China: Analysis of Factors Causing Different Energy Intensities in Different Regions

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Outline

- **There are Great Differences in Regional Energy Intensities**

- **There are Great Differences in Regional Industrial Structures**

- **Great Difference Exists in Regional Segmental Energy Intensities**

- **Factors Affecting Regional Energy Intensities**

- **Conclusions and Policy Options**

Great Difference of Regional Energy Intensities

- National energy consumption intensity in 2006 was 1.206 tce / 10,000-yuan GDP (at the 2005 constant prices)

- Beijing had the lowest energy intensity of 0.76 tce

- Ningxia had the highest intensity of 4.1 tce

- The ratio between the highest and lowest values was 5.4

Great Difference of Regional Energy Intensities


tons of SCE /10000 YUAN
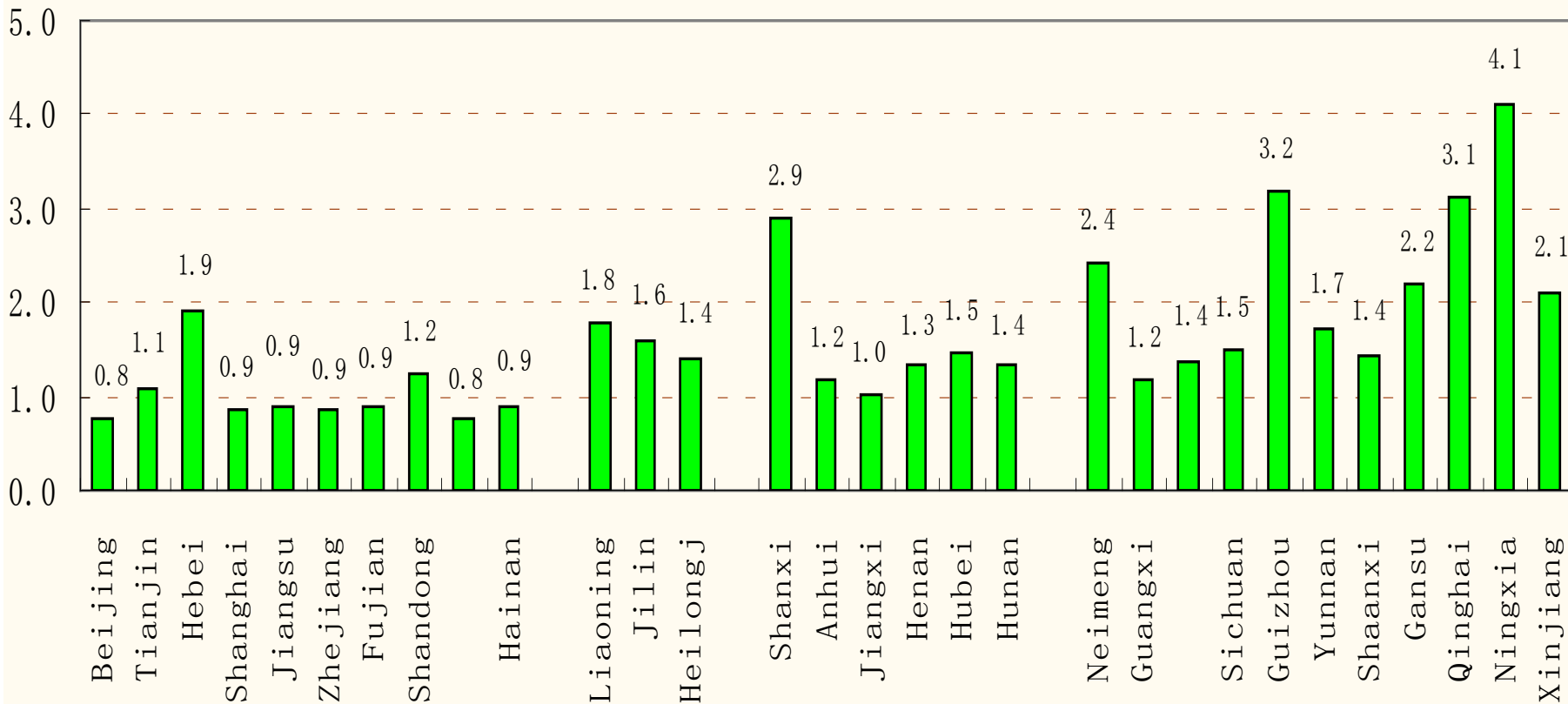
Great Difference of Regional Industrial Structures

- The energy intensity for per unit of GDP in 2006 at the current prices was respectively 0.34 tce for agriculture, 1.92 tce for industry, 0.31 tce for construction, 0.41 tce for services

- The economic survey data indicate that in 2004, the energy consumption for 10,000-yuan output value by the sector of non-metal mineral products was 1.815 tce, which was 32 times as much as that of the sector of electronics and communications equipment manufacturing (0.056 tce)
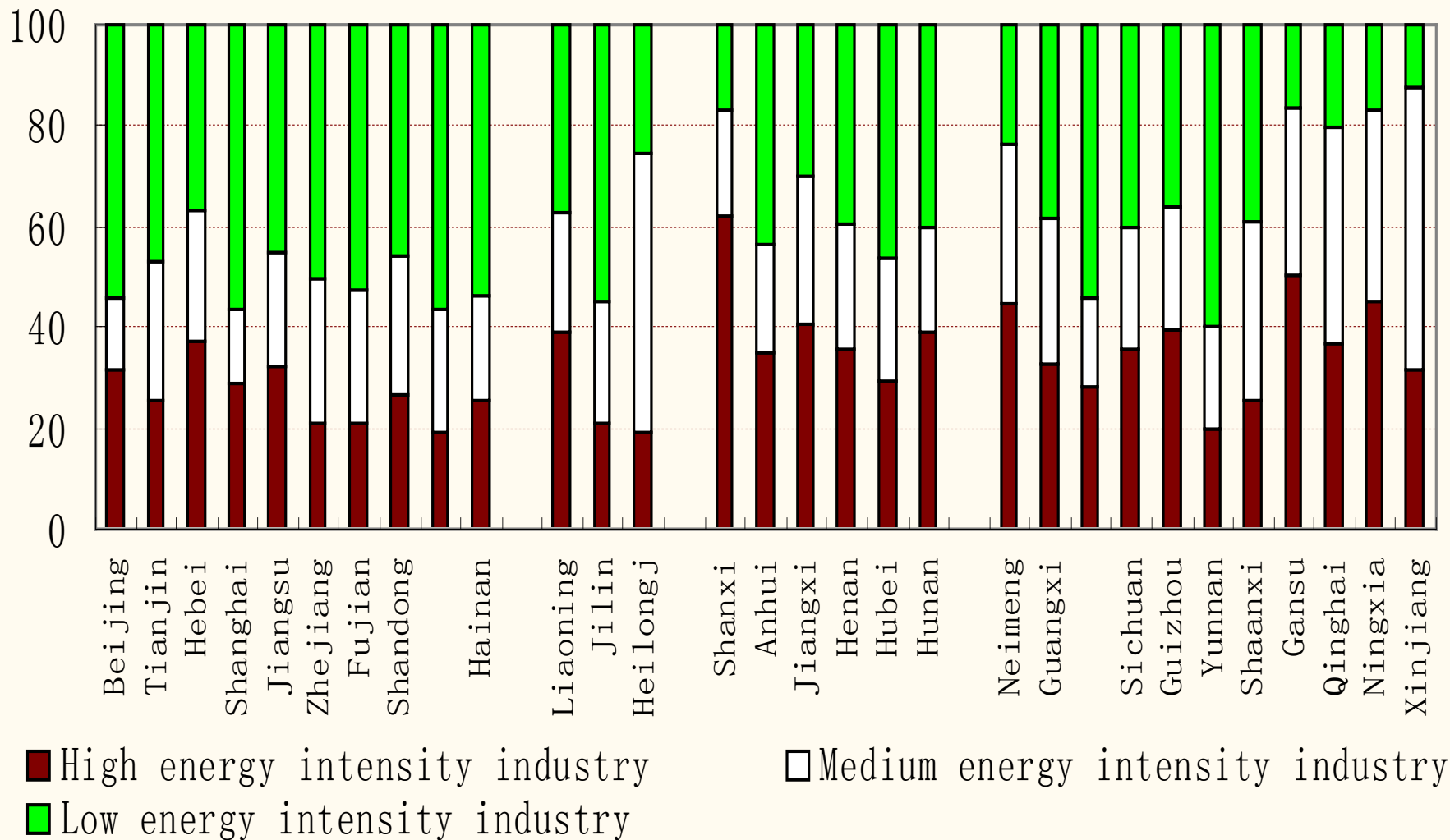
Great Difference of Regional Industrial Structures
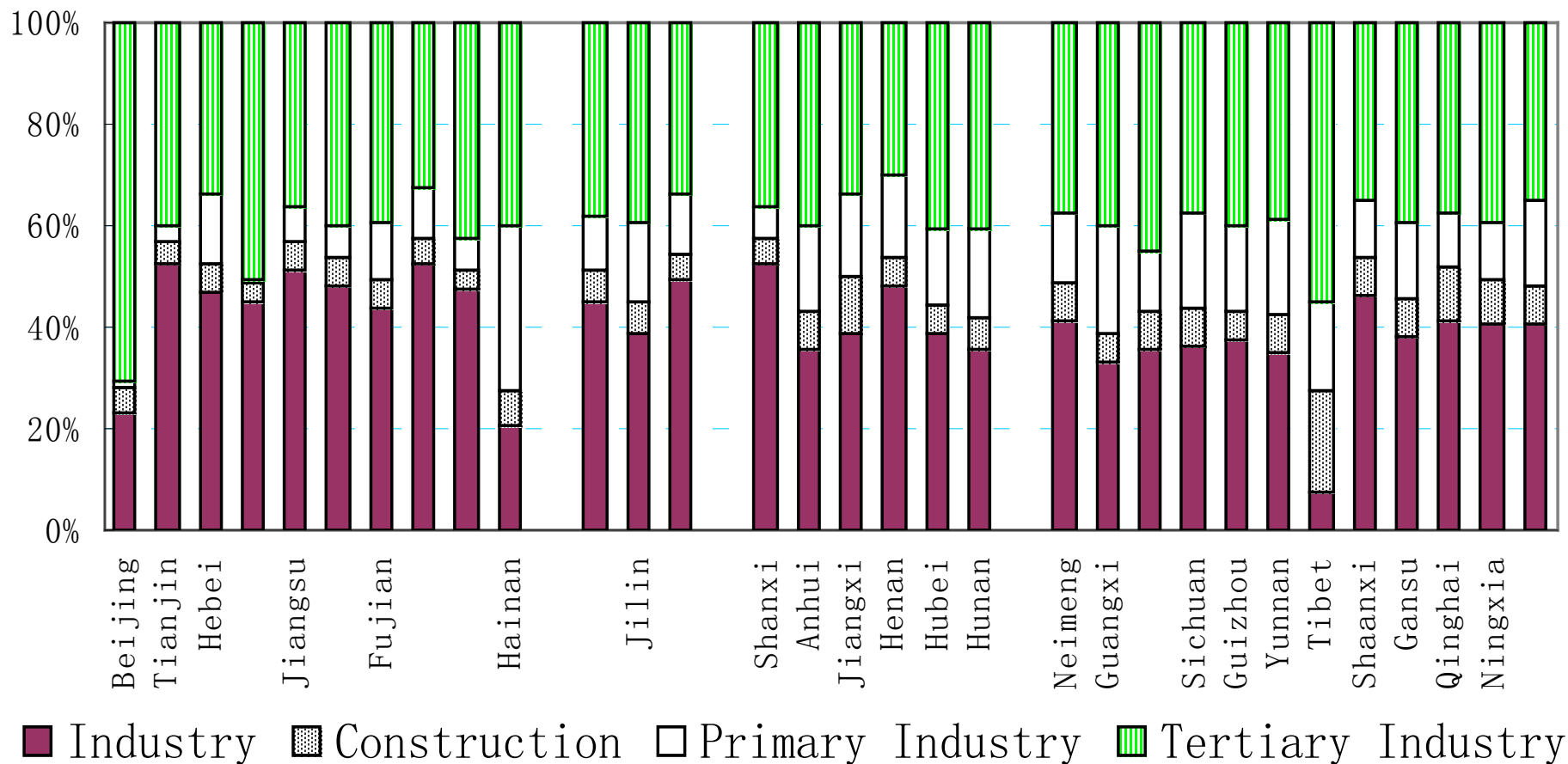
Great Difference of Regional Industrial Structures

Great Difference of Regional Industrial Structures

	High energy-consuming industrial segments	Medium energy-consuming industrial segments	Low energy-consuming industrial segments
East	27.1	30.4	38.0
Northeast	39.7	33.8	26.4
Central	49.5	29.7	20.8
West	56.6	25.7	17.7

Great Difference of Sectoral Energy Intensities in Different Regions

- In agriculture, Shanxi had the highest energy intensity in 2006, at 1.17 tce for 10,000-yuan output value, while Qinghai has the lowest, at 0.15 tce. The former was more than 6 times that of the latter

- In the sector of traditional food processing, Yunnan's energy intensity was 4.93 tce, which was nine times that of Shanghai

- Energy intensity was also visibly different in iron smelting, with Yunnan's intensity being 7.3 times that of Beijing

Great Difference of Sectoral Energy Intensities in Different Regions

- The differences in sectoral energy intensities are related both with the technological levels and the structures of industrial sectors

- Industrial energy intensity is also affected by corporate scale, energy price, corporate management expertise and many other factors

Factor Decomposition Methodology

$$\frac{E_r}{O_r} - \frac{E_a}{O_a} = \frac{A_r' X_r}{O_r} - \frac{A_a' X_a}{O_a} = A_r' S_r - A_a' S_a$$

$$= \underbrace{A_a'(S_r - S_a)}_{\substack{\text{energy difference due to} \\ \text{differeence of industry sturcture}}} + \underbrace{\left(A_r' - A_a'\right) S_a}_{\substack{\text{energy differnce due to} \\ \text{diffence of sector energy efficeiency}}}$$

$$+ \underbrace{A_r' S_r - A_r' S_a - A_a' S_r + A_a' S_a}_{\text{residual items}}$$

- Er represents the total energy consumption of region "r"; Qr represents the total output value of region "r"; Xr = (Xr1, Xr2 …Xri), representing the total output value of all sectors in region "r" (i sectors); Ar = (Ar1, Ar2…Ari), representing the sectoral energy intensity in region "r"; and Sr represents the industrial structure of region "r"

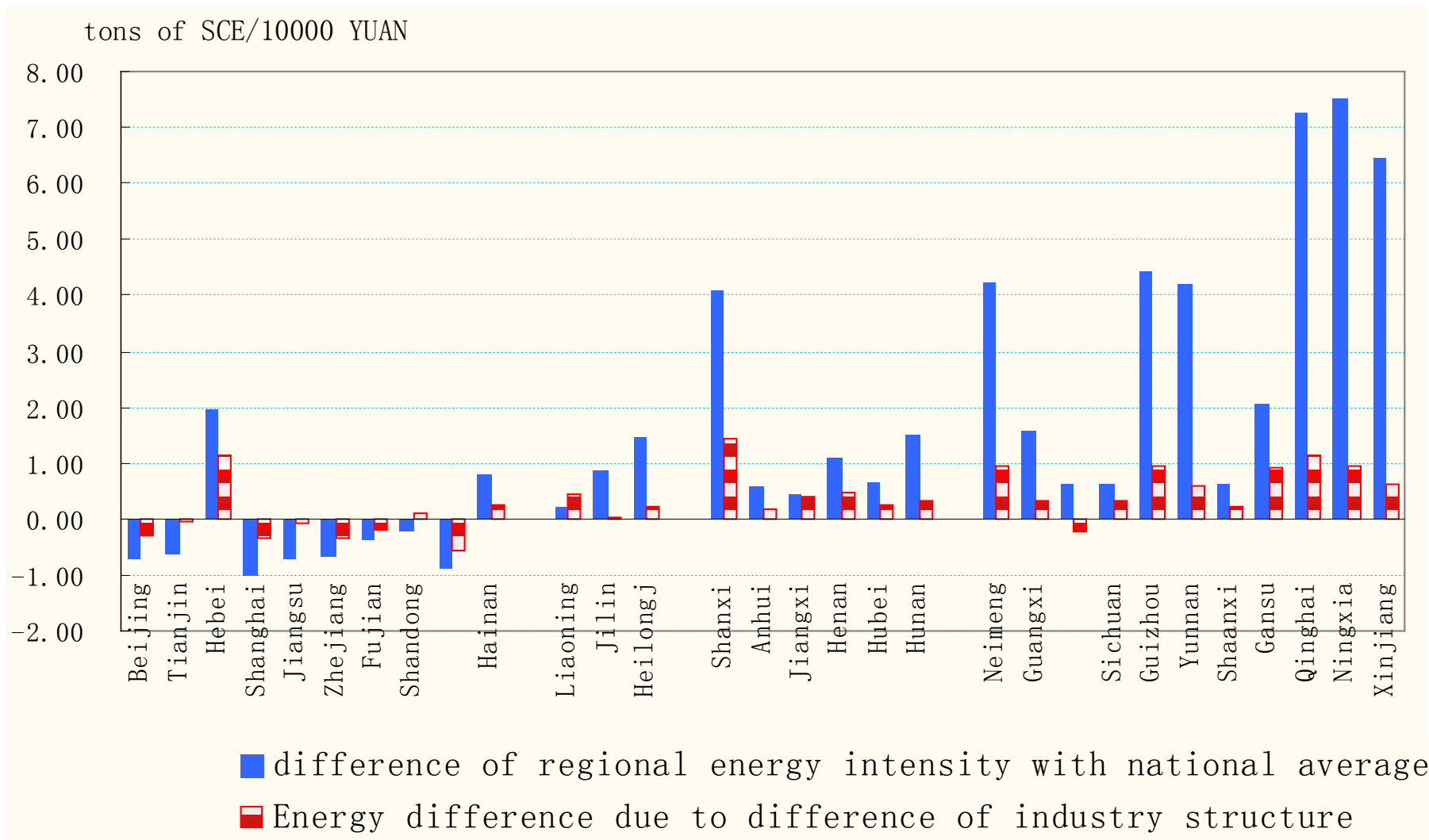# Decomposing Results for Regional Energy Intensities in 2002 (the gross output of various sectors)

Tons of ScE/10000 yuan

Legend:
■ difference of regional energy intensity with national average
□ energy difference due to difference of industry structure
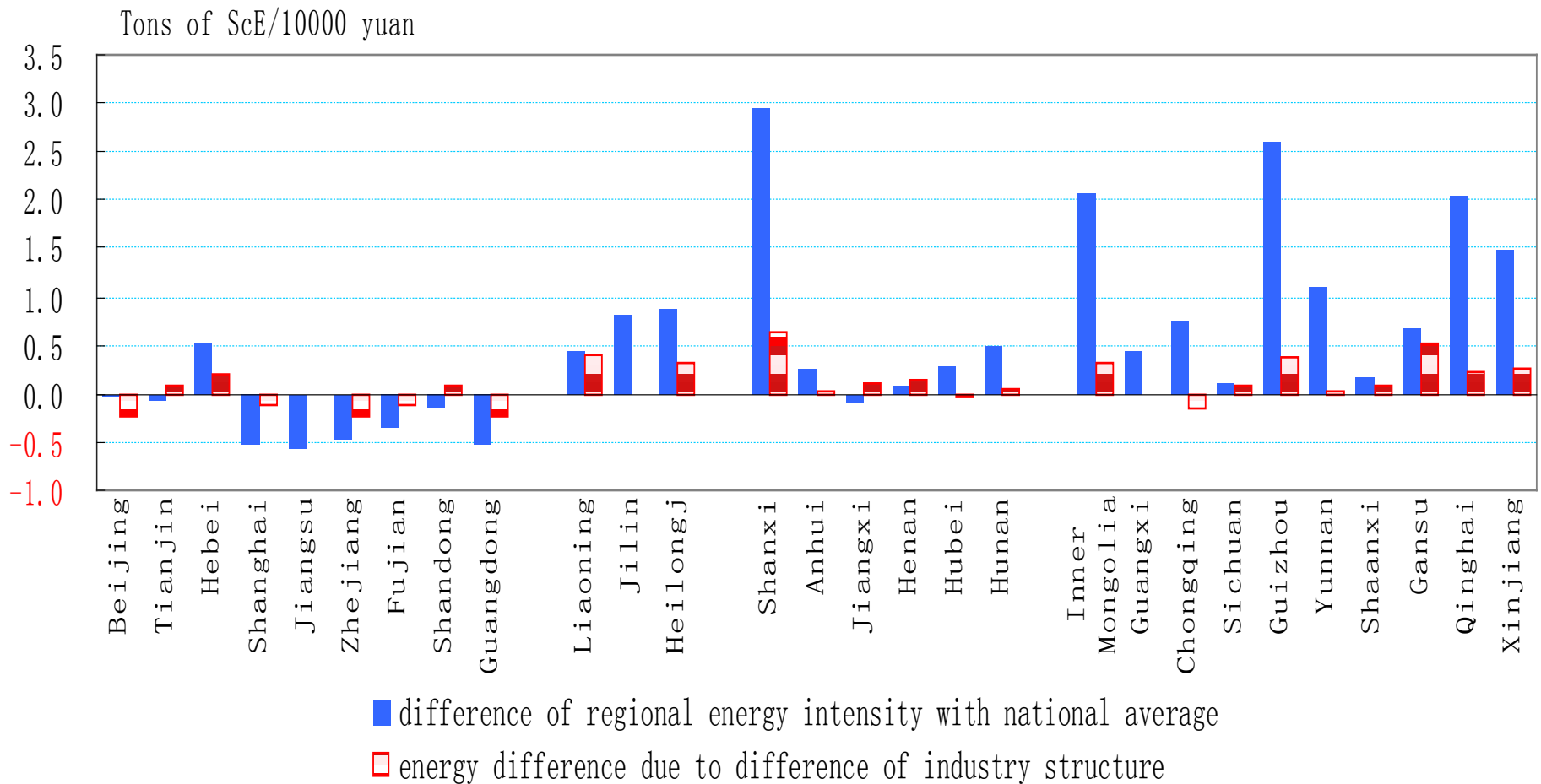
Decomposing Results for Regional Energy Intensities in 2006 (the gross output of various sectors)

tons of SCE/10000 YUAN

■ difference of regional energy intensity with national average
▦ Energy difference due to difference of industry structure

From the decomposing results, we can come up with the following conclusions:

- First, for most regions, the differences in sectoral energy intensities are the main factor to determine the energy intensity differences

- Second, industrial structures have important impacts on regional energy intensity differences

- Third, Regions with high energy intensities have different main impacting factors

- Fourth, different regions have different potentials and difficulties for energy conservation

The regions with relatively high energy intensities can be divided into three types

- The first type referred to the regions where the differences between their energy intensities and the national average level were mainly caused by industrial structures. The contribution of their industrial structures to their energy intensity differences was higher than 50%. They were mainly the four provinces of **Hebei, Liaoning, Jiangxi and Sichuan**, whose high energy intensities were mainly caused by their industrial structures. Their sectoral energy intensities were not very high and therefore they have greater difficulties in energy conservation

The regions with relatively high energy intensities can be divided into three types

- The second type referred to the regions where both industrial structures and sectoral energy intensities had important impacts. The contribution of their industrial structures to their energy intensity differences ranged between 25%~50%. They were mainly **Hainan, Shanxi, Anhui, Henan, Hubei and Chongqing**
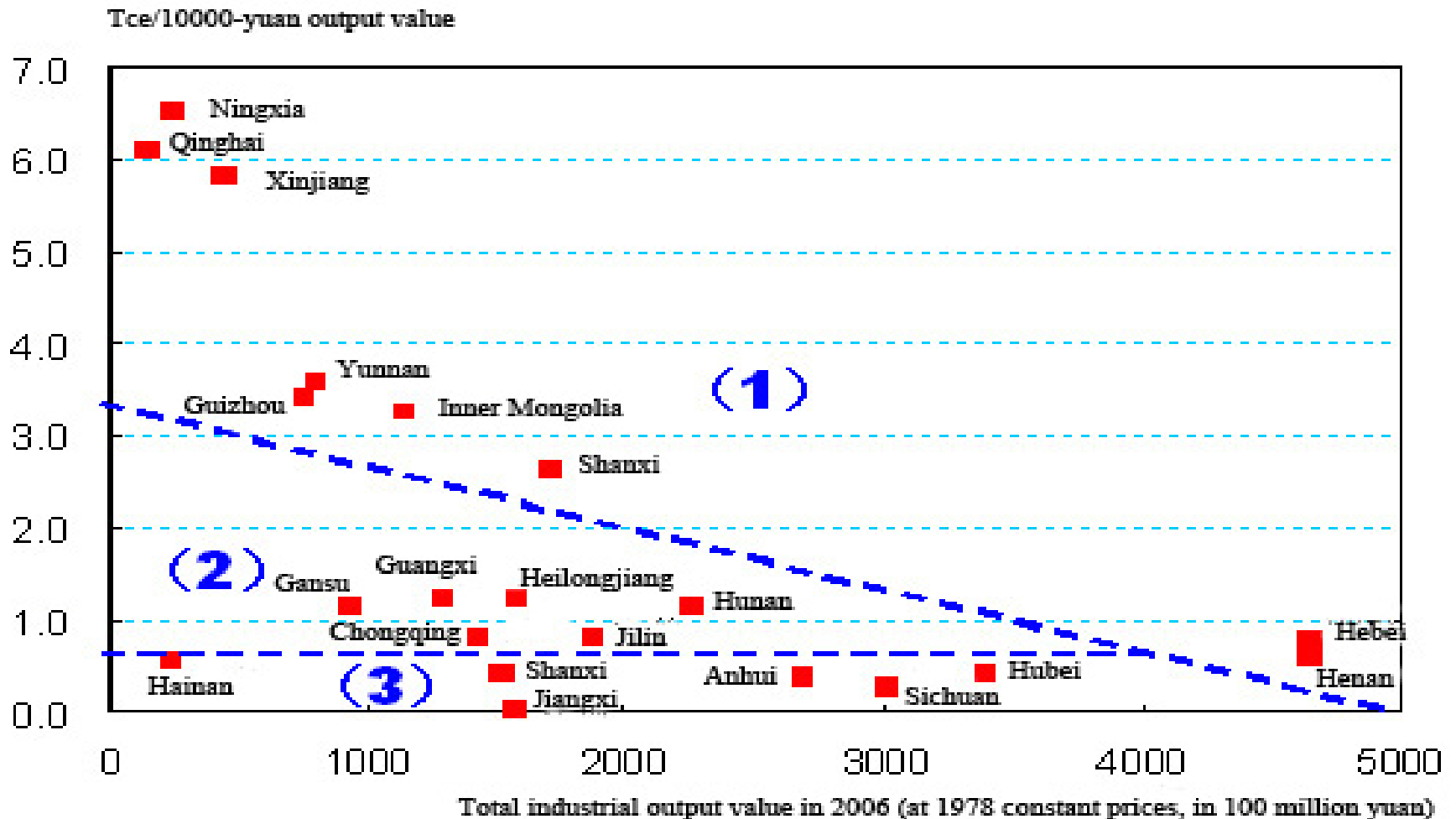
The regions with relatively high energy intensities can be divided into three types

- The third type referred to the regions where sectoral energy intensities had the main impacts on their energy intensity differences. The contribution of their industrial structures to their energy intensity differences was lower than 25%. They were mainly **Jilin, Heilongjiang, Hunan, Inner Mongolia, Guangxi, Guizhou, Yunnan, Qinghai, Ningxia and Xinjiang**. The relatively high energy intensities in these regions were mainly due to the relatively low efficiency of energy utilization and therefore, they had greater room for energy conservation

Regional Energy Intensity Differences, Compared with National Average Level, Arising from Different sectoral Energy Intensities

Tce/10000-yuan output value

Total industrial output value in 2006 (at 1978 constant prices, in 100 million yuan)

Regional Energy Intensity Differences, Compared with National Average Level, Arising from Different sectoral Energy Intensities

- (1) The regions with great potentials for energy conservation. They included the regions with lowest energy utilization efficiencies but small economic scales, such as Ningxia, Qinghai and Xinjiang. They also included the regions with relatively high energy intensities and relatively large economic scales, namely Guizhou, Yunnan, Inner Mongolia and Shanxi. Besides, the provinces of Henan and Hebei also had greater potentials for energy conservation although the differences between their segmental energy efficiencies and the national average level were relatively small but their economic scales were markedly larger than other regions.

- (2) The regions with relatively great potentials for energy conservation. They included Gansu, Guangxi, Heilongjiang, Chongqing, Jilin and Hunan. These six provinces and regions were known for fairly low energy efficiencies, but their economic scales were not so small and therefore had certain potentials for energy conservation.

- (3) The regions with greater difficulties in energy conservation. They included Hainan, Shaanxi, Jiangxi, Anhui, Sichuan and Hubei. These regions had energy utilization efficiencies slightly higher than the national average level, and therefore had greater difficulties in energy conservation

Conclusions and Policy Options

- **Improving technological levels and energy utilization efficiencies is most important for reducing energy intensities**

- **Optimizing intra-industrial structures and developing service industries are also very important for reducing energy intensities**

- **As different regions have markedly different energy intensities and energy efficiencies, they should take regional differences into account when they set their targets for energy conservation and emission reduction so as to cut their energy-saving costs as much as possible**

Thank you very much !