

China's coal exports

Implications for Asia Pacific trade

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China's coal exports have increased nearly threefold in the past three years and China is now the world's second largest coal exporter after Australia. This has had widespread implications for international coal markets, particularly in the Asia Pacific region. This rapid export growth has been underpinned by significant changes in China's domestic coal consumption, production and distribution sectors and expansions in coal rail and port capacity. Government support for coal production and exports in some parts of the industry may also have contributed to China's coal export competitiveness.

The objective in this paper is to examine the key factors behind China's recent coal export growth, to assess the likely outlook for coal exports, and to explore the implications of this outlook for Asia Pacific coal trade. The analysis is undertaken using the coal module of ABARE's global trade and environment model, GTEM.

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Introduction

In the past three years China's coal exports have risen nearly threefold and China is now the world's second largest coal exporter after Australia. The emergence of China as a major coal exporter has had widespread implications for international coal markets, particularly in the Asia Pacific region. China has gained a significant share of key Asian markets at the expense of traditional coal exporters, including Australia, Indonesia and South Africa.

Underpinning China's rapid export growth have been significant changes in China's domestic coal consumption, production and distribution, including reforms in the coal mining sector and in coal using industries, as well as expansions in coal rail and port capacity. There are also indications that some Chinese state owned coal producers and exporters have received government support or assistance. These developments raise a number of questions about the driving forces behind China's emergence as a major coal exporter and whether the present level of exports is sustainable in the long term.

These issues are addressed in this paper, first by analysing recent developments in China's coal industry and broader economy. Of key interest are the circumstances that led China to develop export capacity and quickly penetrate steaming coal markets in north east Asia. Second, the sustainability of China's coal export levels and the role that government policies, including production supports, may play in expanding exports are examined.

The paper is based on findings from a study by ABARE for the Australian Department of Industry, Tourism and Resources that will be released in late 2002.

Recent developments in China's coal and coal using industries

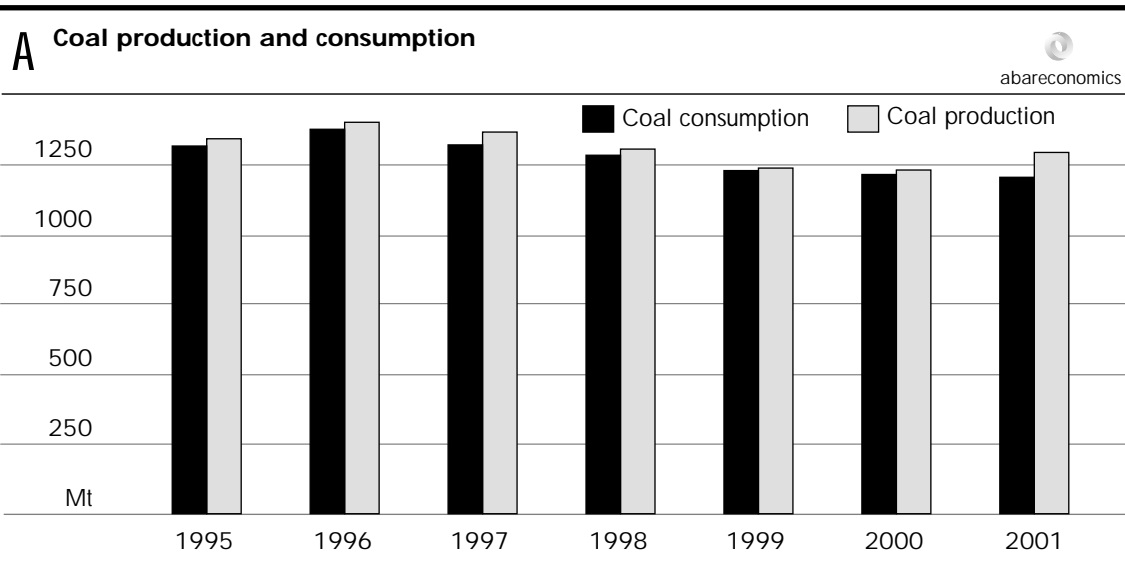
Coal consumption

China is the world's second largest consumer of energy and a major energy producer. An overriding feature of China's energy system is the dominance of coal in both energy consumption and production. Coal accounts for more than two-thirds of China's total primary energy consumption, and more than three-quarters of electricity generation is coal fired.

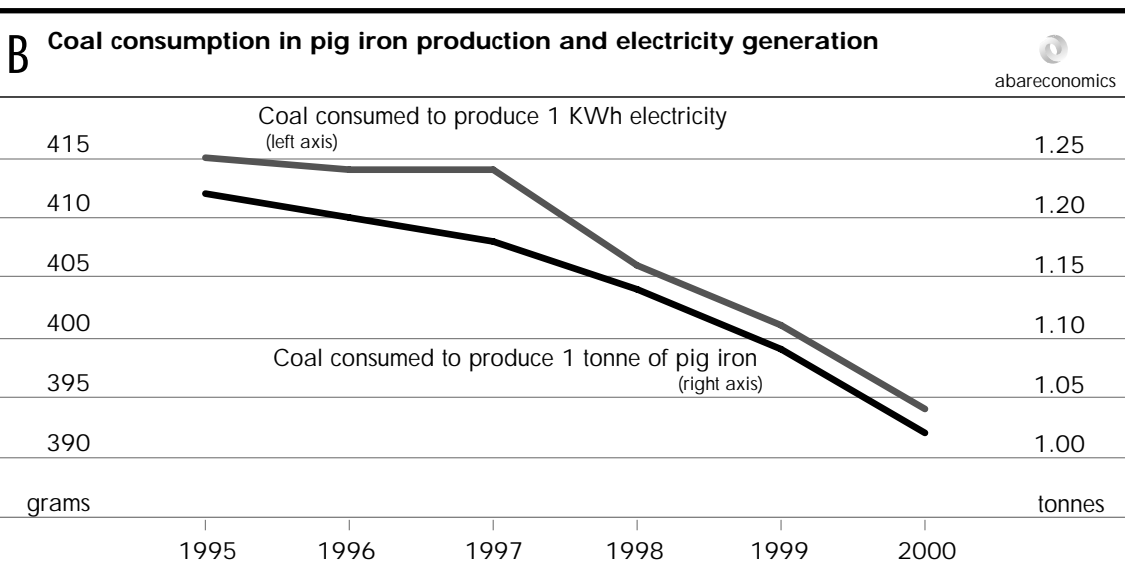
Growth in energy consumption in China has moderated significantly in recent years, primarily as a result of reduced coal consumption. Coal consumption in China fell by almost 12 per cent between 1996 and 2000 (figure A), from a peak of 1377 million tonnes in 1996, to 1215 million tonnes in 2000 (IEA 2002a). Consumption of other fuels, including oil and natural gas, remained steady or grew over the same period.

The relatively sudden and large fall in coal consumption is the result of several factors. A key driver has been the economywide government reforms that have led to significant improvements in the efficiency of China's economy. Reforms have included the closure of some large and inefficient state owned enterprises, as well as the closure of small, less efficient plants in the coal, electricity, petrochemical, iron and steel, and construction sectors under the 'closing the five smalls' policy (SETC 2001). These reforms have resulted in notable efficiency improvements in major coal using industries.

In China's iron and steel sector, for example, the consumption of coal per tonne of pig iron production has declined by 16 per cent since 1996 (figure B). Coal consumption per



Note: 2001 figures are estimates only. Source: IEA (2002a).



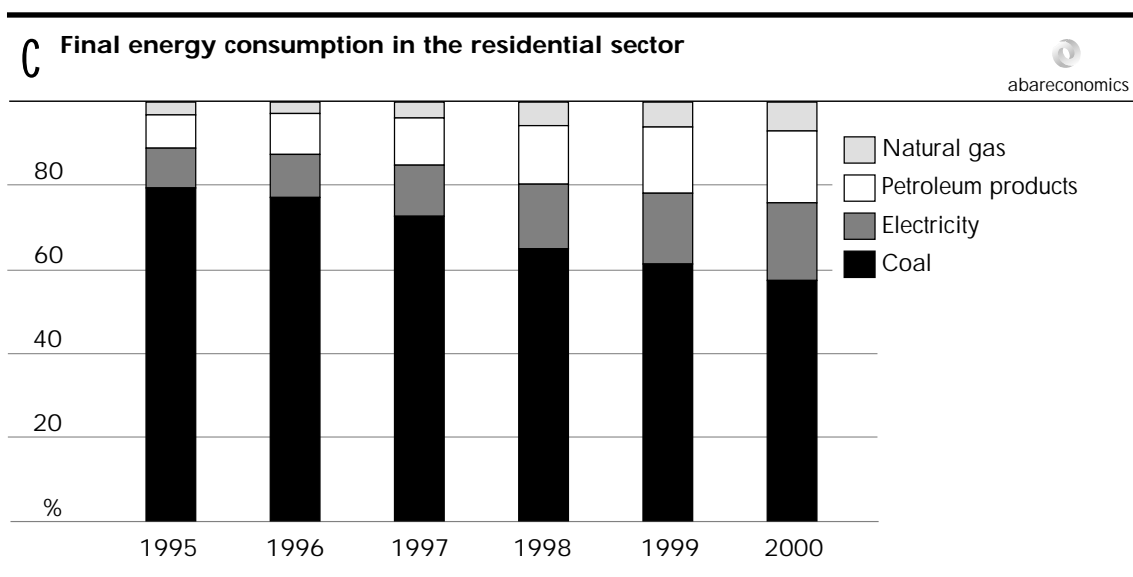
Sources: China Electric Power Publishing House (2001); IEA (2001a, 2002c).

unit of electricity generation has also fallen over this period, from 410 grams per kilowatt hour in 1996 to 396 grams in 2000 for state owned electricity plants.

The supply of higher quality coal, with a lower ash content and higher calorific value, has also been an important factor in reducing coal consumption. In addition to improvements in the quality of coal that is mined, an increase in the volume of coal that is washed has also improved coal quality. Around 25 per cent of China's coal production was washed in 2000, compared with 15 per cent in 1996 (CCIPH 2001). It is estimated that the use of higher quality coal reduced coal consumption by state owned electricity generators, for example, by over 70 million tonnes between 1996 and 1999 (Sinton and Fridley 2000).

Other factors that have contributed to the reduction in coal consumption include structural changes in China's economy, principally a shift in growth toward the lower energy intensive services sector, and some fuel switching by industry from coal into other fuels such as oil and natural gas. The share of coal in the final energy mix of China's chemical and petrochemical sector, for example, fell from 51 per cent in 1996 to 33 per cent in 2000. For the industrial sector as a whole, the share of coal fell from 71 per cent to 58 per cent over the same period (IEA 2002b).

In addition, the increasing use of electricity and natural gas at the expense of coal in the residential sector, as China's population becomes more urbanised, as well as environmental policies aimed at improving air quality have resulted in lower coal consumption in recent years. The share of coal in residential energy consumption fell from 77 per cent in 1996 to 57 per cent in 2000, while the share of electricity increased from 10 per cent to 19 per cent, and that of natural gas from 3 per cent to 7 per cent over the same period (figure C).



Source: IEA (2002b).

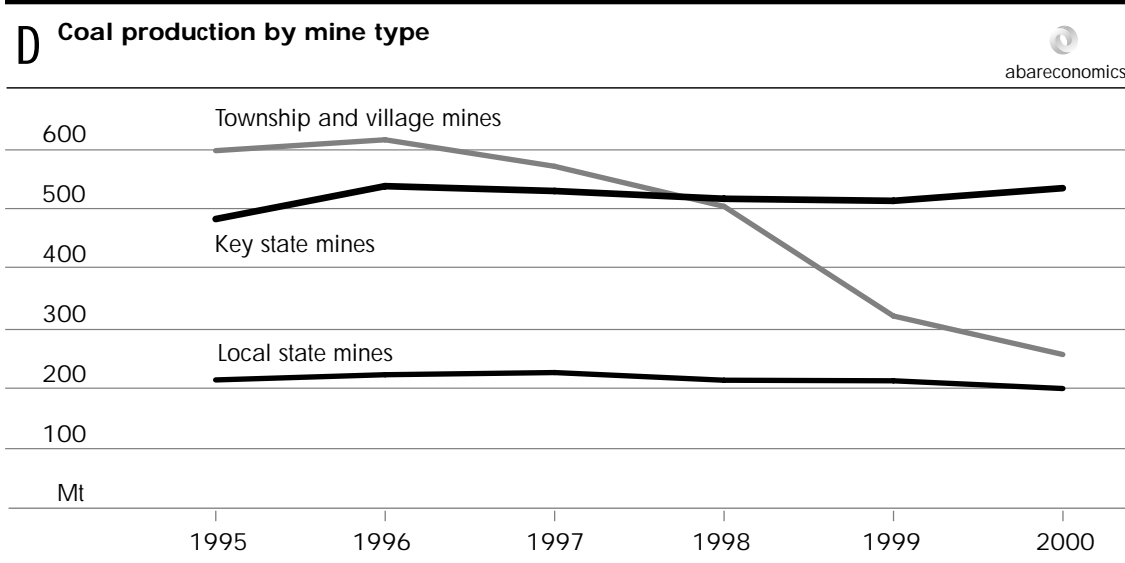
Economic growth and hence output growth in key coal using industries also moderated over the 1990s, particularly in the second half of the decade, leading to lower growth in coal consumption. From almost 10 per cent in 1996, China's official GDP growth rate slowed to 7 per cent in 1999 (NBS 2001). The growth in coal consumption usually generated by economic growth has been outweighed in recent years by the factors described above.

Coal production

Coal production in China has also fallen in recent years, at a similar rate to coal consumption. Raw coal production peaked at 1402 million tonnes in 1996 but steadily contracted (by around 12 per cent in total) to 1231 million tonnes in 2000 (figure A). In 2001, this trend reversed, and coal production increased to an estimated 1294 million tonnes (IEA 2002a).

The fall in production has not been evenly spread across all coal mine types in China. Almost all the decline in production has been from small township and village enterprise mines, as a result of the 'closing the five smalls' policy referred to above. It has been reported that between 50 000 and 80 000 small coal mines have been closed since the introduction of this policy (Coal Week International 2002; CIEC 2002). State owned mines have been largely protected from this policy directive and their production levels remained steady in the late 1990s (figure D). [Note: The production statistics used in figure D are official Chinese statistics. The official total production statistics are lower than the IEA statistics used in figure A.]

While some state mines were closed or merged over this period, others implemented significant growth in mechanisation and productivity that offset the falls in production that may



Source: Huang and Hu (2001).

otherwise have occurred. For example, output per worker per shift increased by 33 per cent in state owned mines between 1996 and 2000 (CCIPH 2001).

A further reason why China's key state owned mines maintained production levels over this period of declining domestic demand was the range of explicit and implicit supports for production that they received. These supports include preferential access to capital, low interest loans, and taxation and interest cost relief. While there is some uncertainty about their magnitude, the value of direct and indirect support to state coal producers identified in this study was around US\$1.7 billion in 2001, or around US\$1.30 for every tonne of coal produced in China (table 1). These supports largely shielded state producers from the increasingly market responsive coal consumers in China's economy, and provided incentives to maintain supply at levels that exceeded domestic demand. The supports have also enabled Chinese coal exporters to lower the price at which they are able to supply coal to the international market.

Even with significant falls in production in the late 1990s, China has had a marked oversupply of coal. The coal stockpile was estimated to be around 200 million tonnes in 1998, and was still around 140 million tonnes by the end of 2000 (Wang 2000; Huang and Hu 2001). This oversupply reduced domestic coal prices and severely affected the financial situation of state owned mines (Wright 2000). In 1998, over 80 per cent of key state owned coal enterprises were reported to have recorded a 'severe economic loss', with losses amounting to 2.28 billion yuan (US\$275.4 million) (Huang and Hu 2001). However, recent indications are that state owned mines are recording improvements in financial performance, with the proportion of mines running at a loss falling substantially in 2001-02 (CIEC 2002; Xie 2002).

Table 1: **Estimated government supports to state owned coal enterprises, 2001**

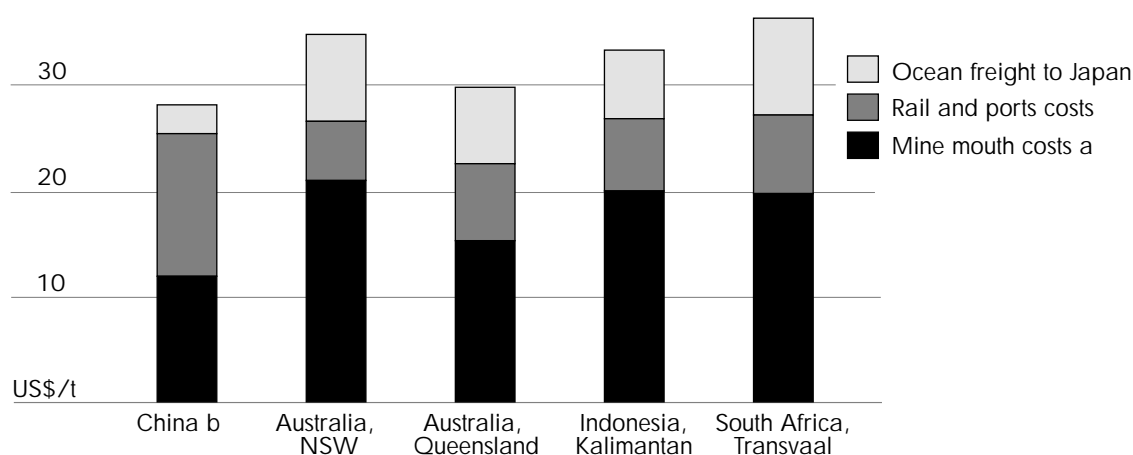
	billion yuan	US\$ billion
Exemption of loans	5.00	0.60
Debt-to-equity swap for interest cost relief	4.00	0.48
State treasury bonds and loans for equipment and technology upgrade	1.36	0.16
Welfare payments	3.46	0.42
Total support	13.82	1.68

Infrastructure development

China's rail and port infrastructure has expanded significantly in recent years, benefiting from increased government spending and foreign direct investment. Improvements have included an expanded, more efficient and reliable rail network, and greater port capacity. For example, the proportion of the rail network in China that is double tracked increased from 24 per cent to more than 36 per cent between 1990 and 2000, while the proportion of electrified track increased from 13 per cent to 25 per cent (NBS 2001). These developments have reduced congestion and delays in coal transport and have increased coal transport flexibility.

E Indicative export costs for steaming coal exporters to Japan, 2000

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a Mine mouth costs include mine operating costs and coal beneficiation costs. **b** China's costs of production are operating only and do not include beneficiation costs, and are an average for four major China coal exporters. China data were not available from IEA (2001b) and have been compiled from various sources.

Note: Cost data are representative of the median cost for surface mines in specific regions.

Sources: IEA (2001b); Herbert, T., Glencore – Beijing, personal communication, December 2001; Yanzhou Coal Mining Company undated; Mélanie et al. (2002).

A major development in this context has been the construction of the rail network to link the Shenhua Shendong coalfield with the recently completed Huanghua port facility. Once fully operational, this development will increase China's rail capacity by 100 million tonnes a year and expand coal port capacity to over 300 million tonnes a year (Shenhua Group Corporation 2000).

China's transport infrastructure is important because coal reserves are largely situated in the north and north west whereas the major markets and ports are adjacent to the coast. Reflecting this, the average coal haulage distance in 2000 was 555 kilometres (NBS 2001). Given the long distances involved in rail haulage, transport costs are important elements in determining China's export competitiveness. For example, transporting coal 555 kilometres by rail is estimated to cost around US\$10.24 a tonne for domestic use. For export coal, the railway construction tax component is waived as an export incentive, which brings the cost down to around US\$7.77 a tonne.

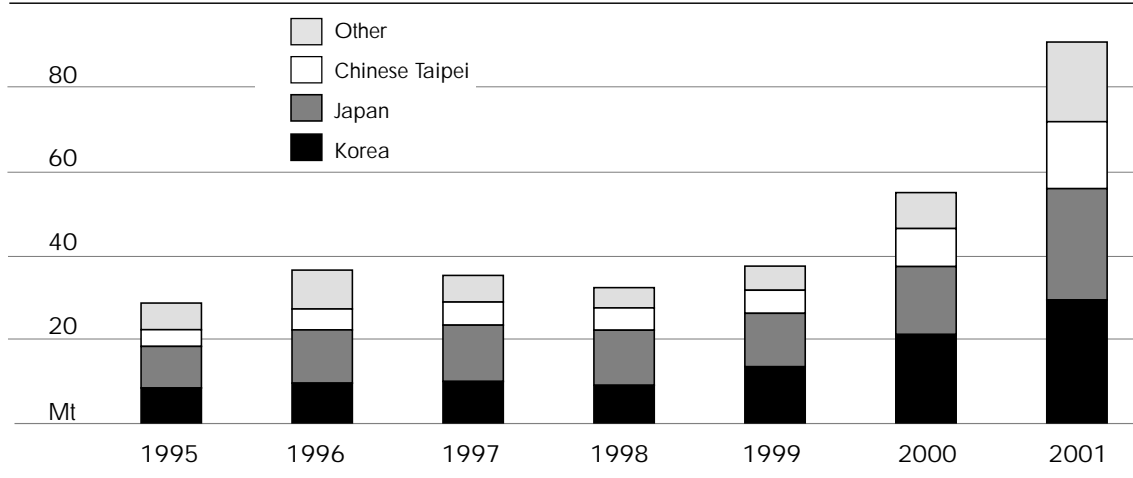
Despite lowering port fees in recent years, China's rail and port costs are still generally higher than in other coal exporting countries, particularly Australia. However, China does have an ocean freight advantage to Asian markets over most other coal exporters (figure E).

Emerging coal exports

China's coal exports increased from 32 million tonnes in 1998, to 55 million tonnes in 2000, and to over 90 million tonnes in 2001, mostly to Korea, Japan and Chinese Taipei

F China's coal exports

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Sources: IEA (2002a); Tex report (2002).

(figure F). Although this increase can be attributed to a number of factors, the most likely driver was China's growing domestic coal stockpile. Export markets effectively created a safety valve for domestic stockpiles and reduced the pressure on coal producers to adjust production in times of slowing domestic consumption. Exporting surplus production was also a means for state owned mines to earn foreign revenue and address their deteriorating financial situations.

Additional factors underpinning China's capacity to expand exports were the improvements to rail and port capacity discussed above, and the development of state owned enterprises such as the Shenhua Group Corporation that specifically focused on the production, distribution and marketing of coal to international markets. The Chinese government also introduced a number of export supports in 1999, such as lower port fees and the exemption of export coal from certain taxes, which were aimed at improving the cost competitiveness of China's coal exporters.

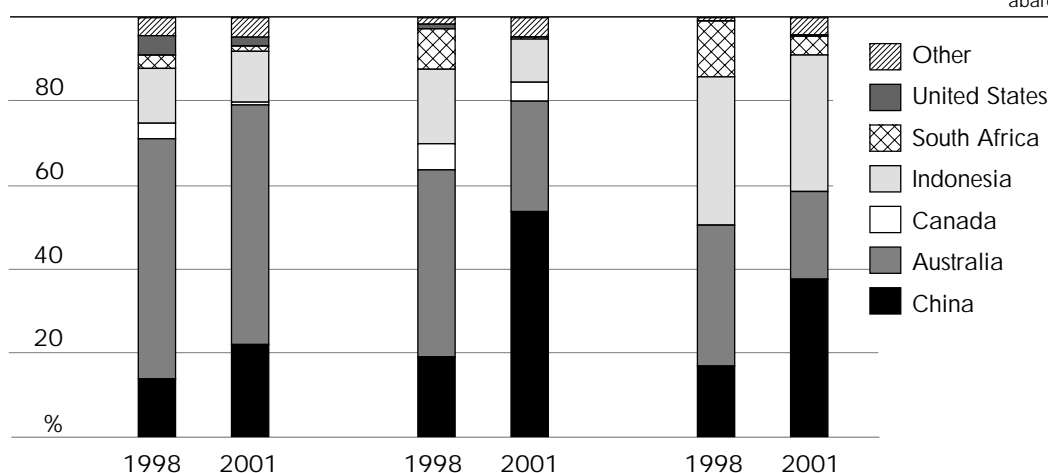
China's penetration into north east Asian markets has been assisted by its cost competitiveness. For example, the cost of Chinese coal delivered to Japan compares favorably with other exporters, including Australia and South Africa (figure E). It has also been reported that some countries, including Japan, have assisted China's coal export expansion through the provision of investment loans for infrastructure development (Urandaline Investments 2001).

Impacts on competing coal exporters

The export expansion by China has led to a loss of market share by most competing coal exporters in the key Asian steaming coal markets of Japan, Korea and Chinese Taipei. In

G Import shares in Asian steaming coal markets

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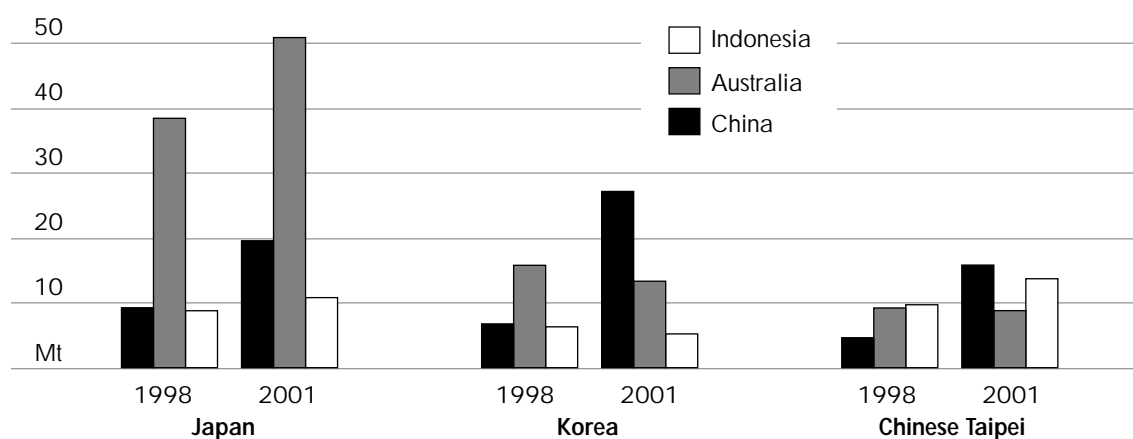
Sources: IEA (2002a); Tex report (2002).

1998, China's share of Japan's steaming coal imports was 14 per cent and grew to 22 per cent in 2001 (figure G). In contrast, Australia maintained its share of the Japanese import market at 57 per cent over the same period, while Indonesia's share fell from 13 per cent to 12 per cent, and South Africa's fell from 3 per cent to 1 per cent. Export volumes of steaming coal to Japan from most key exporters still grew over this period, with Australia maintaining its position as the chief exporter to Japan (figure H).

In the Korean market, the emergence of China has been stronger. China's share of Korea's steaming coal imports grew from 19 per cent in 1998 to 54 per cent in 2001, overtaking Australia as the main source of coal imports. This expansion affected all other key exporters in the region. Australia's share of the Korean market fell from 45 per cent to 26 per cent

H Export volumes to Asian steaming coal markets

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Sources: IEA (2002a); Tex report (2002).

over the same period; Indonesia's from 18 per cent to 10 per cent; and South Africa's from 10 per cent to under 1 per cent. Steaming coal export volumes from these countries to Korea also fell over this period, while in contrast, the volume of China's steaming coal exports to Korea more than tripled.

China also expanded its share of the Chinese Taipei steaming coal market, from 17 per cent in 1998 to 38 per cent in 2001, again mainly at the expense of Australia and South Africa. The volume of steaming coal exports from Australia to Chinese Taipei also fell; however, export volumes from Indonesia increased over the same period. China also overtook Indonesia and Australia as the largest source of steaming coal imports into Chinese Taipei.

Are China's coal exports sustainable?

The issue of whether China's coal exports can be sustained in the long term is complex, but important to China and to other coal exporting countries in the region. A key factor is the role that government producer supports and other government policies play in maintaining China's export competitiveness and export volumes.

Three scenarios have been developed to examine a range of issues around this topic. The reference case or 'business as usual' scenario represents a likely outlook for China's coal industry and world coal markets to 2015, in the absence of any significant policy changes. It assumes that over this period China maintains around its current share of the international coal market. The reference case provides a benchmark against which to compare the results of policy scenarios.

The second scenario assumes that China initiates policies to reduce government support to the coal industry. In this scenario, US\$1.2 billion of identifiable government supports to China's coal producers are gradually removed over the period to 2015. This figure excludes government payments to state owned enterprises for welfare provisions such as employee pensions that were included in the earlier estimate of US\$1.7 billion, as these payments are not unique to the coal sector.

The third scenario is a speculative one that assumes that China continues to expand coal exports rapidly, up to a level of either 120 million tonnes or 150 million tonnes by 2005. Given the importance of government policy in driving China's coal exports, it is difficult to forecast export levels in the future with any certainty. However, the latter level of exports represents the full utilisation of China's expected coal export port capacity by 2005. The expansion to 120 million tonnes represents the midpoint between current export levels and the assumed upper limit of 150 million tonnes. The scenario is not intended to forecast actual outcomes in China's coal market but rather to demonstrate the potential implications if China's export growth continues at a rapid rate.

Results for the two policy scenarios are reported as deviations from the reference case.

Analytical framework

The impacts of these scenarios on Chinese and world coal markets are examined using GTEM-Coal, a specific module of ABARE's global trade and environment model (GTEM). GTEM is a multiregion, multisector, dynamic general equilibrium model of the world economy. These features make GTEM an effective tool for analysing energy markets where interactions between sectors and between economies are significant.

GTEM-Coal builds on this capacity and incorporates additional features that enhance ABARE's capacity to analyse international coal markets. These include:

- a comprehensive treatment of different types of coal — brown thermal coal, black thermal coal and coking coal;
- identification of the world's key coal supply and demand regions;
- a detailed representation of technological change and interfuel substitution possibilities in the industries that are primary users of coal, namely electricity generation and iron and steel; and
- the capacity to analyse important policy issues that are likely to determine the future direction of the coal market.

A more detailed description of the characteristics of GTEM and GTEM-Coal and the underlying model framework can be found in Mélanie et al. (2002) and Brown et al. (1999). A full specification of the model is available on ABARE's web site (www.abareconomics.com).

Reference case

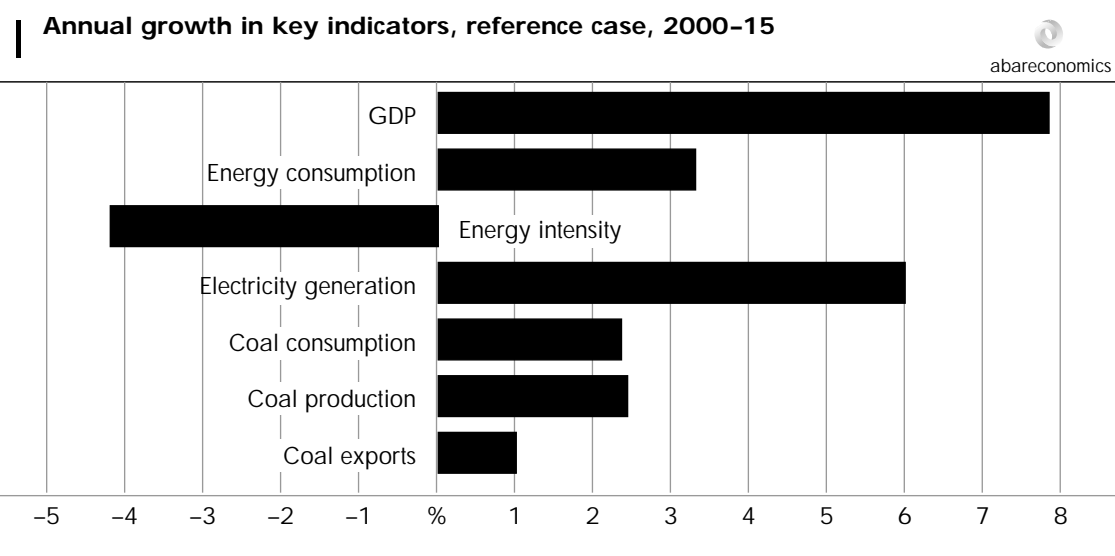
In the reference case scenario, China's energy consumption is projected to expand by 3.3 per cent a year, underpinned by a sustained high level of economic growth (figure I). The share of coal in China's primary energy mix is projected to continue to fall, from 70 per cent in 2000 to around 64 per cent by 2015. However, domestic coal consumption is projected to grow strongly by 2.3 per cent a year, indicating that strong growth in the economy is

Table 2: Coal industry outlook, reference case

	2000	2005	2015
	Mt	Mt	Mt
Consumption	1 215	1 342	1 678
Steaming coal	1 095	1 190	1 487
Coking coal	120	139	191
Production	1 231	1 406	1 764
Steaming coal	1 107	1 255	1 560
Coking coal	124	151	204
Exports	90 ^a	91	104
Steaming coal	79	80	91
Coking coal	11	12	13

^a 2001 data.

Note: Totals may not add due to rounding errors.



Note: Growth in coal exports is for 2001–2015.

expected to outweigh efficiency gains and other demand dampening factors discussed earlier.

Coal production is also projected to grow strongly, by 2.4 per cent a year, to 1764 million tonnes in 2015 (table 2). Approximately 88 per cent of production is projected to be steaming coal.

China is projected to remain the world’s second largest exporter of coal, with exports growing at 1.0 per cent a year, to reach around 104 million tonnes by 2015, 91 million tonnes of which is steaming coal. The majority of China’s coal exports continue to satisfy demand in key Asian markets.

Removal of China’s coal production supports

When government supports to coal producers are removed, there are consequences throughout China’s coal and coal using sectors. These arise principally because the domestic price of coal rises by 7.1 per cent relative to the reference case in 2015, as the coal industry is required to pass on an increased proportion of production costs to consumers (table 3). As a result, coal consumption is projected to fall by 5.7 per cent relative to the reference case, as coal using industries, including electricity generators, use energy more efficiently or switch into other fuels such as oil and natural gas.

Table 3: **Impact of removing coal industry supports, 2015**

Deviation from the reference case

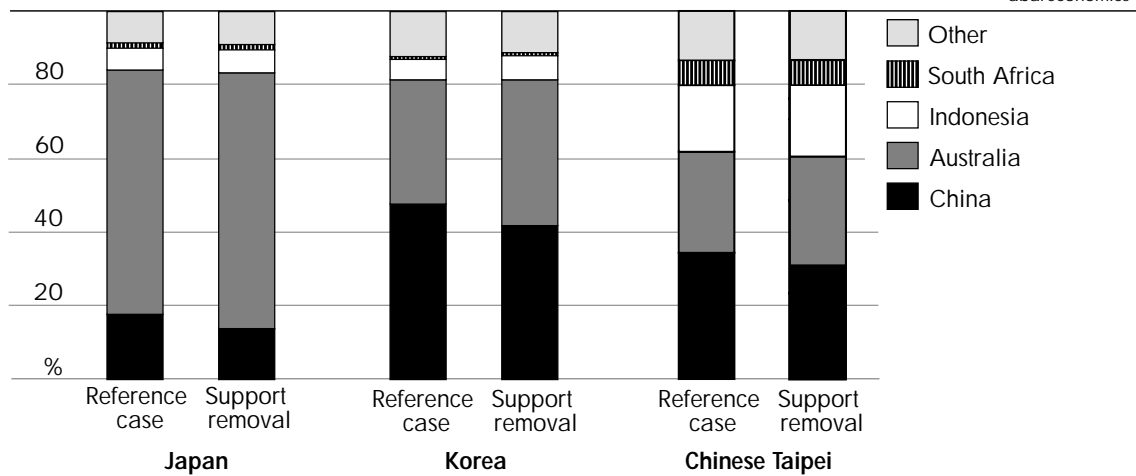
	%
Electricity generation	-0.3
Coal price	7.1
Coal consumption	-5.7
Coal production	-6.8
Coal exports	-20.5

Demand for goods that use coal intensively in production, particularly electricity generation and alumina refining, is also projected to decline relative to the reference case, as their input cost structures also rise. In response, coal production is projected to fall by 6.8 per cent relative to the reference case in 2015.

The reduction in the cost competitiveness of China's coal production is projected to result in total coal exports falling by 20.5 per cent relative to the reference case in 2015, or to around 83 million tonnes. The decline in China's coal exports favors the expansion of exports from competitive suppliers such as Australia and Indonesia. Australia's steaming coal exports are projected to rise by 5.7 per cent relative to the reference case in 2015, to around 142 million tonnes, while Indonesia's steaming coal exports rise by 5.4 per cent relative to the reference case.

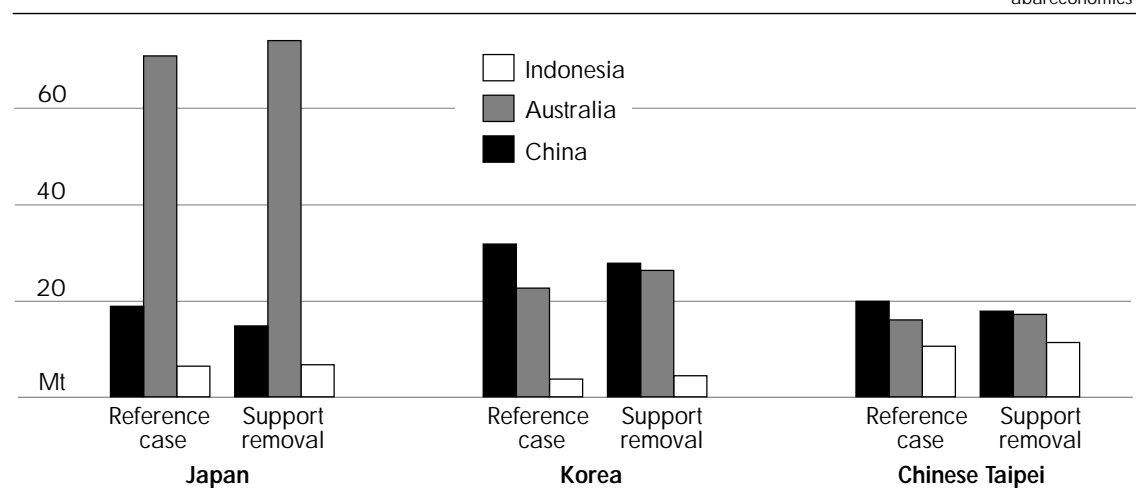
J Import shares in Asian steaming coal markets, 2015

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K Export volumes to Asian steaming coal markets, 2015

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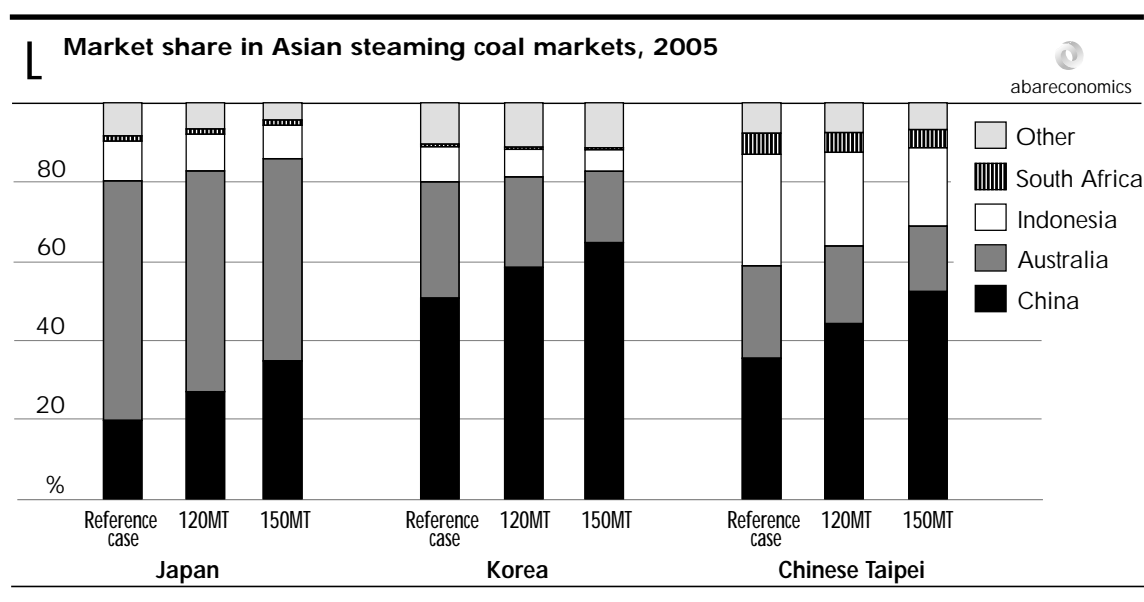
The effects of this policy change can be seen in the key steaming coal markets of Japan, Korea and Chinese Taipei. China's market share is projected to decline in each of these markets relative to the reference case in 2015, as are China's export volumes (figures J and K).

Continued expansion in China's coal exports

In this scenario, China's coal exports are assumed to expand to either 120 million tonnes or 150 million tonnes by 2005. The rise to 120 million tonnes results in a fall in China's coal export price of 8.7 per cent in 2005 relative to the reference case for steaming coal, leading to greater demand for China's exports relative to those of other coal exporters. Higher quantities of Chinese coal in the global market pushes down global coal prices relative to the reference case, leading to a rise in global coal consumption of 0.3 per cent compared with reference case levels.

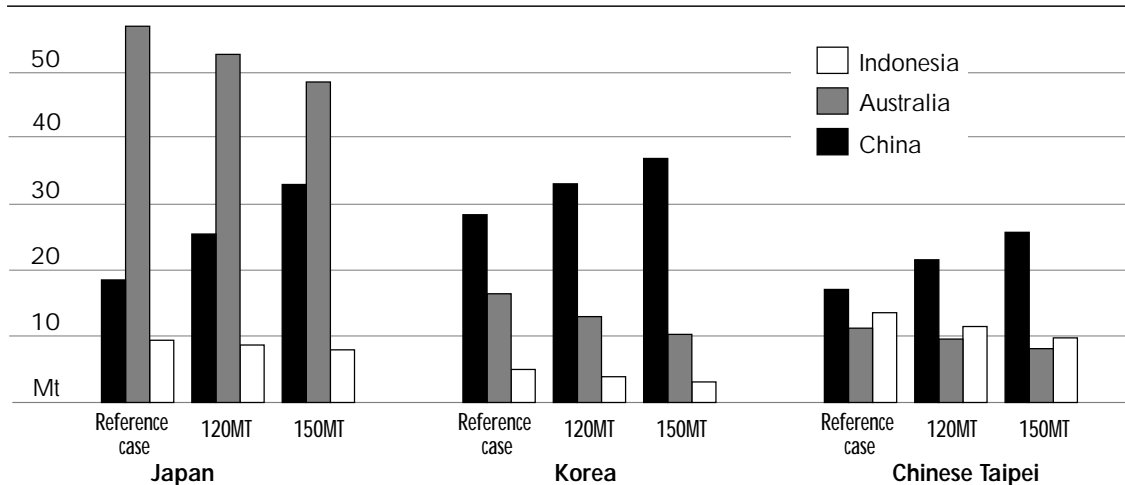
The rapid expansion of exports from China to 120 million tonnes and 150 million tonnes significantly increases China's market share in the key Asian steaming coal markets of Japan, Korea and Chinese Taipei (figure L). Most of the export expansion by China is at the expense of Australia and Indonesia, which both experience declines in market shares and export volumes compared with reference case levels (figure M).

When China's exports expand to 120 million tonnes, total Australian exports of steaming coal are projected to be 8.9 per cent lower than the reference case in 2005, or around 91 million tonnes. Indonesian steaming coal exports are also projected to decline by 8.9 per cent relative to the reference case in this scenario, while South African steaming coal exports are projected to decline by 0.6 per cent. When China's exports expand to 150 million tonnes, the effects on competing exporters are of a greater magnitude.



M Export volumes to Asian steaming coal markets, 2005

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Conclusions

Changes to China’s economy, government policy, domestic coal demand and supply, and infrastructure have all provided a base for China to increase coal exports rapidly in recent years, to become a major coal exporter with the ability to influence world coal markets. Given the importance of policy factors in driving export volumes, it is difficult to forecast the future with any certainty. However, many commentators agree that such conditions and domestic coal surpluses are likely to continue to prevail in the short to medium term, enabling Chinese coal producers to continue to export at around current levels.

In the longer term, the extent to which this occurs will depend on the rate of growth of China’s economy, which is likely to drive strong domestic coal demand; the expected continuing energy efficiency growth in coal using industries in China, which will exert downward pressure on domestic coal demand; and the ability of China’s coal industry to respond to these domestic trends.

A key issue on China’s export sustainability in the future is that while China is a competitive coal exporter into Asia, producer supports have played a role in enhancing this competitiveness. When supports are removed, China’s coal output and exports are projected to decline relative to a reference case in which there is no policy change. The removal of supports provides opportunities for other competitive coal exporters into Asia. However, if China’s exports continued to expand to the extent of capacity, it would be at the expense of the same competing exporters to Asian markets.

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