

# Adjusting to the Commodity-Price Boom: The Experiences of Four Industrialized Countries

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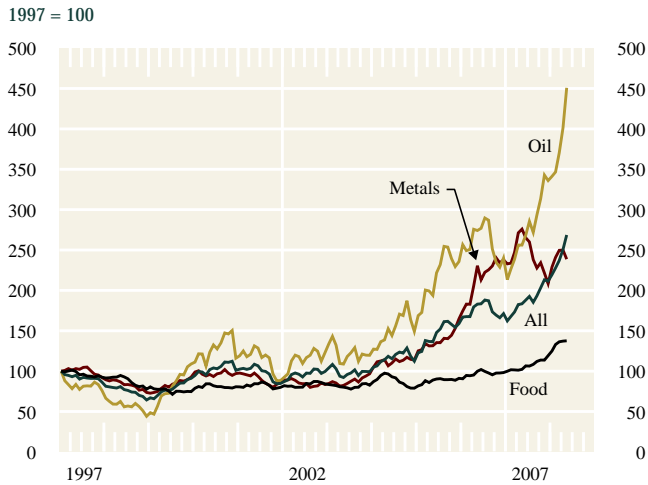
- *Since 2002, there has been an unprecedented, broad-based increase in global commodity prices. Although this increase has had a large economic impact on the major industrialized commodity-exporting economies, the resource-producing sectors have not expanded as a share of GDP in Australia, Canada, New Zealand, and Norway (collectively referred to as the CX4 countries).*
- *This article analyzes the economy-wide effects of the commodity-price boom by considering two key channels of adjustment: a direct channel through which increasing commodity prices reallocate productive inputs into the commodity-producing sectors, and an indirect channel whereby the growth in income generated by the commodity-price boom stimulates a broader economic adjustment.*
- *The indirect channel has generally proven to be relatively more important, generating increases in spending and exchange rate adjustment in all of the CX4 economies.*

Since 2002, the world has experienced an unprecedented increase in commodity prices.<sup>1</sup> Oil prices have risen by over 300 per cent, metals prices by more than 180 per cent, and food prices by 66 per cent (Chart 1).<sup>2</sup> These price increases have provided a significant economic boost to the major commodity-exporting countries, including emerging markets like Chile, Russia, and the Middle East. But some industrialized countries that are major commodity exporters, such as Australia, Canada, New Zealand, and Norway (referred to here as the CX4) have also been particularly well placed to take advantage of the price increase (Table 1). For example, in nominal terms, almost 50 per cent of Canadian merchandise exports are commodity based, with oil and gas, which account for about 20 per cent of total exports, being particularly important. In the other three economies, the shares of commodity-based exports are even higher, ranging from 73 per cent of exports for New Zealand to 83 per cent in Norway. In comparison, the share of manufactured goods in merchandise exports ranges from approximately

1. Since this article was written, the global economy entered a mild recession. Global economic growth began to decelerate in the late summer and fall of 2008 as the problems with the U.S. subprime-mortgage market and falling house prices spread to consumption and investment. This has also led to a decline in commodity prices in recent months.

2. In this article, unless otherwise stated, commodity-price statistics are taken from the International Monetary Fund's commodity-price database, and are measured in terms of the IMF's Special Drawing Right (SDR). Using SDR as the unit of account for commodity prices provides a "global" measure, effectively removing the influence of any individual exchange rate. In particular, it largely accounts for the depreciation of the U.S. dollar, which would otherwise inflate the price of commodities measured in dollar terms. It also accounts for the strength of the currencies of the commodity-exporting countries, which would otherwise deflate the global commodity price.

**Chart 1**  
**Primary Commodity Prices**



Source: International Monetary Fund commodity statistics

40 per cent for Canada to just over 10 per cent for Norway.<sup>3</sup>

An intriguing element of the current resource boom, however, is that the commodity-producing sectors in the CX4 economies have not generally increased their share of real gross domestic product (GDP) during the past five years. In Australia, Canada, and New Zealand, where the extractive industries and agriculture account for between 7 and 10 per cent of GDP, the share of the commodity-producing sectors fell marginally (by 1.3 per cent in Australia, 0.2 per cent in Canada, and 0.3 per cent in New Zealand). In Norway, where the commodity-producing sector accounts for approximately 23 per cent of GDP, the share in GDP declined by close to 6 per cent (Table 2).

The modest contribution to GDP of the commodity-producing sectors raises some interesting questions: How have these sectors adjusted to the boom and, given that their direct contribution to GDP has been relatively modest, what are the channels through which economic adjustment and resource reallocation have occurred?

This article describes the key elements of adjustment within these four industrialized commodity

3. Based on 2005 United Nations Comtrade data. The composition of imports is generally the reverse. Imports of finished manufactures account for over 50 per cent of imports in all the CX4 economies compared with commodity-based imports, which account for around 30 per cent.

**Table 1**  
**Export Shares of Major Industrialized Commodity-Exporting Countries, 2005**

	(%)			
	Australia	Canada	New Zealand	Norway
Food, beverages, and tobacco	17	7	50	5
Wood and wood products	2	10	9	2
Metals and minerals	29	11	8	8
Coal	16	1	0	0
Petroleum	7	10	2	50
Gas	3	9	0	18
Other commodities	3	0	4	0
<b>Commodity subtotal</b>	<b>75</b>	<b>47</b>	<b>73</b>	<b>83</b>
Chemicals	5	7	5	3
Finished manufactures	13	39	16	11
Other	8	7	6	4
Total	100	100	100	100

Note: Columns do not sum to 100 per cent due to rounding.

Source: United Nations Comtrade database and author's calculations

exporters.<sup>4</sup> The focus of the discussion is on two main channels through which the rise in commodity prices operates.<sup>5</sup> The first channel is via a direct effect—the rise in commodity prices raises wages and profits in the commodity-producing sectors, which in turn brings labour and capital into those sectors.

The second channel is via an indirect effect that results from the growth in income generated by the rise in commodity prices. This indirect effect consists of two parts: (i) the growth in spending associated with the increase in incomes, and (ii) an adjustment to the real exchange rate. The second part results from the rise in the prices of non-traded goods relative to the prices of traded goods that occurs if some of the income increase is spent on domestically produced, not readily traded goods (such as construction or services). This relative price change, referred to as a real appreciation, can be brought about by either an appreciation of the CX4 nominal exchange rates or by inflation in

4. Dupuis and Marcil, in this issue, provide a more detailed analysis of the Canadian case.

5. The theoretical framework for the analysis is based on the three-sector small open economy model as described in Corden (1984). The three sectors are a non-traded sector, which produces goods and services (such as construction) that do not typically compete on global markets, and two traded sectors—a “booming” commodity-producing sector and a “lagging” sector that produces tradable goods, such as manufactures. Corden uses this model to consider the effects of a resource boom.

Table 2

**Size of the Extractive and Agricultural Sectors**

		Australia		Canada		New Zealand		Norway	
		Extractive	Agriculture	Extractive	Agriculture	Extractive	Agriculture	Extractive	Agriculture
Share in total employment (%)	2002	0.9	4.4	0.9	2.7	0.2	8.8	1.4	3.8
	2007	1.3	3.4	1.2	2.3	0.3	7.2 <sup>a</sup>	1.5	2.8
Share in total capital expenditure (%)	2002	20.0	n/a	13.0	2.0	0.4	7.4	63.0	2.5
	2007	28.0	n/a	16.8	1.3	0.4	7.2 <sup>b</sup>	63.2	1.9
Share in gross domestic product (GDP) (%)	2002	8.0	3.0	5.0	2.2	2.7	4.8	27.9	1.6
	2007	7.4	2.3	4.8	2.2	2.3	4.9	21.9	1.6 <sup>a</sup>

Note: a) 2006 estimate; b) 2005 estimate

Source: Employment and capital expenditure figures are from national statistical agencies and author's calculations. GDP shares are taken from Datastream and author's calculations, except for Norway (World Bank)

the non-traded sectors of their economies. In either case, the real appreciation will tend to encourage resources to move out of the CX4 traded sectors like manufacturing and into their non-traded sectors. Largely because of these expenditure and real exchange rate effects on the demand for non-traded goods, the resource boom affects other sectors of the economy, such as construction and manufacturing.

The direct effect of the resource boom is discussed in the following section, followed by a discussion of the indirect effect. The final section of the article provides some concluding remarks.

## Direct Effects of the Resource Boom

As commodity prices have risen, so too, has the incentive to reallocate resources to the commodity-producing sectors in the CX4 countries. But, as discussed in this section, impediments to this process have limited the speed and size of the adjustment. To facilitate exposition, the extractive (mining and oil and gas) sector is discussed separately from the agricultural sector.<sup>6</sup> The focus is on the response of employment and capital expenditure, and the resulting impact on the contributions of these sectors to CX4 GDP.

### Adjustment in the extractive industries

Both Australia and Canada have abundant supplies of energy and mineral resource deposits of varying grades. In the extractive industries, a rise in price can act as a signal to producers to “move through the grades” and commence exploitation from deposits

that were not previously profitable. Canada's oil sands are an excellent example. Extraction of oil was not generally commercially viable at an oil price below US\$25 per barrel, but as the price rose above this level, commercial production became profitable (National Energy Board 2004, 2006). At higher prices, extraction of oil from subterranean deposits, which requires the oil sands to be heated and liquefied before the oil can be drawn to the surface, also became feasible. Thus, as the price of oil rose from US\$10 per barrel to more than US\$100, the possibility of large-scale exploitation of low-grade oil deposits has become possible.

In Canada, the response to the rising commodity prices has been to invest heavily in the development of new and existing mines (Dupuis and Marcil 2008). The same has been true for Australia. Between 2002 and 2007, in both Australia and Canada, the average pace of real capital-expenditure growth in the extractive sector significantly exceeded that for the economy as a whole (respectively, 23 per cent year-over-year versus 13 per cent in Australia, and 10 per cent versus 8 per cent in Canada).<sup>7</sup> In Australia, where resource extraction accounts for more than one-quarter of economy-wide capital expenditure (Table 2), the sector has been a major contributor to economy-wide investment.

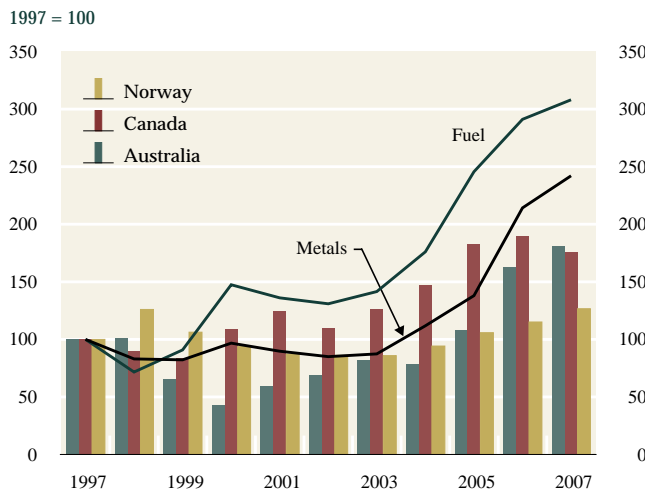
Generally speaking, growth in capital expenditure in the extractive sectors has been quite well correlated with the movement in commodity prices, albeit with a lag of approximately one year (Chart 2). Such a lag is

6. Due to the small scale of its extractive industries, New Zealand is omitted from the discussion of the extractive sector. Norway is excluded from the discussion of agriculture because it is a net importer of food.

7. The numbers reported here are the average annual percentage change starting from 2003 (with 2002 as the base) through to 2007. They cover the same period used by Dupuis and Marcil (in this volume).

Chart 2

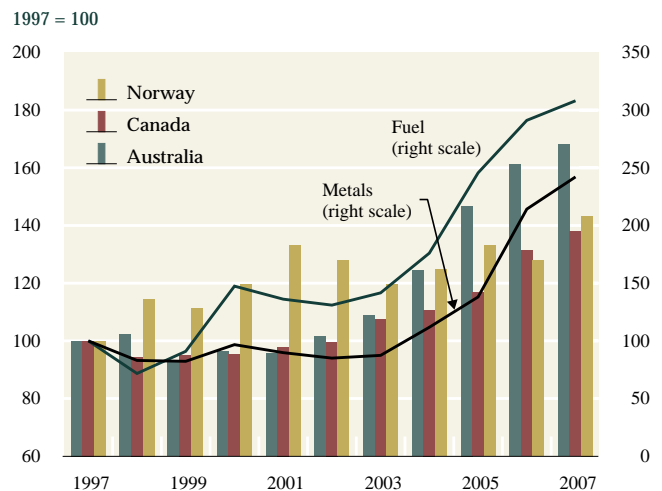
**Indexes of Metals and Fuel Prices and Capital Expenditure in the Extractive Industries, 1997–2007**



Source: International Monetary Fund, national statistical agencies, and author's calculations

Chart 3

**Indexes of Metals and Fuel Prices and Employment in the Extractive Industries, 1997–2007**



Source: International Monetary Fund, national statistical agencies, and author's calculations

not surprising. Mining investments are often large, expensive, and irreversible.<sup>8</sup> Consequently, because mining companies are forward-looking entities, their investment activities tend not to respond immediately to price rises, which may be temporary. Rather, investment in new projects will only occur when there is an expectation that prices will remain sufficiently high to ensure that the cost of the initial investment can be recovered from the stream of expected future profits. Because commodity prices are volatile, forming an expectation of a sufficiently persistent increase can take time.

In the case of new mining projects, once a decision to invest is taken, the development of the project can be another source of delay. The International Monetary Fund (IMF) estimates that investment gestation can be three to five years in the minerals sector and even longer in the oil sector (IMF 2006). These delays in turn affect employment and output growth. Consequently, although trend employment in the Canadian and Australian extractive sectors has been well correlated with prices (Chart 3), short-term fluctuations have tended to reflect the opening of new mining projects. In 2003, for example, employment growth in the Canadian extractive sector rose sharply as Shell Canada's \$5.7 billion Athabasca Oil Sands facility

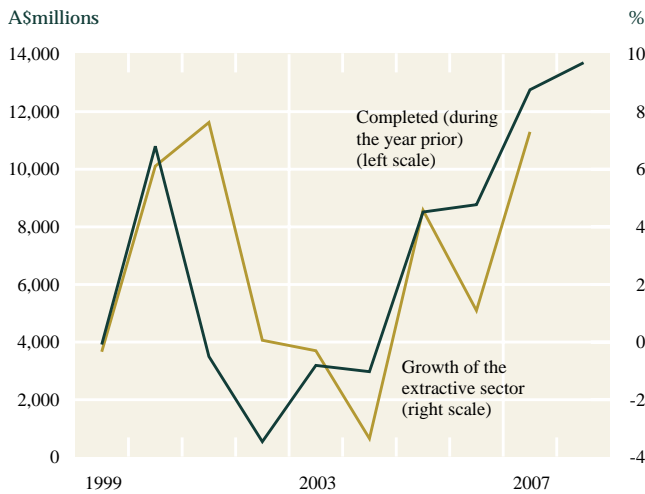
commenced operations. Similarly, employment growth in the Australian mining sector accelerated in 2004 and 2005 as the value of newly completed mining projects increased from A\$1.6 billion in the year ending October 2003 to approximately A\$8 billion in each of the two subsequent years.<sup>9</sup> GDP growth shows a similar pattern. In Canada, GDP growth in the Canadian mining and oil and gas sector peaked at 2.8 per cent in 2003 compared with an average rate of sectoral growth of 1.7 per cent between 2002 and 2007. In Australia, there is a clear relationship between the commencement of production at newly completed mines and the growth rate of Australia's extractive sector (Chart 4).

There is also evidence that both Australia and Canada are experiencing some challenges in meeting the growing demand for labour in the extractive sector. Rapid wage growth in the sector is one indication of this. Both countries had experienced employment growth in their extractive sectors during the 2002–05 period, but wage growth remained similar to (or even slightly slower than) manufacturing wages in both countries. Between 2005 and 2007, however, wages in the extractive sector accelerated as sectoral employment grew three to four times faster than the economy-wide average in both economies, which suggests

8. In Australia, for example, the typical cost of a new mining project ranges from A\$30 million to A\$5 billion and averages approximately A\$500 million (Australian Bureau of Agricultural and Resource Economics [ABARE] 2008).

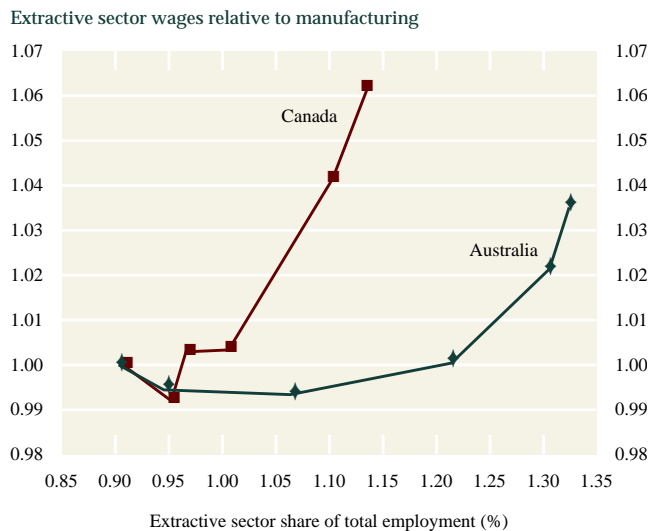
9. The data on completed mining projects were provided by ABARE (see ABARE 2008 for a discussion). For each year, the period November to October is represented.

**Chart 4**  
**Australia: Newly Completed Mining Projects and Growth of the Extractive Sector**



Source: Australian Bureau of Agricultural and Resource Economics, Australian Bureau of Statistics, and author's calculations

**Chart 5**  
**Wages and Employment in the Australian and Canadian Extractive Sectors**



Source: National statistical agencies author's calculations

that labour demand in the sector was growing even faster than supply (Chart 5).<sup>10</sup>

An important implication of the foregoing discussion is that the employment growth experienced by the Australian and Canadian extractive sectors has the potential to continue for some time as new mining projects become operative in the years ahead. For example, ABARE (2008) reported that the stock of advanced mining projects was valued at A\$70 billion in the early part of 2008 (close to seven per cent of Australia's GDP). Similarly, capital-expenditure intentions reported by Statistics Canada (2008) indicated that investment spending in the mining and oil and gas industries would grow significantly during 2008.<sup>11</sup>

Unlike Australia and Canada, Norway's extractive sector accounts for over 20 per cent of GDP. Its oil industry is considered mature, however, since most of the country's oil fields have reached their peak pro-

duction capacity, and oil production has been in steady decline since 2001.<sup>12</sup> Norway's gas fields are expanding, however, and the economic effects of a declining oil industry and growing gas industry have somewhat offset each other. Between 2002 and 2007, capital-expenditure growth in the extractive sector averaged 8 per cent per year (equal to the economy-wide average), employment growth only slightly exceeded the economy-wide average, and wages in the sector actually grew slower than manufacturing wages. Thus, despite its significant size, the mature state of Norway's extractive sector has limited its ability to be a driver of growth. In fact, between 2002 and 2007, the sector contracted at an average rate of approximately two per cent per year.

### Agriculture

Food prices have also risen in recent years (Chart 6), but have behaved somewhat differently than metals and energy prices. In particular, increases in food prices have, on average, been smaller and more recent. As is evident in Chart 6, prices of cereals such as wheat and barley began to rise modestly in 2005 and accelerated sharply upwards in 2007. Dairy prices began to rise earlier, but also escalated in 2007 (partly

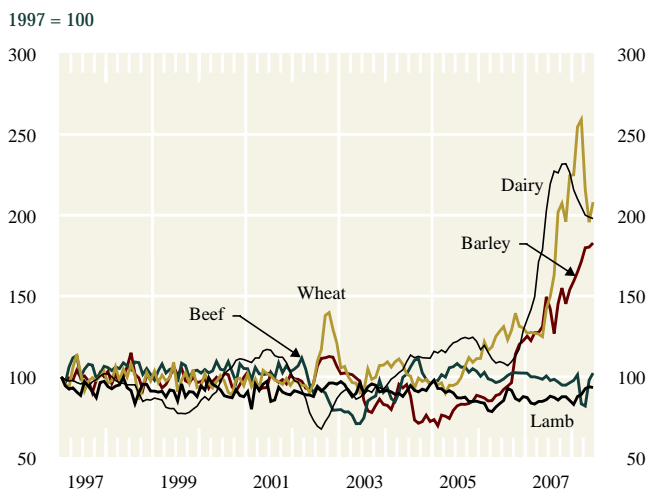
10. Employment in the Australian and Canadian mining and oil and gas sectors grew at 7 per cent and close to 9 per cent per year, respectively, during the 2006-07 period. In comparison, growth of economy-wide employment averaged just over 2 per cent in both economies during the same period.

11. The survey of capital-expenditure intentions indicated that investment would grow by 4.3 per cent in the oil and gas sector and by 12 per cent in the mining sector. Of course, the deepening of the credit crisis and a softening of commodity prices may adversely affect realized investment in the sector in both countries.

12. Opportunities to expand production farther from existing reserves are limited. Substantial deposits are thought to exist off Norway's northern coast but, to date, government policies have largely constrained exploration and development (for a discussion, see Energy Information Administration 2006).



**Chart 6**  
**Primary Food Prices in SDR, 1997Q1–2008Q1**



Source: International Monetary Fund and author's calculations

in response to the winding down of European Union export subsidies). Some food commodities, such as meat (reflected on the chart in the prices of beef and lamb) have remained stable, however.

At the same time, other non-food commodity prices were also rising, and the cost of inputs such as fertilizers, fuel, and feed increased significantly. As a result, the ratio of farm-product prices to farm-input prices (often referred to as the “farmers’ terms of trade”) for Australia, Canada, and New Zealand began declining in 2002 and 2003 and did not start rising until after 2005 for Australia, 2006 for Canada, and 2007 for New Zealand. Thus, despite the rise in global food prices, the farming sectors, until recently, have not been significant beneficiaries of the commodity-price boom.

Other factors have also influenced structural adjustment within the agricultural sectors. Drought has had an extremely detrimental impact on the Australian farm sector over the past five years or so. Australian wheat production, for example, contracted by close to 60 per cent in 2002, and by almost 50 per cent in 2006 and 2007 relative to 2005. Similarly, Canada’s beef industry was affected by the incidence of bovine spongiform encephalopathy (BSE), which effectively closed the export markets for Canadian beef for much of the period under examination. In addition, farm support and supply-management policies may have also impeded agricultural adjustment to world price movements. In 2006, Australia, Canada, and New Zealand provided farm support equal to 6 per cent, 23 per cent, and 1 per cent of gross farm revenue,

respectively, compared with an OECD average of 29 per cent of gross farm revenue (OECD 2007).

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*The balance of different economic forces operating on the agricultural sectors has tended to limit their expansion.*

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Overall, it is difficult to separate the effects of rising food prices from the combination of higher input costs, problems with drought and disease, and government assistance policies. Nevertheless, the following generalizations can be drawn. First, as with the mining and energy sectors, the agricultural sectors are relatively small. Second, employment growth has been negative, with the exception of Canada, where it was modestly positive. And lastly, the contribution to GDP growth has also been small. Even in New Zealand, where agriculture accounts for 7 per cent of the labour force and 5 per cent of GDP, and where capital expenditure growth has been robust, the sector has been growing more slowly than the rest of the economy. In other words, despite the strength of food prices, the balance of different economic forces operating on the agricultural sectors has tended to limit their expansion. Given their comparatively small size, their contribution to overall employment and GDP growth in the CX4 countries has been even more modest.

## Broader Economic Adjustment

The relatively small size of the CX4 commodity-producing sectors and their seemingly modest contribution to GDP growth raises the question: How can these sectors be having such a significant effect on the commodity-exporting economies, as is widely perceived? The answer lies with the second channel of adjustment and the indirect-spending and exchange rate effects. When commodities are important exports, increases in the prices of these goods relative to imports cause a terms-of-trade improvement, and the purchasing power of GDP in international markets also rises. This increase in real income is the catalyst for broad adjustment in the rest of the economy. It triggers increased spending on domestically produced goods through several channels: (i) as inputs demanded by the resource-producing sectors, (ii) as increased demand from individuals whose wealth and income

have risen because they own factors of production specific to the resource-producing sectors (e.g., the owners of shares in mining firms), and (iii) as increased demand by governments, whose revenues have risen. Since a proportion of this spending occurs on goods and services that aren't readily traded, it will cause the prices of these goods to rise relative to traded goods and, hence, a real appreciation of the currency.<sup>13</sup> This appreciation in turn erodes the profitability of the sectors that compete on international markets (such as manufacturing), while increasing the profitability of the sectors that do not trade. This section explores the impact of these indirect channels on macroeconomic adjustment, particularly in the manufacturing and construction sectors of the CX4 economies.

### Income and expenditure growth

As a result of the terms-of-trade improvement experienced over recent years, the real purchasing power of domestic production in world markets has increased for all four of the CX4 economies. This increase in real incomes is best measured by real gross domestic income (GDI), which adjusts GDP to account for the change in purchasing power from the change in the terms of trade. GDP is a poor measure of the macroeconomic consequences of a terms-of-trade improvement because although nominal GDP rises with the terms of trade, the GDP deflator also increases. This leaves real GDP mostly unchanged, even though real value-added and real income must have increased (Kohli 2006, 46).<sup>14</sup> Chart 7 illustrates the cumulative growth in real GDI relative to real GDP for the CX4 during the periods 1997–2002 and 2002–07. Note that the trading gains associated with the terms-of-trade improvement have contributed an additional 6–7 per cent to real incomes in excess of GDP gains during the past five years. The exception is Norway, where the trading gains have been much greater.

The income gains will accrue, in the first instance, primarily to the owners of the various factors of production in the resources sector. This includes not only firms (via increased profits) and workers (through increases in wages), but also governments, via increases in royalties collected from the sector and

Chart 7

### Cumulative Increase in Real Gross Domestic Income Relative to Real Gross Domestic Product



Note: Data for Norway end in 2006.

Source: National statistical agencies and World Bank (for Norway)

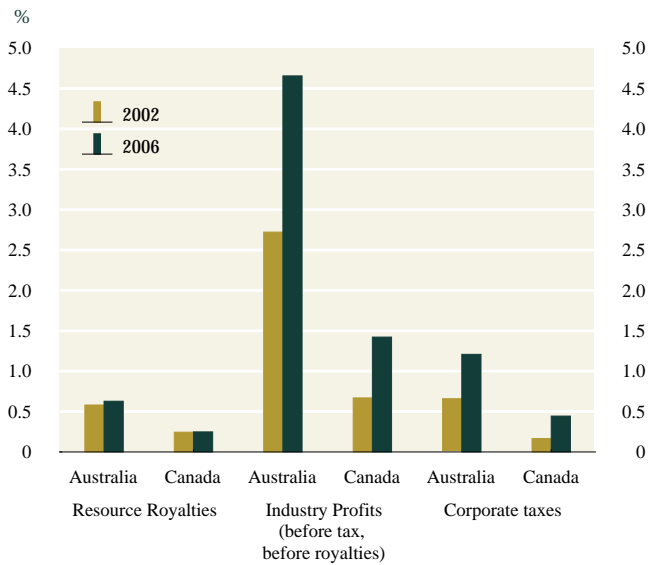
other taxes, such as corporate and personal income taxes. In this respect, as global commodity prices have risen, mineral, oil, and gas resources have become potentially important sources of government revenue. In Norway, for example, where the oil and gas sector consists primarily of conventional offshore oil and gas, over 50 per cent of the gross value of oil and gas production is channelled back to the state in one form or another. In 2006, petroleum revenues accruing to the government accounted for 17 per cent of GDP (up from 10 per cent in 2002) (OECD 2007). In Australia and Canada, the revenues generated through resource royalties have grown slower than industry profits, but because profits have been rising, tax revenues collected through corporate taxation have risen considerably. Compared with Norway, however, the government revenue in Australia and Canada that is directly attributable to the resources sector is relatively small, with the sum of royalties and corporate taxes from the sectors accounting for less than 2 per cent of GDP in both countries (Chart 8).<sup>15</sup>

13. The real appreciation itself generates a reinforcing increase in demand from the general population, which benefits from a fall in the price of imports.

14. Kohli (2006) and Macdonald (2007a, b) provide useful discussions of the measurement of real GDI with applications to Canada; see also Duguay (2006). For an analysis of the Australian experience, see Diewert and Lawrence (2006).

15. Nevertheless, compared with other sectors of the economy, which do not generate royalties and have not been as profitable in recent years, the mining sectors account for a disproportionately large amount of revenues in all three countries.

**Chart 8**  
**Extractive Sector Profits, Royalties, and Corporate Taxes as a Percentage of Gross Domestic Product**



Source: National statistical agencies and author's calculations

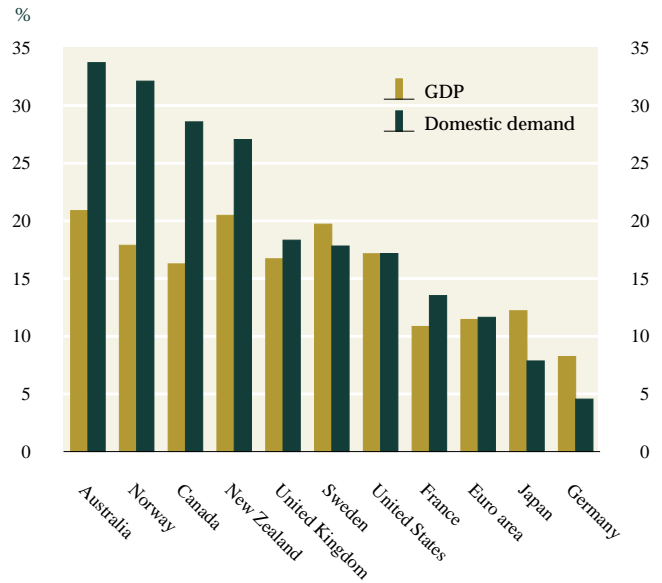
*As global commodity prices have risen, mineral, oil, and gas resources have become potentially important sources of government revenue.*

The income gain is one of the most important drivers of the economic adjustment that follows a terms-of-trade shock because it directly affects expenditure, which in turn transmits the shock through the rest of the economy. The income gain from the terms-of-trade improvement helps to explain the particularly strong growth in domestic demand that has occurred in the CX4 countries over the past five years. As Chart 9 shows, between 2002 and 2007, CX4 domestic demand increased by approximately 30 per cent, much more than CX4 GDP growth. Furthermore, the growth in domestic demand was significantly greater than that in many other industrialized countries.<sup>16</sup>

One reason for the strength in domestic demand has been growth in investment spending. As illustrated by

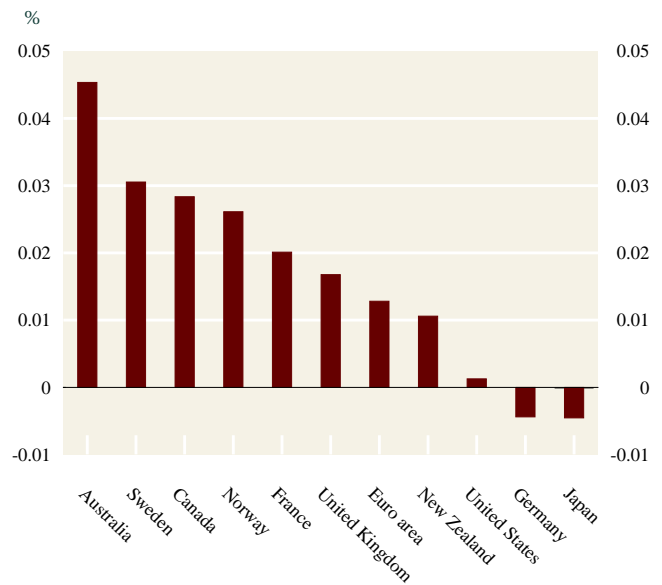
16. According to theory, permanent (or long-lasting) terms-of-trade shocks are more likely to be spent than temporary shocks as households attempt to smooth consumption.

**Chart 9**  
**Cumulative Real Growth in Gross Domestic Product and Domestic Demand Growth, 2002Q1–2007Q4**



Source: Organisation for Economic Co-operation and Development

**Chart 10**  
**Change in the Investment Share of Gross Domestic Product, 2002–2007**



Source: International Monetary Fund



Chart 10, between 2002 and 2007, the share of investment in GDP rose significantly for Australia, Canada, and Norway (and less so for New Zealand), reflecting growth in capital spending across a range of sectors. Nevertheless, the contribution to investment growth from the Australian, Canadian, and Norwegian extractive sectors was disproportionately high, on average. In this regard, there is a link to the direct effect, since some of the terms-of-trade income gain has accrued directly to mining companies as profits, which in turn have been used to finance the purchase of capital equipment. To the extent that this capital equipment is domestically produced, this investment spending has also contributed to the expansion in domestic demand and increased economic activity in other sectors of these economies.

If it is spent, or finances tax cuts, the growth in government income is also a potential source of domestic demand. Unlike past episodes, however, when commodity-price booms helped to fund pro-cyclical fiscal policies, governments in the CX4 countries have taken the opportunity in recent years to improve their balance sheets by running sizable surpluses. In particular, the restraint on spending has helped to limit the exchange rate appreciation, which (as discussed below) would otherwise be detrimental to manufacturing and other industries that compete on world markets.<sup>17</sup> Government outlays in the CX4 have fallen as a share of GDP during the period of the commodity-price boom compared with the five previous years (Chart 11). In this respect, the CX4 governments have directly offset the strength in domestic demand experienced during the 2002–07 period. In Norway, where the government invests its oil revenues in the offshore Government Pension Fund–Global (GPF), the growth in government spending reflects a spending cap of 4 per cent of the real rate of return on the value of the fund.<sup>18, 19</sup> In Australia and Canada, although

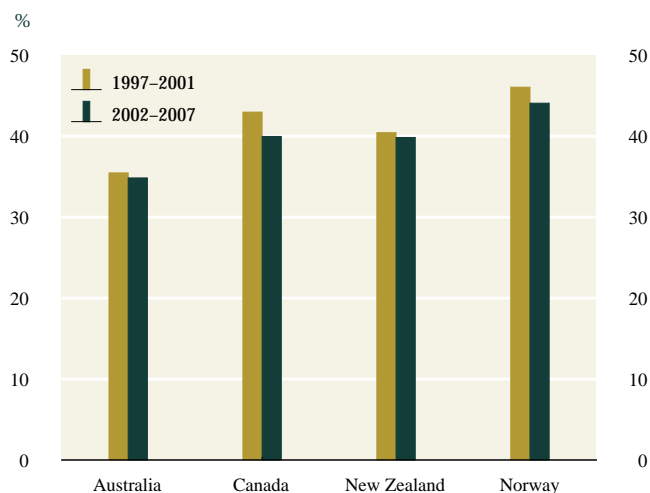
17. See Carney (2008) for a discussion of the Canadian experience during the previous commodity-price boom.

18. The GPF is designed to preserve much of the wealth generated from oil and gas extraction for future generations. In addition, by investing the funds in foreign assets, the effects of inflows of oil revenue on the current account are largely matched by an outflow on the capital account, leaving the overall balance of payments in equilibrium, without the need for an exchange rate appreciation.

19. It is not the Norwegian government's intention that this cap be binding in every year, but on average over a number of years. Thus, the cap was not met prior to 2005, but has been met since.

Chart 11

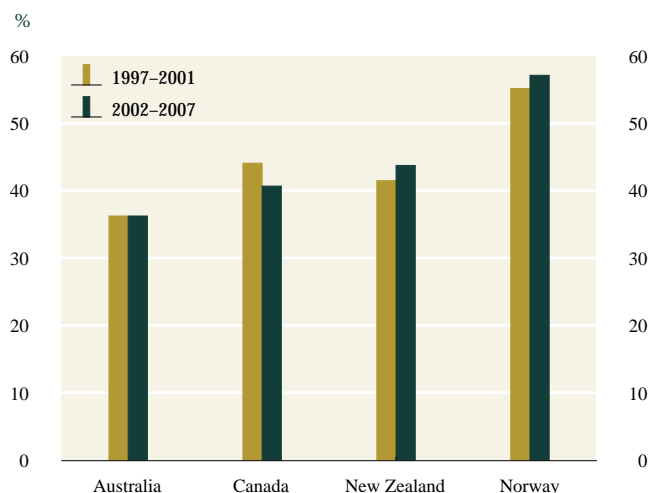
**Average General Government Outlays as a Percentage of Gross Domestic Product**



Note: General government includes all levels of government. Source: Organisation for Economic Co-operation and Development

Chart 12

**Average General Government Revenues as a Percentage of Gross Domestic Product**



Note: General government includes all levels of government. Source: Organisation for Economic Co-operation and Development

government spending has decreased as a share of GDP, some indirect stimulus has been provided because the increase in tax revenues earned from higher royalties and corporate taxes on mining firms has largely been redistributed to taxpayers. As a result, general government revenues have not increased but have remained constant in Australia and have declined in Canada (Chart 12).

### Real exchange rate changes and associated adjustment

The growth in domestic demand can also be expected to have an effect on exchange rates. In principle, if the income transfer is spent primarily on domestic goods, the income effect resulting from the change in the terms of trade should cause the real exchange rate to appreciate.<sup>20</sup> In practice, under a floating exchange rate system, such as that employed in the CX4 economies, the nominal exchange rate will respond quickly to changes in commodity prices (and in the terms of trade) in anticipation of the future consequences of increased demand.

As shown in Chart 13, the trade-weighted real exchange rates appreciated in all four countries, although less so in Norway.<sup>21</sup> Moreover, with the exception of Norway, the CX4 currencies have generally exhibited greater strength than those of other industrialized economies. The appreciation of Norway's exchange rate has been more muted than that of the other CX4 economies because a significant amount of oil revenues are invested abroad in the GPF.

The appreciation of the real exchange rate also tends to partially offset the impact of the increase in domestic demand by causing internationally traded goods and services to fall in price (in domestic currency terms) relative to those that are not traded. As a result, the exchange rate appreciation tends to reduce the profitability of the manufacturing sector and to stimulate the services and construction sectors, thus facilitating the adjustment of productive resources within the economy.<sup>22, 23</sup> The real appreciation can most easily be accomplished with an appreciation of a flexible

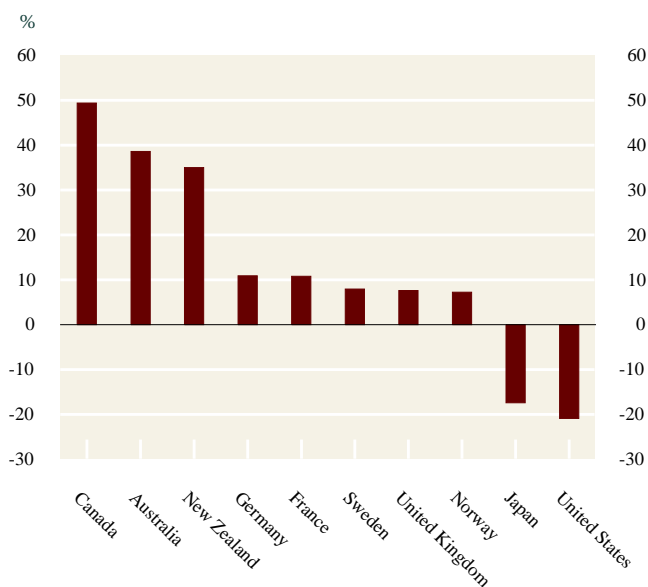
20. The transmission of a terms-of-trade shock might also affect the exchange rate via capital flows.

21. A variety of other factors have affected exchange rates during this period, including a weakening of the U.S. dollar against other currencies in response to its large current account deficit. Nevertheless, the currencies of commodity exporters have generally exhibited greater strength than those of commodity-importing economies.

22. The exchange rate effect also partially offsets the direct effect of the global increase in commodity prices.

Chart 13

### Percentage Change in Real Effective Exchange Rate (CPI-based), 2002Q1–2007Q4



Source: International Monetary Fund

exchange rate; otherwise, the real appreciation would have to take place via higher inflation. As is well documented elsewhere, a lack of nominal exchange rate adjustment is widely accepted as a reason for the high inflation that coincided with, and followed, earlier resource booms.<sup>24, 25</sup>

In each of the CX4 economies, the non-traded construction and utilities sectors (labelled as “other” on Charts 14 and 15), have grown dramatically between 2002 and 2007 while, with the possible exception of

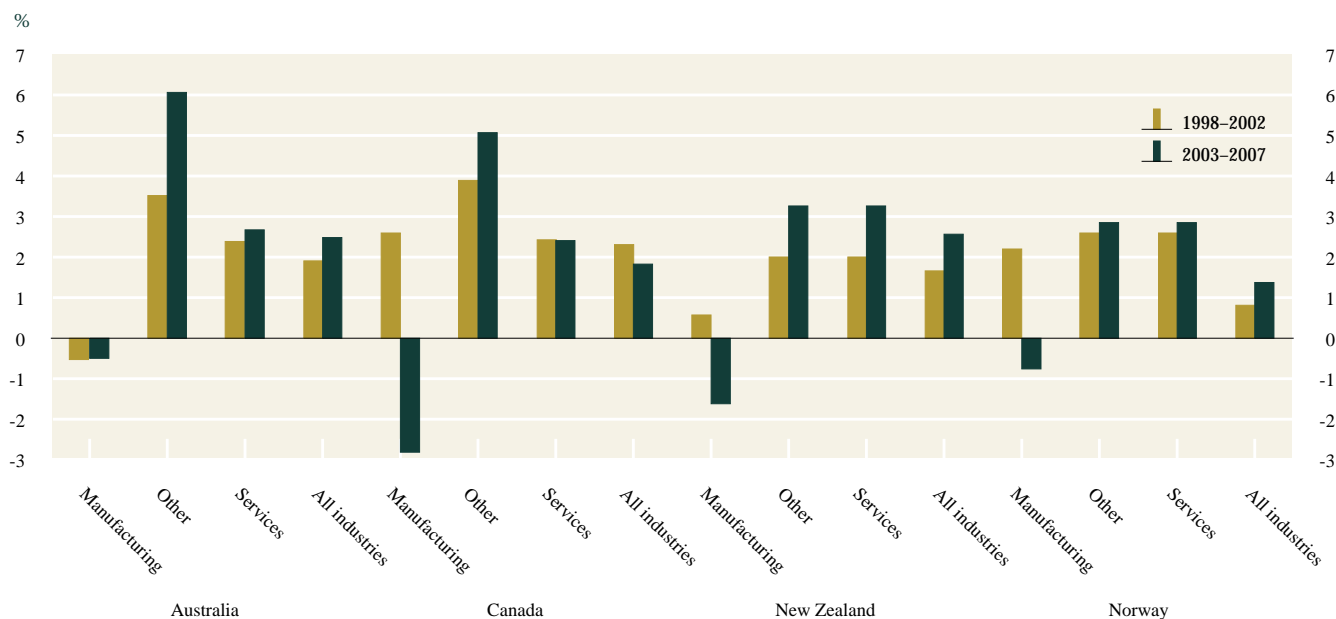
23. The decline in the manufacturing sector due to the real exchange rate appreciation is sometimes referred to as “Dutch Disease” (as in Corden 1984, for example). Some authors have argued that Dutch Disease can lead to a lower rate of economic growth and possibly a lower level of welfare. Such a possibility could arise if firms in the manufacturing sector experience learning-by-doing, and thereby generate improvements in technology that spill over to other firms in the sector (see, for example, Krugman 1987; and Sachs and Warner 1995). However, the mining sector may also be a source of learning-by-doing, and it is unclear to what extent, if at all, the decline in manufacturing that a commodity boom induces will reduce long-run growth.

24. See, for example, Schembri (2008) for a discussion of Canada's experience with flexible exchange rates following the Korean War resource boom. Carney (2008) and Stevens (2008) provide a discussion of past Canadian and Australian experiences and the benefits of exchange rate flexibility under the current circumstances.

25. The benefits of a flexible exchange rate have been widely discussed. Friedman's 1953 article is the seminal contribution.

Chart 14

### Employment Growth by Sector



Source: Organisation for Economic Co-operation and Development and author's calculations

Norway, the performance of the (relatively more traded) manufacturing sector has remained weak. In particular, employment growth in construction greatly outstripped that in the manufacturing sector, which was negative across all four economies. The strong performance of the construction sector in these economies is partly owing to the expansion of the mining and energy sectors, but is also a result of the income effects, which are feeding back through strong residential and commercial property investment.

*In each of the CX4 economies, the non-traded construction and utilities sectors grew dramatically between 2002 and 2007.*

The data also indicate that, since 2002, manufacturing in Australia and Norway has performed better than might have been expected (generally showing a slower rate of employment decline and, in Norway, stronger output growth, than before). One explanation is that the manufacturing sectors in these countries have directly benefited from the increase in investment

spending, perhaps because the manufacturing sector is partly integrated with the mining sector. In Norway, for example, where the manufacturing sector has performed especially well during the boom, a survey of Norwegian enterprises found that about one-quarter (27 per cent) of surveyed enterprises supplied the oil industry (Solheim 2008). In Australia, seven per cent of manufacturing firms cited the strength of the mining sector during 2007 as a factor contributing positively to their own production growth.<sup>26</sup> Similarly, in New Zealand, between 2002 and 2007, the meat and dairy-processing sectors accounted for one-third of the expansion in manufacturing output. In the specific case of Norway, it is also likely that limited appreciation of the Norwegian krone (which could be due to the investment of oil revenues in the GPF) may have contributed to the relatively strong performance of the sector.<sup>27</sup>

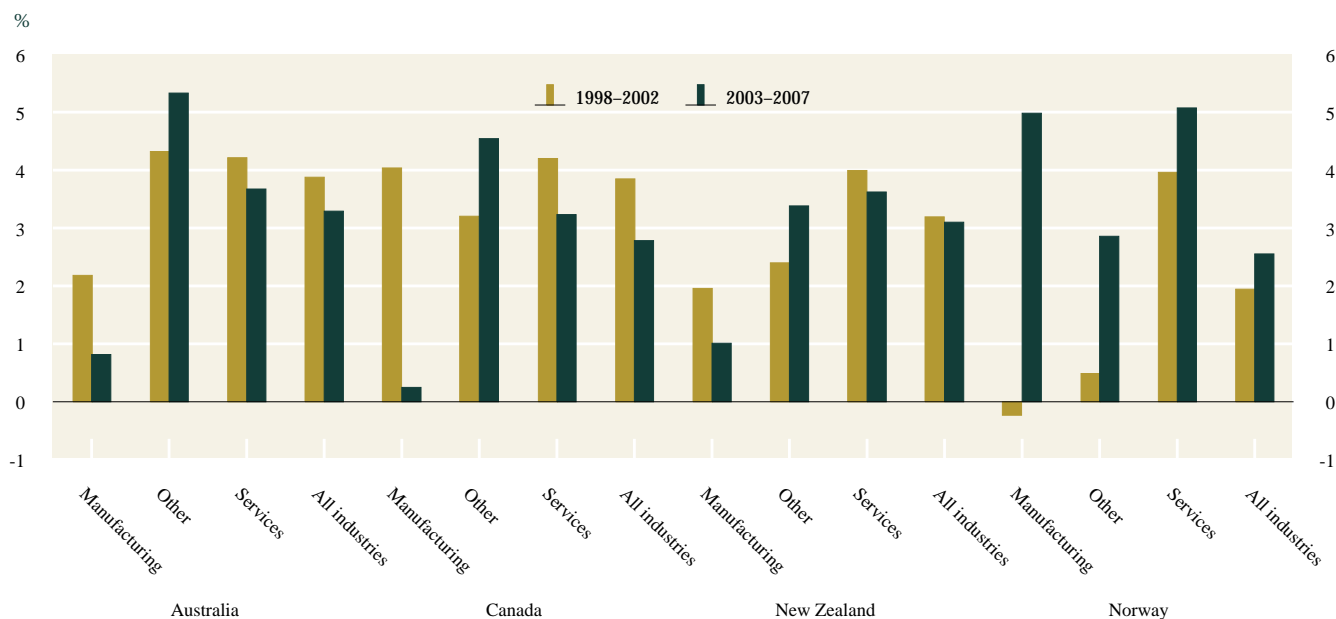
Canada has had a somewhat different experience than the rest of the CX4. Manufacturing growth in the pre-boom period was much stronger than it was for the other countries, and it has been weaker during the

26. Australian Industry Group and PriceWaterhouseCoopers, Survey of Australian Manufacturing, June 2007

27. In addition, firms in the manufacturing sector may have also benefited from lower costs of imported inputs and investment goods.

Chart 15

### Average Annual Growth of Gross Domestic Product by Sector



Source: National statistical agencies and author's calculations

boom period. This could reflect several factors, such as the appreciation of the exchange rate, which are discussed by Dupuis and Marcil in this volume.

## Conclusion

The direct adjustment of the resources sectors in Australia, Canada, New Zealand, and Norway (collectively known as the CX4) to the rise in commodity prices has been small relative to the size of their respective economies, and they tend to lag price movements. In addition, output and employment in the resources sectors, which tend to increase sharply when new projects finally commence production, have not adjusted to the resource boom as smoothly as has investment. Given the large stock of new projects under development in Australia and Canada and the long lags involved, the prospects exist for the resources sectors in these countries to continue to act as a source of employment and output growth for some time. In Norway, the mature state of the oil sector limits the scope for further development.

In agriculture, adjustment has also been modest because not all food prices have shown strong rises and, for those that have risen, the increase has generally been more recent than that for metals and energy prices. Moreover, the combination of rising feed and

fertilizer prices and the influences of disease and drought have also had a significant impact on the industry, somewhat diluting the beneficial impact of rising food prices.

On the other hand, the indirect effects of the commodity-price increase have been more dramatic and have helped to transmit the adjustment to other sectors of the CX4 economies. With the exception of Norway, where the process of investing oil revenues abroad has limited the exchange rate appreciation, the increases in domestic demand help to explain the relatively large exchange rate appreciations and the associated impact on the construction and manufacturing sectors that have taken place.

Unlike past commodity cycles, the current rise in commodity prices is likely to be more persistent because it reflects an unprecedented structural change in the global economy. The opening up and integration of China, and increasingly India, which together account for almost 40 per cent of the world's population, are causing a fundamental change in primary commodity demand (Francis 2007; Francis and Winters 2008). While the process could slow, it is highly unlikely that it will be fully reversed.

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