A Inter-Regional Modeling Capacity for China

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Outline

- Introduction and Motivation
- The three-regional CGE model

Introduction

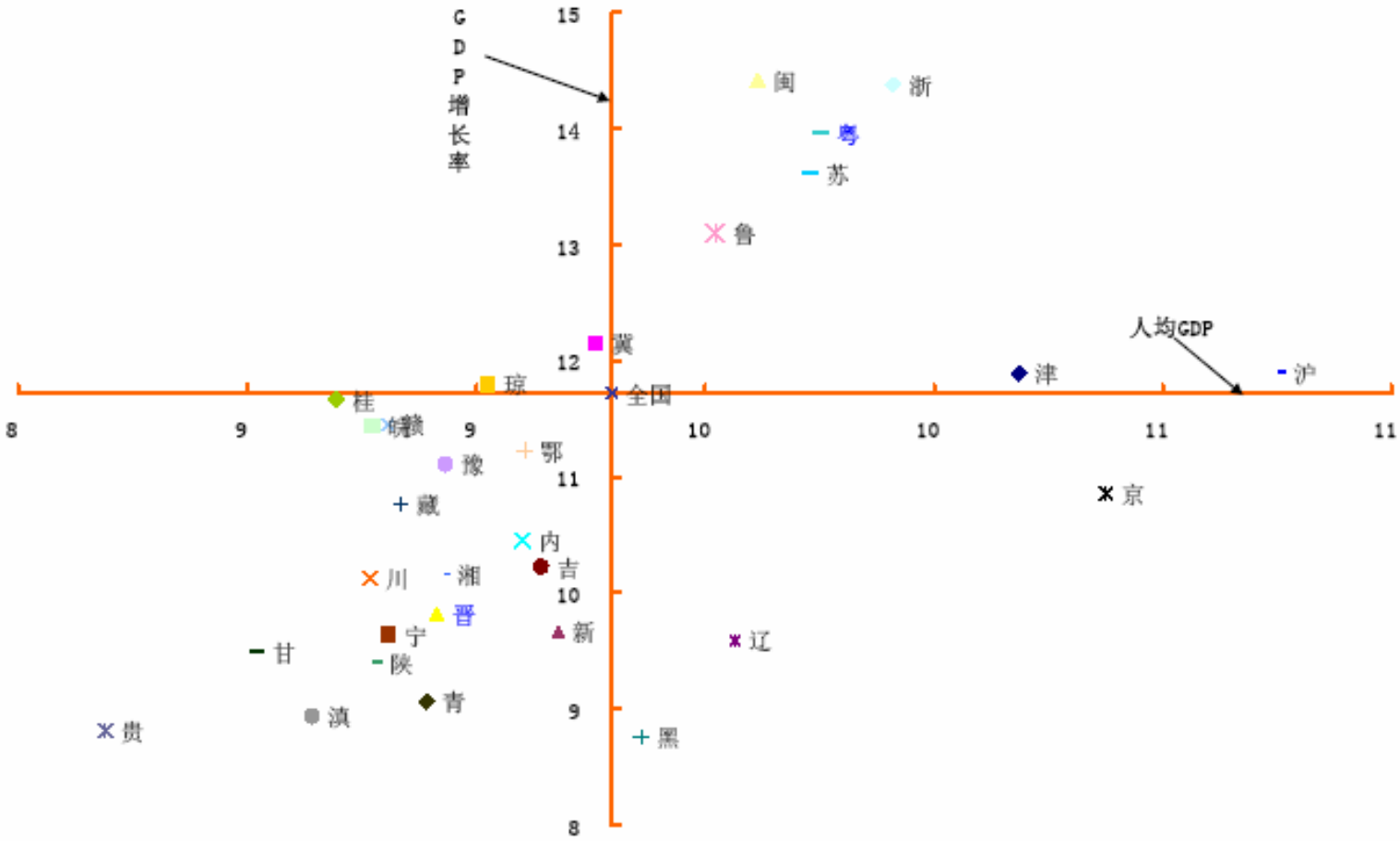
Inter-regional and inter-provincial linkages are a high priority for Chinese policy research:

- Balanced growth priorities
- Trade linkages and regional protectionism
- Fiscal linkages and transfer mechanisms
- Strategic sector (food, energy) policies
- Resource utilization (water, urbanization)
- Environmental policy

Example: Balanced Growth Policy

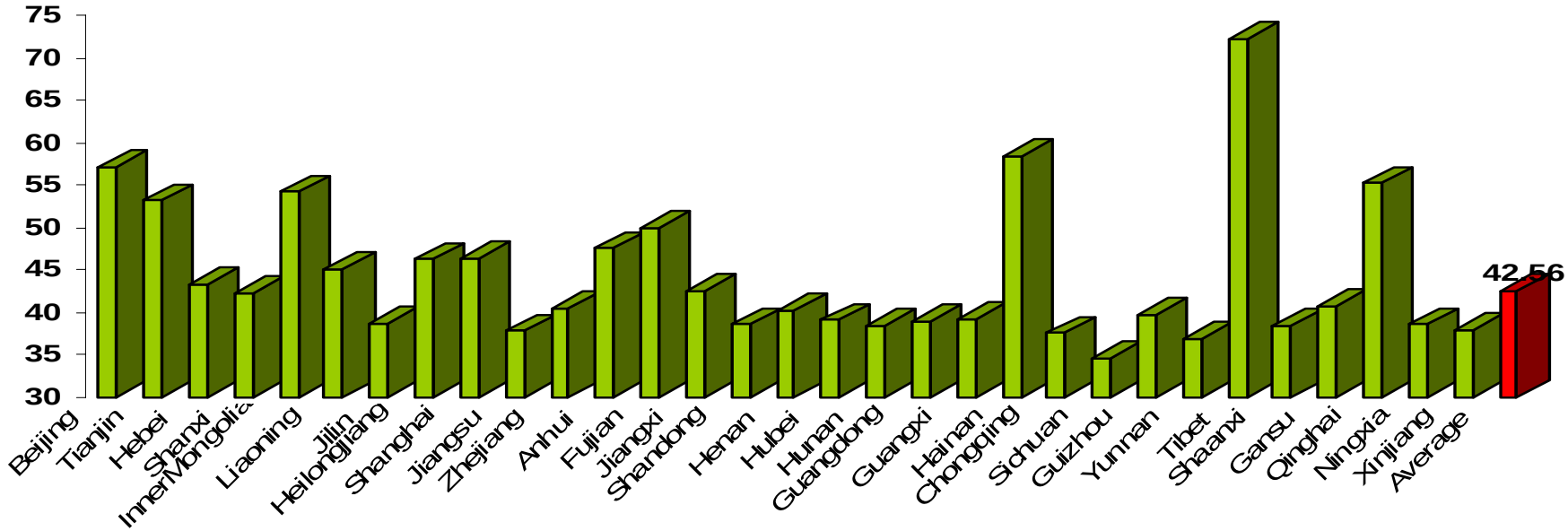
- Regional Income Disparity
  - Geographical Location
  - Factor endowments and quality
  - Industrial and public infrastructure
  - Cultural heterogeneity

GDP Growth and GDP per Capita



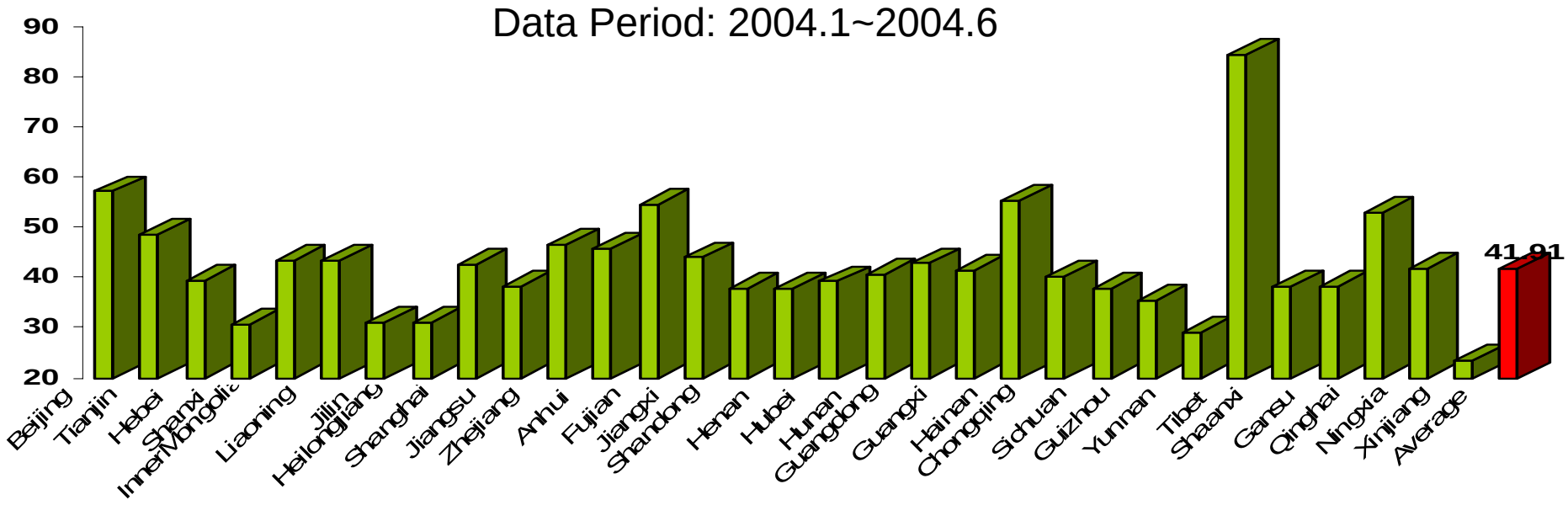
Note: Vertical axis gives 1990-2003 GDP growth/yr, horizontal axis gives ln(per capita 2003 GDP)

Data Period: 2004.1~2004.6



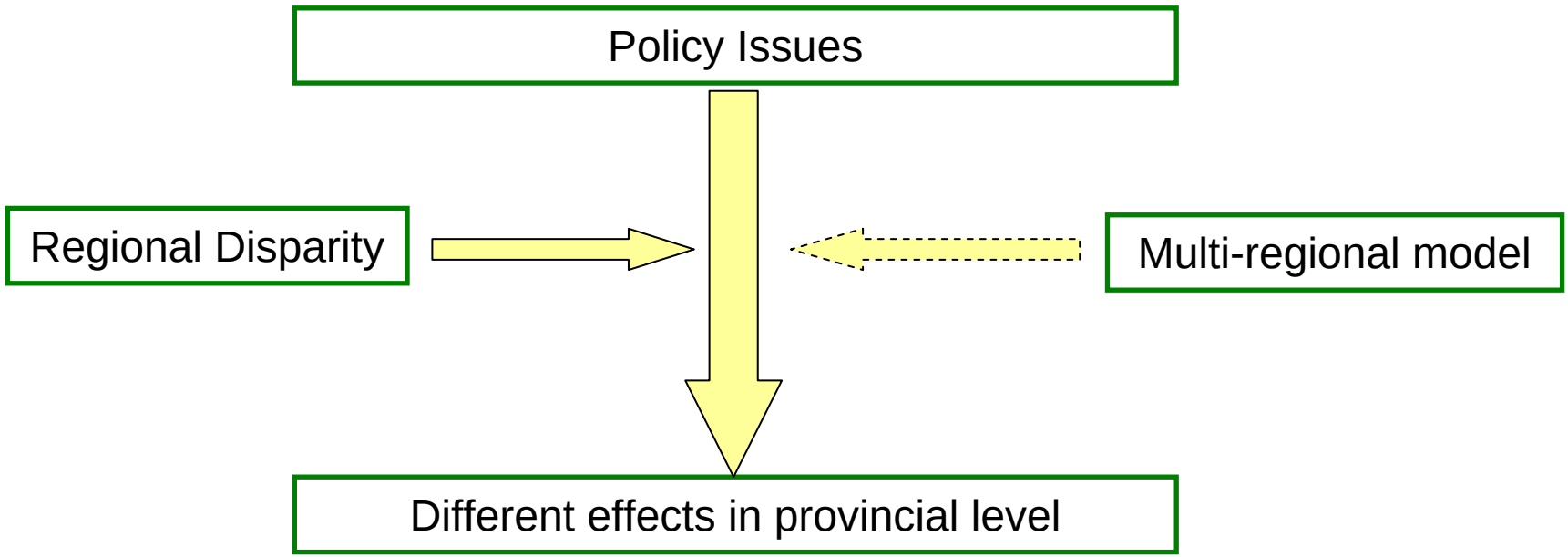
Ratio of provincial exports to total sales

Average	43%
Highest (Tibet)	72%
Lowest (Sichuan)	35%



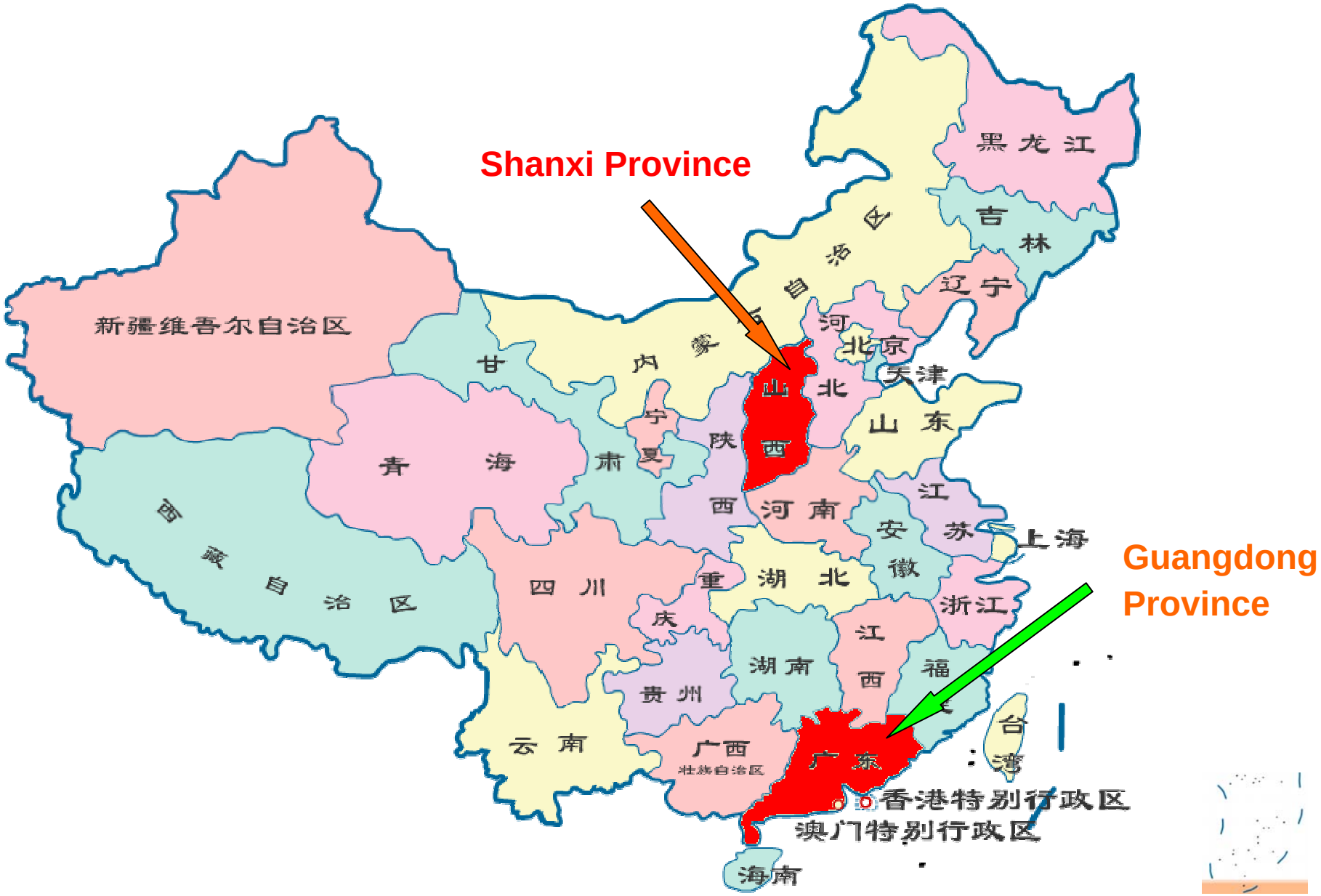
Ratio of provincial imports to all total demand

Average	43%
Highest (Tibet)	85%
Lowest (Xinjiang)	24%


Policy Issues
Regional Disparity
Multi-regional model
Different effects in provincial level

A Three-region CGE model

- The three -region Chinese CGE model we constructed is an extension of two models used in China's WTO accession research
  - National Chinese CGE model (DRC, 1998)
  - Two-region Chinese CGE model (Li and Zhai, 2000,2002)
- Three regions
  - GD (Guangdong), SX (Shanxi) and Rest of Mainland, China (ROMC)
  - **Why?**


Shanxi Province
Guangdong Province
黑龙江
吉林
辽宁
内蒙古自治区
新疆维吾尔自治区
甘肃
青海
西藏自治区
宁夏
陕西
山西
河北
北京
天津
山东
河南
江苏
安徽
上海
浙江
湖北
重庆
四川
湖南
江西
福建
贵州
云南
广西壮族自治区
广东
台湾
香港特别行政区
澳门特别行政区
海南

Guangdong Province

- Guangdong province locates in southern China, neighboring Hong Kong and Macao. As **the largest sub-national economy in China in 2004**,
- It accounts for 35 percent of foreign trade in 2003.
- The development of Guangdong since 1978 and its economic structure is a model for all of **China's coastal area**.

Shanxi Province

- Shanxi, located in the middle of North China.
- The "**Coal Warehouse of China**“: coal output in Shanxi accounts for nearly one-fourth of China’s total.
- According to UNIDO classifications, resource-based manufactured export accounted for 61.94% of total manufactured exports in 2000.

Inter-regional trade

- Inter-regional trade is not covered by official statistics in most countries (including China and the U.S.A).
- To overcome this deficiency, we are developing imputation methods to analyse regional trade patterns.
- The basic approach is a synthesis of gravity estimation and maximum entropy econometrics.

Technical Details - Gravity model

$$T_{ij} = \alpha \frac{D_j S_i}{TDS} \frac{(GDP_i)^{\gamma_1} (GDP_j)^{\gamma_2} (OI_i)^{\delta_1} (OI_j)^{\delta_2}}{(d)^{\beta}}$$

Where, suffix i refers to the origin, j refers to the destination. D_j is the total demand for a given commodity in region j; S_i is the total supply in region i; TDS is the total demand (or total supply) for the three regions. *GDP* is the regional economic size (share of GDP). *OI* is the trade openness index. *d* is the distance between the regsion i and j. α,β ,γ andδ are parameters.

- **first step** :To choose the parameters, we structure the following programming problem :

$$\min \quad destination = \sum_j \left(\sum_i T_{ij} - IF_j \right)^2$$

$$s.t.$$

$$\begin{cases} T_{ij} = \alpha \dfrac{D_j S_i}{TDS} \dfrac{(GDP_i)^{\gamma_1} (GDP_j)^{\gamma_2} (OI_i)^{\delta_1} (OI_j)^{\delta_2}}{(d)^{\beta}} \\ \sum_j T_{ij} = OF_i \\ OI_{ROMC} = \dfrac{(IF_{ROMC} + OF_{ROMC})}{OUTPUT_{ROMC}} \\ \sum_j IF_j = \sum_i OF_i \\ T_{ij} \geq 0 \\ IF_{ROMC}, OF_{ROMC} \geq 0 \end{cases}$$

- **Second step** :To balance the trade matrix, we use Cross Entropy Methods:

$$\min \quad entropy = \sum_i \sum_j \left(\frac{T_{ij}^0}{OF_j} LN\left(\frac{T_{ij}}{T_{ij}^0} \right) \right)$$

$$s.t.$$

$$\begin{cases} \sum_j T_{ij} = OF_i & , i = "GD","SX" \\ \sum_i T_{ij} = IF_j & , j = "GD","SX" \\ T_{ij} \geq 0 \end{cases}$$

Model Dimension

- **3 Region - Guangdong province, Shanxi Province and ROMC (the rest of Mainland, China)**
- **53 industries**
  - of which 10 are agricultural, 29 are manufacturing and 8 are service
- **14 groups of households**
  - 7 groups of urban households and 7 groups of rural households.
- **5 factors of production**
  - agricultural land, capital, agricultural labor, production worker, and professionals
- **calibrated**
  - A three regional SAM of China for 1997 is the benchmark data set.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