Research on China's Domestic Value Chain from the Perspective of Global Value Chain

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Note: views presented in this report are those of the author rather than those of the organization where the author works.

Outline

- **Research Background**
- **Methodology and Data**
- **Analysis**
  - **Decomposition of provincial international export**
  - **The participation of each province in GVC and DVC**
  - **The impact of DVC on regional economy**
- **Conclusions**
- **Further works**

Global Value Chain: Important and Hot topic

- **Both global and domestic division of labor are continuously deepening**
  - Globalization over three centuries: **Two "Unbundlings"** (WTO, 2013)
    - The first "Unbundling" was driven by the steam revolution
    - The second "Unbundling" was driven by the revolution ICT
  - **From trade in goods to trade in tasks**: The rise of global value chains (WTO and IDE-JETRO, 2011)
    - In second unbundling, production is "sliced and diced" into separate fragments that can be spread around the globe.
    - Gene Grossman and Esteban Rossi-Hansberg called this new paradigm "trade in tasks".
    - The possibility of slicing up and optimizing value chain activities among multiple companies and various geographical locations has even spawned a broader term - the "global value chain" (GVC).

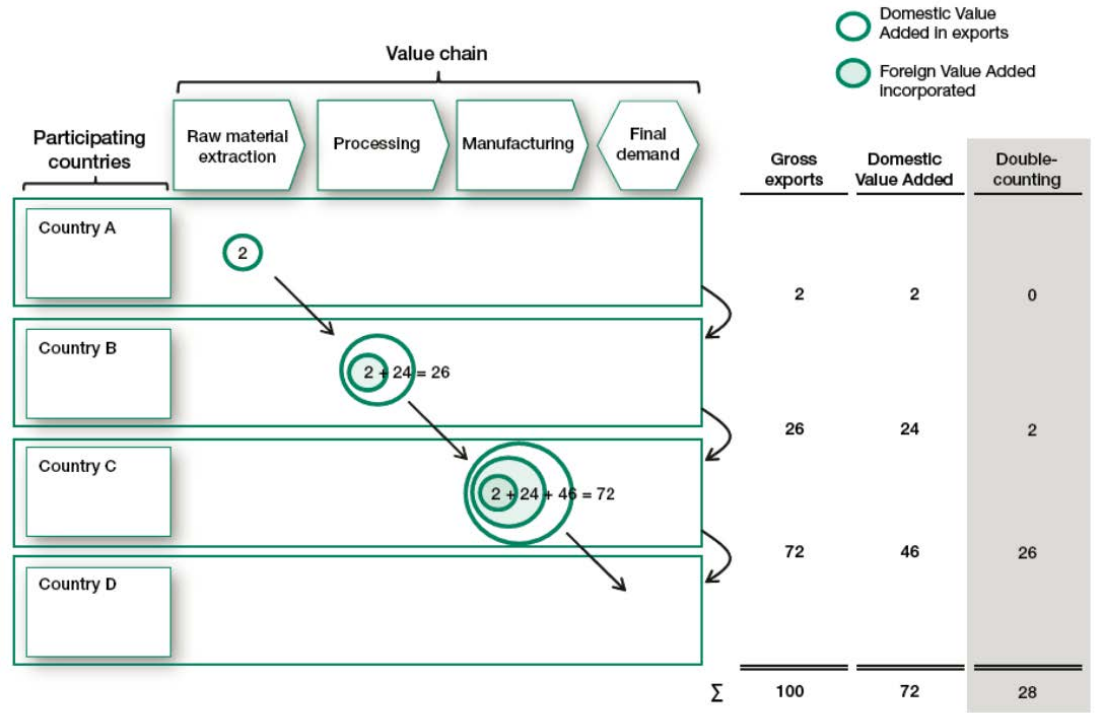
Global Value Chain: Important and Hot topic

- From the 1930s to the 1960s, intermediate goods trade was relatively unimportant. Today, it is about two-thirds of gross world trade, so being able to decompose intermediate goods trade has become crucial in generating a complete value-added accounting of gross trade flows. (Wang et.al, 2014)
- From 1987 to 2007, the trade relations between provinces in China have been strengthened continuously, and the average of dependence on inter-provincial trade for all provinces has increased by 20 percentage point.

- **In 2010, The "Made in the World" initiative was launched by the WTO to support the exchange of projects, experiences and practical approaches in measuring and analyzing trade in value added. Then more and more international organizations and researchers focus on GVC.**

GVC : Trade in value-added

- The various steps to obtain finished products can be associated through the notion of a “value chain”, which refers to the entire sequence of productive (i.e. value-added) activities, from the conception of a product to its manufacturing and commercialization.

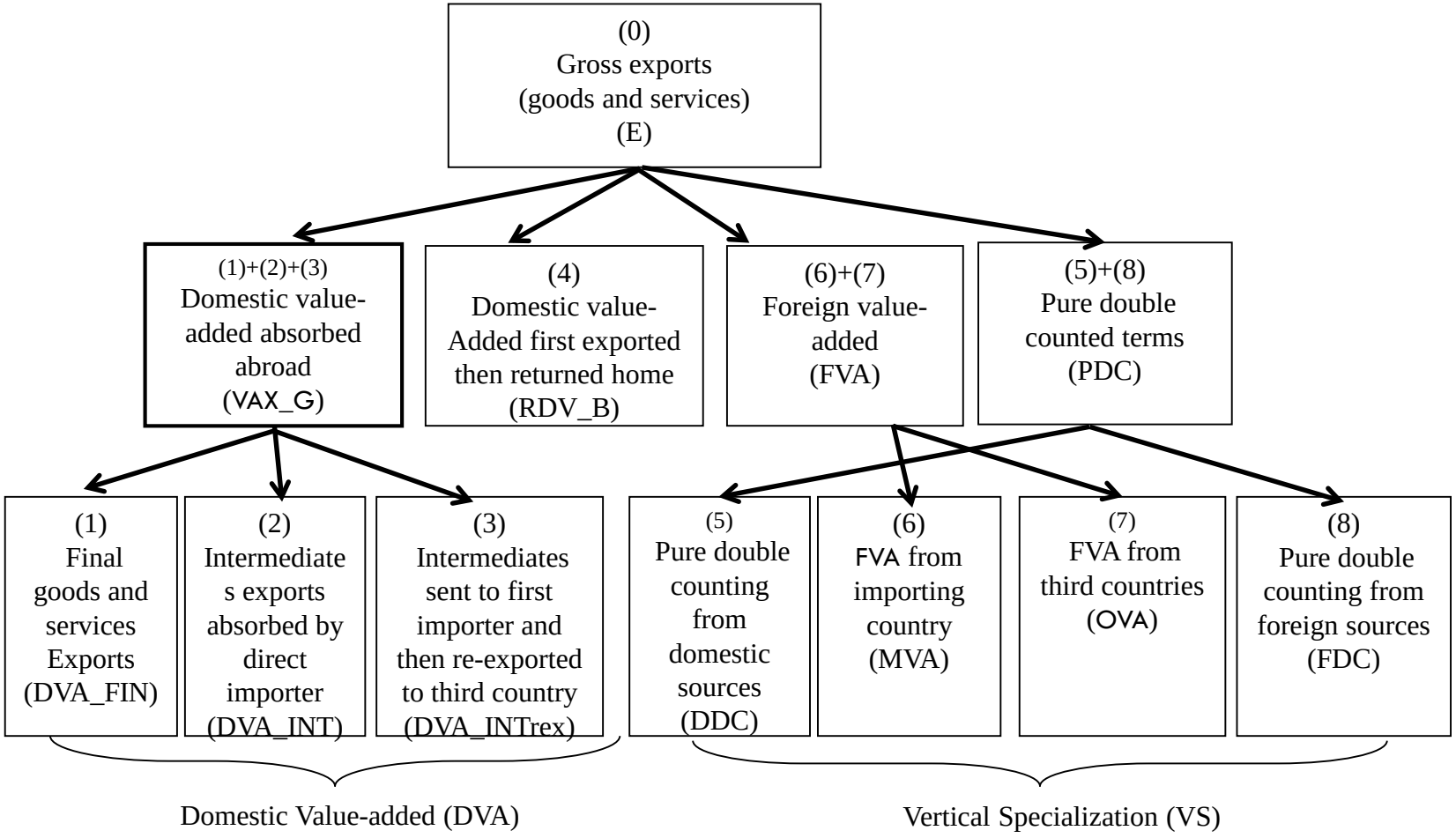


Source: UNCTAD.

Methodology

- **Study on GVC: From standard trade statistics record trade in gross terms to trade in value-added (Wang et.al, 2013)**
  - National income accounts record domestic output in value added terms but standard trade statistics record trade in gross terms.
  - Official trade statistics are misleading in the presence of trade in intermediate goods. Need a transparent framework which helps policymakers and the public to discover GVC-related information masked by official trade data.
  - Need a method to fully decompose intermediate trade in term of factor content. Quantifying value-added structure and double counting of gross trade and their implications for cross country production sharing and a country's position and participation in global value-chains (GVCs).
- **Recently, the study on GVC is to decompose export by "value Chain" (esp. countries) to describe the participation of different countries in GVC.**

Methodology-KWW



Decomposition of Export

- **Gross bilateral trade flows can be decomposed into 4 buckets:**
  - **Domestic value-added absorbed abroad (VAX_G);**
  - **Domestic value added that is initially exported but finally returned and consumed at home via imports from other countries (RDV). It is not part of a country's exports of value-added, but account for part of the country's GDP ; (1)+(2) = DVA;**
  - **Foreign value added used in the production of exports (FVA);**
  - **Double counted terms due to intermediate goods being traded back and forth that cross border multiple times (PDC).**

Indicators used in this study

- Following Hummels, Ishii, and Yi (HIY, 2001), this study use Vertical Specialization index (VS) to measure the participation of in global value-chains. VS measures the imported input content of export goods.
- **Vertical Specialization in global value chain (VS_GVC)**

$$\text{VS\_GVC} = \frac{FVA + PDC}{E}$$

  - FVA is “Foreign value added used in the production of international exports in each province”, PDC is “Double counted terms” in the international trade.
- **Vertical Specialization in domestic value chain (VS_DVC)**

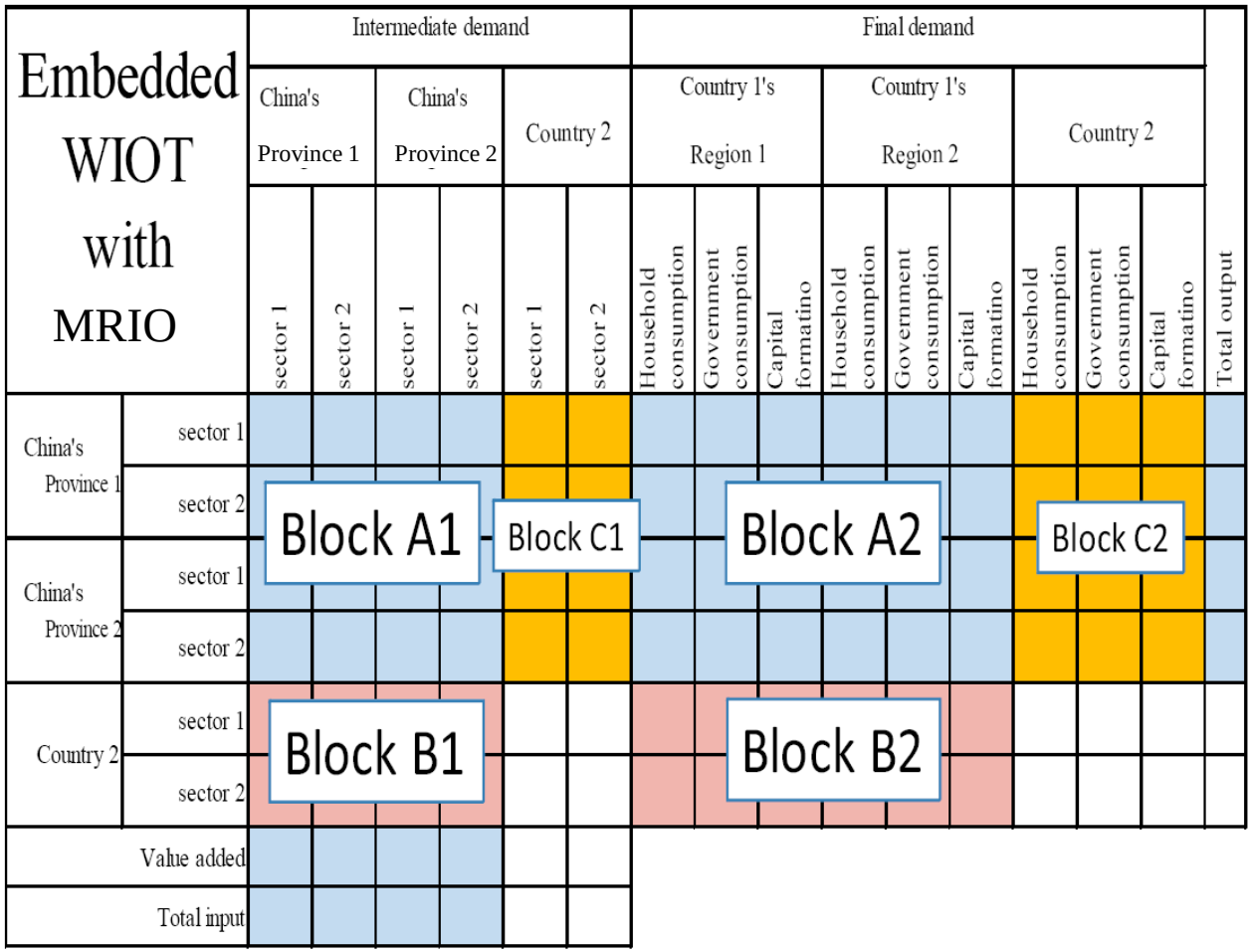
$$\text{VS\_DVC} = \frac{RVA + PDC}{DE}$$

  - RVA is “Value added of all other provinces used in the production of domestic exports in one province”, PDC is “Double counted terms” in the domestic trade.

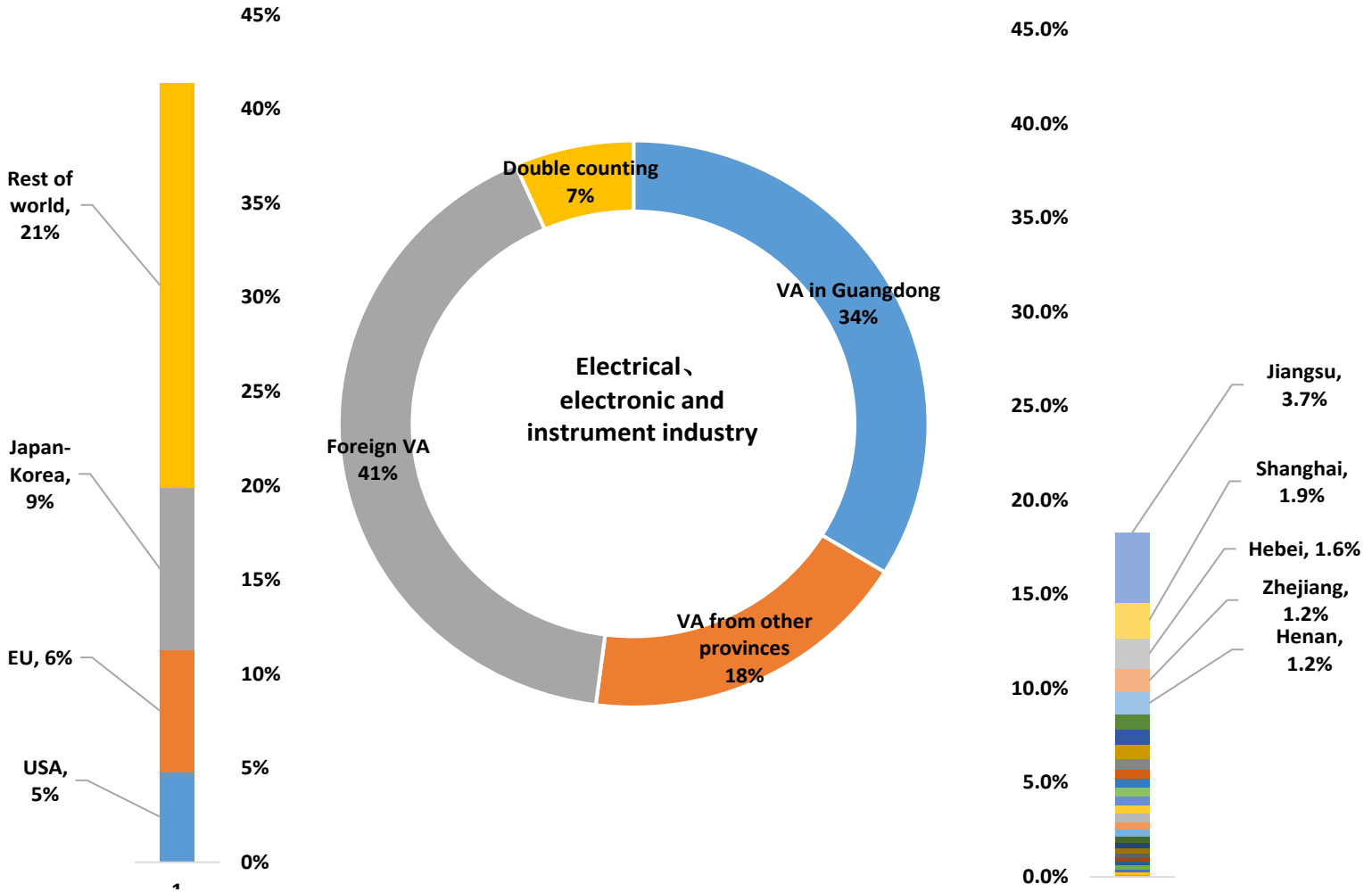
Database

- **Embed WIOD with China's MRIO**
  - EMRIO=WIOD+MRIO
- **China(30 provinces)+ Rest of Word(4 countries and regions: USA, EU, Japan-Korea, ROW)**
- 14 sectors
- 476×476 Matrix
- **Following Bo Meng et.al (2013):**
  - Setting the existing international IO table as the total control of China's MRIO : Adjusting MRIO according to WIOD.
  - Reconciling MRIO and WIOD with the programming model (Cross Entropy model)

Database


Embedded WIOT with MRIO
Intermediate demand
Final demand
China's Province 1
China's Province 2
Country 2
Country 1's Region 1
Country 1's Region 2
Country 2
sector 1
sector 2
Household consumption
Government consumption
Capital formatino
Total output
China's Province 1
China's Province 2
Country 2
Value added
Total input
Block A1
Block C1
Block A2
Block C2
Block B1
Block B2

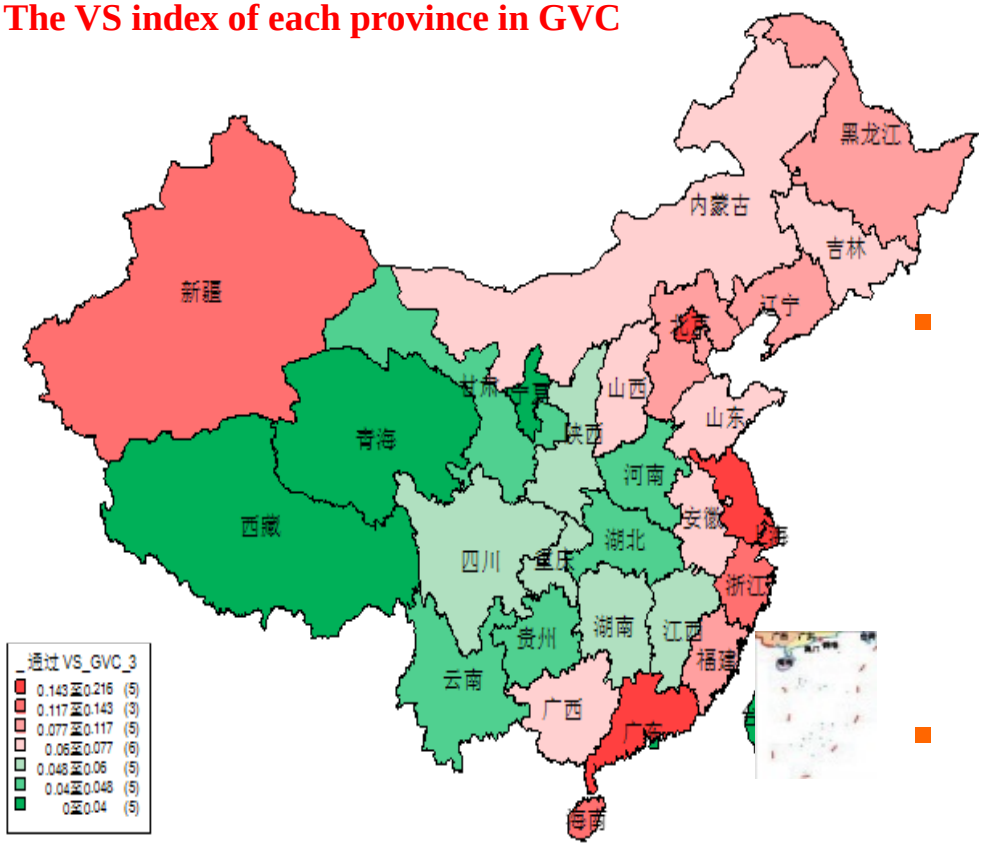
Decomposition of provincial international export : Guangdong exported to USA



Electrical、electronic and instrument industry

The participation of each province in GVC

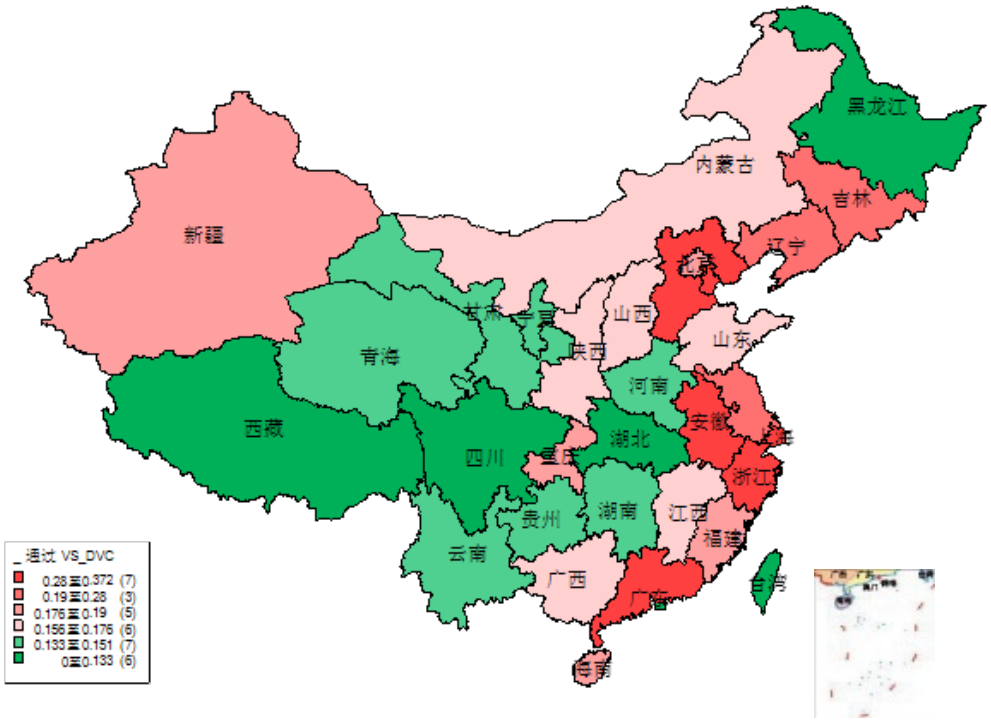
The VS index of each province in GVC



- The participation in GVC of coastal provinces are significantly higher than that of the inland provinces.
- The participation in GVC of the three economic circles (Jing Jin Ji Area, Yangtze River Delta, Pearl River Delta) is higher than that of other regions
- The participation in GVC of provinces near the coastal area is higher than that of province far away from the coastal area.

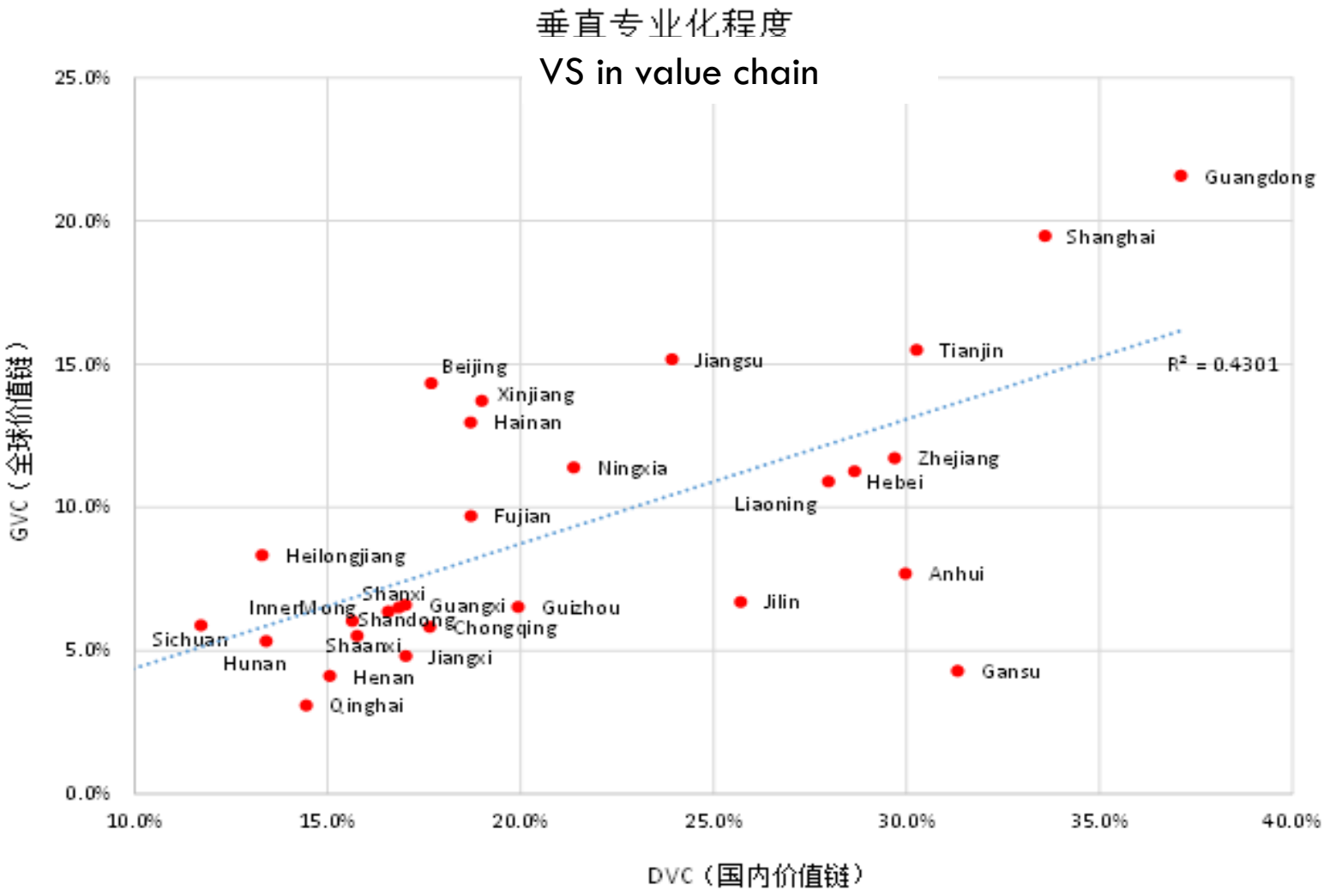
The participation of each province in DVC （Domestic Value Chain）

Vertical Specialization in domestic value chain (DVC)

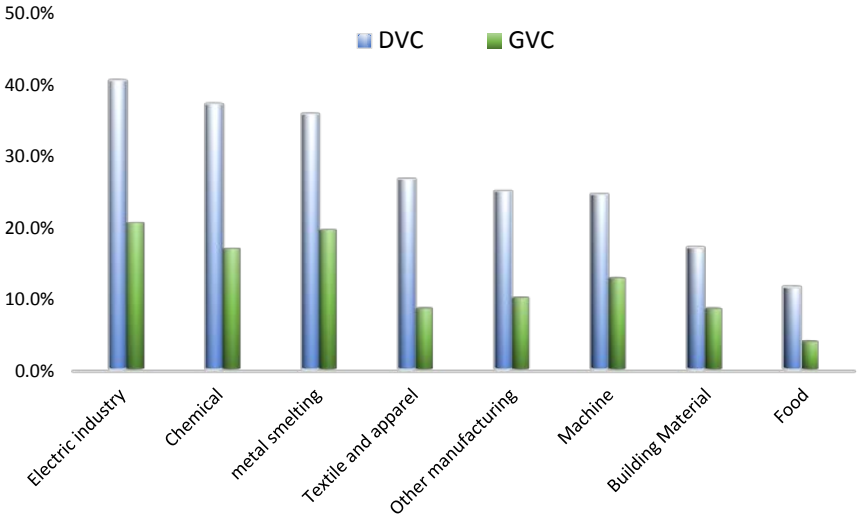


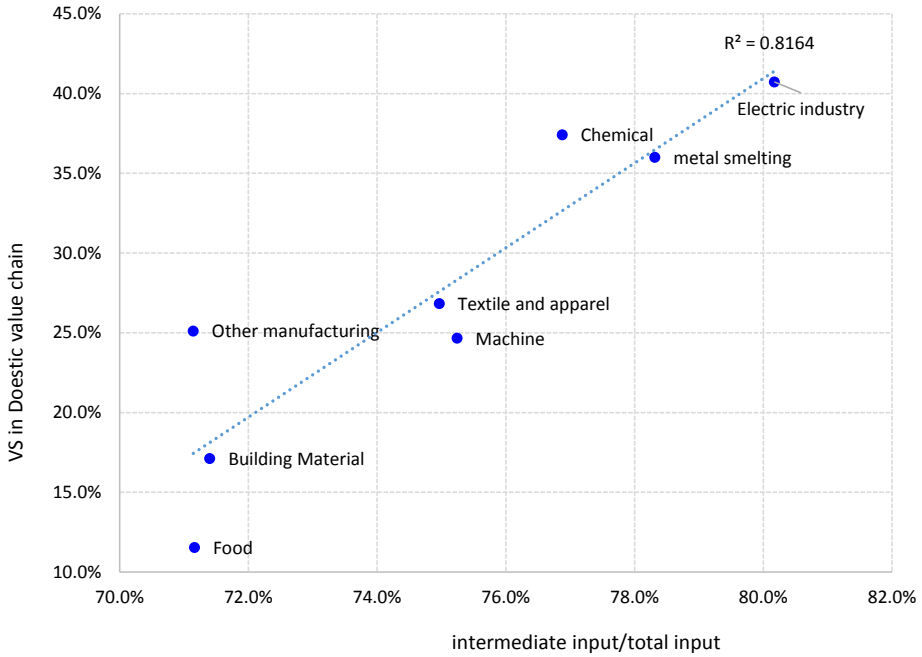
- The participation of most of eastern coastal provinces in DVC is higher than other provinces.
- The participation of the three economic circles and their surrounding area is higher than other area.
- The participation of most of northeast provinces is very high.

The participation of each province in GVC vs. DVC

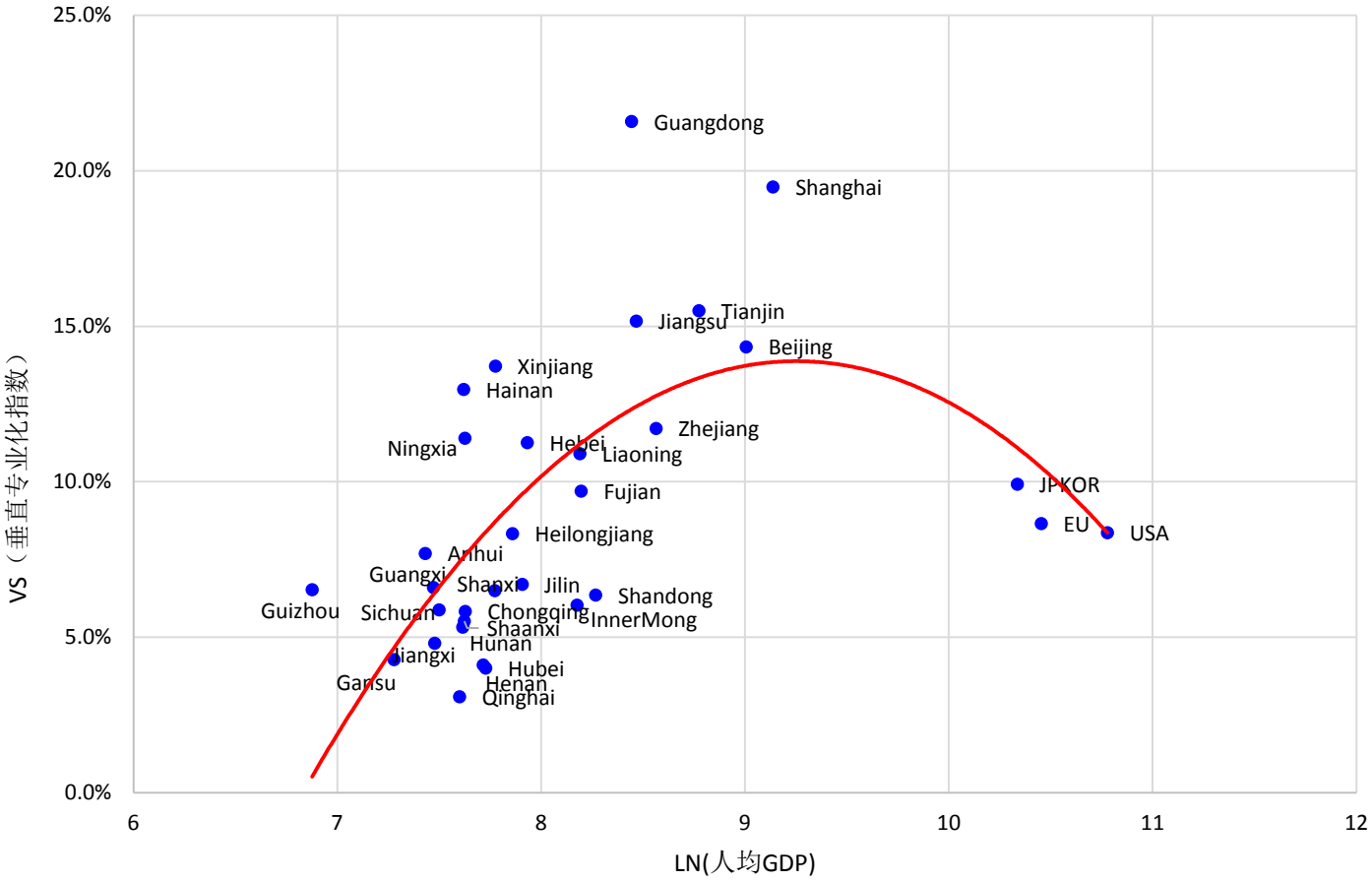


The participation by industry

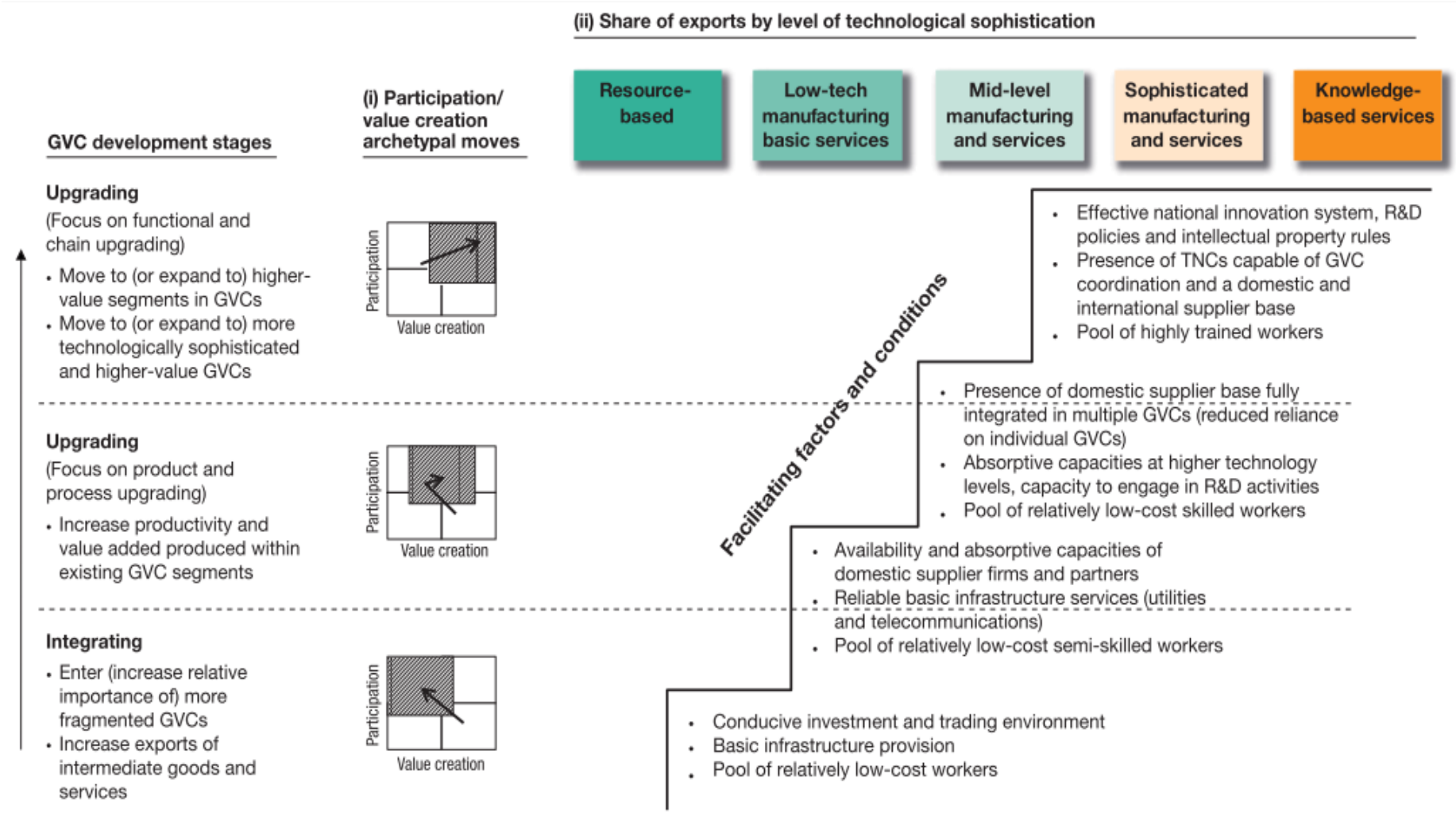




The VS in GVC vs. GDP per capita



Upgrading of value chain



Source: UNCTAD analysis.

Analysis on the influence factors of VS index

Following Diewert（1974）and Kohli（1978，1991）,which was adopted in their studies on international trade：

Cost function

$$LnC = \alpha_0 + \sum_{h=1}^{H} \alpha_h Lnw^h + \frac{1}{2}\sum_{h=1}^{H}\sum_{j=1}^{H} \gamma_{hj} Lnw^h Lnw^j + \beta_y LnY$$

$$+ \frac{1}{2}\beta_{yy} LnY^2 + \sum_{h=1}^{H} \emptyset_{hy} Lnw^h LnY$$

VS

$$VS = \alpha_h + \gamma_{ml} LnWage + \gamma_{mk} LnRent + \gamma_{mm} LnP^m + \gamma_{mm} LnP^d + \emptyset_{hy} LnY$$

Econometric equation

$$VS_i = \alpha + \beta Ln\left(\frac{K_i}{L_i}\right) + \sum_j \gamma_j LnX_i^j + \emptyset LnY_i + \varepsilon_i$$

- industrial output
- capital-labor ratio
- the density of infrastructure
- industrial openness
- average size of enterprises

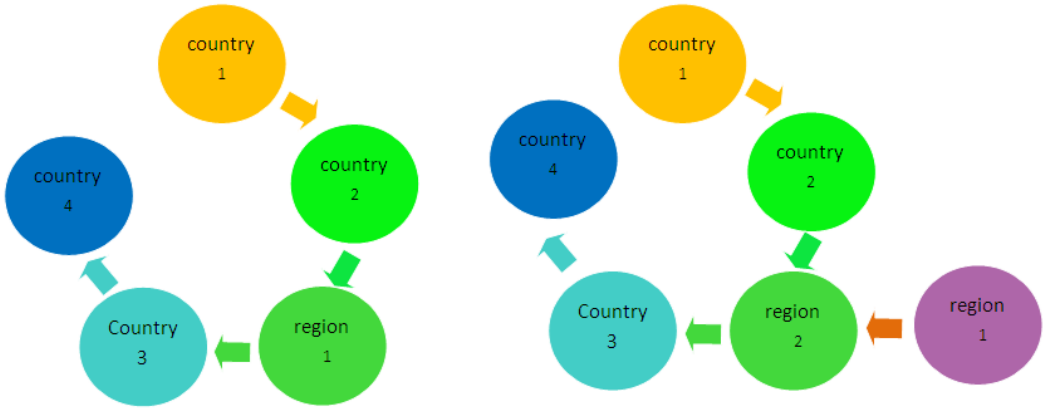
Regression result

	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
C	0.15521***	0.11954***	0.15401***	0.08596***	0.08295***	0.11684***	0.14392***	0.14947***
XP	0.00001***	0.00001***	0.00001***	0.00001***	0.00001***	0.00001***	0.00001***	0.00001***
INFRA1			0.17236***					
INFRA2		2.40116***		2.27330***	2.57659***	2.30830***	2.17506***	2.16045***
OP				0.15112***	0.13926***	0.08588***	0.08940***	0.08781***
K/L	0.00078***	0.00075***	0.00070***	0.00056***	-0.00006	0.00016	0.00048*	0.00052*
SCALE					0.02642***	0.00831	-0.01843**	-0.02274***
Cross-RE	No	No	No	No	No	Yes	No	No
Period-RE	No	No	No	No	No	No	Yes	No
Period-FE	No	No	No	No	No	No	No	Yes
Observations	240	240	240	240	240	240	240	240
R2	0.218	0.349	0.237	0.409	0.425	0.244	0.285	0.558

注：显著性水平，***p<0.01,**p<0.05,*p<0.1.

The impact of DVC on regional economy（1）

- **Foreign economic dependence of province**



Participation directly(left) or indirectly(right) in GVCs

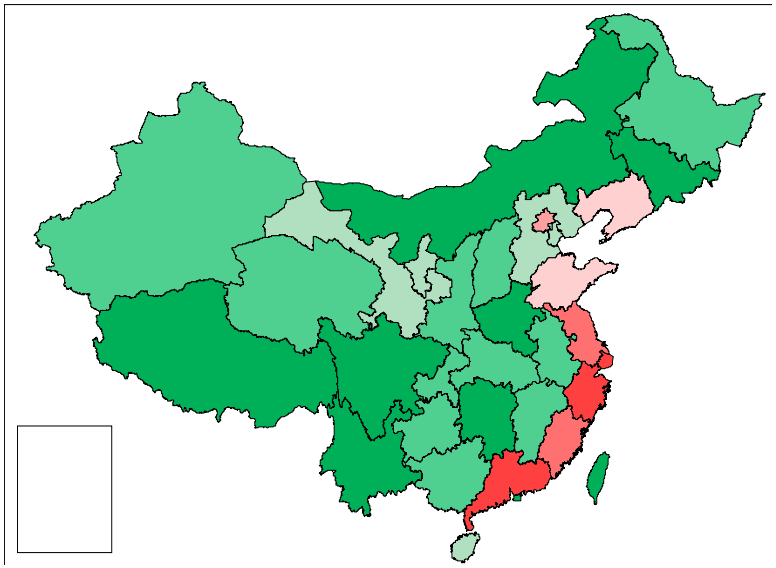
➢ Dependence on international export for province in terms of standard trade statistics:

$$Dep\_trade_r = \frac{\text{Total provincial r export}}{\text{GDP of Provincial r}}$$

➢ Dependence on international export for province in terms of value chain:

$$Dep\_gvc_r = \frac{\text{Total provincial r VA embedded in national(province r + other provinces) export}}{\text{GDP of Provincial r}}$$

Dependence on export from the perspective of trade and value chain

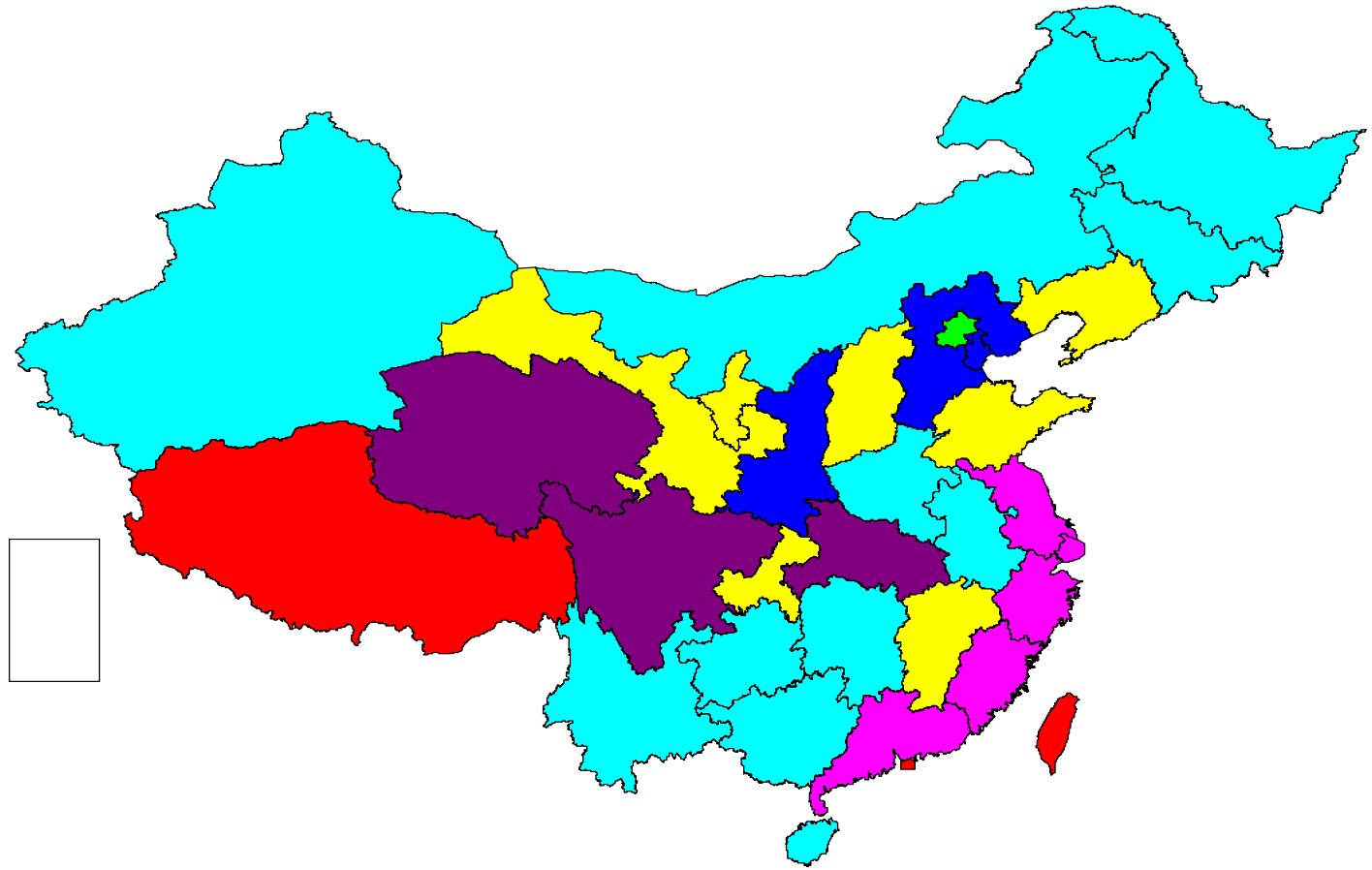


- On the one hand, the dependence on export from perspective of trade may overestimate the degree of real dependence for some regions(mainly in eastern coastal area) because export includes local value added, as well as foreign value added and double counting.
- On the other hand, the dependence on export from perspective of trade may underestimate the degree of real dependence for some regions (mainly in western area) because it does not include indirect dependence (via export of other provincial exports)

The impact of DVC on regional economy（2）

- The driving forces for regional economy are more complex

	consumption	Investment	export
local	direct	direct	direct
Other provinces	indirect	indirect	indirect



Main conclusions

- Since the reform and opening-up, China has formed a “dumbbell” regional division (coast region +western region).
- The three economic circles (Jing Jin Ji Area, Yangtze River Delta, Pearl River Delta) have significant spillover effects on the surrounding areas.
- The VS index and GDP per capita show inverse U relationship.
- Market size, capital intensity, infrastructure and the openness have positive effect on the participation in domestic value chain.

Main conclusions

- The dependence on export for each province from perspective of value chain can reflect the real condition, comparing to the traditional calculation method.
- The spillover effect of provincial international export is positively correlated with its DVC participation.
- From the perspective source of market and type of demand, different regions show different pattern of driving forces.

Further works

- How to increase participation and upgrade in DVC and GVC
- What's the policy implication

Thank you very much !