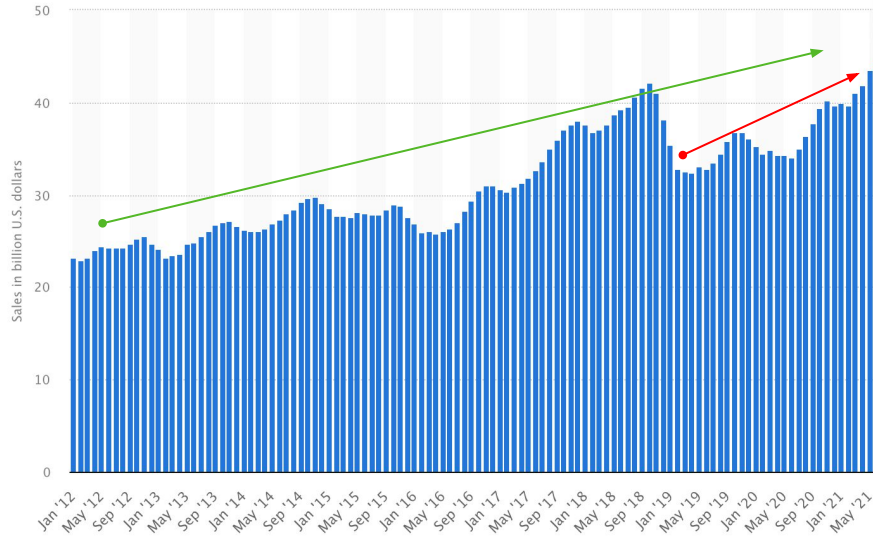


Network Analysis And Global Supply Chain



Introduction and Project's background

A high global demand for the semiconductor with a long lasting impact from the chip shortage caused a huge effect on Automotive industry with an expected loss of 210 Billion USD.



A diagram shows the semiconductor sales worldwide from year 2012-2021 which can be reflected the consumption demand over the year

The demand and sales of semiconductor is significantly rising from 2020 to 2021 by 19.7% and 8.8% in 2022 with top three product drivers of logic chip, sensors chip, and memory chips.

From the forecasted 3.9 million units of production up to 7.7 million units of production **will be lost** in 2021 according to the consulting firm.

Source: World Data ATLAS, Statista.com, Yahoo.finance, and Alix Partners consulting.

Introduction and Project's background

With the consequence from the second unbundling, the advantage from the production-relocation has been taken with an increasing global value chain (GVC)

From upstream to downstream production chain, it can be separated into **two main groups** of companies involved in semiconductors industry

1st

Semiconductor Fabrication Plant "Fab/Foundry"

2nd

Fabless Semiconductor Companies "Fabless"

After the second unbundling revolution, the production has been relocated to other countries where the cost of labor is cheaper. Companies can enjoy higher profit margin from squeezing the cost, and the international trade traffic has been taken place and increasing the amount of global value chain (GVC).

Source: Investopedia.com, and Investors.com



World Input-Output Database

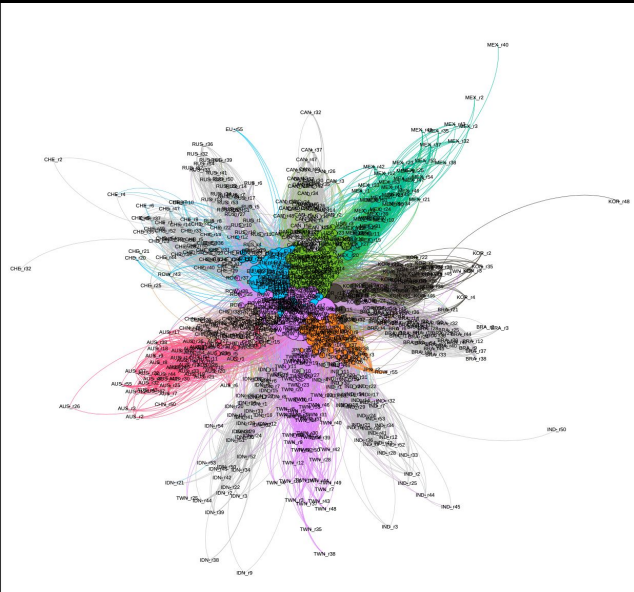
Briefs of Analytical methodologies



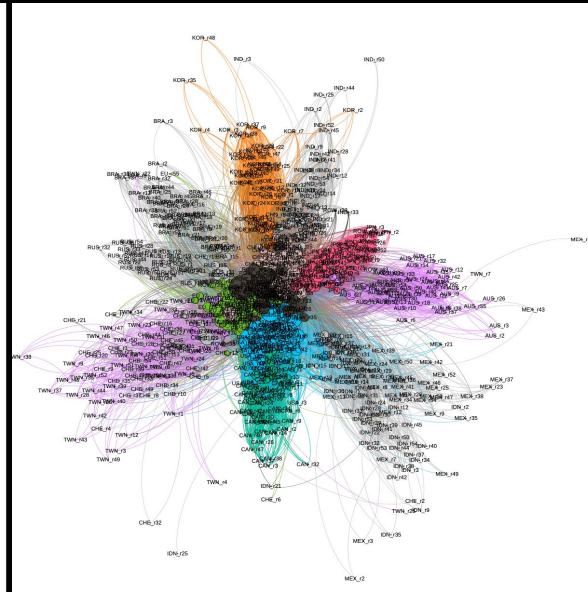
- Exporting the input-output data from the World Input-Output Database
- Importing the file to Gephi program
- Computing all the indicators
- Constructing the network diagrams
- Exporting the diagram and also the data laboratory

Results: Comparison of network diagrams

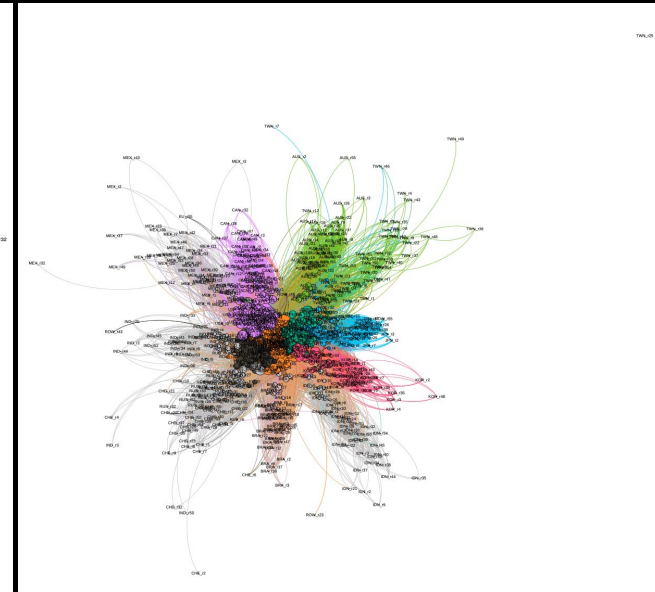
The diagrams show the network analysis in year 2000 and 2014, including year 2009 with the impact of Global Financial Crisis that can be seen the numerical effect in the statistical time series data.



Network Diagram: 2000



Network Diagram: 2009



Network Diagram: 2014

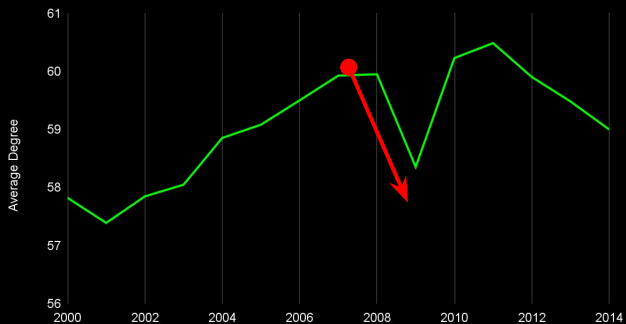
Results: Comparison of main network indicators

The effect from the Global Financial Crisis can obviously be seen through the numerical illustration. The year 2009 makes most of the indicators deviate from its normal trend.

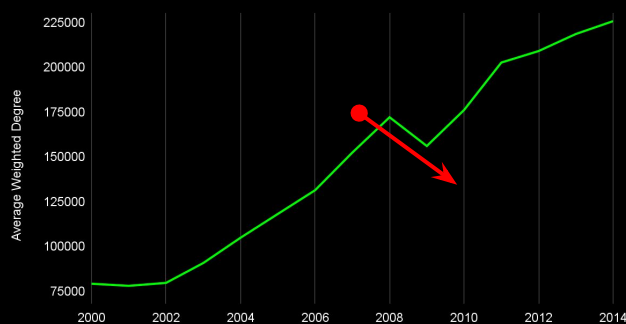
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Average Degree	57.823	57.391	57.848	58.049	58.855	59.083	59.502	59.929	59.951	58.355	60.231	60.488	59.905	59.484	59.001
Average Weighted Degree	79113.885	77946.181	79584.563	90690.887	104804.432	118066.251	131296.932	152321.545	172039.406	155988.825	176098.019	202578.462	208984.769	218507.529	225680.751
Network Diameter	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Graph Density	0.079	0.078	0.078	0.079	0.08	0.08	0.081	0.081	0.081	0.079	0.082	0.082	0.081	0.081	0.08
Modularity	0.698	0.702	0.7	0.697	0.688	0.694	0.687	0.691	0.69	0.716	0.712	0.705	0.705	0.697	0.702
Average Clustering Coefficient	0.622	0.623	0.623	0.627	0.625	0.623	0.626	0.624	0.623	0.629	0.623	0.623	0.617	0.617	0.619
Average Path Length	2.352	2.36	2.36	2.357	2.345	2.336	2.335	2.322	2.314	2.342	2.311	2.31	2.308	2.315	2.328

Results: Comparison of main network indicators

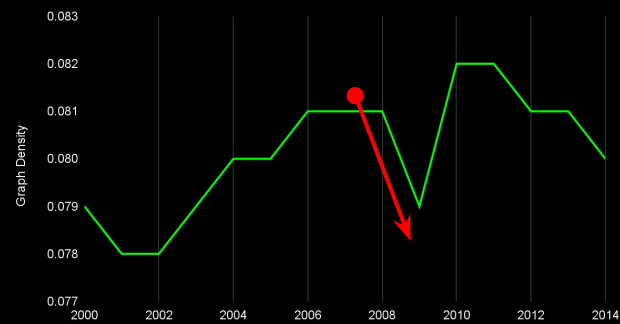
Average Degree



Average Weighted Degree



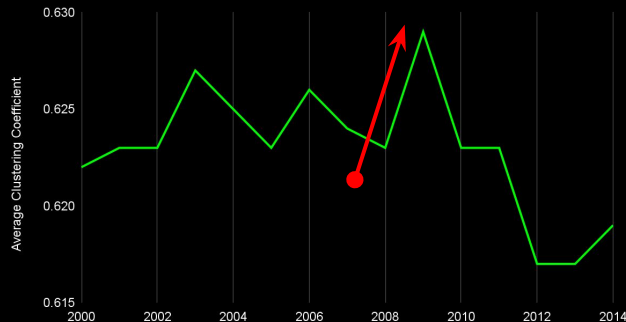
Graph Density



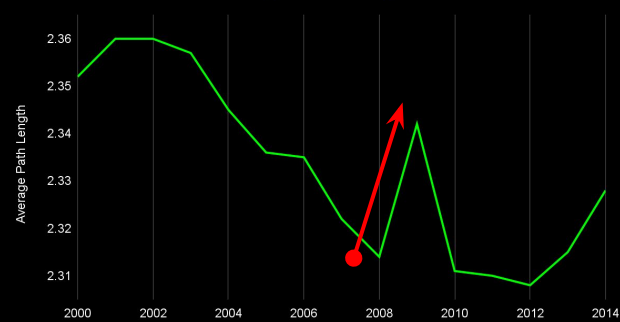
Modularity



Average Clustering Coefficient



Average Path Length



PART 1

PART 2

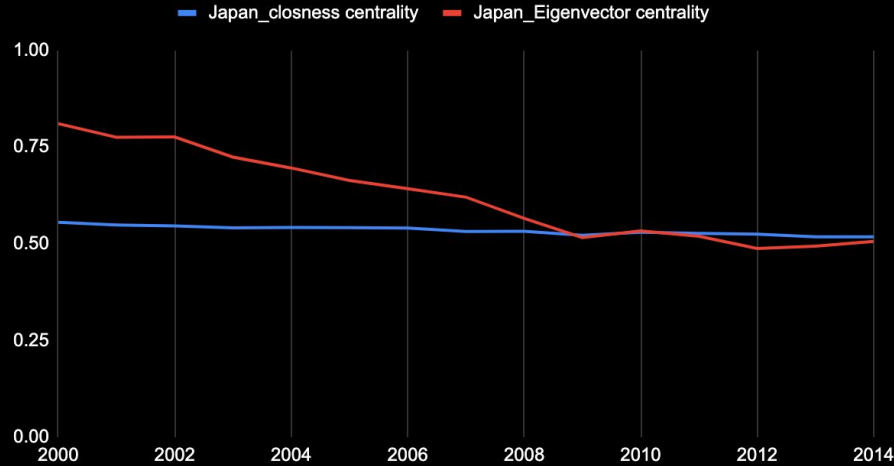
PART 3

PART 4

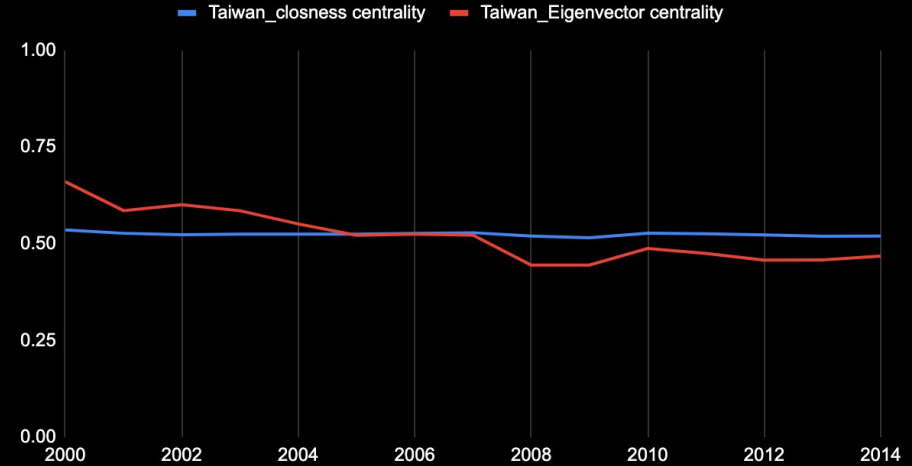
PART 5

Results: Comparison of centrality indices of Electronic Industry

Japan_Electronic Industry (sector no.17)



Taiwan_Electronic Industry (sector no.17)

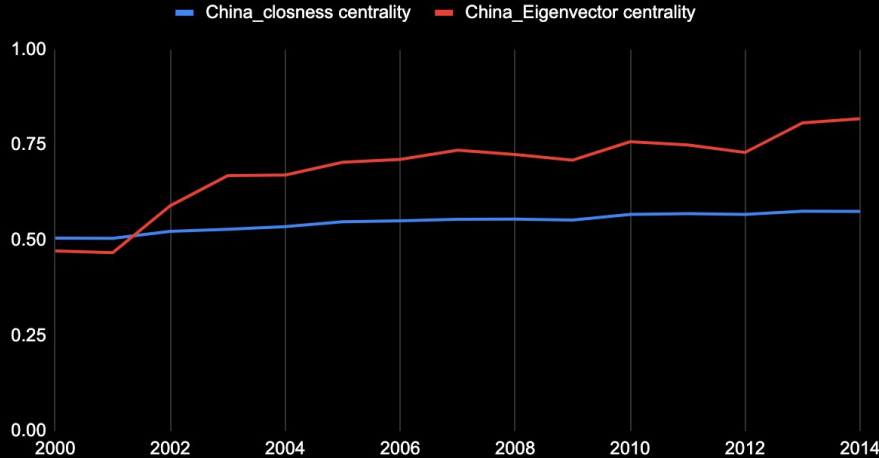


Keys takeaway

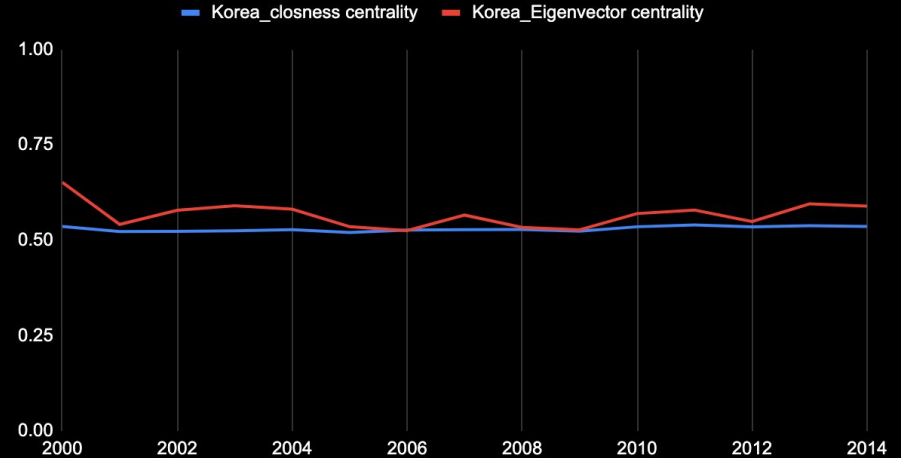
- The Closeness centrality trend of both countries are stable
- The Eigenvector centrality trend of both countries are declining
- Both countries tend to move in quite same direction

Results: Comparison of centrality indices of Electronic Industry

China_Electronic Industry (sector no.17)



Korea_Electronic Industry (sector no.17)

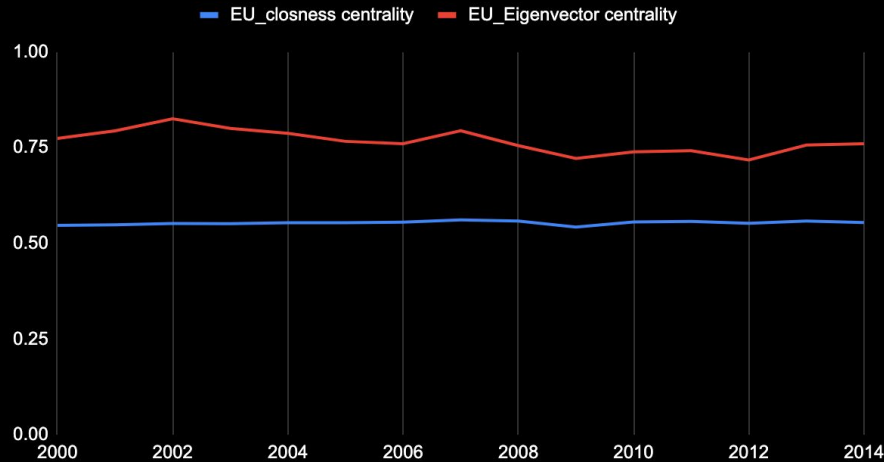


Keys takeaway

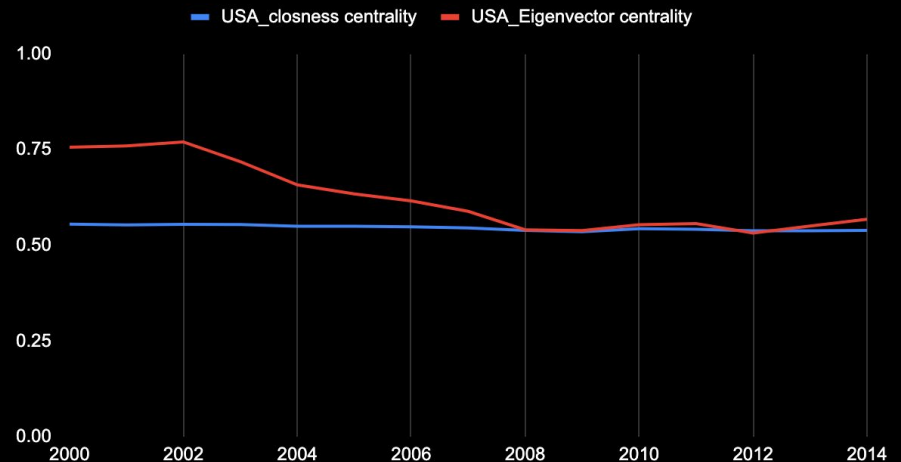
- The Closeness centrality trend of China is slightly increasing and Korea is stable
- The Eigenvector centrality trend of China is increasing and Korea is quite stable with a little fluctuate

Results: Comparison of centrality indices of Automotive Industry

EU_Automotive Industry (sector no.20)



USA_Automotive Industry (sector no.20)



Keys takeaway

- The Closeness centrality trend is stable
- The Eigenvector centrality trend is fluctuate
- Both indicators tend to move in quite same direction

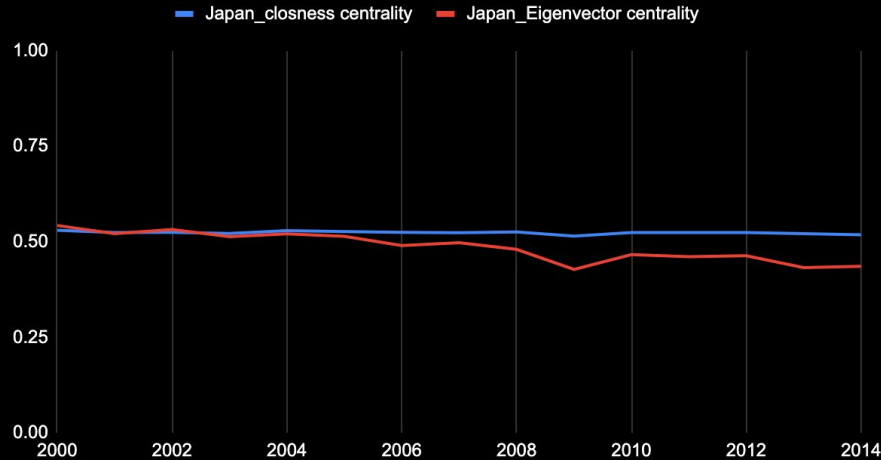


Keys takeaway

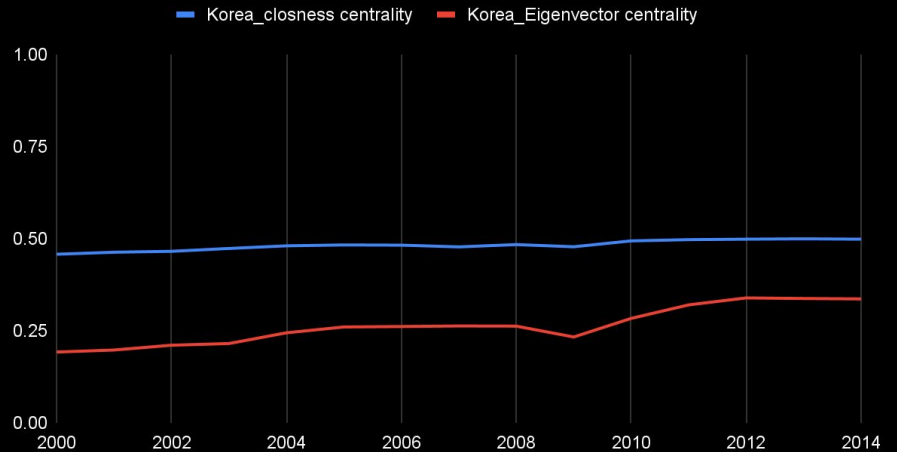
- The Closeness centrality trend is stable
- The Eigenvector centrality trend is declining
- Both indicators tend to move in different direction

Results: Comparison of centrality indices of Automotive Industry

Japan_Automotive Industry (sector no.20)



Korea_Automotive Industry (sector no.20)



Keys takeaway

- The closeness centrality is stable trend over period.
- The Eigenvector centrality tends to decline over period.
- The Closeness centrality is higher than the Eigenvector centrality for most time period.



Keys takeaway

- The closeness centrality is stable trend over period.
- The Eigenvector centrality tends to increase over period.
- The Closeness centrality is higher than the Eigenvector centrality over period.

Policy recommendations

1 Government should support industries which enable to construct high tech innovation which they may relocation their resources to produce some parts in other countries but they can added more value to their final stage of production. Hence, government should support industries that able to maintain their Closeness centrality not only focus on their Eigenvectors centrality.

2 Government should invest more on finding strategic alliances and perform more R&D on these partners. This will able to support industries that split their productions across the countries.

3 Subsidization on targeted industry reflected from centrality indices which will generate spillover effect to the overall economy in both medium run and long run.

Thank you

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