

**Resources and Security: the Asia Pacific in the Early
Twenty First Century**

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Introduction

We have seen in the early twenty first century the replaying of an old story of rapid growth in part of the world generating strong demand and high prices for resources, leading to anxiety about resource security in rapidly growing, resource-poor countries. We have seen a replay of expressions of concern that insecurity of resources supply might lead to strategic intervention. That concern is embodied in the title of this session.

Resource insecurity was a big issue in the age of Imperialism. It was important in the troubles of the 1930s that led to the intrusion of the Second World War into this region. Energy security has been invoked as one motive for oil importing countries' military intervention in the Middle East over the past century.

Imperialism was a costly path to resource security. No-one argues that Japanese military intervention in the Asia Pacific was a cost-effective means to resource security. Military intervention in the Middle East has been horrifically costly and has not been obviously stabilising to the global cost of energy.

A different approach to resource security, based on market exchange, has been dominant since the Second World War. The postwar industrialization of Japan, later followed by one after another Asia Pacific economies, was accompanied by unprecedented growth in demand for energy and metals. Metals prices in the 1960s and early 1970s rose to unusually high levels, with oil and other fossil energy following from the early 1970s.

New commercial mechanisms were developed to expand supply capacity onto global markets. These included the long-term contract around iron ore and coal supplies from the early 1960s and project financing commencing with the Bougainville Copper project in Papua New Guinea in the late 1960s. New types of ships radically reduced the costs of transport over long distances and greatly expanded the geographic range over which imports could be drawn.

Intervention by the governments of some exporting countries from time to time during the Japan resources boom raised doubts about the reliability of international markets. Importing countries' governments sometimes provided finance on concessional terms and other assistance to encourage new suppliers, with a view to enhancing resource security and to lower prices. However, these interventions were at the margins. The experience of the emergence of Japan and the first echelon of newly industrialised economies generally confirmed the viability of relying on markets for resource security.

Market exchange as a vehicle for meeting rapidly expanding demand for resources was given its most severe test in the first decade of the twenty first century.

During this decade, the global economy experienced the largest and longest resources boom in the history of modern economic development. From the beginning of the century until 2011, with a pause for a year or so after the Great Crash of 2008, global demand for most energy and metals commodities rose exceptionally. Supply from new investment lagged behind demand, so that prices rose to the highest ever in real terms. Analysts in some countries began to

wonder about resource constraints on modern economic growth. Anxieties about security of resources supply rose in the major importing countries, and inevitably gave rise to discussion of the possibility of political conflict over access to resources. Governments of major importing countries promoted investments abroad by their national companies to ease resource constraints. Commentators in some exporting countries began to wonder whether the extraordinary demand for resources gave them increased leverage in resources markets—and sometimes in international affairs more generally.

As in other, less virulent historical episodes of strong demand for resources, the high prices themselves set in motion structural shifts in the global economy that eventually lowered prices and eased anxiety about security of supply. As in earlier episodes, new sources of supply were brought into international trade, and commercial and policy innovation led to the emergence of alternative products and patterns of development that reduced demand for commodities. Tendencies towards excess demand and high prices gave way to an overhang of supply capacity, low prices and adjustment problems in the resource exporting countries.

In mid-2015 global markets are well along the path to moving supply and demand back into balance at prices within their historical ranges. Market responses have again proven their value in securing resource security.

The China Resources Boom

The twenty first century global resources boom was a China boom. In the first eleven years of this century, the world's most populous country experienced economic growth that was faster over a comparably long period and more resource-intensive than the world had ever seen before. The effects on global commodities markets were greatest for energy and metals, which the Chinese pattern of development required in unprecedented intensity.

From 2003 until the Great Crash of 2008, exceptionally rapid Chinese expansion was accompanied by growth in demand outside China—in developed and developing countries alike. The rapid increase in Chinese and global demand for energy and metals was broken briefly by the Great Crash in 2008 extending into 2009. However, China's immense fiscal and monetary expansion in response to the financial crisis returned the world to strong growth in demand from late 2009. There was no comparable resumption of growth in economic activity and resources demand in the developed countries. From 2008, China accounted for virtually the whole of the increase in global demand for energy and metals (Garnaut 2012; 2014).

The story is remarkably similar across commodities that are important to industrial development: oil, coal, gas, iron and steel, nickel, copper and others. Here I will illustrate general tendencies with reference to the commodity that was most important in meeting Chinese energy requirements (coal), and the metal that was required most intensively for the Chinese pattern of growth (steel).

China began to follow a different model of economic growth which used resources much less intensively from about 2011. The changes in China had large international consequences. The changes were particularly important for trade in resource-based commodities.

The old model of economic development was built around high and rapidly increasing levels of investment, especially in industrial activity and urban infrastructure. It was supported by the movement of huge numbers of workers from the countryside to the towns and cities, allowing strong growth in urban employment with modest increases in real wages. With wages growing less rapidly than the value of output, the profit share of income rose continually, in turn supporting increases in savings. Much of the massive increase in savings was committed to investment, reinforcing the process of investment-led growth.

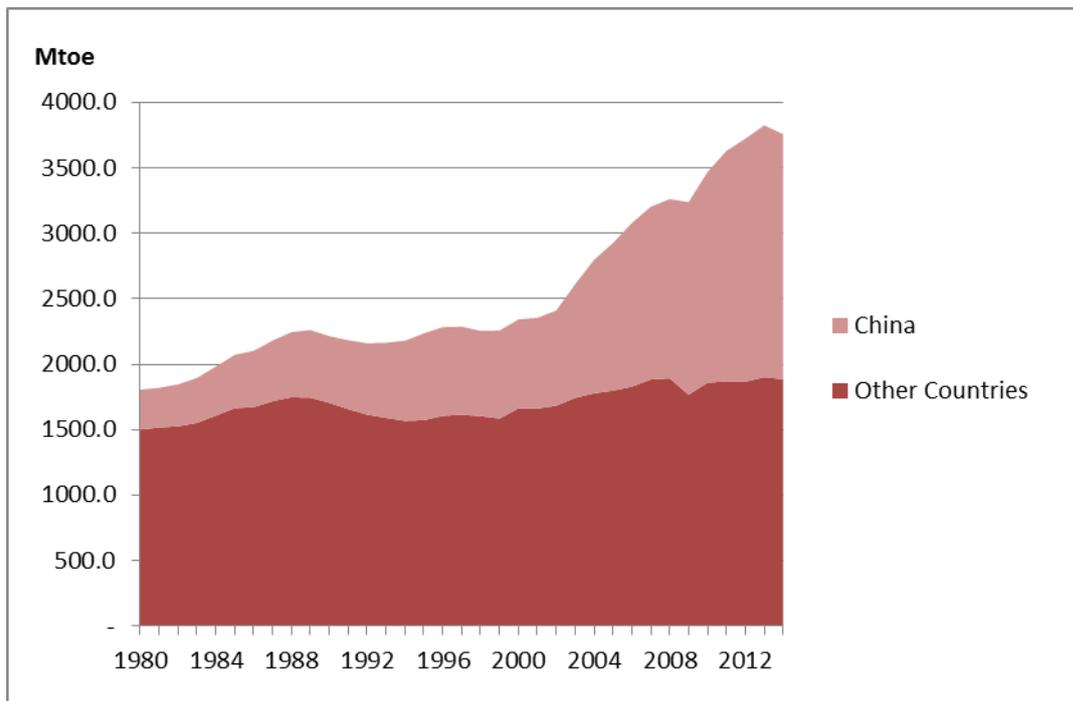
The high investment share of expenditure in the reform era was reinforced by the Chinese policy response to massive recessionary shocks from abroad. The first of these was the Asian financial crisis of 1997-9. The Chinese Government chose to maintain the exchange value of the renminbi against the United States dollar despite massive currency depreciation in all of its Western Pacific trading partners. To maintain a reasonable if diminished rate of growth in economic output, employment and incomes through a huge deceleration of export growth and fall in net exports, the authorities engaged in a large Keynesian monetary and fiscal expansion. The second shock was from the Great Crash of 2008. The immediate effects on China were even larger and potentially more destabilising than those of the Asian financial crisis. Again the response was to maintain a fixed exchange rate against the United States dollar despite large currency depreciation in other Western Pacific economies, with massive monetary and fiscal expansion to maintain growth in output and employment. Fiscal and monetary expansion were applied on a much larger scale in 2008-9 than during and after the Asian financial crisis.

The Keynesian expansions of 1998-9 and 2008-9 were implemented principally through expansion in the resources made available through state-connected entities—through local, Provincial and national governments as suppliers of infrastructure, and through state-owned enterprises which were disproportionately active in heavy industry—all drawing large amounts of finance from the state-owned banks.

The outcome was an intensification of the role of investment in the growth process. Investment is much more metals-intensive and energy-intensive than consumption, so development in the early twenty first century and especially after the Great Crash of 2008 further increased the extraordinary pressure that Chinese growth was placing on world energy and metals markets.

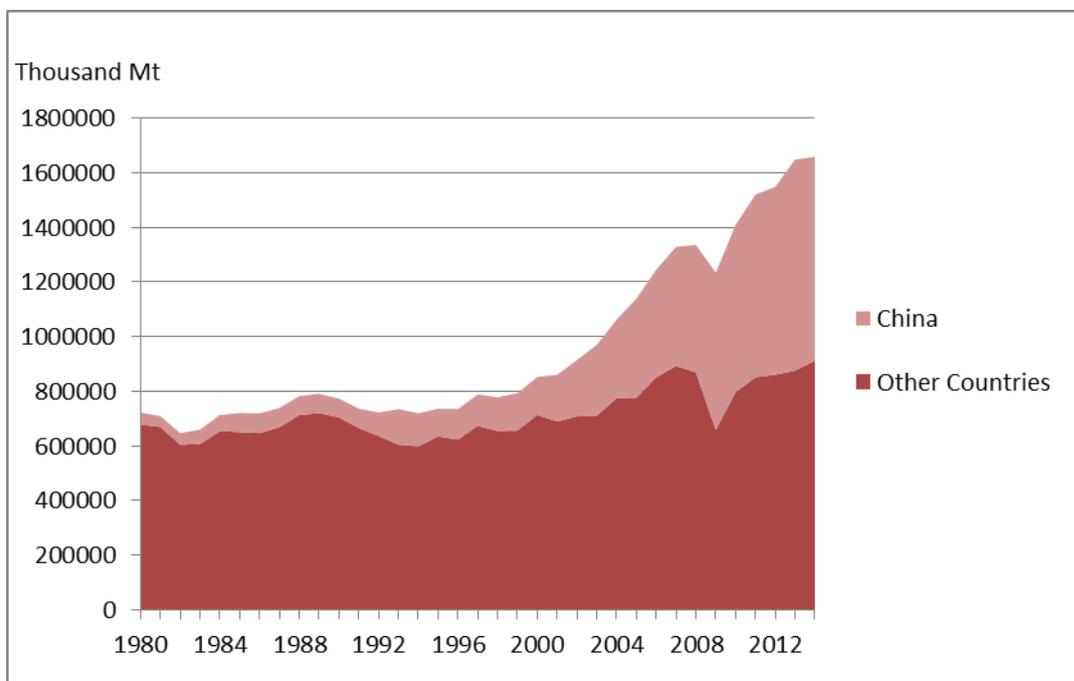
Figures 1 and 2 illustrate how China contributed most of the strong increase in global demand from the beginning of the new century to 2011 for the energy source (thermal coal, Figure 1) and metal (steel, Figure 2) that were most important in Chinese growth. The central role of China was especially pronounced after the Great Crash of 2008, when growth in demand for energy and metals accelerated in China and decelerated in the rest of the world.

Figure 1 Coal consumption of China compared to other countries



Source: BP statistical review online database <http://www.bp.com/en/global/corporate/about-bp/energy-economics/energy-charting-tool.html> and author's estimation.

Figure 2 Steel consumption of China compared to other countries



Source: World Steel Association <http://www.worldsteel.org/statistics/crude-steel-production.html> and author's estimation.

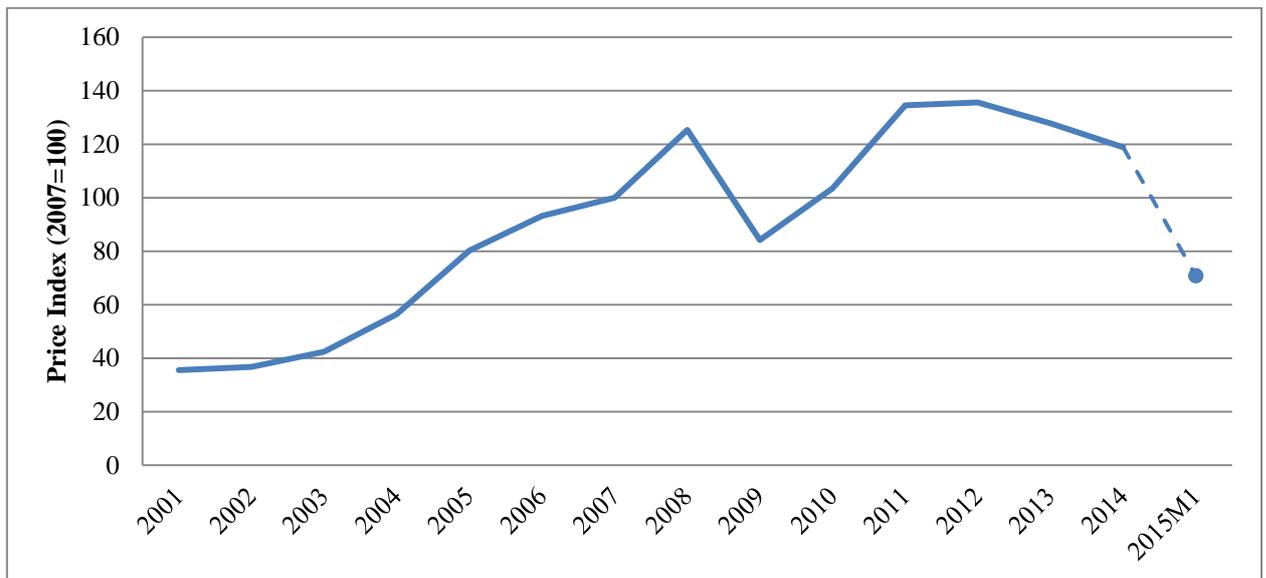
The increase in China's demand took suppliers of metals and energy by surprise. Investment in expanding mining capacity lagged a long way behind demand for all metals and major energy sources. Prices rose to or close to their highest levels ever in real terms (see Figures 3, 4 and 5 for thermal coal, oil and copper).

Figure 3 Thermal Coal Price Index (US\$/MT; 2007 prices, 2007=100)



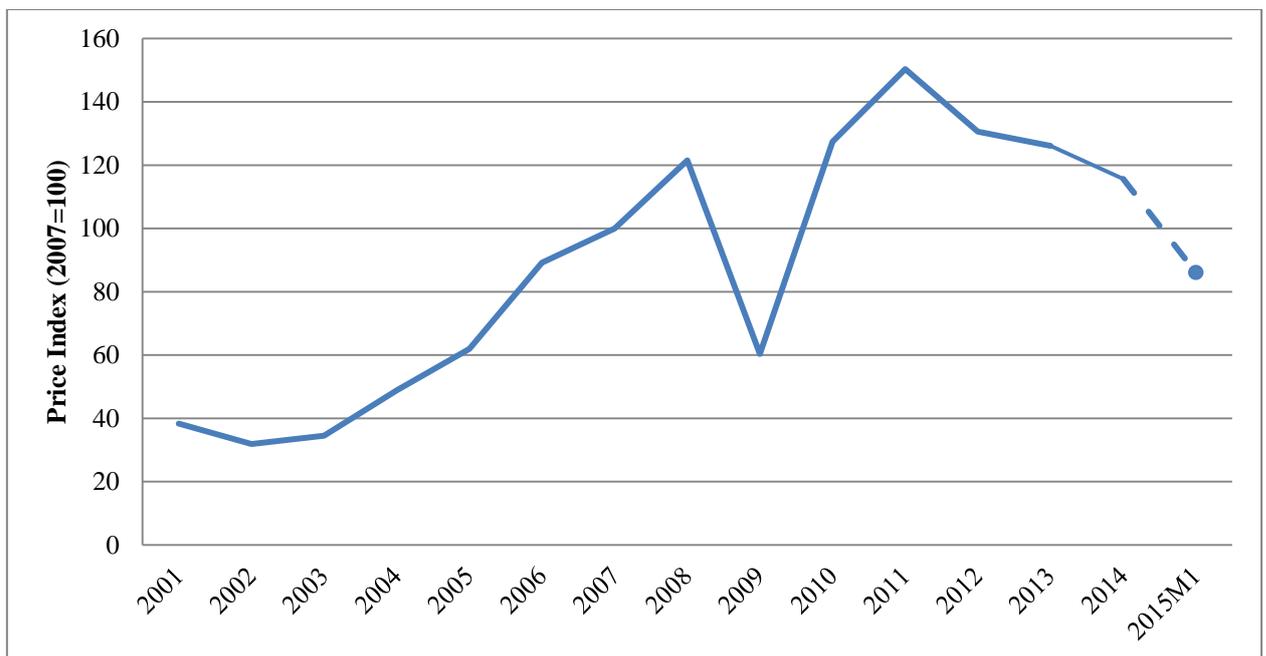
Note: FOB Newcastle/Port Kembla. Source: Index Mundi commodity prices <http://www.indexmundi.com/commodities/?commodity=coal-australian>. Reproduced from Garnaut 2015 forthcoming.

Figure 4 Crude Oil Price Index (US\$/Bbl; 2007 prices, 2007=100)



Source: Price data from World Bank & EIA; US Goods Deflator from IMF International Financial Statistics (2007\$).
Reproduced from Garnaut 2015 forthcoming.

Figure 5 Copper Price Index (US\$/MT; 2007 prices, 2007=100)



Source: Price data from London Metal Exchange via Datastream; US Goods Deflator from IMF International Financial Statistics (2007\$). Reproduced from Garnaut 2015 forthcoming.

The transition to the new model of economic growth is driven by two separate forces. One is straightforwardly economic: pressures that emerge naturally from successful economic development. The most important of these is growing scarcity of labour and rising wages since 2005 and especially since 2009. The other is changes in national objectives and policy, towards

more equitable distribution of income and less damaging impacts on the domestic and international natural environment. The changes in objectives and policy are themselves partly a response to rising incomes, which reduce the priority of higher material living standards relative to other dimensions of the quality of life.

These pressures from the labour market began to force profound change in the composition and rate of growth. Sooner or later, they were bound to be associated with a rise in the consumption and fall in the savings and investment shares of national income—and therefore reduction in the energy and metals intensity of economic growth.

The changes in objectives and policy emerged gradually, but had taken full shape by 2012. Implementation of policy took longer but now has considerable momentum.

The energy-intensive pattern of growth of the early twenty first century placed immense pressure on the global environment through growing greenhouse gas emissions. It was also important in the deterioration in domestic air and water quality to an extent that was seriously damaging to human health and life expectancy. Both global and local environmental costs were especially high because of the exceptionally large role of coal as an energy source in power generation and industry.

China contributed a majority of the global increase in greenhouse gas emissions through the first decade of the century. This attracted increasing disquiet within the Chinese scientific community, which had access to the Premier and other leading policy-makers. It also attracted critical comment from the Governments of developed countries as the international community geared up for stronger action to mitigate human-induced climate change in the lead up to and following the Copenhagen conference of the United Nations in December 2009. China made commitments on reductions in the emissions-intensity of economic activity to the international community at Cancun in 2010 that required a substantial change in the structure of economic growth.

Concern over local environmental effects has risen in a number of steps since the Great Crash of 2008. The focus on dangerously high concentrations of small carbon particulates in the air in cities of east and north China has intensified with scientific study of their effects on health and increasing attention in popular media (Chen et al 2013). This has been a major source of popular disquiet at least since early 2013 (Chai 2015). It has become a separate and powerful driver of policy to diminish the energy intensity of economic activity and the dominant position of coal in energy use.

Official policy continues to elevate the priority of reductions in energy intensity and the substitution of all of the low emissions alternatives for coal.

Effects on the Global Resource Sector so far

The end of the period in which China growth dominated world demand for energy and metals and lifted global commodities prices to unprecedented levels has been most emphatic for

commodities whose production or use has large negative effects on local and global environmental amenity.

The end of the era is illustrated in Figures 1 (coal) and 2 (steel). China accounted for most of the global increase in demand for coal and steel from early in the century and more than the whole from the Great Crash of 2008 until 2011. By 2011, China accounted for close to half of global use of each of these commodities. Chinese demand growth for both commodities decelerated sharply in 2012 and 2013 and became negative in 2014. This caused growth in global demand for both commodities to turn negative in 2014.

Many elements of Chinese policy aimed at directly changing the relationship between economic growth and pressure on the natural environment have been introduced since 2011. Many policy interventions have had multiple objectives: to reduce Chinese dependence on potentially unreliable external sources of resources supply; to moderate the huge deterioration in Chinese terms of trade between 2003 and 2011; to reduce and then reverse the deterioration of local air and water quality and so to diminish detrimental impacts on health and longevity; to reduce greenhouse gas emissions and therefore to contribute to the global effort to mitigate climate change; and, in a world in which “green” outcomes were going to be increasingly important in future, to establish China as a competitive supplier of the capital goods and services that would become important in the emerging global economy.

All of these causal influences have been at work for coal and several of them for steel.

Chinese developments within the old growth model used energy with unusual profligacy. The improvements in energy efficiency since the global financial crisis are part of a global tendency but go well beyond developments elsewhere because they are correcting earlier excesses.

The developments in the electricity sector are particularly important. Electricity demand grew more rapidly than economic output through the first decade of the century. Growth in economic activity has run ahead of demand for electricity since then. In 2014, when economic output increased by 7.4 percent, demand for electricity grew by only 3.8 percent. The whole of the diminished demand growth plus several percentage points of total electricity supply came from zero emissions sources: in diminishing quantitative order, hydro-electricity, wind, nuclear and solar (Table 1). Growth in solar electricity supply has been most rapid from a base near zero four years ago. The absolute contribution of solar to the increase in electricity supply was similar to wind and nuclear in 2014, and is set to exceed them in the years immediately ahead.

Table 1: Electricity Generation by Source 2010-2014

Year	Quantity (million Mwh)						Rise over previous year %					
	Total	Thermal	Hydro	Nuclear	Wind	Solar	Total	Thermal	Hydro	Nuclear	Wind	Solar
2010	4228	3416	687	75	49	0	14.9	13.4	20.1	6.7	78.9	74
2011	4731	3900	668	87	74	1	11.9	14.2	-2.7	16.7	49.9	459
2012	4986	3925	856	98	103	4	5.4	0.6	28.1	12.7	39.1	412
2013	5372	4222	892	112	138	9	7.7	7.6	4.2	14.3	34	125
2014	5550	4205	1070	126	156	23	3.3	-0.4	20	12.5	13	156

Source: National Bureau of Statistics of China and China’s National Energy Administration.

Thermal electricity output fell in 2014. Within the diminishing total, the share of zero emissions (biomass) and low emissions (gas) sources of thermal electricity rose rapidly from a low base. Thermal coal consumption fell by 2.9 percent.

The early months of 2015 have seen an accelerated decline in thermal power generation from coal. Thermal coal use was 10% lower in the March quarter than in the corresponding period of the year before. Chinese imports of coal, which became the largest in the world through the period of strong, energy-intensive growth, fell by 42 percent in the first quarter of 2015 compared with the previous year.

Many and varied policy interventions have been applied to moderate and then reduce demand for electricity and to shift supply away from use of coal. The most powerful early interventions were regulatory: the forced closure or transformation of facilities that failed to meet increasingly high emissions standards. Propaganda played an important role in changing behaviour. Many subsidies for production and use of low-emissions technologies were influential. Increased taxes and reduced subsidies on fossil fuel had large effects.

For the future, the Government has heralded a shift towards greater reliance on market-based mechanisms. It has announced that the pilot greenhouse gas emissions trading schemes in five cities and two provinces will be merged into a national emissions trading scheme from 2016. Regulatory interventions, taxes and subsidies are likely to remain important in maintaining momentum in the transformation of the local and global environmental impact of the Chinese energy sector.

Steel demand also decelerated markedly from 2012. It fell absolutely in 2014, and again in the first quarter of 2015. Production has also fallen but by smaller amounts as part of the Chinese supply has been exported with losses by the steel-making enterprises. The deceleration of growth in Chinese steel demand after 2011, and the absolute decline in 2014 and early 2015, has been the main factor behind the absolute fall in global steel demand since 2012 (Figure 2).

Global supply of energy and metals had been slow to recognise and then respond to the acceleration of Chinese demand growth from the beginning of the century. That contributed to the extraordinary increase in global prices for almost all metals and energy. Global supply eventually responded to higher prices and prospects for increased demand—but the largest expansion in supply, from 2011, coincided with the deceleration of and then decline in Chinese demand.

The global price profiles for coal, oil and copper in Figures 3, 4 and 5 are similar to those for nickel, iron ore, gas and most other commodities: sharp increases from 2003 to the eve of the Great Crash of 2008; large falls in late 2008 and 2009; a rise to near or beyond pre-Crash heights in 2010 and 2011; and declines from 2011 with the coincidence of deceleration of demand growth in China with increased global supply.

China, like other resource-importing countries, has benefitted from oversupply of metals and energy through a large improvement in its terms of trade. Low and declining prices can be

expected to continue until enough old or new supply capacity has been removed to establish a global balance between supply and demand at a lower level of Chinese demand.

The improvement of Chinese terms of trade since 2011 has already been of large dimension and has further to go. It is the other side of the coin to large fall in the terms of trade, adjustment challenges and setbacks to economic growth in resource exporting countries. Australia and Indonesia, for example, have been experiencing slow growth in incomes and employment since Chinese demand and global prices for metals and energy began to fall in 2011, and will be grappling with the consequences of the end of the resources boom for many years (Garnaut 2013; forthcoming 2015). Johnston has drawn attention to the sharp deceleration of growth in West African countries with the fall in export prices for metals and energy (Johnston 2015).

China's increased prominence in the global economy in the twenty first century has made adjustment to its new model of growth a major challenge for the rest of the world.

Conclusions for Asia Pacific Resource Security

While Chinese economic growth rates remain strong by global standards, and there is reasonably strong growth momentum elsewhere in Asia, there is no longer anxiety about resource supply. It is the resource exporting countries in the Asia Pacific that are under pressure.

Massive adjustments on both the supply and demand sides have introduced comfortable margins above foreseeable requirements. There has been huge expansion in global supply capacity. New regions have become suppliers into the international market, including from the attraction into the market of new supplying regions—for example, Africa for both iron ore and coal. High prices have encouraged development of substitutes in supply—in energy, unconventional shale gas and oil and coal seam gas, as well as greatly reduced costs for renewable energy. High energy prices have encouraged efficiency in its use. And the new model of development in China has radically changed the balance of demand and supply in global resource markets.

The new forms of energy have made the major resource importing countries less dependent on concentrated sources of supply for fossil fuel. Renewable energy—vastly more important than at the beginning of the century in the world as a whole—can be produced reasonably efficiently by international standards in at least the large developing countries of Asia.

It happens that the domestic and international environmental pressures that have led China to diversify its energy sources away from the old, internationally traded fossil fuels have contributed to excess supply capacity in global coal markets and relatively low prices for coal and gas for a considerable period ahead.

The reduced costs of capital goods for solar, wind and other renewable energy that have emerged from China's deliberate development of alternatives to fossil fuels have expanded the energy options for other Asian developing countries. They have therefore made it less

likely that strong future economic growth in India and other Asian developing countries will be associated with anxieties about international fossil fuel supplies. The Asia Pacific region has emerged from the most virulent period of demand expansion for resources that the world has seen, with reasons for confidence that resource security through reliance on global markets can meet the resource requirements of continued rapid economic growth.

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