

**Rapid Industrialisation and Market for  
Energy and Minerals:  
China in East Asian Context**

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**The ACESA Conference on Emerging China: Internal  
Challenges and Global Implications  
Victoria University, 13-14 July 2006**

**Natural resources and economic  
growth**

- Adequate supplies of natural resources have always been preconditions for economic growth
- The requirements for energy and metallic mineral resources have been associated with the modern economic growth that began in parts of the North Atlantic in the 18th century and has made its main home in East Asia in the late 20th and early 21st century

## Natural resources and economic well-being

- The idea that scarce natural resources can (and eventually will) constrain the growth of population and economic well-being has been analysed and debated for centuries
- Historically, economists and political philosophers have taken positions of both pessimism and optimism about man's ability to overcome the constraints imposed by finite stocks of resources

## Economists' view

- Economists, unlike other social scientists and general policy, do not fear that the world economic growth will grind to a halt because the world 'runs out' of potential for expanding production of energy, metals or other natural resource-based products

## The economics of the mineral resource industries (1)

- The natural resources that are used in the production of the energy and metals that are essential to economic development are not scarce in any absolute sense.
- All of the industrial metals are abundant in nature, to an extent that is unlikely to be challenged by human demands for the foreseeable future at any conceivable rate of global economic growth

## The economics of the mineral resource industries (2)

- While it is possible that the growth of human demand might test the limits of some particular sources of energy-notably petroleum, especially in liquid form-the total potential supply of natural energy sources that are available for utilisation by humans exceeds any conceivable requirements

## The economics of the mineral resource industries (3)

- The main value of Hotelling's (JPE 1931) contribution was the observation that resource scarcity would be signalled by rising prices
- Higher prices will induce expansion of output and substitution in supply and demand for scarce resources, as well as some modification of the rate and pattern of economic expansion.

## Key issues

- What is the experience of growth in resources demand and the associated pressure on global markets from Japan, Taiwan and Korea during their periods of sustained and rapid growth
- What are the main factors which are likely to moderate the increasing resource intensities in the Chinese economy and thus ease the pressure on world supply of resources in the long run?
- What are the strategies that China is likely to adopt in addressing its supply deficiency?

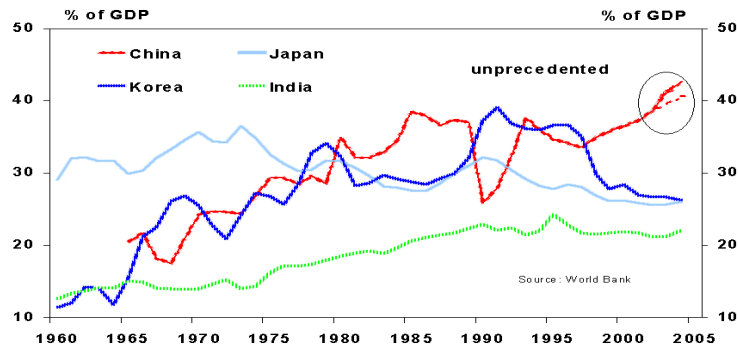
## China's industrialisation and demand for resources

- Rapid growth and industrialisation in China has led to the shift to a more energy-intensive and resource-intensive output basket and production technology
- The growth prospects ensure that China will continue to be a large consumer of imported resources including energy and minerals

## Contributing factors to growth

- The main factors behind strong growth are strong investment growth funded by exceptionally high rates of domestic savings, the continuing supply of relatively low cost and efficient labour supplies, the growth and role of the private sector including FDI, and large-scale public and private investment in overcoming infrastructural bottlenecks (urbanisation, construction, etc)

Figure 14 Long run investment shares of GDP:  
China, Japan, Korea and India



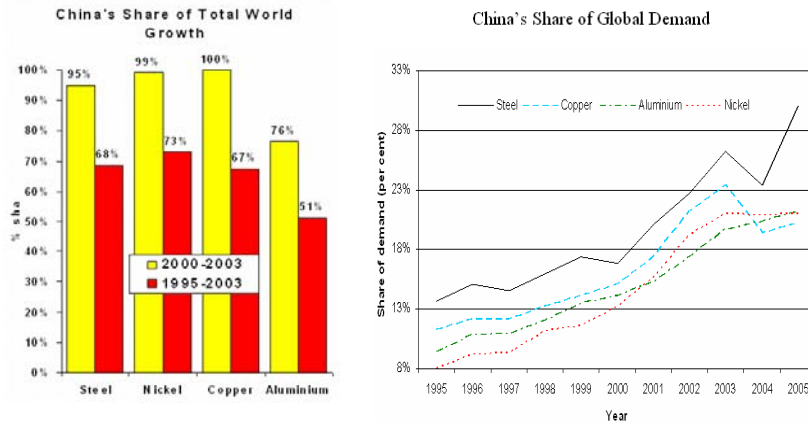
Note: the dotted line for China is calculated with the adjusted national account data, and the solid line is calculated with the pre-2005 national account data.

Source: Calculated using the data from Garnaut and Huang (2005) and the World Bank.

## China's increasing dependence on imported resources

- China's dependency ratio of oil is about 45 per cent as compared with 100 per cent dependency ratios for Japan, Germany and Korea. China's net oil imports account for about 6 per cent of the world total imports
- By 2010, China's dependency ratios of oil will reach 57 per cent, iron ore 57 per cent, copper 70 per cent and lead 80 per cent

**Figure 6 China's shares of major demand of key metals: 1995-2005**

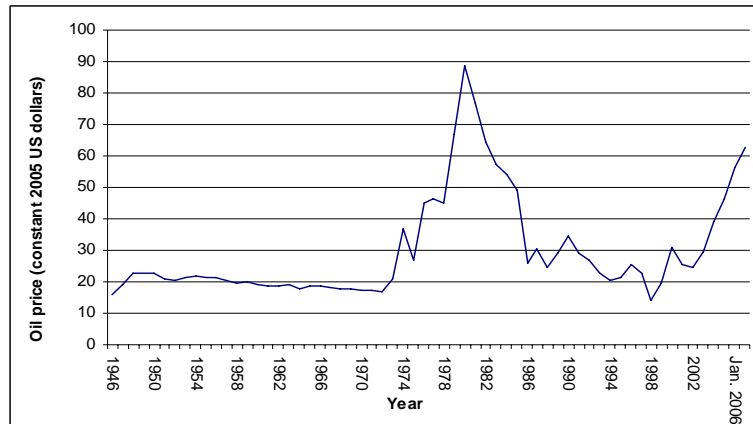


Source: data for 2004 and 2005 are collected from websites of Chinese Mining and Resource ([www.ChinaMR.net](http://www.ChinaMR.net)).

## Resource prices and Northeast Asian demand

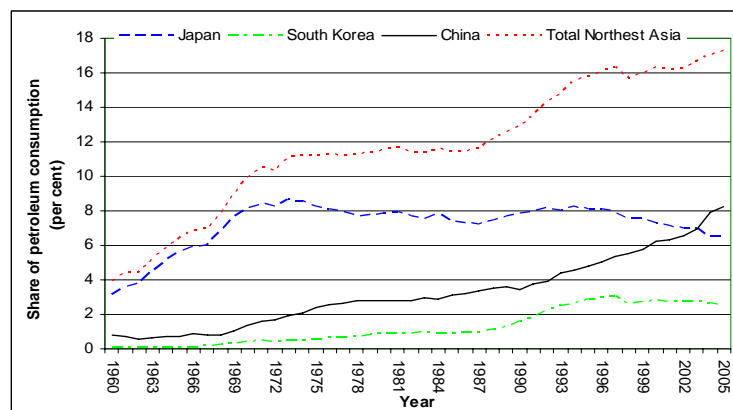
- The extraordinarily rapid economic growth in Northeast Asian over the past half century—first in Japan, then in the newly industrialising economies with Korea the largest, followed by China, has added significantly to growth in global demand for energy and metallic minerals. The Northeast Asian economies now loom large enough in global demand for unanticipated fluctuations in the growth in their demand to affect global prices

Figure 2 Crude oil prices adjusted for inflation:  
1946-February 2006



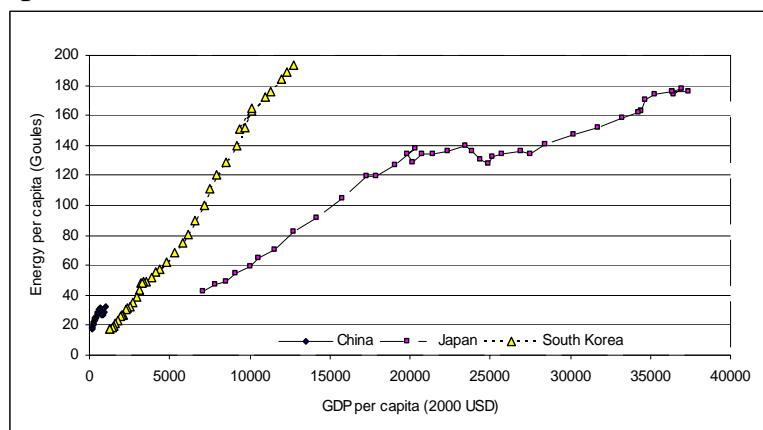
Source: Authors' calculation using the data from US Department of Energy.

Figure 3 Shares of petroleum consumption in the world: Japan, South Korea, China and total Northeast Asia: 1960-2005



Source: Authors' calculation using the data from US Department of Energy.

Figure 7 Total energy consumption intensity: China, Japan and South Korea



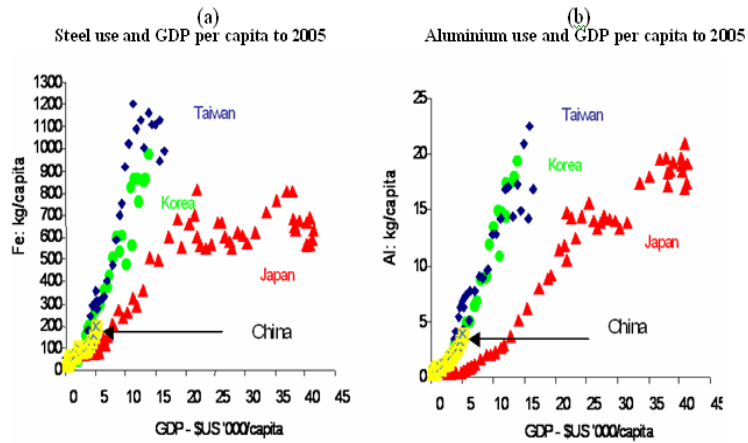
Note: the data for China coming from pre-2005 national account.  
Source: authors' own calculation

Table 1 International comparison of energy consumption per capita: 2003 (toe)

Year	Coal	Petroleum	Natural gas	Hydro- and other power	Total
United States	1.95	3.11	1.93	0.83	7.82
France	0.21	1.57	0.66	1.91	4.34
Germany	1.06	1.52	0.93	0.52	4.03
Japan	0.88	1.95	0.54	0.59	3.95
United Kingdom	0.66	1.29	1.45	0.36	3.76
China	0.61	0.21	0.02	0.06	0.90
World average	0.41	0.58	0.37	0.19	1.55

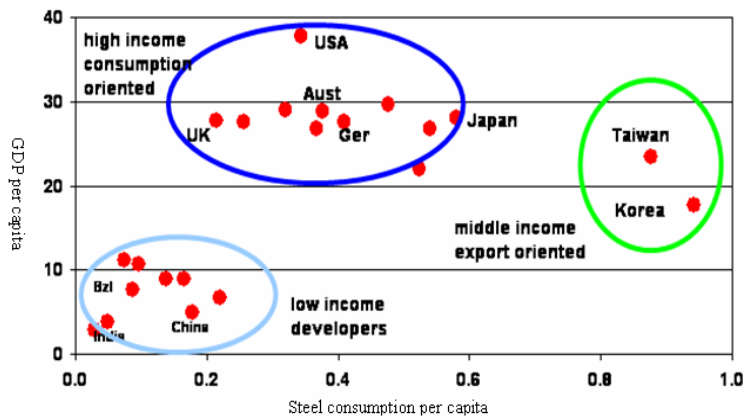
Source: China Energy Research Institute.

Figure 8 Metals demand and economic growth in Northeast Asia



Source: Macquarie Research Metals and Mining and authors' calculation using pre-2005 China national account data

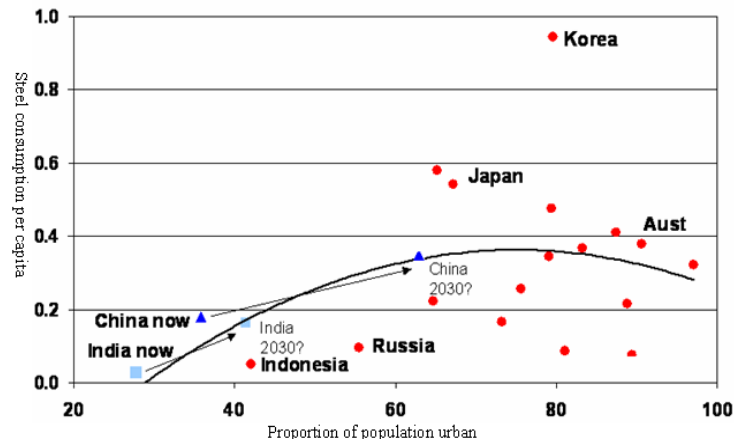
Figure 9 Steel consumption and level of development



Note: the calculation is made with the data from China pre-2005 national account.

Source: Westpac.

Figure 11 Steel consumption and urbanisation

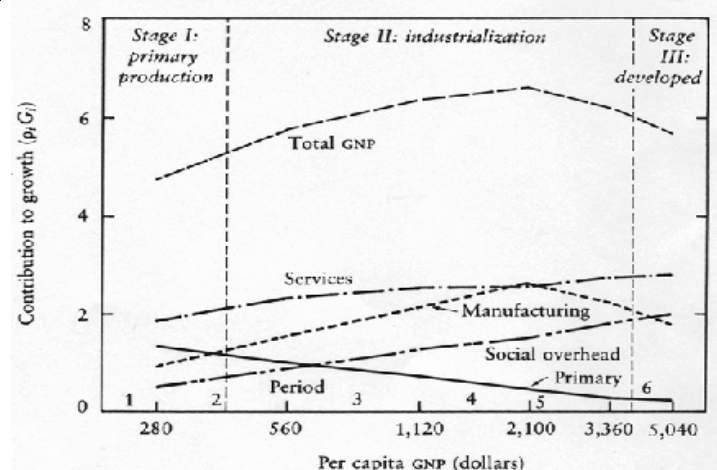


Note: the data for China coming from pre-2005 national account.  
Source: Westpac.

## Main factors for easing pressure on supply

- Structural changes with rising services sector and falling industrial sectors
- Application of resource-saving technology
- Under-pricing of natural resources

## Sectoral sources of growth



**Table 2 China: shares of resource sectors in total investments, exports, and outputs (per cent)**

Sector	Investment		Export		Total Output	
	1997	2000	1997	2000	1997	2000
Coal and Petroleum	2.09	5.58	1.51	1.92	1.91	3.35
Metal Product	11.29	13.56	6.94	7.81	6.25	6.28

Source: Calculated using the Input-Output Tables of China: 1997 and 2001

## Resource-saving technical change

- The extent to which energy and resources are used will be moderated by the improvement in technology (new mode of growth), which leads to more efficient use of energy and resources

## China's efficiencies in using energy and resource

- In 2005, China produced about 5 per cent of the world GDP, but consumed 8.26 per cent of world oil, 34.4 per cent of coal, 21 per cent of aluminium, 30 per cent of steel and 51.4 per cent of cement.

## Underpricing of natural resources

- When natural resource inputs are priced below social cost, both the overall level and the composition of consumption can be affected in ways that lead to excessive natural resource use.
- The IEA (1999) shows that full-cost pricing would reduce energy consumption in India, China and Russia by 7, 9 and 16 per cent, respectively

## China's strategies

- Structural adjustment
- Domestic supplies and reserve system
- Energy conservation and recycling
- Industrial mergers and concentration
- Technological improvement
- Environmental regulation and enforcement
- FDI in resource sectors
- China's go-out strategy (FX reserves and RMB revaluation)