



# Spatial-temporal changes of China's export trade since the Reform and Opening Up

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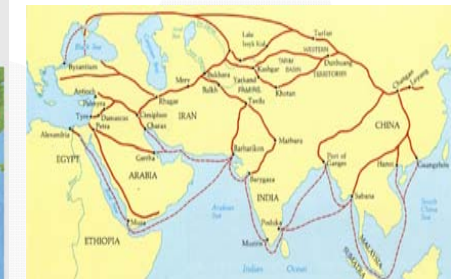
## Introduction



In 2013, President Xi Jinping put forward the strategic conception of building the "Silk Road Economic Belt" and "21st Century Maritime Silk Road", known shortly as the "One Belt and One Road" initiatives.

### ONE ROAD & ONE BELT

BUILDING OF THE SILK ROAD ECONOMIC BELT AND THE 21ST CENTURY MARITIME SILK ROAD



The overland and marine Silk Road

- Before Han Dynasty (2-3 centuries A.D.), the ancient China had trade connections with many countries in Eurasia.
- After Han Dynasty, these trade activities gradually became **government-dominated**, developed with larger trade scale and spatial range, including the **Eurasia, northern and eastern Africa**. It was named by German geographer Richthofen, and is known as the **Silk Road**.
- The history of ancient China's export trade is closely related to **the overland and marine Silk Road**.

## Object

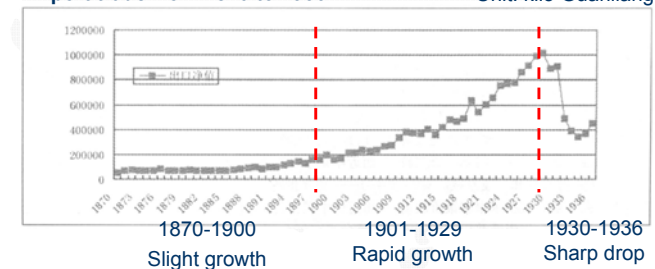
- How about the process and characteristic of China's export trade ?
- Which factors did affect China's export trade in resent years? Did these factors change ?
- Under the "One Belt and One Load" strategy, what will happen to the export trade tendency of China?

## 1.China's export trade in modern Chinese history

1.1 China's export trade has experienced three different stages from 1870 to 1936

- **State I (1870-1900):** The export trade **grew slowly**. The net exports increased from 55 to 159 million Guanliang (1.88 times than in 1870), the annual growth rate was only 4.22%.

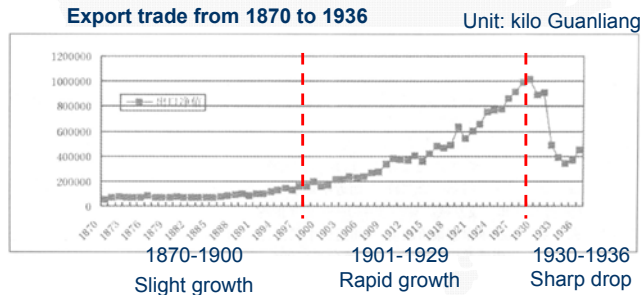
Export trade from 1870 to 1936 Unit: kilo Guanliang



# 1.China's export trade in modern Chinese history



- **State II (1901-1929):** The export trade **increased greatly**. The net exports increased to 1015 million Guanliang (8.06 times than in 1900), the annual growth rate was as high as 29.8%.
- **Stage III (1930-1936):** The export trade **dropped sharply**. In 1934, the net exports had a minimum of 343 million Guanliang.



Note: an important reason of the drop in 1931 is that northeastern China was not included.

# 1.China's export trade in modern Chinese history



## 1.2 Characteristic of modern China's export (1870 to 1936)

- 1)The export goods were mainly low value-added commodities, such as **agricultural** and **mineral** products.
- 2) Before late 19<sup>th</sup> century, **England** is the main export trading partner, while after that the **United States** became the major exporting country.

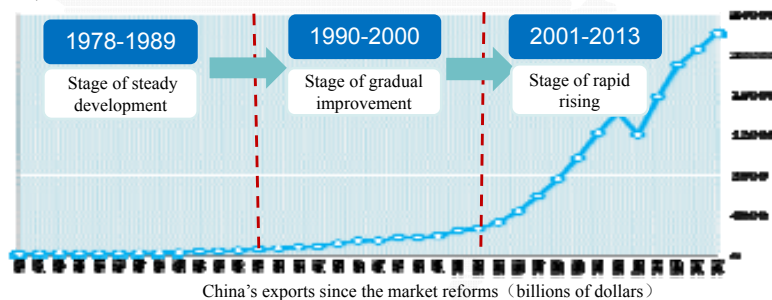


# 2.China's Export Trade since the Reform and Opening Up



## 2.1 General Situation

Since the reform and opening up(the year of **1978**), China's export trade has been developing rapidly with the export volume increasing from **\$16.76 billion** (account for **1.5%** in the world) to **\$2.21 trillion**, and China has become the world's largest exporter and trader of goods(account for **12%** in the world in 2013).

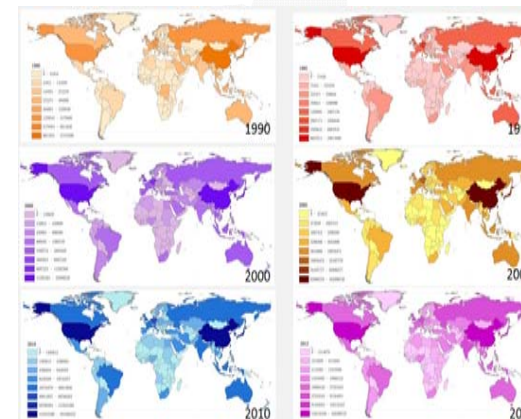


# 2.China's Export Trade since the Reform and Opening Up

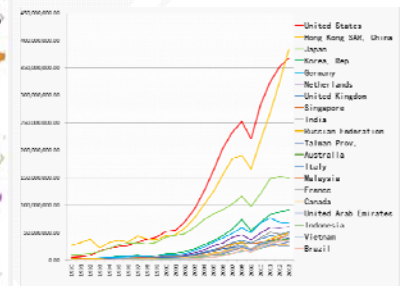


## 2.2 Temporal and Spatial of China's Export Market

### (1) Nations and areas



There is a diversified and balanced trend in the development of export market's structure.



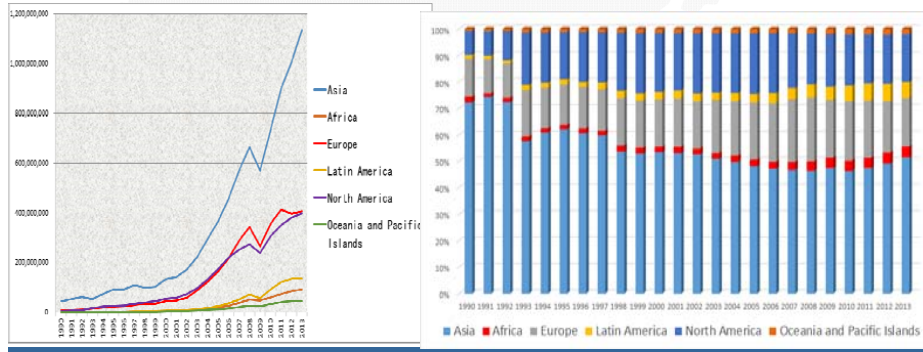
China's top 20 export destination since 1990 to 2013

## 2.China's Export Trade since the Reform and Opening Up



### (2) Organizations

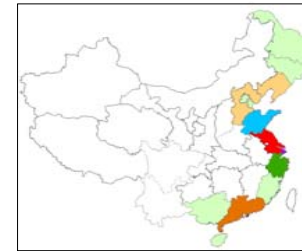
Developed countries such as **Europe, USA and Japan** are still the main trading partners, but their share have continued to decline, while emerging economies such as **Asian, Latin America and Africa** have increased rapidly, especially in **ASEAN countries**.



## 2.China's Export Trade since the Reform and Opening Up



### (3) Provincial Differences in the Capacity of China's Export Trade



Including 14 Provinces : Fujian, Guangxi, Hainan, Hebei, Heilongjiang, Jilin, Liaoning, Beijing, Shanghai, Zhejiang, Jiangsu, Shandong and Guangdong province

三来一补 :processing and compensation trades(processing with materials or given samples, assembling supplied components)

The export volume of China's 14 provinces

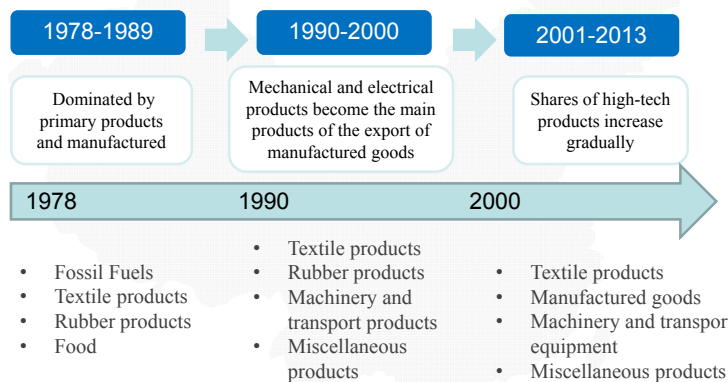
Year	Exports of 14 provinces (Thousands of dollars)	China's exports (Thousands of dollars)	The proportion (%)
2013	195953660	220900400	88.71
2010	146084702	157775432	92.59
2009	111510777	120161181	92.80
2005	71078374	76195341	93.28
2004	55072967	59332558	92.82
2000	23001108	24920255	92.30

Export trade of Eastern regions accounts for 88.71% of China's total export trade in 2013; trade capacity of 21 Midwestern provinces is disproportionate to their areas and populations, and there is an imbalance in trade distribution geographically nationwide.

## 2.China's Export Trade since the Reform and Opening Up



### 2.3 Commodities' distribution of China's Export trade



## 3. Influencing Factors of China's Export trade



### 3.1 Trade gravity model

J.Tinbergen (1962) and P.Poyhonen (1963) were and first to introduce gravity model into the field of international trade and considered market scales of trade between two countries from scale economy with elements like gross domestic product (GDP), population size and distance from market (or transportation costs) as the model index, thinking that the trade flow from one country to another country mainly depends on *scale of national economy measured by GDP or population and geographical distance between two countries*.

Improvement of model:

$$F = G \frac{m_1 m_2}{r^2}$$

Elements like population, policy, history, culture, preferential trade agreements, trade restriction measures, colonial relations and common language are added.

(H.Linneman, 1966; James Anderson, 1979; Jeffrey Bergstrand, 1989; Alan Deardorff, 1995; Eric Van Wincoop, 2003; Carlo Filippini, Vasco Molin, 2003; Mohammad Mafizur, 2010; Vladan Nastic, 2013)

### 3. Influencing Factors of China's Export trade



#### 3.2 Model specification:

$$X_{ij} = \alpha_1 GDP_i^{\beta_1} GDP_j^{\beta_2} POP_i^{\beta_3} POP_j^{\beta_4} D_{ij}^{\beta_5} WTO^{\beta_6} APEC^{\beta_7} \mu_1$$

Combined with the above temporal and spatial evolution characteristics of China's export trade volume over a relatively longer period of time, and in the selection of models, influence of macro economy and economic organizations (trade barriers) on China's export trade is considered.

The meaning of variables and coefficient in Trade Gravity Model

Variable	Meaning	Expected symbol
$X_{ij}$	trade between countries $i, j$	-
$GDP_i$	China's GDP	+OR-
$GDP_j$	GDP of countries and regions of China's export destination	+
$POP_i$	the population of China	+OR-
$POP_j$	the population of China's export destination	+
$D_{ij}$	distance between Beijing and its export country	-
$WTO$	$WTO=1$ , trading countries belong to the association of WTO, otherwise 0	+OR-
$APEC$	$APEC=1$ , trading countries belong to the association of APEC, otherwise 0	+OR-

### 3. Influencing Factors of China's Export trade



#### OLS parameter estimation

Results of regression for basic model using OLS method(1)

Source	SS	df	MS	Number of obs	= 4057
Model	24369.81	8	3046.227	F( 8, 4048)	= 1977.56
Residual	6235.528	4048	1.540397	Prob > F	= 0
				R-squared	= 0.7963
				Adj R-squared	= 0.7959
				Root MSE	= 1.2411
Total	30605.34	4056	7.545696		

Results of regression for basic model using OLS method(3)

amountofexport	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]
gdp_china	-10.3551	2.172566	-4.77	0	[-14.6146 -6.0957]
gdp_exportcountry	0.686893	0.01503	45.7	0	[0.657426 0.71636]
Pop_china	2.409485	0.170225	14.15	0	[2.07575 2.743219]
pop_exportcountry	0.215006	0.015052	14.28	0	[0.185495 0.244517]
capital_distance	-0.67575	0.040371	-16.74	0	[-0.7549 -0.5966]
1.wto	0.212753	0.065323	3.26	0.001	[0.084685 0.340822]
1.asiapaci	0.998819	0.079542	12.56	0	[0.842874 1.154765]
cons	147.5136	40.85982	3.61	0	[67.40585 227.6213]

Results of regression for basic model using OLS method(2)

variables	amountofexport
gdp_china	-18.819***
gdp_exportcountry	0.133***
pop_china	3.412***
pop_exportcountry	0.605***
capital_dis	-0.666***
asean	-0.569***
0.wto	0
1.wto	1.458***
0.asiapacific	0
1.asiapacific	2.091***
_cons	303.327***
N	4155
R <sup>2</sup>	0.719
First_stage_F_stat	
Standard errors in parentheses * p < 0.10, ** p < 0.05, *** p < 0.01	

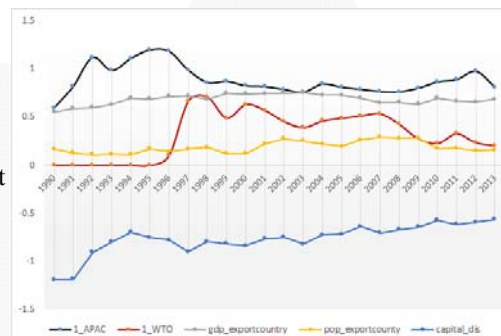
Factors influencing China's export trade: economic scale, population size, geographic distance and trade relation agreement \* (trade system) of the two parties.

#### 3.3 Analysis of empirical results

●Based on Gravity Model of trade, GDP is positively correlated to the amount of exports, the impact remains constant.

●Distance is correlated to the amount of exports, but the impact is falling.

●Belonging to the same organization is positively correlated to the amount of exports, the impact is increasing.



### 4. The pattern of China's export trade in future



What will happen to the spatial and commodities' pattern of China's export trade under the "One Belt and One Load" strategy?

Influencing Factors of China's Export trade

Variable	GDP	Population	distance	organization
Direction	—	—	↓	↑



"Belt and Road Initiative" area



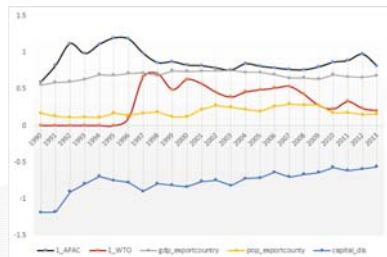
Asian Infrastructure Investment Bank

## 4. The pattern of China's export trade in future



### 4.1 The spatial pattern

The destination country of China's exports	The Investment Bank country	"Belt and Road" country	China's exports of year in 2013 (billion dollars)	The rankings in China's exports to all destination country	The difference focus on bilateral trade
Russia	1	1	49591172	9	I ***
India	1	1	48432411	11	I ***
Malaysia	1	1	45920591	12	I ***
Indonesia	1	1	36950487	16	I ***
United Arab Emirates	1	1	33411295	18	I ***
Thailand	1	1	23717904	19	I ***
Philippines	1	1	19968125	24	II **
Saudi Arabia	1	1	18759814	26	II **
Turkey	1	1	17746991	27	II **
Iran	1	1	14088643	30	II **
Poland	1	1	12574873	32	II **
Kazakhstan	1	1	12545124	33	II **
Pakistan	1	1	11019796	35	II **
Bangladesh	1	1	9703087	37	III *
Israel	1	1	7643304	41	III *
Myanmar	1	1	7338089	42	III *
Kirghizia	1	1	5075346	53	III *
Sri Lanka	1	1	3436349	59	III *
Jordan	1	1	3433555	60	III *
Cambodia	1	1	3409507	61	III *
Kuwait	1	1	2675508	73	III *
Uzbekistan	1	1	2613333	74	III *
Malta	1	1	2514566	75	III *
Nepal	1	1	2210887	84	III *
Oman	1	1	1900844	87	III *
Tadzhikistan	1	1	1869968	88	III *
Laos	1	1	1722577	92	III *
Qatar	1	1	1710908	93	III *
Brunei	1	1	1703776	94	III *
Azerbaijan	1	1	848548	118	III *
Georgia	1	1	862092	119	III *
Maldives	1	1	97414	168	IV *



#### Remarks:

- (1) The Investment Bank country=1, trading countries belong to the association of The Investment Bank, otherwise 0;
- (2) "Belt and Road" country=1, trading countries belong to the association of "Belt and Road", otherwise 0;
- (3) Categories I: exports more than us \$20 billion; Categories II: exports between \$10 billion and \$20 billion; Categories III: exports between \$1 billion and \$10 billion; Categories IV: exports less than 1 billion us dollars.

## 4. The pattern of China's export trade in future



## 4. The pattern of China's export trade in future



### 4.2 The commodities' pattern

#### Research approach and technical route



- Set several variables to describe the dominance of products in different countries and build the link among products;
- Analysis the product structure and build the "product tree" according to the variables and the product structure distribution pattern can be seen from that;
- Make the prediction for product structure by iteration.

The method and process are from *The Product Space Conditions the Development of Nations*(C. A. Hidalgo et al, Science 317, 482 2007)

## 4. The pattern of China's export trade in future



● **RCA(Revealed Comparative Advantage)**

$$RCA_{c,i} = \frac{\left( \frac{x_{c,i}}{\sum_i x_{c,i}} \right)}{\left( \frac{\sum_c x_{c,i}}{\sum_{i,c} x_{c,i}} \right)}$$

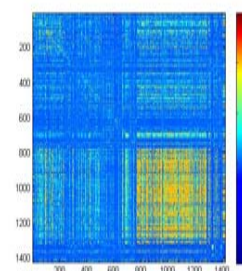
which measures whether a country c exports more of good i, as a share of its total exports, than the "average" country (RCA > 1 not RCA <1).

When  $RCA_{c,i} \geq 1$ , the country c is at advantage in exporting i good, it is not if  $RCA_{c,i} < 1$ .

● **Proximity ( $\phi_{i,j}$ )**

Formally, the proximity f between products i and j is the minimum of the pairwise conditional probabilities of a country exporting a good given that it exports another.

$$P(RCA_i | RCA_j) = \frac{\sum_c (RCA_{c,i} * RCA_{c,j})}{\sum_c RCA_{c,j}}$$



With these international trade data, we calculated the 1423-by-1423 matrix of revealed proximities between every pair of products by using the equation above.

Index calculation

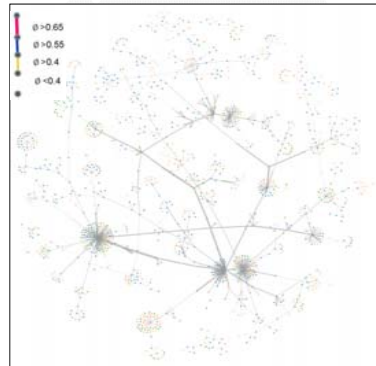
## 4. The pattern of China's export trade in future



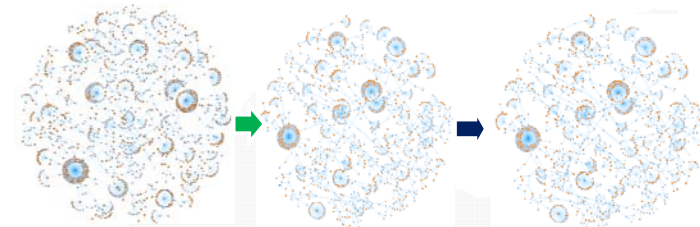
The **core** is formed by metal products, machinery, and chemicals, whereas the **periphery** is formed by the rest of the product classes such as food and so on.

- food
- mineral
- chemicals
- manual goods
- machinery

Product tree



## 4. The pattern of China's export trade in future



Iterating simulation

present      5<sup>th</sup> iteration      10<sup>th</sup> iteration

China	China	China's top 10 export commodities
clothing accessories, of textile fabrics, whether or not knitted or crocheted (other than those for babies)	clothing accessories, of textile fabrics, whether or not knitted or crocheted (other than those for babies)	clothing accessories, of textile fabrics, whether or not knitted or crocheted (other than those for babies)
Live animals, n.e.s.	Live animals, n.e.s.	General industrial machinery and equipment, n.e.s., and machine parts, n.e.s.
Power-generating machinery	General industrial machinery	Live animals, n.e.s.
pottery	Fine animal hair, not carded or combed	Fine animal hair, not carded or combed
Machinery specialized for agricultural machinery (excluding tractors)	Manufactured goods, n.e.s.	Manufactured goods, n.e.s.
Essential oils and retinoid preparations	Power-generating machinery	Raw silk (not thrown)
oil-seeds and oleaginous fruits (excluding flours and meals)	Raw silk (not thrown)	tea and maté
oil-seeds and oleaginous fruits (excluding flours and meals)	oil-seeds and oleaginous fruits (excluding flours and meals)	Radio-broadcast receivers capable of operating without an external source of power
tea and maté	fixed vegetable oils (including animal oils)	oil-seeds and oleaginous fruits of a kind used for the extraction of "soft" fixed vegetable oils (excluding flours and meals)
Dyeing, tanning and colouring preparations	Clothing accessories	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding crops and parts thereof

## 4. The pattern of China's export trade in future



### 4.3 The implications of prediction and simulation

- The evolution of product tree by iterations shows that the commodities' pattern of China's export trade will still stick on the **cloth and textile**.
- The influence to China's export could lead to that export commodities still focus on the **machinery products**.
- The proximate industries around those could increase easily, while farther products maintain a slow growth for the lack of techniques, resource and regime relevant.

Hypothesis: path-dependent, without the intervention of emergency

## 5. Conclusion and discussion



### 5.1 Conclusion

- With the overview the history of China's export trade, developed countries such as Europe, USA and Japan are still the main trading partners, but their share have continued to decline, while emerging economies such as Asian, Latin America and Africa have increased rapidly, especially in ASEAN countries.
- Based on the Trade gravity model, this search shows that economic scale, population size, geographic distance and trade relation agreement are the important factors. Further more, the influence of GDP and population keep stable, while the influence of distance is fall, at the same time organization are increasing.
- Under the "One Belt and One Road" strategy, the pattern of China's export trade in future will be a little change, the relative areas will become more important and the commodities will focus on more machinery products and so on.

## 5. Conclusion and discussion



### 5.2 Discussion

- History to understand the past(**mechanism**), geography to show the pattern(**spatial linkage**), simulation to prediction the future(**rational**).
- Limitation: hypothesis and without considering some event
- But broadly speaking : based on problem-oriented, we need multidiscipline and multivariate.
- History virtual lab(hypothesis ,rules, simulation, explanation)
- GIS is tool : data manage(spatial information), analysis, visualization
- Ideas come from discipline questions and real-world questions

*Thank you for your attention!*



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