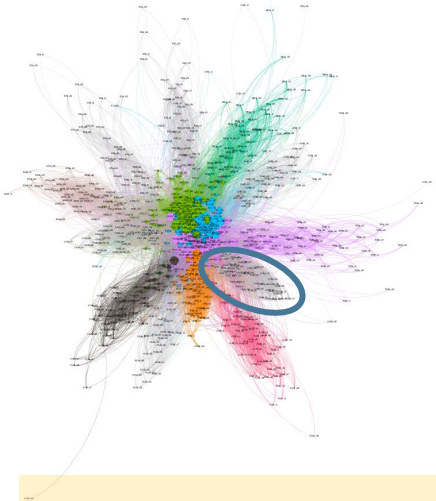
01

TASK 1

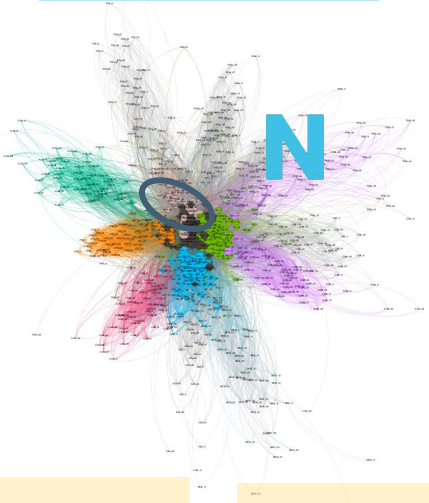
Analyze evolution of
Network Indicators by applying
World IO table of 2000-2014

Network Diagram

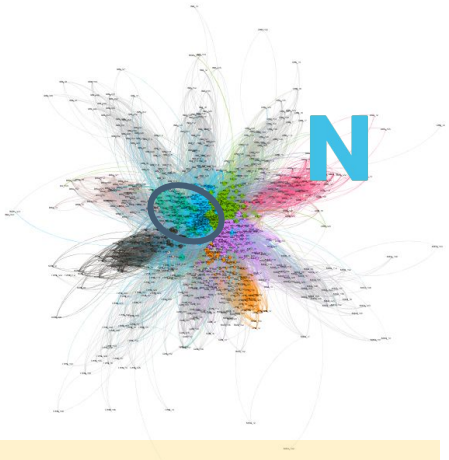
2000



2009 (Post GFC)



2014



- The **bigger** the bubble, the more this sector **expose to many other sectors**.
- In 2000, **USA and EU were showed in the center** of the diagram. However, 2009, China has started to **play more role** as a the center of global trade, because they move to the center of diagram.

- In 2009, the world experience the **GFC**, but the diagram **does not show a clear retraction** of trade volume, so we have to see on the table of network diameter that I will discuss in the next slide.
- Even though the size of trading were impacted from GFC, **USA and EU still located in center** of Diagram

Table of Network Indicators

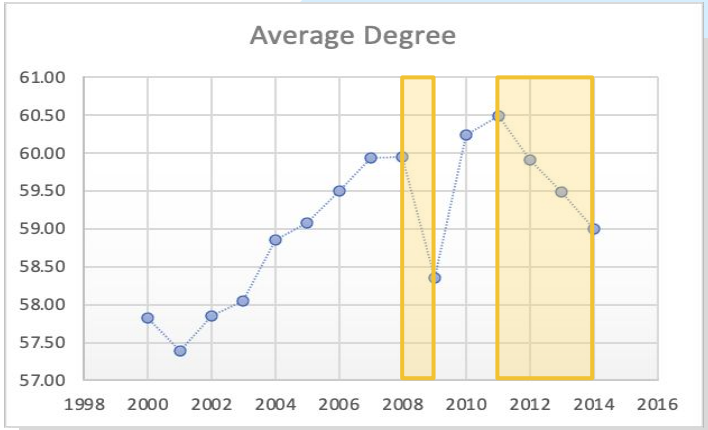
Year	Average Degree	Average Weighted Degree	Network Diameter	Graph Density	Modularity	Avg. Clustering Coefficient	Avg. Path Length
2000	57.823	79113.885	5	0.079	0.698	0.622	2.352
2001	57.391	77946.181	5	0.078	0.702	0.623	2.36
2002	57.848	79584.563	5	0.078	0.7	0.623	2.36
2003	58.049	90690.887	5	0.079	0.692	0.627	2.357
2004	58.855	104804.432	5	0.08	0.688	0.625	2.345
2005	59.083	118066.251	5	0.08	0.69	0.623	2.336
2006	59.502	131296.932	5	0.081	0.692	0.626	2.335
2007	59.929	152321.545	5	0.081	0.692	0.624	2.322
2008	59.951	172039.406	5	0.081	0.686	0.623	2.314
2009	58.355	155988.825	5	0.079	0.716	0.629	2.342
2010	60.231	176098.019	5	0.082	0.711	0.623	2.311
2011	60.488	202578.462	5	0.082	0.705	0.623	2.32
2012	59.905	208984.769	5	0.081	0.706	0.617	2.308
2013	59.484	218507.529	5	0.081	0.703	0.617	2.315
2014	59.001	225680.751	5	0.08	0.701	0.619	2.328

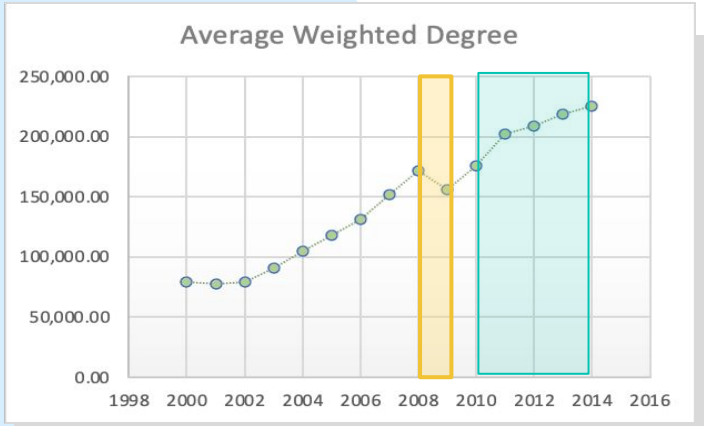
Interpretation

- All 15 years have the same Network diameter, 5.

Results

Interpretation of Average Degree and Average Weighted Degree



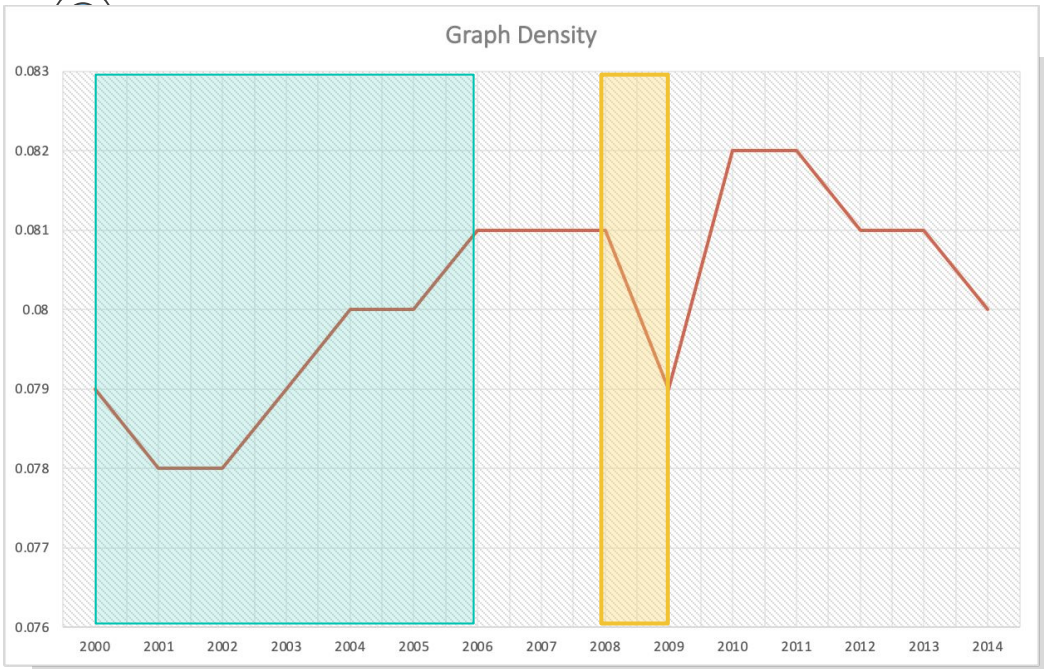


- Average degree has risen up until 2008 and drastically **dropped** in because of GFC.
- This means that post GFC, the connection between each industry was **decreased.**

- However, The amount of trade volume after GFC were **increasing.**
- Average weighted degree has risen up since 2000, but it showed **small drop** in 2008

Results

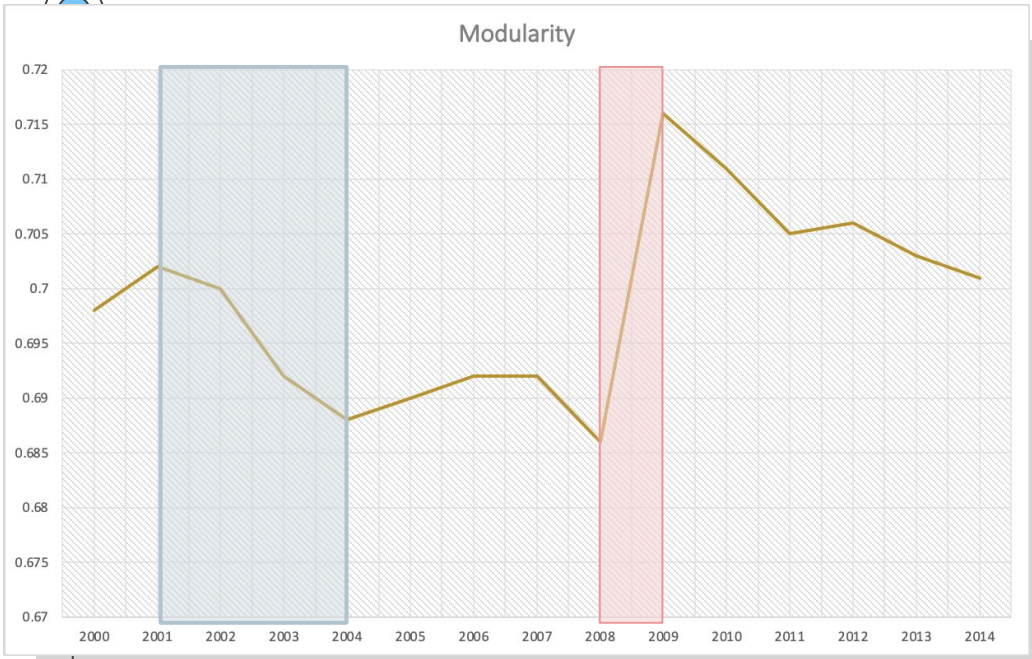
Interpretation of Graph Density



- Between 2000-2008, the value of density were **increasing** because of the introduction of globalization, but after GFC in 2008, the value has **dropped significantly**.
- Post GFC, the trend was reversed back and start to decline again.

Results

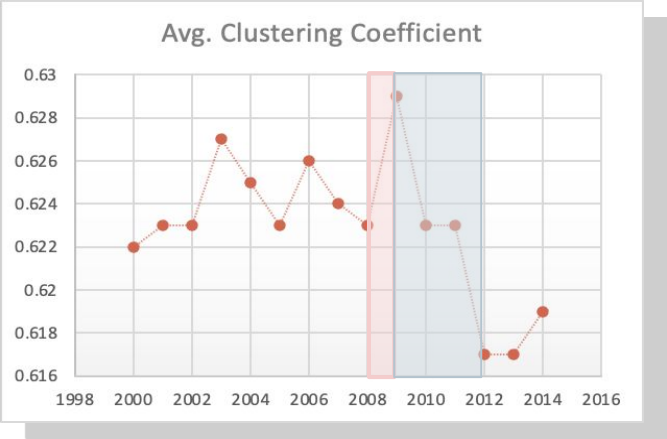
Interpretation of Modularity

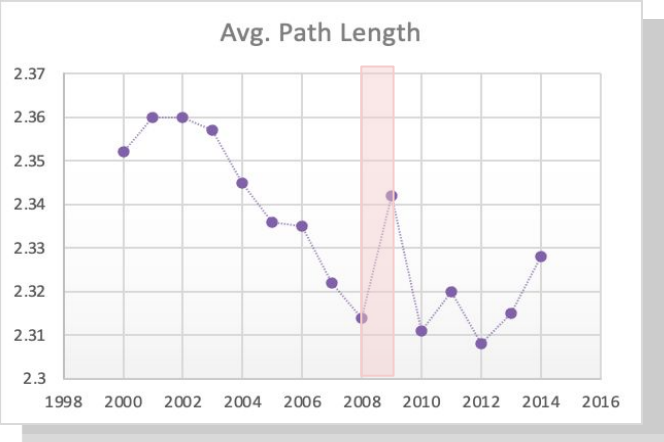


- Between 2001-2004, the trend of modularity is **gradually decreasing**
- According to the GFC, many firms that have offshored their sources of supply have experienced serious disruptions to obtain materials and products causing the trend of modularity was **drastically increasing.**
- After GFC, the trend was gradually decreasing again.

Results

Interpretation of Average Clustering Coefficient and Average Path Length





- The average clustering coefficient was **sharply increasing** due to the global financial market crash in 2008.
- In the remaining years, the trend **was decreasing.**

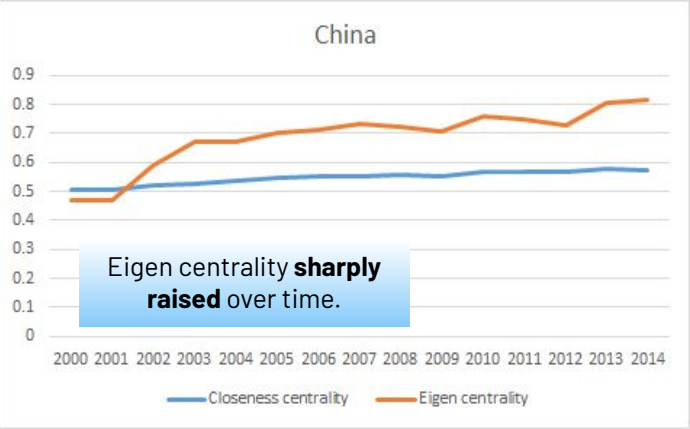
- Due to the effects of crises, the trend of average path length was **significantly increasing** during 2008-2009.

02

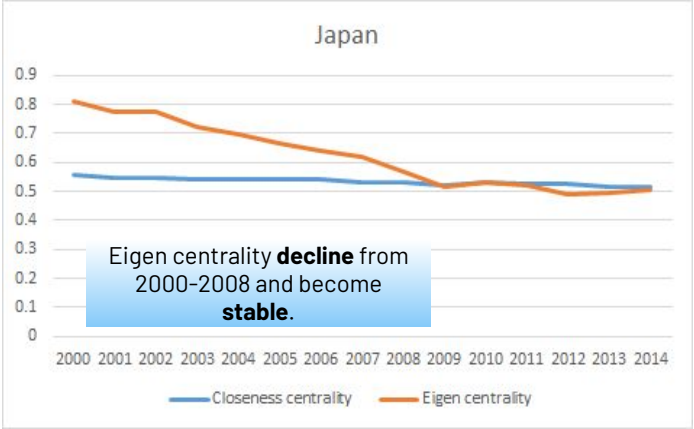
TASK 2

Compare the trends of centrality indicators indice of China, Korea, Japan and Taiwan in **electronic industry**

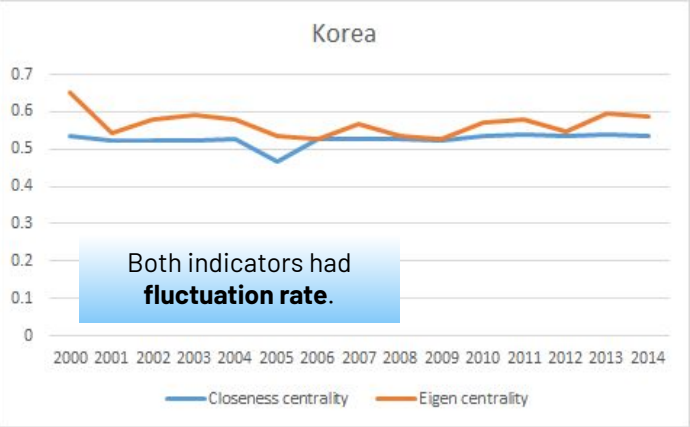
Centrality Indicators: Electronic industry



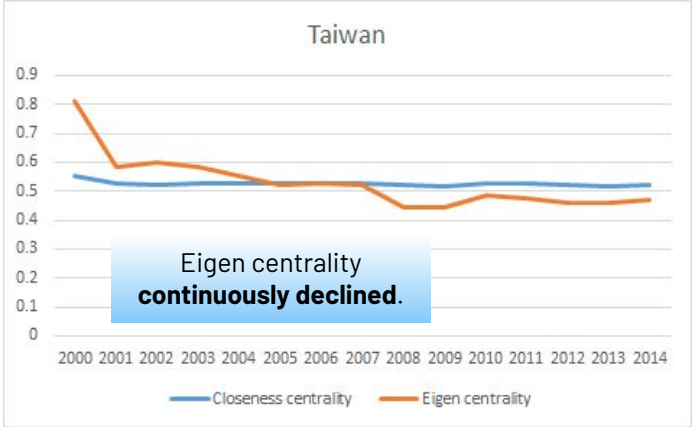
Eigen centrality **sharply raised** over time.



Eigen centrality **decline** from 2000-2008 and become **stable**.



Both indicators had **fluctuation rate**.



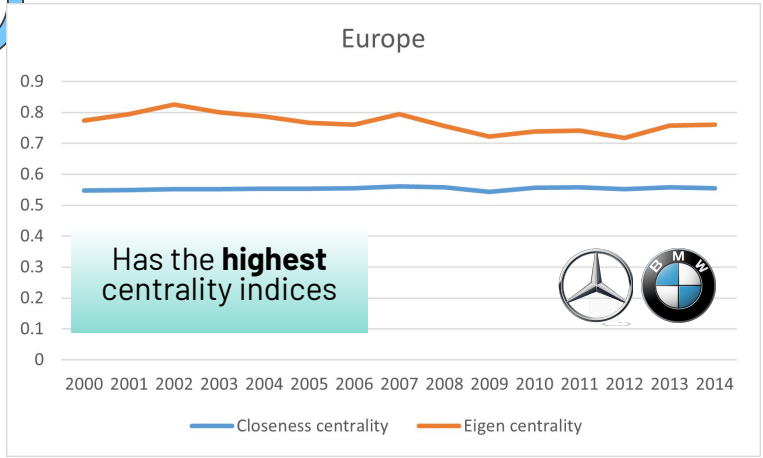
Eigen centrality **continuously declined**.

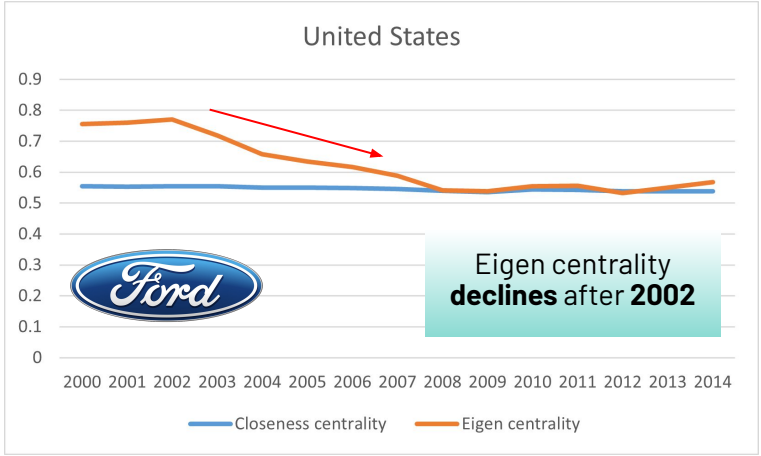
03

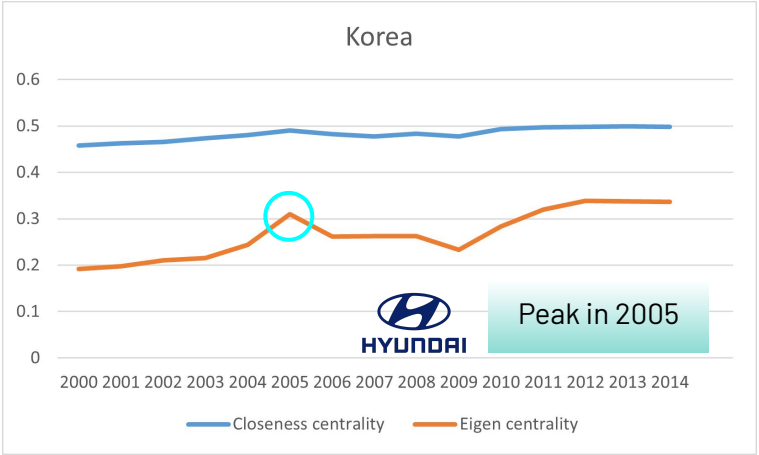
TASK 3

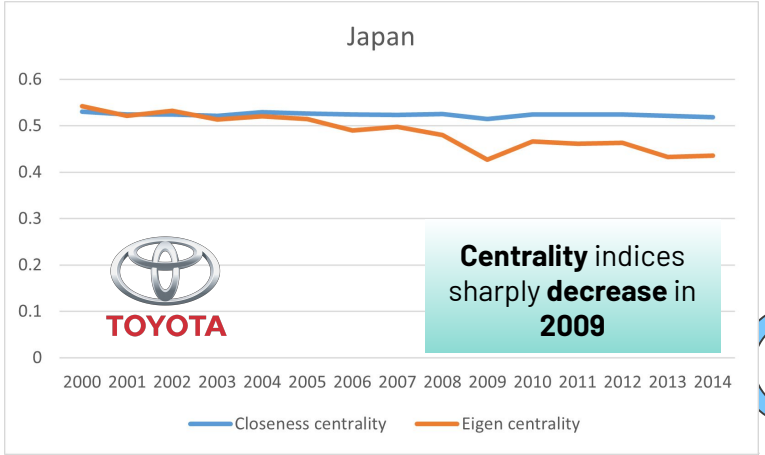
Compare the trends of Closeness centrality and Eigen-vector centrality indices of EU, USA, Japan and Korea in **automotive industry**

Centrality Indicators: Automotive industry









Policy recommendations

01

Connection is a key

Unite with the countries that is the **center of network** for **trading benefit** and **gain connections.**

02

Preparation

Study from the past events and **fast recovery countries** to **prepare** for the future crisis.

03

Invest in supply chain management

Invest on improving the countries supply chain **management system**

04

Centrality of a country

Selecting countries ,given their position in the Global Supply Chain, that are **suitable for signing** successful **trade agreements.**

Thank you