



**australian food industry**  
performance and competitiveness

abare research report 06.23

christopher short, courtney chester and peter berry

december 2006

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Australian Bureau of Agricultural and Resource Economics

GPO Box 1563 Canberra 2601  
Telephone +61 2 6272 2000 Facsimile +61 2 6272 2001

Internet [www.abareconomics.com](http://www.abareconomics.com)

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## foreword

The Australian food industry is a major component of the Australian economy, generating export income of \$24 billion in 2004-05. Globally, food manufacturing is a highly significant sector, with food sales worldwide estimated at around US\$4 trillion and packaged foods alone valued at around US\$1.9 trillion in 2002.

A key trend in world food markets is increasing globalisation, driven by large multinational food manufacturers and supermarket chains that have the ability to source their input requirements from many different countries. The increased competition associated with globalisation is putting greater pressure for change on both Australia's domestic and export oriented food sectors.

This report provides an overview of the evolving nature of the Australian food industry and identifies key competitive forces that are shaping both the world and Australian food industries. The analysis contained in this report is intended for use in private and public policy making process aimed at positioning the Australian food industry in an increasingly competitive world market for food.

The Department of Agriculture, Fisheries and Forestry commissioned ABARE to undertake this analysis of current and emerging trends in the food industry.



Phillip Glyde  
*Executive Director*  
December 2006

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## summary

### food manufacturing in Australia

- > Since the late 1970s the value of output from Australia's manufacturing sector as a whole has declined as a proportion of gross domestic product (GDP). Within the sector, food manufacturing accounts for about 20 per cent of output, and remains one of Australia's largest manufacturing industries. Growth in the value of output from the food industry averaged around 2.0 per cent a year over the past ten years, slightly higher than the 1.9 per cent a year average for the manufacturing sector as a whole.
- > Geographically, the distribution of food manufacturing in Australia closely resembles the distribution of population, with the bulk of the industry located along the east coast, predominantly in Victoria and New South Wales. Between 1998-99 and 2002-03, most of the growth in the industry was concentrated in New South Wales.
- > Within food manufacturing, the most solid growth over the past five years has been in wine, beer and malt, and soft drinks, cordial and syrup. Although not the largest food category overall, between 1997-98 and 2003-04 the value of wine production almost doubled, to \$1.7 billion (in 2005-06 dollars). The other beverage categories and meat also had large absolute increases in value added, of about \$300 million (in 2005-06 dollars) each. Meat products were the largest single product category in terms of value added, worth \$3.4 billion (in 2005-06 dollars) in 2003-04.

### domestic consumption

- > In Australia, consumer expenditure on food is relatively insensitive to changes in income, with expenditure changing by smaller proportions than the changes in household income. Not surprisingly, total household expenditure on food and nonalcoholic beverages increased by only about 3 per cent in real terms between 1988-89 and 2003-04, equivalent to an average growth rate of 0.2 per cent a year. Consumption expenditure increased most significantly for poultry, seafood and fresh fruit and vegetables, and shifted away from meat, eggs, grains and sugar. The overall trend in expenditures suggests that, since 1948-49, consumers may have been including higher proportions of high value foodstuffs such as seafood in their diets.

## food exports

- > Between 1995-96 and 2004-05, total food exports (that is, minimally, substantially and elaborately transformed food products) increased by \$4 billion to \$24 billion (in 2005-06 dollars), at an average growth rate of around 2 per cent a year. Food exports (excluding bulk commodities) have been dominated by substantially and elaborately transformed products. Meat products have been the main export category, although there have also been large increases in wine and dairy exports.
- > Despite Queensland being only the third largest producer of manufactured food products in Australia, the state had the largest exports, with shipments valued at more than \$5 billion (in 2005-06 dollars) in the substantially and elaborately transformed categories in 2004-05. The main export commodities from Queensland were meat (\$3 billion) and sugar (\$1 billion).
- > In 2004, Asia was the biggest market for Australian food exports (US\$7.0 billion). The composition of exports differed significantly between regions – for example, while the European export market was worth only about US\$1.5 billion in 2004, it was the largest export market for Australian wines.

## employment and productivity in the food industry

- > High labor and multifactor productivity growth in food manufacturing has contributed to output growth in the sector, enabling employment to remain relatively unchanged over the past twenty years. On a year to year basis, employment levels fluctuate, reflecting fluctuating incomes in the food industry. These fluctuations are associated with primary product supplies being affected by major climatic events, such as droughts, flooding and severe storms, or through impacts on the value of sales caused by exchange rate movements or sudden shifts in consumption patterns.

## research and development expenditure

- > Research and development (R&D) are closely linked with the location of production centres, which is reflected in the distribution of R&D expenditure between states. Most of the \$50 million (in 2005-06 dollars) increase in food, beverage and manufacturing research and development expenditure between 1997-98 and 2003-04 occurred in Victoria, and close to 70 per cent of total R&D expenditure was in New South Wales and Victoria. R&D expenditure tended to be undertaken by firms with 200 or more employees, and mostly (88 per cent) covered labor costs and other current expenditure (not including capital).

### market concentration

- > The global food industry is dominated by large, multinational firms, and the Australian market reflects that trend. In 2003, about 75 per cent of industry revenues in Australia were generated by fifty firms, more than half of which were foreign owned or publicly listed companies. However, the market shares of the largest fifty firms varied widely in individual food categories – from 95 per cent for milk and cream processing to 7 per cent for seafood.
- > Almost half of the largest fifty firms were foreign owned companies. These firms generated about 45 per cent of domestic revenue in the five years to 2002. There were about nine firms in each of publicly listed companies, cooperatives and privately owned companies, which generated 30 per cent, 14 per cent and 10 per cent respectively of domestic revenue.

### supply chain

- > In 2001-02, inputs (in value terms) into food manufacturing comprised raw agricultural products (32 per cent), major services (26 per cent), labor (17 per cent), food products (13 per cent) and other industrial inputs (12 per cent). Output from the industry was consumed by households (43 per cent), exported (22 per cent), used as inputs by other industries (33 per cent) or through changes in inventories (2 per cent).
- > The meat products industry, including beef and dairy cattle, sheep meat, poultry and pigs, was the largest industry examined. In 2001-02, the industry had a total supply value of around \$15 billion (in 2001-02 dollar values). Agricultural goods were the main input (57 per cent), followed by major services and labor. Within the major services inputs, transport and storage, wholesale trade and business services were the main services provided. Of the buyers of meat products, industries consumed the largest proportion of output (37 per cent), followed by exports (32 per cent) and household consumption (25 per cent).

### global food trends

- > Food sales worldwide in 2002 are estimated to have been worth more than US\$4 trillion (in 2002 dollars), with processed products (packaged foods and beverages) making up more than 70 per cent of this amount. Packaged foods alone were worth approximately US\$1.9 trillion (in 2002 dollars).
- > A key trend in food consumption is that the rate of growth of consumption per person, albeit from a low base, is higher for low and middle income countries. As incomes rise, the rate of growth in food consumption per person tends to decline.

- > The composition of food consumed also changes as incomes increase, with changes to the proportion of different foods in consumer diets. Consumption of fish, dairy and meat products all increase as incomes rise, while there are declines in the proportions of cereals, oils and fats, and fruits and vegetables.
- > The responsiveness of household consumption to income changes also varies with level of income, with significant differences in both the magnitude and range of income responsiveness for different food categories. Per person consumption of food in high income countries tends to have relatively low responsiveness to income changes and narrow ranges of responsiveness between different categories, whereas the inverse holds for developing countries.

### **changing consumer preferences**

- > Reflecting the difference in income growth rates between high and low income countries, the opportunities for the food industry to expand volumes sold within domestic food markets tend to decline as incomes increase. In high income countries, which also tend to have low or declining population growth, firms tend to increase their market share through product differentiation.
- > The types of foods likely to be developed include products that can be sold on the basis of specific sensory appeal (color and flavor enhancement), desired nutritional content, relevant health benefits, food safety, origin of production and processing practices or greater convenience.

### **industry location and trade**

- > The global food processing industry is dominated by a relatively small number of firms. These firms operate food processing facilities across countries and are responsible for most of the investment in such operations. Despite a relatively high concentration in ownership of branded products and production facilities, the existence and location of food processing industries is strongly influenced by the costs of manufacturing and distribution within a region or country.
- > The various economic forces at work in the market for inputs (raw materials, labor and capital investment) mean there is no reason to expect that countries that have a comparative advantage in producing agricultural goods used as raw inputs to food manufacturing will be advantaged in producing manufactured foods for export to other countries.
- > The economic characteristics of food manufacturing have a significant role in determining where processing plants are located internationally. Access to

investment funds and new technologies are two of the most important inputs to the production of elaborately transformed foods as most manufacturing processes are capital intensive.

- > The location of manufactured food production is not necessarily dependent on the availability of the natural resource endowments required to produce raw material inputs. This is because raw product inputs such as refined sugars, starches and grains are relatively nonperishable and easily transportable without loss of nutritional value or quality.
- > Another factor affecting food trade is the cost of the trading activities. Trade related costs include such things as transport charges, cost of coordinating deliveries for managing supply chains with multiple inputs from a variety of regions, and communication and transactions costs (such as cost of meeting legal and regulatory requirements). Together, these factors can result in a decline in trade, the further the final market is from the country where the goods are produced. In this regard, Australia performs well compared with other trading nations given Australia's distance from its major trading partners.
- > The value of internationally traded food products is increasing at an average rate of 2.4 per cent a year. However, this trade is highly regionalised – with most trade occurring intraregionally. That is, exports and imports of food products occur predominantly within Asia, within the European Union and within the North American Free Trade Area rather than across regions.
- > These trade flow patterns provide an indication that the desire to locate processing facilities close to final markets exerts a strong influence on the location of food processing industries across countries.

### **Australia's export performance**

- > Comparative advantage is a fundamental economic driver in determining the long run export performance of an industry. By engaging in trade, countries that specialise in producing goods in which they are relatively efficient will maximise their economic benefits.
- > For Australia, the composition of food exports is such that 95 per cent of the value of exports occurs in the bulk, and minimally or substantially transformed product categories. Only a small percentage of Australia's food exports are represented by elaborately transformed products such as confectionery products.
- > Analysis of the rate of growth of food exports relative to the growth in world trade on a product line basis indicates that over 75 per cent of the value of

total food exports is in products in which the Australian share of export markets is increasing. In addition, 35 per cent of total exports are occurring in products for which the rate of annual growth in trade exceeds that of the growth in world trade for food products in total. That is, 35 per cent of Australian food product exports are being shipped to growing world markets and are increasing their share of world trade at the same time.

- > Conversely, only a small share – 6 per cent – of exported product lines are in markets for which both trade is declining and Australia is losing market share.

## food industry overview

In this chapter, changes and trends in Australia's food manufacturing sector are examined in terms of production, domestic consumption and changes in food exports. The performance of the food manufacturing sector compared with the manufacturing sector as a whole is also considered by looking at productivity estimates, changes in employment and investment in research and development. Market concentration and the presence of multinational food firms in Australia are considered. At the end of the chapter, a series of supply chain figures are provided that highlight the key inputs for individual food subsectors and trends in food consumption.

### *food manufacturing sector in Australia*

Food manufacturing has consistently been a major component of Australia's manufacturing sector and the industry has achieved strong growth in output over recent years. Between 1996-97 and 2002-03, industry output (as measured by income from sales and services) grew at an average rate of 4 per cent a year in real terms (that is, net of inflation).

When considering the contribution of the food manufacturing industry to the Australian economy, it is important that comparisons are undertaken using value added by the industry rather than industry turnover. In real terms (2005-06 dollars) the value added from food manufacturing increased by more than \$3 billion between 1995-96 and 2004-05 (figure A; ABS 1999b, 2006b). This made it the largest value added industry in Australian manufacturing, at \$20 billion in 2004-05.

The average growth rate for the food manufacturing industry over the period 1995-96 to 2004-05 was about 2 per cent a year. This was

fig A **industry value added, Australian manufacturing industry** in 2005-06 dollars

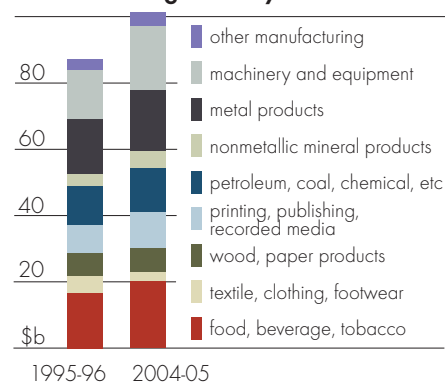
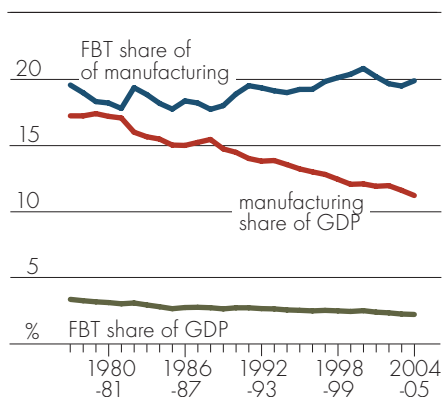


fig B food, beverage and tobacco (FBT) manufacturing share of Australian GDP

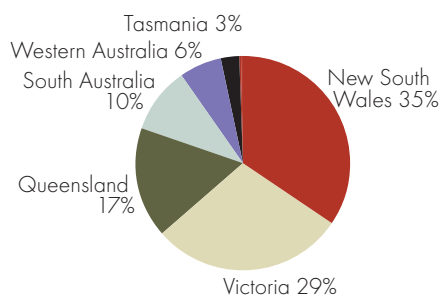


slightly higher than the annual growth rate for the manufacturing sector as a whole over the same period, but lower than some other industries in manufacturing, including nonmetallic minerals, printing, publishing and recorded media, and machinery and equipment, which grew on average by around 5 per cent, 3 per cent and 2.5 per cent a year respectively. Only textile, clothing, footwear and leather manufacturing declined in terms of value added during this period – by about \$2.4 billion (in 2005-06 dollars).

Over the 25 years to 2004-05, the share of the food manufacturing sector in Australia's GDP declined slightly (figure B; ABS 2006a). At the same time, the share of the manufacturing sector as a whole declined from 17 per cent in 1977-78 to 11 per cent in 2004-05. Although the contributions to GDP of both the manufacturing sector and the food manufacturing industry have declined, food manufacturing remains important, producing about 19 per cent of the manufacturing sector's contribution to GDP in 2004-05 (figure B).

The food manufacturing industry is concentrated along the eastern coast of Australia, with more than 80 per cent located in New South Wales, Victoria and Queensland (figure C; ABS 2006d). The distribution of food manufacturing between the states shown in figure C closely resembled the distribution of population at June 2003.

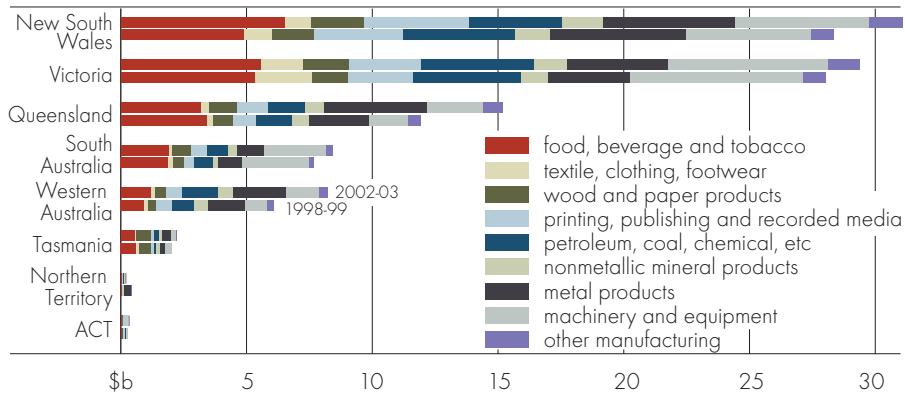
fig C state shares in Australian food, beverage and tobacco manufacturing, 2002-03



The Northern Territory and ACT had shares of 0.2 per cent.

As a proportion of state manufacturing industries, between 1998-99 and 2002-03 the food manufacturing sector increased in value added terms in New South Wales, Victoria and Western Australia, and remained constant in Tasmania and South Australia (figure D; ABS 2006d). The value added in food manufacturing declined in Queensland and the two

fig D Australian manufacturing industry value added, by state

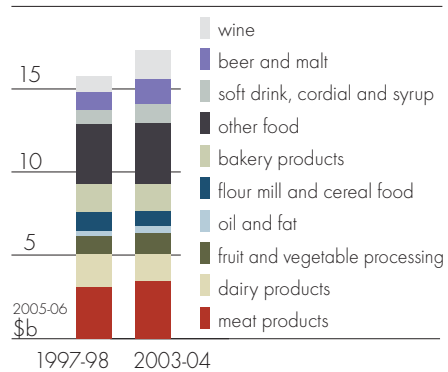


territories. Almost all of the \$1.8 billion (in 2005-06 dollars) increase during this period occurred in New South Wales (\$1.6 billion). The food industry maintained a share of more than 20 per cent of the total manufacturing sector value added in New South Wales, Queensland, South Australia and Tasmania.

Within the food manufacturing industry, the largest individual subsectors in 2003-04 were 'other food' products (20 per cent), meat products (19 per cent), wine (10 per cent) dairy products (9 per cent) and bakery products (9 per cent) (figure E; ABS 1999b, 2006b). 'Other food' products included sugar, confectionery, seafood processing, prepared animal and bird feed and food not elsewhere specified. Confectionery and food not elsewhere specified represented most of the category, with about two-thirds of its value.

Value added in the wine industry increased the most during this period, almost doubling from \$900 million to \$1.7 billion (in 2005-06 dollars). Apart from flour mill and cereal foods, bakery products and dairy products, the other categories also increased.

fig E Australian food, beverage and tobacco industry value added, by subsector



## domestic food consumption and expenditure

Between 1988-89 and 2003-04, average weekly household expenditure on food and nonalcoholic beverages increased by about 3 per cent in real terms. This was equivalent to an average growth rate of less than 0.2 per cent a year. Further, although total expenditure on food increased, it declined as a proportion of total household expenditure (table 1). The majority of the \$110 (in 2005-06 dollars) a week increase in household expenditure between 1988-89 and 2003-04 was spent in areas other than food. Expenditure on food is relatively less sensitive to income growth than are other forms of expenditure; income elasticities of demand for most food products are less than 1 (Gehlhar and Coyle 2001).

table 1 **weekly Australian household expenditure**  
in 2005-06 dollars

	1988-89		2003-04	
	\$	%	\$	%
food and nonalcoholic beverages	156.6	19	161.2	17
alcoholic beverages	27.6	3	24.6	3
tobacco products	11.3	1	12.2	1
current housing costs (selected dwelling)	117.3	14	142.4	15
domestic fuel and power	21.0	3	24.9	3
other	487.7	59	566.5	61
total	821.6	100	931.7	100

Note: Figures may not add due to rounding.  
Source: ABS (2006c).

table 2 **apparent per person consumption of selected foods, Australia**

		1948-49	1958-59	1968-69	1978-79	1988-89	1998-99
meat <b>a b</b>	kg	89.9	100.4	89.5	102.1	86.7	80.3
poultry <b>b</b>	kg	na	na	8.3	17.1	24.1	30.8
seafood	kg	4.1	4.5	5.6	6.4	8.3	11
dairy	kg	22.3	22.1	25.4	22.1	23.8	23.3
fresh fruit equivalent	kg	80.9	72.2	86.5	91	111.6	135
fresh vegetable equivalent	kg	129.7	117.1	124.3	122.5	148.1	162
eggs	no.	255	206	222	220	146	137
grain	kg	162.1	na	145.6	127.5	na	138.1
nuts	kg	6	6.5	8.6	5	6.1	7.1
oils and fats <b>c</b>	kg	14	na	14.3	21.6	20.4	18.5
sugar <b>d</b>	kg	56.8	53	51.9	54.5	48.3	43.4

**a** Meat does not include canned meat. **b** Dressed weight equivalent. **c** Includes an estimate for vegetable oils and other fats. **d** Includes sugar content of syrups, honey and glucose. **na**. Not available.  
Source: DAFF (2005).

Long term food preferences have also been changing in Australia (table 2). Consumption has shifted away from meat, eggs, grains and sugar, and increased for poultry, seafood, and fresh fruit and vegetables. Consumption of dairy products has remained relatively stable since 1948-49. The trend suggests that consumers may be including a higher proportion of high value foodstuffs in their diets, such as seafood, and fresh fruit and vegetables.

With stable household expenditure on food, growth of the food manufacturing sector is closely linked to domestic population growth and growth in overseas demand for Australian food products.

### food exports

Exports of manufactured food items have consistently accounted for a large proportion of total exports of manufactures. Between 1996-97 and 2003-04, food manufacturing exports increased by \$4.5 billion which was second in size to metal product manufacturing (\$8.3 billion) in 2005-06 dollars (figure F; ABS 1998, 2006b). Apart from textiles, clothing, footwear and leather (down by \$350 million), all of the other industries had slight increases during this period.

Minimally transformed food products have declined as a proportion of total food exports since the mid-1990s (figure G; DAFF 2005), as have many individual food subgroups (seafood, dairy, fruit and vegetables, oil and fat, flour mill and cereal food and bakery products).

The only subsectors to increase their percentage share of food exports were meat products, and beverages and malt. The value of exports in most subsectors increased in real terms. Between 1990-91 and 2004-05, the largest increase was in meat products (\$3.5 billion in 2005-06 dollars). Seafood, which fell by \$4.9 billion (in 2005-06 dollars), was the only subsector to record a reduced value of exports.

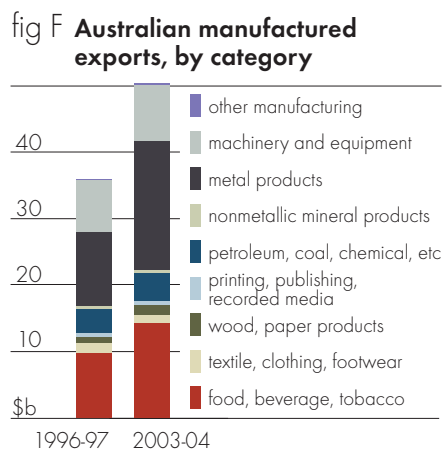
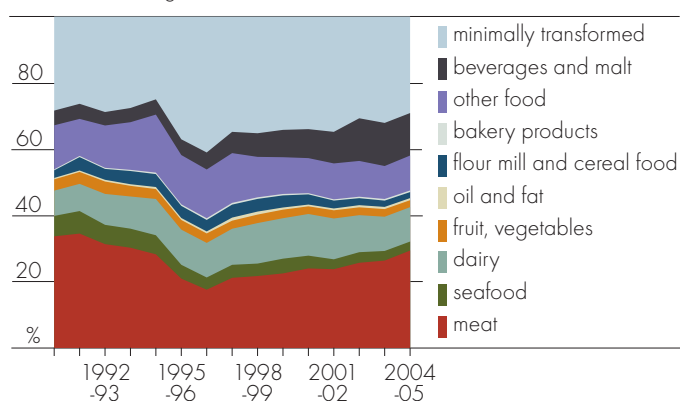


fig G Australian food export shares  
excluding bulk commodities



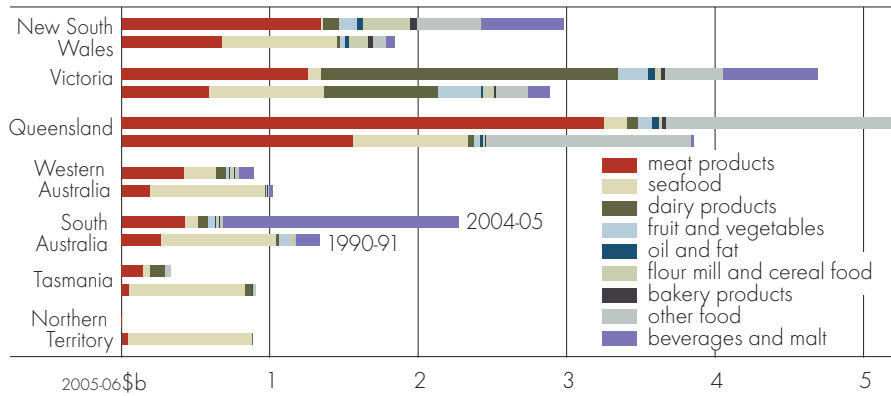
The increases (in 2005-06 dollars) in the other subsectors of Australian manufactured exports were:

- > beverages and malt (\$2.5 billion)
- > dairy products (\$1.5 billion)
- > other food (\$745 million)
- > flour, mill and cereal products (\$153 million)
- > oil and fat (\$86 million)
- > bakery products (\$64 million)
- > fruit and vegetables (\$43 million).

In 2004-05, meat exports were the largest category in most states, particularly in Queensland (figure H; DAFF 2005). Most of the other export categories were relatively small, with the exception of beverages and malt from South Australia, Victoria and New South Wales, dairy products from Victoria and sugar from Queensland (in the other food category). Sugar exports by value from Queensland were more than 96 per cent of national sugar exports in 2004-05.

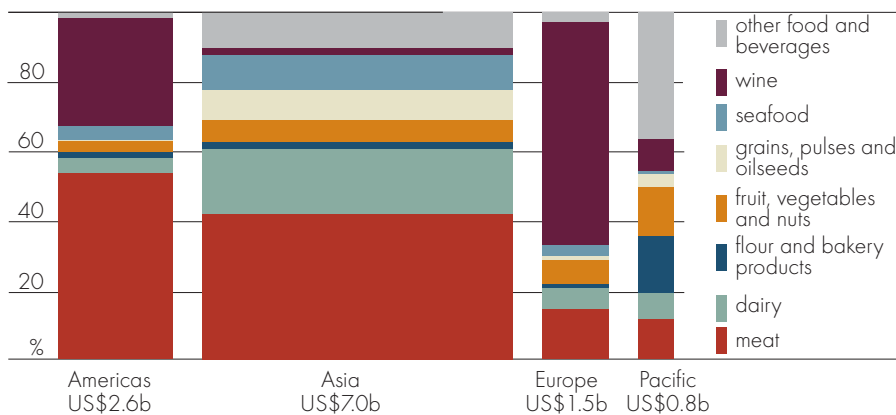
Although being only the third largest state in terms of value added to food production, Queensland had the highest value of food exports, and the largest share of national exports in two categories (meat \$3 billion and sugar \$1 billion in 2005-06 dollars). Other exports from Queensland included seafood (\$151 million), fruit and vegetables (\$94 million), dairy (\$75 million) and oil and fat (\$46 million).

fig H **Australian food exports, by state**  
excluding bulk commodities



There were also clear regional trends in exports depending on their destination (figure I; United Nations Statistics Division 2006). Meat products were the largest food category exported to both the Americas and Asia, including Australian beef exports to the United States, Japan and the Republic of Korea. Most of Australia’s dairy exports were also destined for Asia. Europe was the second smallest market for total food exports, but had the largest market for Australian wine exports. Although the Pacific was a small market overall, it was the second largest destination for Australian flour and bakery products.

fig I **Australian food exports, by destination region, 2004**



The competitiveness of the Australian food production industry, in both domestic and export markets, has been affected by productivity growth and investment in research and development. In the following sections, changes in productivity and employment in food manufacturing relative to manufacturing as a whole and the wider economy, and trends in research and development are examined.

### food industry productivity

Productivity growth in an industry is important for maintaining competitive performance. The simplest definition of productivity growth describes it as being the change in the ratio of the quantity of outputs to the quantity of inputs. Total factor productivity growth refers to the relationship between all production inputs and outputs. Labor productivity growth is the increase in output for each unit of labor input. Maintaining the ability to compete in the marketplace when the terms of trade faced by an industry are declining requires productivity to increase at a rate at least equal to that of the decline in the terms of trade.

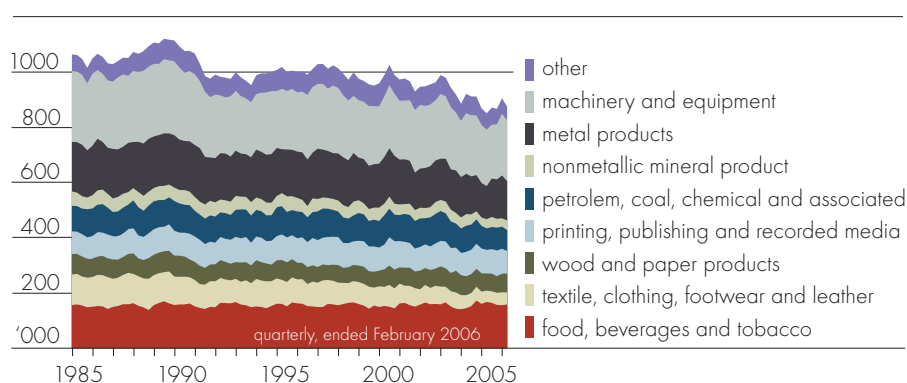
Between 1993-94 and 2000-01, multifactor productivity in the food manufacturing industry increased at an average rate of 0.8 per cent a year, well above the multifactor productivity growth in the manufacturing sector, but below the national average (all industries) (table 3). This productivity growth could be regarded as one of the factors behind the 4 per cent annual growth in the value of the output of the industry discussed above.

table 3 **productivity growth rates for Australian manufacturing industries** average annual growth

	1973-74 to 1984-85	1984-85 to 1993-94	1993-94 to 2000-01
	%	%	%
<b>labor productivity</b>			
food, beverage and tobacco	3.6	1.9	2.2
total manufacturing	3.6	1.9	1.8
national average (all industries)	3.4	3.1	2.9
<b>multifactor productivity <sup>a</sup></b>			
food, beverage and tobacco	1.3	0.7	0.8
total manufacturing	2.0	0.3	0.6
national average (all industries)	2.0	1.7	0.9

<sup>a</sup> Productivity attributable to labor and capital combined  
Source: Productivity Commission (2003).

fig J trends in full time manufacturing sector employment in Australia



In the food industry, labor productivity growth rates have been higher than those achieved in the manufacturing sector over the past ten years. In contrast to the manufacturing sector as a whole (table 4), the number of full time workers employed in the food industry in 2003-04 was almost the same as it was twenty years ago (figure J). Despite the relative long term stability in the number of workers in full time employment in food manufacturing, annual fluctuations in the number of full time workers can be quite large. Quarterly fluctuations in workers employed were sometimes more than 12 per cent. The lowest number of workers employed full time during the period 1998-2004 was 130 000 in August 1988, compared with the highest of 172 000 in August 2004.

table 4 full time employment in Australia, by sector

	February 1985		February 1995		February 2006	
	'000	%	'000	%	'000	%
manufacturing	1 061.5	20	1 018.0	17	931.6	13
construction	421.3	8	507.6	8	757.4	11
property and business services	333.9	6	576.6	9	893.4	12
cultural and recreational services	78.5	1	124.7	2	149.5	2
communications	139.8	3	137.8	2	154.9	2
other employment sectors	3 417.3	63	3 797.2	62	4 356.5	60
total employment	5 452.3		6 161.9		7 243.3	

Source: ABS (2006e).

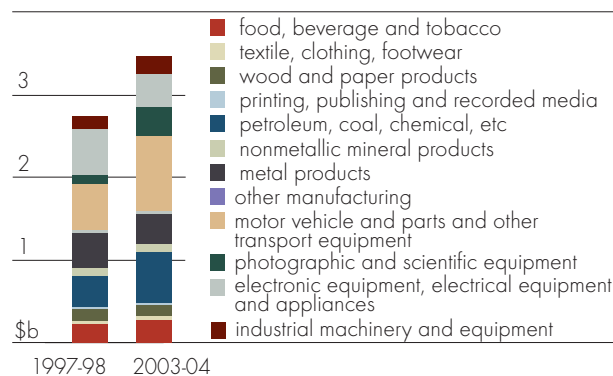
Over the long term, increased productivity in the food manufacturing industry has allowed output to increase, while using fewer resources (such as labor). This helps to improve the competitiveness of the industry.

### research and development expenditure

Productivity growth is closely linked to the development and adoption of more efficient technology (including products and processes), often a product of research and development. Research and development is defined as ‘the systematic investigation or experimentation involving innovation or technical risk’ (ABS 2005, p. 41). The outcome of research and development will be a new or improved product, process, material, device or service, and includes the modification of existing processes or products. Work ceases to be research and development once it is no longer experimental (ABS 2005).

Between 1997-98 and 2003-04, spending on research and development increased by \$50 million (in 2005-06 dollar terms) in the food manufacturing sector, although it declined as a share of the total research and development expenditure within the manufacturing industry (figure K; ABS 1999a; 2005). Despite the overall increase in research and development expenditure over this period, there was year to year variation of up to \$36 million. This may reflect the fixed, ‘lumpy’ nature of most research and development expenditure, such as upgrades of equipment or facilities.

fig K manufacturing R&D expenditure in Australia, by subsector



Spending classified as 'research and development expenditure' in ABS (2005) statistics is separated into three separate categories: capital expenditure, labor costs and other current expenditure (box 1). Of the \$274 million spent on research and development in the food manufacturing sector in 2003-04, 12 per cent was spent on capital expenditure, 45 per cent on labor costs and 43 per cent on other current expenditure.

Firms with a thousand or more employees were responsible for 45 per cent of the expenditure on research and development in the food manufacturing sector in 2003-04. A further 30 per cent was undertaken by firms with 200-999 employees. Firms in the categories with 50-99 and 100-199 employees each spent 7 per cent, while firms with fewer than 50 employees spent 9 per cent.

Research and development expenditure in the food manufacturing industry has not been as large as in some of the other manufacturing industries, although total spending increased in most states (figure L; ABS 1999a, 2005). Tasmania and the two territories were the only regions of Australia to record a decline in food manufacturing research and development expenditure between 1997-98 and

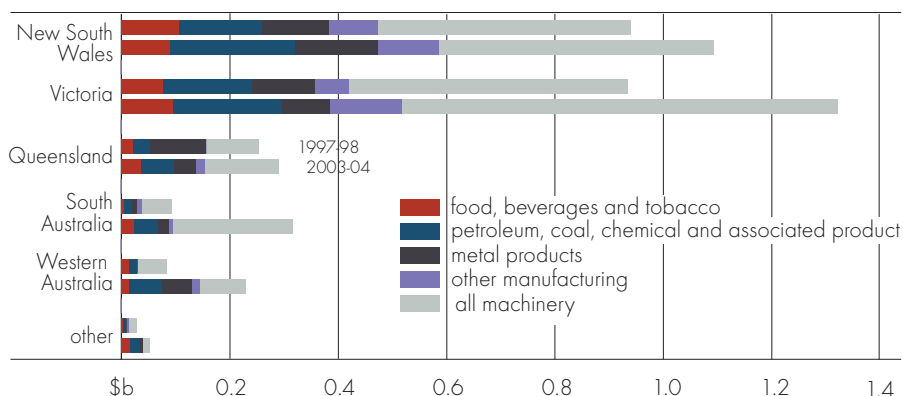
#### box 1 types of research and development expenditure

**Capital expenditure** includes the acquisition of fixed tangible assets, such as land, buildings, vehicles, plant, machinery and equipment attributable to research and development.

**Labor costs** include wages and salaries; overtime earnings; penalty payments; shift allowances; employer contributions into superannuation; fringe benefits and payroll taxes; severance, termination and redundancy payments; workers' compensation premiums/costs; provisions for employee entitlements; salaries and fees of directors and executives; retainers and commissions of persons who received a retainer; bonuses; annual and other types of paid leave.

**Other current expenditure** includes materials, fuels and other inputs; rent, leasing and hiring expenses; repair and maintenance expenses; payments to outside organisations for use of specialised testing facilities or for analytical work, engineering or other specialised services in support of R&D projects carried out by the business; commission and consultant expenses for research projects carried out by the business (except direct labor costs); software for own account produced as part of R&D; and the proportion of expenditure on general services and overheads (ABS 2005).

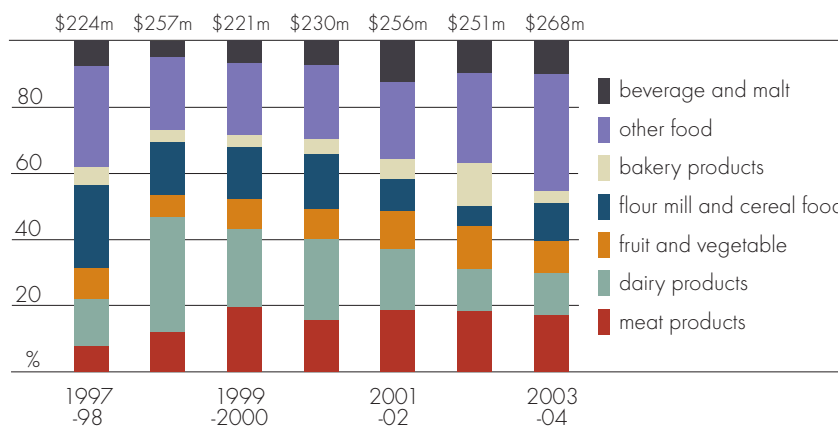
fig L manufacturing R&D expenditure in Australia, by state



'Machinery' includes: motor vehicle and parts, plus other transport equipment; photographic and scientific equipment; electronic equipment and electrical equipment and appliances; and industrial machinery and equipment. 'Other manufacturing' includes: textile, clothing, footwear and leather; wood and paper products; printing, publishing and recorded media; nonmetallic mineral products; and other manufacturing.

2003-04. The largest increases in state spending during this period (in 2005-06 dollars) were in Victoria (\$38.6 million), followed by South Australia (\$19.1 million), Queensland (\$18.7 million) and New South Wales (\$13.1 million). Western Australia had a small increase in expenditure. Almost 70 per cent of the national research and development expenditure in the food manufacturing sector occurred in New South Wales and Victoria in 2003-04.

fig M food manufacturing R&D expenditure in Australia, by subsector



Although meat products, dairy products and flour mill and cereal food were the largest single subsectors of research and development spending, the 'other food' category had the strongest growth in R&D spending between 1997-98 and 2003-04, and was the major spending category by the end of the period (DAFF 2005). The 'other food' category includes sugar, confectionery, prepared animal and bird feed and seafood. Research and development spending gradually increased in beverages and malt, but spending on R&D for bakery products and fruit and vegetables declined overall during 1997-98 and 2003-04 (figure M).

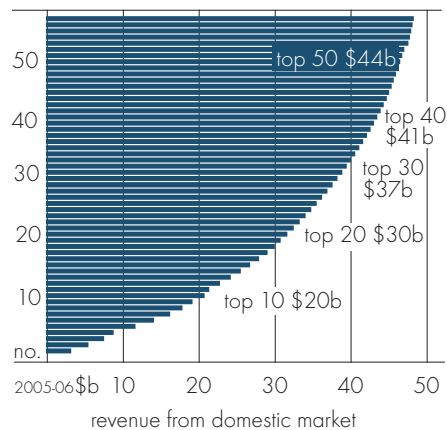
### market concentration

Subsectors of the food manufacturing industry worldwide tend to be dominated by large, multinational firms. This is also the case in the Australian market, where the largest fifty food and beverage corporations produced close to three-quarters of the domestic industry's revenue (\$44 billion) in 2003 (IBISWorld 2003). The next largest ten corporations only accounted for an additional 2 per cent of industry revenue. A list of the largest fifty firms shown in figure N can be found in appendix A. At the retail level, 100 companies accounted for more than 75 per cent of packaged food sales (AC Nielsen 2004).

Selected features of the largest fifty food and beverage corporations are shown in table 5. Foreign owned corporations made up almost half of the largest fifty, and produced 47 per cent of domestic revenue. They were also the type of company that generated the highest average return on shareholder funds during the five years to 2002. Most of the activities of foreign owned corporations in Australia tend to be confined to Australia, with only 3 per cent of their total revenue generated from offshore investments.

Publicly listed companies generated close to 30 per cent of total local revenue, but had lower returns to shareholders than foreign owned companies. They operated almost as much offshore as onshore, with 44 per cent of their total revenue generated from overseas investment.

figN Australia's largest 50 food and beverage corporations



The smallest two company categories, cooperative and private companies, had smaller shares of sector revenues – 14.4 per cent and 10 per cent respectively. Returns to cooperative shareholders were in between the two categories above, at 11.6 per cent. Neither cooperative nor private companies generated revenue from offshore investments (IBISWorld 2003).

Similar to the distribution of food manufacturing production, the largest fifty food and beverage corporations were based in New South Wales and Victoria, followed by Queensland, South Australia and Western Australia.

Although the largest fifty food and beverage corporations in Australia account for a large proportion of food manufacturing revenues in 2002, their revenue shares vary considerably between different subsectors (from 7 per cent in the case of sea food processing to 94 per cent in the case of milk and cream processing) (table 6).

The assets (manufacturing facilities and logistics operations) and main sources of revenue of the largest fifty food and beverage corporations in Australia are in

table 5 **features of the largest fifty food and beverage corporations in Australia, 2002**

	number of firms	total revenue	share of total	australian revenue	return on share of total	weighted shareholder funds after tax five years to 2002
	no.	\$b	%	\$b	%	%
<b>by ownership</b>						
foreign	24	21.19	39	20.59	46.9	13.8
listed	9	22.56	42	12.59	28.7	9.0
cooperative	9	6.32	12	6.32	14.4	11.6
private	8	4.38	8	4.38	10	na
total	50	54.45	100	43.89	100	11.1
<b>by location</b>						
New South Wales	25	30.03	55	22.07	50	11
Victoria	15	17.07	31	14.63	33	12
Queensland	7	5.46	10	5.45	12	11
South Australia	2	1.48	3	1.33	3	14
Western Australia	1	0.41	1	0.41	1	10
total	50	54.45	100	43.89	100	11.1

Source: IBISWorld (2003).

similar locations and were predominantly located in Australia (figure 0; IBISWorld 2003).

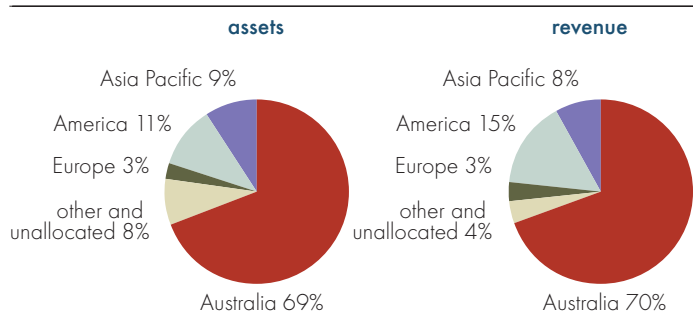
America (dominated by the United States) is the second largest source of revenue for the top fifty corporations. The Asia Pacific, Europe and others account for the remaining sources of revenue and location of manufacturing facilities for the said corporations. This suggests that despite the global trend of multinational corporations to invest locally to service domestic markets, the main firms operating in Australia generally invest in Australian assets and export products rather than develop offshore production capacity.

table 6 **revenue shares of Australia's largest fifty food and beverage corporations in individual subsectors, 2002**

subsector	revenue share %
milk and cream processing	94
confectionery manufacturing	88
beer and malt manufacturing	88
soft drink, cordial and syrup manufacturing	85
sugar manufacturing	81
bread manufacturing	80
spirit manufacturing	79
wine manufacturing	79
poultry processing	75
fruit and vegetable manufacturing	75
cereal food and baking mix manufacturing	73
biscuit manufacturing	70
food manufacturing n.e.c	70
prepared animal and bird feed	66
fats and oils manufacturing	65
flour mill product manufacturing	63
cake and pastry manufacturing	50
meat processing	47
ice cream manufacturing	45
bacon, ham and smallgoods	43
seafood processing	7

Source: IBISWorld (2003).

fig 0 **assets and revenue of the largest fifty food and beverage corporations in Australia, 2002**



## *supply chain: Australian food manufacturing industry*

In this section the 2001-02 cost structure of the Australian food manufacturing sector supply chain as well as the industries where the final products are consumed are examined using the latest available input-output data (2001-02) from the Australian Bureau of Statistics. An analysis of the cost structure of the food manufacturing sector and the distribution of products or outputs across users provides information on the important inputs to the sector and identifies the principal buyers of the sector's outputs. Average values of inputs and outputs for different food subsectors, as well as the industry as a whole, are presented in appendix B, diagrams B1-B10.

Given that the dollar values will have changed since 2001-02, the discussion that follows will be based primarily on the shares involved.

Inputs to each subsector included agricultural goods, food industry goods, other major goods (such as plastic, glass and sheet metal) and major services (such as utilities, transport and business services). In 2001-02, raw agricultural inputs accounted for 32 per cent of total inputs, while major services accounted for 26 per cent, labor 17 per cent, food industry goods 13 per cent and other major goods 12 per cent (appendix B, diagram B1).

The total value of inputs to the food processing industry also includes the value of imported goods in each subsector and the gross industry value added (gross operating surplus and net taxes). Total intermediate inputs from local sources made up an average of 79 per cent of the value of processing outputs in 2001-02. Industry gross value comprised 11 per cent of the value of output and imports were 10 per cent. Within the food processing subsectors, however, there was considerable variation in the proportions of the three different sources of input value. In contrast, wages as a proportion of total value of inputs were around 17 per cent, across most of the subsectors.

The final output table for each industry subsector provides the value of household consumption, exports, industry use and change in inventories. The export values reflect the exports from a particular food processing subsector, not the total exports of a particular food or commodity. For example, meat and meat product exports do not include meat exported as bakery products (such as ravioli). For this reason, they should not be interpreted as the total exports of a single commodity (for example, meat) as nonprocessed exports and exports from other processed food categories will not be included.

Household consumption reflects direct purchases of end use products from retail outlets. It does not include food prepared outside the home, which is captured in the accommodation, cafes and restaurants consumption category. Other industry use reflects the use of processed food or food byproducts in other industries. Food used in the retail sector reflects food used in retail production processes (for example, bakeries and salad bars) and loss, damage and wastage at the retail level.

For outputs, most food (in 2001-02 dollar terms) was consumed by households (43 per cent), exported (22 per cent) or used by industries (33 per cent), with the remainder representing changes in inventories in 2001-02 (appendix B, B1). Of the output used by industries, the processed food industry, together with accommodation, cafes and restaurants, and the retail industry tended to dominate, with shares of 32 per cent, 30 per cent and 19 per cent respectively. Of the output used in the larger two categories (in 2001-02 dollar terms), the majority was consumed by households, although smaller amounts were used within the industry or exported (appendix B, B1). Generally the shares of food product users varied considerably between the individual food products (see appendix B, diagrams B2-B10).

# 2

## global food trends

Global food sales, including food sales through retail stores and food service establishments, were estimated to be worth more than US\$4 trillion in 2002 (table 7). Within global food sales, processed products, including packaged food and beverages made up approximately 78 per cent of estimated global sales (Regmi and Gehlhar 2005b). Packaged food alone accounted for 48 per cent of total food sales, while beverages accounted for over 29 per cent. Fresh food was the smallest subcategory, at 22 per cent of total food sales.

### *food consumption*

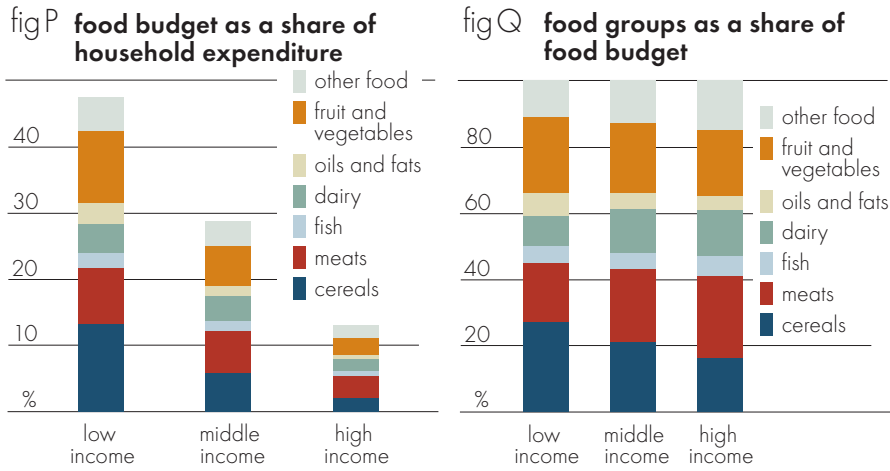
A key trend in food consumption is that the rate of growth per person over time is higher for lower income countries, reflecting growth from a relatively low level. The rate of growth declines as incomes rise and as nutritional needs are increasingly satisfied. Together with increases in consumption of non-food items such as services, this results in a smaller share of expenditure on food in the household budget as income increases. For low income countries, the average share of the household budget spent on food in the late 1990s was 47 per cent, while for high income countries the share was 13 per cent (figure P; Regmi and Gehlhar 2001).

table 7 **global food sales, 2002**  
in 2002 US dollars

	<b>retail stores</b>	<b>food service</b>	<b>total</b>
	US\$b	US\$b	US\$b
fresh food	531	382	913
processed products	1 762	1 420	3 182
packaged food	1 148	828	1 976
beverages	614	592	1 206
- alcoholic drinks	316	422	729
- hot drinks	53	12	65
- soft drinks	245	167	412
total food	2 293	1 803	4 096

Source: Regmi and Gehlhar (2005b).

The type of food consumed also varied between the different income regions. Cereal consumption represented 28 per cent of total food consumption for low income countries but only 16 per cent for high income countries. There were also small differences (3 per cent each) in the proportions of oils and fats and fruit and vegetables consumed in high income countries relative to low income countries (figure Q; Regmi and Gehlhar 2001). Expenditure on other food and fish was slightly higher in the higher income regions, as were the differences in the amount spent on dairy products (6 per cent) and meat



Expenditure in 2002 by income group (based on per person gross national income in US dollars): low income: ≤US\$760; middle income: US\$761-9360; high income: ≥ US\$9361 (World Bank 2000).

products (7 per cent) (figure Q; Regmi and Gehlhar 2001). The breakdown of per person expenditure on food products for each of the different income groups shown in figures P and Q highlights the potential for growth in the value of food markets in low income and middle income countries.

Although the changes in the types of food consumed were not large for most food categories across income groups, the change in the proportion of the food budget spent on nonpackaged food compared with packaged food was significant (table 8). For low income countries, only 16 per cent of food purchased during the late

table 8 annual average growth in packaged food sales, by income groups <sup>a</sup>

	GDP per person 2000A\$	per person retail expenditure on food 2002 A\$	growth in packaged food sales per person 1996-2002 %
high income	≥15 912	1 800	2.5
upper middle income	5 145-15 911	548	6.7
lower middle income	5 144-1 298	263	28.1
low income	≤1 297	116	11.9

<sup>a</sup> World Bank classification.  
Source: Regmi and Gehlhar (2005).

1990s was packaged, while for upper middle income and high income countries, more than 50 per cent of food expenditure was on packaged foods (Regmi and Gehlhar 2005). More than 60 per cent of global packaged food sales were consumed in high income countries, such as Japan, the United States and the European Union. Growth in retail sales of packaged food, however, was much larger for lower middle income and low income countries.

There was also a notable difference in the responsiveness of per person consumption to changes in the price of food across different income groups. Low income countries tended to have much higher consumption responses to changes in food prices, particularly for fish, dairy and meat products (Regmi and Gehlhar 2001). The responsiveness of consumption to changes in prices in high income countries was less than half that of low income countries for almost every food commodity.

Within each income bracket, the range of price elasticities of demand for food was estimated to decline as incomes increased (Regmi and Gehlhar 2001). As a result, changes in food prices result in larger changes in per person consumption in low income countries than in high income countries. For example, if all food prices increased by a given percentage, low income countries like Viet Nam would experience higher rates of decline in consumption than would high income countries such as Australia, particularly for foods such as dairy or meat products that have high income elasticities of demand.

table 9 **retail sales and growth of selected food items, by income groups, 2002** in 2002 Australian dollars

		oils/fats	breakfast cereals	ready meals	dried food	dairy products
<b>high income</b>						
France	A\$m	4 218	1 188	5 376	1 995	27 088
annual growth rate 1998-2003	%	1.3	5.0	4.8	1.5	3.8
<b>upper middle income</b>						
Korea, Rep. of	A\$m	1 438	259	44	7 237	4 795
annual growth rate 1998-2003	%	4.9	9.2	5.0	4.6	4.1
<b>lower middle income</b>						
Philippines	A\$m	905	42	55	561	1 050
annual growth rate 1998-2003	%	8.0	12.0	4.8	12.0	11.0
<b>low income</b>						
Viet Nam	A\$m	377	0.37		177	287
annual growth rate 1998-2003	%	14.7	182.0		30.6	10.6

Source: Gehlhar and Regmi (2005).

As incomes increase, the size (value of retail sales) of the food market in a country also increases, despite the declining proportion of income spent on food. Expenditure on food and annual growth rates of retail sales in the median income countries from four different income country groups (high income, upper middle income, lower middle income and low income) are shown in table 9. Although the size of food markets increases with income, the rate of growth in consumption declines.

### *changing consumer preferences*

Increasing incomes in low income or lower middle income countries are often accompanied by high rates of urbanisation. Higher disposable incomes enable urban residents to diversify their food consumption, while increased employment opportunities often reduce the amount of time available for food preparation at home. Both these factors are likely to contribute to diversified diets, which may include higher shares of processed food products, such as dairy products, pre-cut fish and meat, processed fruit and vegetables and ready made meals.

Food markets in high income countries are already dominated by processed food products and have some potential for further growth. However, market expansion in developed countries tends to be limited by low rates of both per person consumption growth and population growth. Most expansion, therefore, occurs as a result of product differentiation.

Product differentiation involves the development or promotion of high value food products with attributes beyond the provision of sustenance. The types of food likely to be developed include products with specific sensory appeal (color and flavor enhancement); desired nutritional content; relevant health benefits; food safety guarantees; origin of production; processing practices; or greater convenience.

Within the food manufacturing industry, Australia is both a source of exports and destination for imports of manufactured food products. The Australian market has characteristics that are common to high income markets – low population growth and a declining proportion of household income being spent on food products. For domestic producers to expand their market shares, they need to differentiate their products and develop new export markets. Foreign demand and barriers to trade will influence the opportunities for exports, as will Australia's relative comparative advantage in supplying processed foods.

# 3

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## industry location and trade

The global food processing industry is dominated by a relatively small number of firms (Bolling and Gehlhar 2005). These firms operate food processing facilities across countries and are responsible for most of the investment in new processing facilities.

Despite the relatively small concentration in ownership of branded products and production facilities, the existence and location of food processing industries is strongly influenced by the costs of both manufactured food production and distribution within a region or country.

When countries are exposed to trade, both the production of goods and the resulting international trade patterns will be determined by their comparative advantage. It is expected that countries will specialise in producing the goods that they are relatively suited to produce – and this in turn is determined by the relative endowment of various factors of production. These can include natural resources (like arable land), skilled and semiskilled labor as well as capital. In particular, it is expected that countries will specialise in producing the goods that rely heavily on the factors that they have in relative abundance.

Although consumption of manufactured foods has grown over the past three decades, and is increasing rapidly, only a small proportion of global food sales are traded products (Regmi and Gehlhar 2005b). In 2002, only 6 per cent of processed food products were traded, compared with 16 per cent of bulk agricultural commodities (Regmi and Gehlhar 2005a). Although consumer demand for processed food continues to grow globally, growth in trade has generally stalled since the mid-1990s (Regmi et al. 2005).

It is important to recognise that trade in processed food products is influenced by trade policies and the economics of food manufacturing.

The transformation of bulk (or raw) agricultural commodities into prepared food products is classified by the degree of processing and inputs involved. This distinction is reflected in the Australian data published annually by the Australian Government Department of Agriculture, Fisheries and Forestry in *Australian Food Statistics* (DAFF 2005). In that publication, processed foods, such as flour or frozen vegetables, are classified as 'minimally transformed' and animal and vegetable oils, pasta

and chocolate are classified as ‘substantially transformed’. Manufactured foods are included in the elaborately transformed data and include items such as cakes and pastries or stuffed pasta. That is, elaborately transformed foods are those where various raw and processed agricultural products (such as sugars, salts, flours, sweeteners etc) are combined to produce a highly transformed product.

For the purposes of the analysis undertaken here, traded food products are classified as:

- > **bulk commodities**, such as grains and fresh fish
- > **minimally transformed products**, such as meat cuts, flour; oils
- > **substantially transformed products**, such as preserved and frozen products
- > **elaborately transformed products**, such as confectionery.

### trade policy influences

Across the range of trade policies on agricultural produce, tariffs generally, but not always, appear to increase with the level of processing. Tariff escalation (where trade restrictions increase with the level of processing) affects trade and food production patterns by restricting opportunities to export processed food. As a result, opportunities for processed food industries to develop in countries facing tariff escalation are limited, while domestic industries in countries with escalating tariffs are encouraged. Tariff escalation occurs in both developed and developing countries, with the rate of increase being relatively high for vegetable oils, beefs, eggs and cereal products (Regmi et al. 2005).

The average tariff level across a range of food processing items in developing countries is presented in table 10. However, considerable care is required when examining average tariff levels. Averages may be strongly influenced by very high tariffs in only a limited number of markets and may not be representative of tariffs affecting the tariff lines most

table 10 **tariff escalation in developing countries <sup>a</sup>**

	applied average tariff %	bound average tariff %
<b>processing level</b>		
fully processed products	21	53
horticultural products	17	47
semiprocessed products	11	45
primary products	11	45

<sup>a</sup> Includes Argentina, Brazil, Chile, Columbia, Costa Rica, Dominican Republic, Ecuador, Egypt, El Salvador, Guatemala, Honduras, India, Indonesia, Jamaica, Mexico, Morocco, Nicaragua, Pakistan, Panama, Philippines, South Africa, Thailand, Trinidad and Tobago, Turkey, Uruguay and Venezuela  
Source: Regmi et al. (2005), based on AMAD (2003) data.

table 11 **tariff escalation – selected countries and products** <sup>a</sup>

processing chain	average tariffs			
	Canada	European Union	Japan	United States
	%	%	%	%
<b>cocoa</b>				
cocoa beans	0	0	0	0
cocoa paste	0	10	8	0
cocoa butter	0	8	0	0
cocoa powder	6	27	19	16
chocolate and products	57	18	21	15
<b>beef, pork and poultry</b>				
meat: fresh or frozen	54	40	41	7
meat preparations	50	37	91	3
<b>sugar</b>				
sugar	5	61	198	24
sugar confectionery	9	20	16	11

<sup>a</sup> 2000-02 total export value.

Source: Regmi et al. (2005), based on AMAD (2003) data.

traded. Further, tariff levels within particular food types may be unchanged across the level of processing, or even decline.

Average tariff levels on cocoa, meat and sugar products are presented in table 11, demonstrating both increasing and decreasing tariff rates as the degree of processing increases.

In addition to tariff escalation, other trade measures such as countervailing duties and antidumping measures have been increasingly used on processed food products over recent years. Of the total 76 antidumping and

countervailing duties present worldwide on agricultural products in 2002, 43 were on processed food products and only one was on a basic agricultural commodity, the remainder relating to semiprocessed and horticultural products (Gehlhar and Regmi 2005).

## *the economics of processed food production*

The extent to which a country is involved in food processing will be strongly influenced by the input requirements of the food industry, as well as the relative abundance of those inputs domestically. That is, any country can be involved in food processing given the availability of the necessary inputs, access to capital and technology.

The production of manufactured foods requires inputs such as:

- > capital in the form of manufacturing and distribution facilities (including access to relevant technologies)

- > raw agricultural inputs
- > operating inputs such as labor, energy, packaging, marketing, etc
- > transport services.

Capital and access to technologies are two of the most important inputs in the production of elaborately transformed foods as most manufacturing processes are capital intensive. Being capital intensive means that it is possible to locate production facilities in relatively high labor cost countries.

Further, raw inputs, such as refined sugars, starches and grains, are relatively nonperishable and easily transported without loss of nutritional value or quality. The location of manufactured food production that requires these inputs is not dependent on natural resource endowments. Examples of processed products that rely on transportable inputs include breakfast cereals, confectionery, beer or soft drinks.

Many elaborately transformed products, such as breakfast cereals, beers and confectionaries, have a long shelf life. Nonetheless, timeliness of delivery to the retail or food service industries is an important business consideration. Being located close to the final market minimises distribution costs and assists in managing customer inventories. Locating production facilities close to the relevant market can also result in output being tailored to local or regional tastes.

As a result of these factors, there is substantial scope to produce elaborately transformed goods in many countries around the world. That is, there is no reason, based on economic principles, to expect that countries that have a comparative advantage in producing agricultural goods that are raw inputs will also have a comparative advantage in producing manufactured foods for export to other countries. For example, beer can be brewed anywhere. The inputs used in beer production (malt, hops and grains) are widely traded. There are globally recognised licensing agreements for the use of brands and specific brewing technologies. To minimise transport costs, a beer of Australian origin is brewed in Canada, where it is sold and exported to the United States under its Australian name (Regmi et al. 2005).

Moving further back along the food processing classification to minimally and substantially transformed foods leads to further consideration of the cost of storage and transporting raw agricultural inputs to processing plants. In this case, there is often colocation between the processing plant and the production of the agricultural good, and this occurs primarily because many agricultural goods are perishable. The effective cost of the raw input increases rapidly between the time

of harvesting and the time of processing because of the spoilage associated with both the time and distance traveled and the increased handling and cold storage logistics. Transport costs have a linear relationship to the distance between the processing facility and the growing region. The impact of spoilage on production costs, however, increases more rapidly, as the ability to convert fresh produce to a quality specific processed product decreases more and more quickly the longer the time elapsed between harvesting and processing.

Except where there may be specific country advantages with large scale broadacre farming for grains or livestock, there is little reason to expect that countries such as Australia have any natural advantage in supplying manufactured food items precisely because of the interaction between perishability, transport costs and access to internationally cost competitive raw inputs.

In the case of vegetables, the collocation of processing facilities with vegetable growing regions in countries around the world results in the lowest transport costs – and occurs primarily because vegetables are perishable. At the same time, transport costs of delivering processed vegetables are also reduced by locating the processing plants close to the final markets. Overall, production costs of the delivered product are minimised by collocating processing plants where vegetables can be sourced competitively, and as close as possible to large or expanding markets (Apted et al. 2006).

The cost advantages of locating processing facilities in producing areas also creates an incentive to locate these processing facilities in the countries with the lowest vegetable production costs. This is balanced against the incentive to locate production facilities close to the final market. The latter effect increases the dispersion of processing facilities internationally, while the former could lead to a concentration of processing within certain regions.

Although the value of internationally traded fresh and processed vegetable products increased at a rate of 5.2 per cent a year between 1989 and 2001, this trade was highly regionalised – most trade occurred intraregionally. That is, exports and imports of fresh and processed products occurred predominantly within Asia, within the European Union and within the North American Free Trade Area rather than across regions (Huang 2004). These trade flow patterns suggest that the desire to locate processing facilities close to final markets is exerting a strong influence on the location of vegetable processing industries across countries.

Investment in food processing facilities is associated with having sufficiently large demand to satisfy the minimum processing plant sizes in order to achieve

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economically efficient production outcomes. The opportunity for investment in new facilities is also strongest in countries where food consumption is growing strongly in response to factors such as rising incomes, population growth and changing lifestyles. Reflecting this dynamic, recent investment in food processing internationally has been occurring in developing countries such as China, India, the Philippines and South Africa (Regmi and Gehlhar 2005b).

### *other trade considerations*

The volume of trade is dependent on consumer preferences both locally in the producing countries and abroad in the countries consuming the imports. The volume of trade is also dependent on the size of the importing market as well as that of the exporting country.

In general, the larger the economy of the importing country, the larger the demand for the imported product. Similarly, the larger the economy of the exporting country, the more likely it is that the exporting industry is relatively large, as it will typically be servicing a large domestic market as well. Operating in a large domestic market may mean that food processors have access to a larger pool of semiskilled and skilled labor, a large service sector supporting the exporting industry and access to effective infrastructure. These factors act to improve the competitiveness of the exporting sector through providing cost effective inputs to the production and transport of exports.

A key determinant of the volume of trade in food manufactures is the cost of conducting trading activities. Trade costs include transport, trade barriers (such as tariffs and nontariff barriers), information costs, contract enforcement costs, various transaction costs, such as legal and regulatory costs or currency and language barriers, and finally local distribution costs in the final market (Anderson and van Wincoop 2004).

Over the past thirty years, there has been significant research effort into examining the idea that trade between any two countries is proportional to the product of the economic size of both the importing and exporting country (as measured by gross domestic product, for example) and inversely proportional to the distance between the two countries. Models incorporating these relationships are known as 'gravity models' (see box 2).

## global food trade

Turning specifically to food products, international trade and the effect of distance, as discussed above, are highly regionalised – with most trade occurring intraregionally.

On a broader food basis, the regionalisation of bilateral trade is also apparent – see table 12 in which data on trade in food products between countries classified according to location (Americas, Europe and Asia) are summarised. Data from the United Nations Comtrade Database used here included trade information for around 150 countries, and accounted for 664 product classifications (at the 6 digit harmonised code level).

The highest regional concentration in food trade occurred in Europe, where 80 per cent of all exports were to other European countries. In Asia, 65 per cent of food exports by countries were to other Asian countries. Reflecting the relative proximity of the west coast of north America to Asia, some 30 per cent of food exports from countries in the Americas went to Asia. However, the majority of trade was still intraregional.

table 12 **food trade shares, by region, 2004**

	importing region			
	Americas %	Asia %	Europe %	other regions <sup>a</sup> %
<b>exporting region</b>				
Americas	43	30	21	6
Asia	13	65	16	7
Europe	7	9	80	4
Other regions <sup>a</sup>	28	50	16	4

<sup>a</sup> Includes African and Pacific nations.

Source: United Nations Statistics Division (2006).

### box 2: gravity models

In gravity models, distance can be considered as a proxy for a variety of trade costs (Head 2003), such as:

- > **transport costs** of shipping products by road, rail, ship or air
- > **time elapsed** during shipment – for perishable goods, this includes the probability of surviving intact (avoiding spoilage of organic products, damage or loss from weather events or mishandling, and loss of market where the intended buyer becomes unwilling or unable to make payment)

*continued*

box 2: **gravity models** *continued*

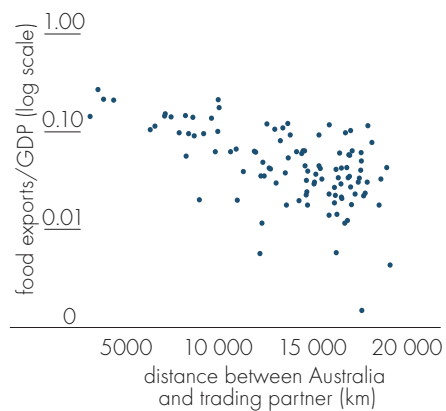
- > **coordination costs** associated with managing supply chains that have multiple inputs sourced from a variety of regions
- > **communication costs**, where electronic communication may provide an imperfect substitute for personal contact between managers, processors and customers
- > **search and transaction costs**, where distance may be inversely correlated with the costs of searching for trading opportunities and the establishment of trust between potential trading partners and
- > **cultural effects**, where the greater the geographic distance, the greater the likely cultural 'distances' that may inhibit communication or result in clashes of business and negotiating styles.

The size of the distance effect appears to be significant. Although the distance effect depends on the product being traded, an analysis undertaken by Disdier and Head (2005) suggested that for every doubling of distance, the value of trade declines by 90 per cent on average. That is, commerce declines dramatically with distance.

A recent study of Australia's aggregate trade performance found that the impact of distance on all exports was such that the value of exports declined by only 50 per cent for every doubling of distance (Battersby and Ewing 2005). This suggests that Australia is performing significantly better than might be expected since, on average, the geographic distribution of Australia's exports is much wider than could be expected based on the size of Australia's economy and its distance from trading partners.

In figure R the relationship between distance, the size of the trading partner's economy and food exports is shown. As expected, because of Australia's geographic isolation, very few trading partners are near Australia. However, although the number of trading partners increases with the distance from Australia, the ratio of exports to GDP declines. This suggests that the size of distance effect reported in Battersby and Ewing (2005) for general manufacturing goods also applies to food trade.

fig R **export destinations, by GDP and distance from Australia**



# 4

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## australia's export performance: revealed comparative advantage analysis

The export of food products (excluding unprocessed items such as grains, live animal and seafood) from Australia has grown at an average of 3.5 per cent a year since 1994, around 1 percentage point higher than the growth in total world trade in food products.

There are fundamental economic drivers that tend to result in countries specialising in the production and export of products for which they have a comparative advantage. Provided that technology is able to be directly acquired and located with relative ease, comparative advantage between countries and regions typically results from differences in the relative supply of inputs, such as labor or natural endowments. Industries that rely on a relative abundance of factors of production in a particular country or region are generally considered to have a comparative advantage in the products they produce. By engaging in trade, countries that specialise in producing goods at which they are relatively efficient will maximise their economic wellbeing by importing the goods that they are relatively less efficient at producing.

In Australia's case, the relatively scarce resource tends to be labor, including unskilled, semiskilled and skilled workers. Relatively abundant resources include natural endowments (such as agricultural land) and capital. Australia can therefore be expected to have a comparative advantage in products that are relatively more land and capital intensive than those of their trading partners.

In this chapter, the performance of Australia's food manufacturing industry is examined by assessing the extent to which the composition of food exports reflects likely comparative advantage.

### *revealed comparative advantage analysis*

By examining the extent to which an exporting country captures world market share for a particular product relative to the degree to which it captures export

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market share for all traded goods, an inference can be made as to whether or not the country is specialised in producing that product, and hence the revealed comparative advantage (see box 3).

An RCA greater than 100 signifies a revealed comparative advantage for the particular item; an RCA less than 100 signifies a comparative disadvantage. The analysis can be conducted either at the individual good level (if data are available) or at an aggregated level. For example, total Australian exports of food products (from bulk products through to elaborately transformed products) represent around 3 per cent of world food trade and total Australian merchandise exports amount to approximately 1 per cent of total world trade. The RCA index for Australian exports of food products of 300 indicates that, in aggregate and as expected, Australia has a revealed comparative advantage in producing food products.

However, an analysis conducted at such an aggregate level overlooks the extent to which exports of individual foods are products in which Australia may have a revealed comparative advantage or whether this advantage is in bulk or transformed food products.

The RCA index is an imperfect measure of comparative advantage because it embodies not only the fundamental economic factors (such as relative factor endowments) affecting relative efficiency but also government policies and institutions that may distort markets, either domestically or internationally. As the produc-

### box 3 revealed comparative advantage

The revealed comparative advantage (RCA) index used in this analysis relies on the level of exports for food (for human consumption) and is defined as:

$$RCA = 100 * \left[ \frac{X_i^k / X_i}{X_w^k / X_w} \right]$$

where:  $X$  = exports;  $k$  = commodity or product;  $i$  = country (Australia in this case); and  $w$  = world.

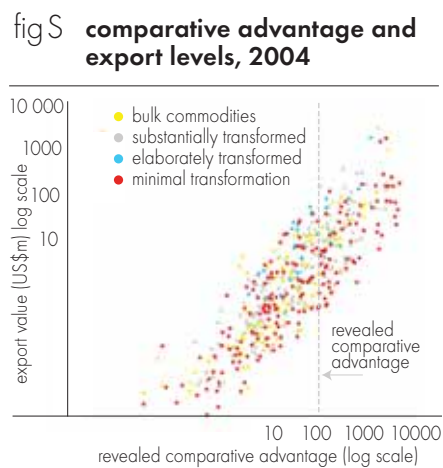
Thus  $RCA = \frac{\text{country } i\text{'s share of world trade in product } k}{\text{country } i\text{'s share of world merchandise trade}}$

tion of food and agricultural products in general in Australia has been only lightly assisted by government, any distortion in the measure will arise from distortions in production or trade from the policies of other countries. That is, if current international trade policies and trade arrangements encourage exports by other countries, or result in lower exports of food products from Australia, the RCA indexes for Australia may be understated. On the other hand, if such policies lead to reduced production or trade by other countries that would not occur in the absence of those policies, RCA indexes for Australia may be overstated.

For this analysis, the trade data have been taken from the Comtrade Trade Statistics Database (2006) at the Harmonised System (HS1992) six digit level. The list of the 570 food product lines considered here is presented in appendix C. Although trade records in HS1992 begin in 1988, substantial coverage (100 countries or more) does not begin until 1994. Hence the changes in revealed comparative advantage for Australia are considered over the eleven year period 1994 to 2004.

Further, in line with the discussion in chapter 2, food product lines have been grouped into four levels of food processing:

- > bulk
- > minimally transformed
- > substantially transformed
- > elaborately transformed.



This reflects both the definitions of processed and manufacturing foods presented in chapter 2 and allows for comparison with the annual data presented in Australian Food Statistics. The broad groupings of harmonised system codes, their descriptions and the processing classification are presented in table 13.

A snapshot of the assessment of the revealed comparative advantage of Australian food products in 2004 is presented in figure S. All products with an RCA index greater than 100 are

table 13 description of product groupings <sup>a</sup>

	HS code – 4 digit		HS code – 4 digit
<b>bulk commodities</b>			
fish (fresh or chilled)	0302	rice	1006
crustaceans, etc	0306, 0307	sorghum	1007
eggs	0407	other grains (eg millet)	1008
vegetables (fresh)	0719-0799	soya beans	1201
wheat	1001	peanuts	1202
rye	1002	copra	1203
barley	1003	oilseeds	1204-1207
oats	1004	other (eg seaweed)	1210, 1211, 1801
corn	1005	pulses (eg lupins)	1214
<b>minimally transformed</b>			
fresh, chilled meats (eg beef, lamb etc)	0201-0206	other meats (eg kangaroo, tripe)	0208, 0401, 0504
poultry	0207	milk and cream	0401-0401
seafood – frozen	0303, 0304	food nec (eg honey)	0408, 0409
other seafood – cooked, frozen, or preserved	0305-0307	processed fruit, nuts and vegetables	0711-0814, 1105
other spices (eg coffee, cloves etc)	0901-0910	flour (inc. groats and rolled grains)	1101-1104, 1208
malt	1107	gum, plant extracts	1301, 1302
animal fat	1502, 1503, 1506	fish oils and fats	1504-1507
sugars (raw and refined)	1701, 1703	cocoa powder, paste	1802-1806
<b>substantially transformed</b>			
bacon, ham and smallgoods,	0209-0210, 0504 1601-1603	seafood – smoked, dried etc	0305-0307
seafood – preserved	1603-1605	dairy products (eg yoghurt, cheese)	0402-0406
frozen vegetables	0710	dried vegetables	0712-1713
preserved vegetables	2001-2005	dried fruits	0801, 0804, 0806, 0813
starch (from grains, potato etc)	1108	thickeners	1302
vegetable oils	1507-1508, 1510-1518	soft drink, cordial and syrup	1702, 2201, 2202
chocolate, cocoa preparations	1806	flour preparations	1901
pasta	1902	tapioca	1903
other grain preparations	1904	extracts, essences and broths	2101-2106
vinegar	2209	proteins, gelatins	3501, 3502
<b>elaborately transformed</b>			
sugar confectionery	1704, 1806	stuffed pasta	1902
biscuits	1905	cakes and pastries	1905
bread	1905	beer, wine & spirits	2203-2208

<sup>a</sup> The Harmonised System (HS) provides a nomenclature for classifying internationally traded goods. The definitions of HS commodity groupings up to the 6 digit level are established by the World Customs Organisation ([www.wcoomd.org](http://www.wcoomd.org)).

regarded as products in which Australia had a revealed comparative advantage in 2004. The positive relationship between the level of exports and the increasing value of the RCA index reflects the nature of the index used, in that the larger the share of total domestic exports of a particular category, the more likely it is that a country has 'specialised' in producing that good because of a revealed comparative advantage.

Of the 497 product lines (at the HS six digit level) exported from Australia in 2004, 158 are classified as products in which Australia has a revealed comparative advantage in that year (see appendix C for a full listing of these 158 product lines). At around \$22 billion, these product lines accounted for 95 per cent of the value of exports in 2004. The total value of exports classified as being products in which Australia does not have a revealed comparative advantage was still significant, however, at approximately \$1.1 billion in 2004.

table 14 **comparative advantage value share, by category, 2004**

level of processing	RCA>100	RCA<=100
	%	%
bulk	97	3
minimally transformed	96	4
substantially transformed	93	7
elaborately transformed	90	10
elaborately transformed (not including wine)	44	56

Although elaborately transformed products had the smallest total share of the exported products that were considered to have an RCA value greater than 100, they still accounted for 90 per cent of the value of exports in the elaborately transformed category (table 14). If wine was not included, however, the share of elaborately transformed products that had an RCA value greater than 100 fell to 44 per cent for the year 2004.

Of the 159 product lines in which Australia is classified in this report as having a revealed comparative advantage, 28 are bulk commodities, 65 minimally transformed, 57 substantially transformed and 8 elaborately transformed.

The top five exports in value terms in each category are reported in table 15 and the top eight are included for the elaborately transformed category. Together, exports in these 23 product lines accounted for 76 per cent of the total value of food exports in 2004.

table 15 selected products and RCA indexes, 2004

	export value 2004 \$m	RCA
<b>bulk</b>		
HO-100190 - wheat except durum wheat, and meslin	4 091	1 681
HO-100300 - barley <sup>a</sup>	1 298	2 861
HO-080290 - nuts edible, fresh or dried, nes	148	1 593
HO-080510 - oranges, fresh or dried	113	290
HO-100110 - durum wheat	95	465
<b>minimally transformed</b>		
HO-020230 - bovine cuts boneless, frozen	2 430	2 539
HO-020130 - bovine cuts boneless, fresh or chilled	2 036	1 942
HO-020442 - sheep cuts, bone in, frozen	368	2 223
HO-020422 - sheep cuts, bone in, fresh or chilled	320	3 353
HO-030621 - rock lobster and other sea crawfish not frozen	236	
<b>substantially transformed</b>		
HO-040690 - cheese except fresh, grated, processed or blue-veined	494	318
HO-040210 - milk powder < 1.5% fat	413	817
HO-040221 - milk and cream powder unsweetened < 1.5% fat	390	621
HO-040630 - cheese processed, not grated or powdered	217	969
HO-210690 - food preparations nes	200	105
<b>elaborately transformed</b>		
H-220421 - grape wines nes, fortified wine or must, pack < 2L	2 470	1 210
H-220429 - grape wines, alcoholic grape must nes	176	684
H-180631 - chocolate, cocoa preps, block, slab, bar, filled, >2kg	107	409
H-180690 - chocolate/cocoa food preparations nes	106	141
H-220410 - grape wines, sparkling	65	138
H-170410 - chewing gum containing sugar, except medicinal	19	185
H-220600 - fermented beverages nes (eg cider, perry, mead, etc)	11	178
H-190510 - crispbread	10	278

<sup>a</sup> Includes barley for feed.

### *revealed comparative advantage over time*

For Australia, the number of food product lines that are exported between 1994 and 2004 in which Australia is assessed to have a revealed comparative advantage has remained relatively stable at around 150-160 items (table 16). That said, however, there are periods when the number of products in which Australia

table 16 **count of Australian product lines with revealed comparative advantage, by transformation process**

	<b>bulk transformed</b>	<b>minimally transformed</b>	<b>substantially transformed</b>	<b>elaborately transformed</b>
	no.	no.	no.	no.
1994	31	59	53	5
1994	31	59	53	5
1995	35	66	56	6
1996	30	67	54	9
1997	32	72	54	8
1998	31	68	54	6
1999	32	66	56	9
2000	36	73	62	8
2001	37	78	56	10
2002	32	68	54	10
2003	27	64	56	8
2004	28	65	57	8

table 17 **Australian exports, by transformation process** in 2005 dollars

	<b>bulk transformed</b>	<b>minimally transformed</b>	<b>substantially transformed</b>	<b>elaborately transformed</b>
	\$m	\$m	\$m	\$m
1994	3 773	8 116	2 766	839
1995	3 190	7 928	2 761	930
1996	6 856	7 190	3 332	1 155
1997	6 632	7 613	3 296	1 265
1998	4 682	5 444	3 001	1 267
1999	4 589	5 895	3 177	1 571
2000	4 542	6 031	3 468	1 716
2001	4 345	6 187	3 345	1 815
2002	4 776	5 970	3 281	2 210
2003	3 473	6 143	2 997	2 573
2004	6 258	7 924	3 692	3 172
annual growth <sup>a</sup>	%	%	%	%
	2.7	< 0.1	6.9	13.0

<sup>a</sup> Annual growth in export value 1994-2004.

can be classified in this report as having a revealed comparative advantage can increase or decrease in response to market opportunities.

In the period 1994-2004, the value of exports in bulk, substantially transformed and elaborately transformed products grew moderately strongly (table 17). The strong growth in exports in elaborately transformed products was largely a reflection of the strong export growth of the Australian wine sector over the period. The value of minimally transformed products generally declined over the period, although the sudden increase in export values in 2004 returned the sector to the levels experienced ten years earlier.

Change in the revealed comparative advantage of different sectors can also be examined over time (figure T). Although there is variation in the RCA indexes across the classifications over time, at the level of aggregation used, all groups of food exported exhibited a revealed comparative

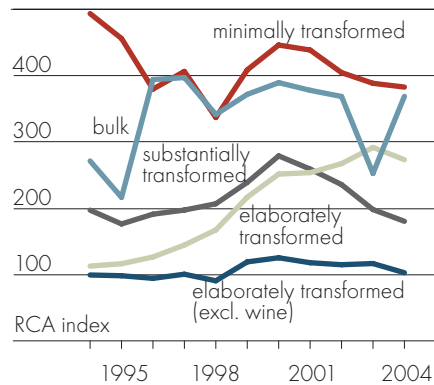
advantage in 1994-2004. The variation in revealed comparative advantage that occurs appears to coincide with changes in exports, particularly in the bulk and minimally transformed sectors. Not surprisingly, large drops in revealed comparative advantage for bulk products coincide with the droughts in 1994-95 and 2002-03.

Individual sectors that are large relative to the chosen level of aggregation, or sectors experiencing strong export growth can significantly influence the determination of whether a

group of commodities exhibits revealed comparative advantage. For example, in the elaborately transformed sector, wine accounted for 33 per cent of Australian exports from this sector in 1988. By 2004, wine products accounted for 84 per cent of elaborately transformed food exports. Considering only those products in which Australia has a revealed comparative advantage, wine accounted for 92 per cent of the value of exported products in 2004.

For elaborately transformed products, the RCA index over time was recalculated to exclude wine products (figure T). This resulted in a much lower level for the index – with the index being less than 100 in four of the eleven years.

figT **changes in Australian revealed comparative advantage by level of transformation**

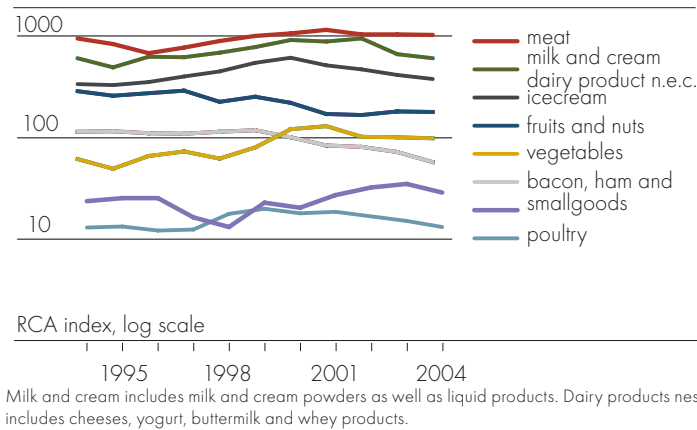


### revealed comparative advantage, by product groups

The majority of the food products that are classified as minimally or substantially transformed are meat, dairy, fruit and vegetables. The RCA indexes between 1994 and 2004 are presented in figure U.

Meat (whole carcasses and specific cuts or portions from cattle, sheep, pigs and other animals) accounted for a large share of exports in the minimally and substantially transformed products during the period examined. For example, in 2004, 55 per cent of the value of minimally and substantially transformed products exported was classified as meat. With an RCA index well in excess of 100 over this period, it is clear Australia has a revealed comparative advantage in these products. Examination of the RCA indexes at the finer product lines within meat, such as

fig U revealed comparative advantage indexes for meat, dairy, fruit and vegetable products in Australia



carcasses or cuts for beef, sheep, lambs and pigs, were all revealed to have a revealed comparative advantage.

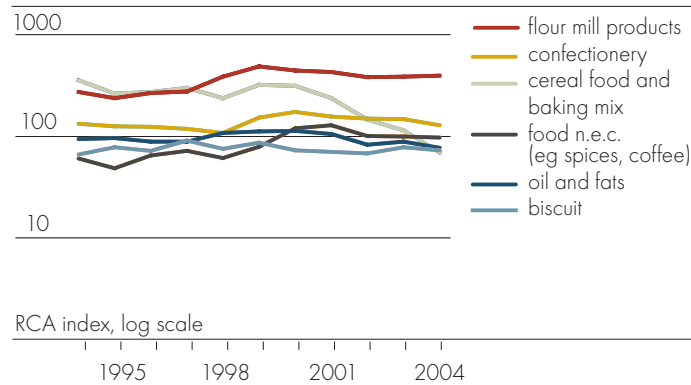
Similarly, dairy products (including milk, cream, milk and cream powders, ice cream, cheeses, whey and yogurt) also had a large export share and at the aggregated product level the RCA indexes were all greater than 100. These products accounted for 20 per cent of the export value of minimally and substantially transformed products in 2004.

On the other hand, both poultry products and processed meats such as bacon, ham and other smallgoods are products in which Australia appeared to have a revealed comparative disadvantage.

Processed vegetables and fruit and nuts were generally not shown as having a revealed comparative advantage. Processed fruits and nuts as a whole did not appear to have a revealed comparative advantage for virtually any of the period examined. Processed vegetables have declined in terms of revealed comparative advantage since the end of the 1990s.

The economic characteristics of processing vegetables and fruits in particular, where there is a relatively high labor input required for harvesting and processing, are likely to mean that any revealed comparative advantage that Australia exhibits in these type of products may be only temporary in nature. For example, this may occur when there is a large harvest and raw crop materials are available at relatively low cost.

fig V revealed comparative advantage indexes for processed flour product, oils and confectionery in Australia



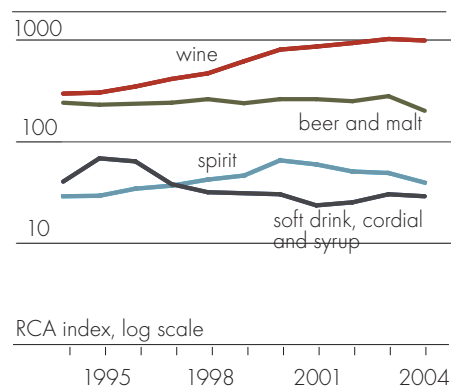
RCA indexes for elaborately transformed products like biscuits, confectionery and beverages are presented in figures V and W.

Biscuit products are estimated to have exhibited a revealed comparative disadvantage in every year from 1994 to 2004. Similarly, the inference for beverage products, such as soft drinks and cordials, is that Australia does not have a revealed comparative advantage in these products.

Where inputs for elaborately transformed products are easily transported, manufacturers prefer to locate their manufacturing plants closer to the final market where local requirements can be accommodated and managing delivery may be easier. This preference will be maintained as long as the final market is of sufficient size to exploit any economies of size of processing plants.

Australia appears to have had a revealed comparative advantage in flour and, until recently, in cereal foods and baking mixes (figure V). In the case of flour, this result is likely to be a reflection of the comparative advantage of grain production and

fig W revealed comparative advantage indexes for beverages in Australia



the capital intensive nature of the milling process offsetting any competitive disadvantages associated with the cost of transporting flour to overseas markets.

### *identifying growth opportunities*

Reflecting the economic incentives associated with profit opportunities and changing cost structures within an economy, the sectors that are considered to have a revealed comparative advantage in the 1994-2004 period are likely to attract resources to them and increase output. In contrast, firms operating in sectors in which Australia does not have a revealed comparative advantage are likely to experience more difficulty in attracting investment to expand their market. Over the medium to long term, it can be expected that sectors in which Australia does not have a revealed comparative advantage may well move away from the export market, and their shares of the domestic market may contract, especially when there is competition from imports.

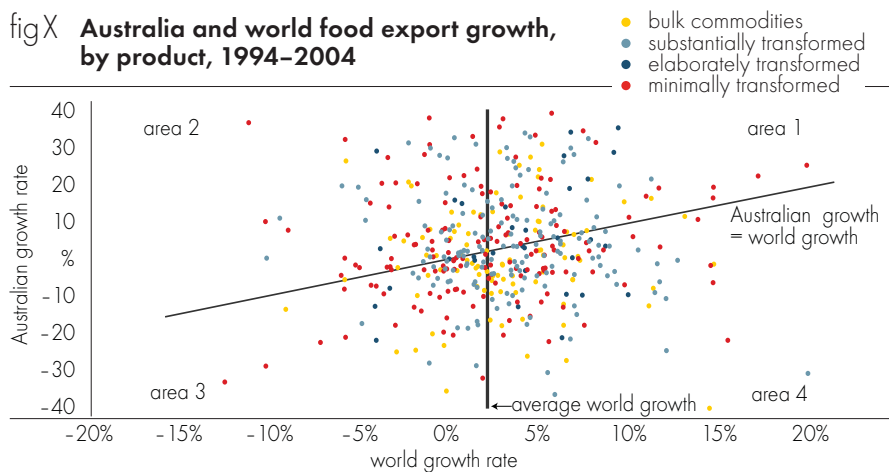
For sectors in which Australia has a revealed comparative advantage, there may be opportunities for Australian exporters to expand their markets. However, such expansion would by no means be certain. For example, if growth in the global market is slow or the market is shrinking, revealed comparative advantage may not reflect increased exports or a larger market share. Key opportunities are likely to be in sectors where Australia has a comparative advantage and the growth of world exports in those sectors is higher and continuing. Sectors where opportunities will be limited are likely to be those where world trade is contracting.

Average annual growth rates between 1994 and 2004 for both world trade and Australian exports across all product lines are plotted in figure X.

The vertical line in this figure is the average world growth (2.4 per cent) a year in real terms (net of inflation) in the value of total food trade from 1994 to 2004. Any point plotted to the right of this line means that world exports in that product line are growing faster than the world average for all items.

The second (inclined) line plots points where the growth rate of Australian exports in food exports matches the world growth rate. Any points plotted above this line are product lines in which Australia's exports are growing faster than world exports. These product lines are considered to be gaining market share in the world market.

figX **Australia and world food export growth, by product, 1994-2004**



Includes product lines that Australia exported for at least 10 of the 11 years between 1994 and 2004.

Given the structure of figure X, it becomes apparent that any point in area 1 indicates a product line in which:

- > world growth is above average and
- > Australian export growth is greater than world growth and Australia is gaining market share.

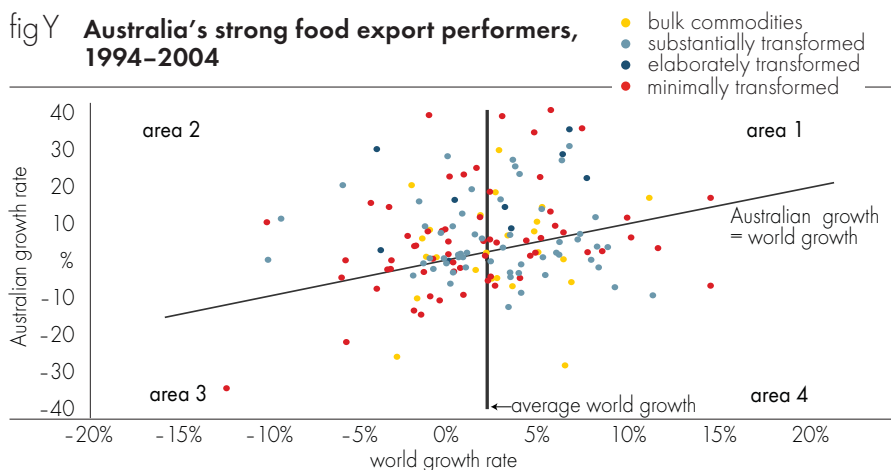
Similarly, any point in area 4 of figure X indicates a product where:

- > Australian export growth is less than world growth and
- > world growth in exports is above the average for the sector as a whole.

In the latter case, the world market for the product is growing faster than Australian firms are increasing their exports of products.

Restricting attention only to those products in which Australia has been previously estimated to show a revealed comparative advantage in the period 1994-2004 results in the information provided in figure Y.

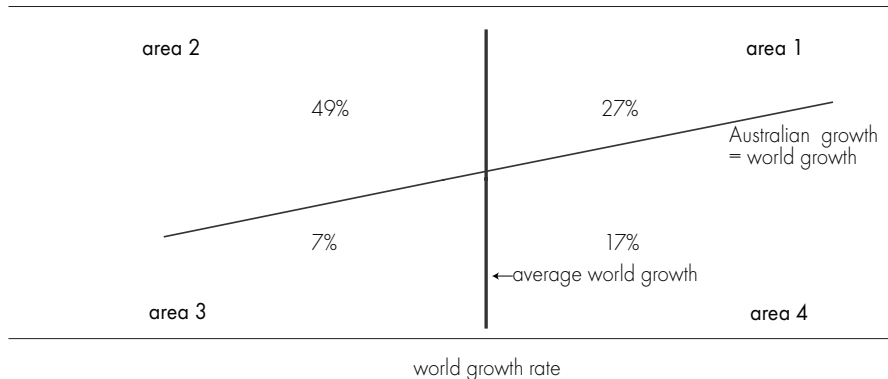
The 159 product lines that demonstrate a revealed comparative advantage accounted for 95 per cent of the total value of Australia's food exports in 2004. Australia's share of world trade has been increasing in 100 of those lines. That is, the growth in exports of 100 food product lines from Australia was greater than the growth in total world trade for each of those products in 2004. These product lines



accounted for 78 per cent of the value of exports for goods with a revealed comparative advantage, and 75 per cent of total food exports in value terms in 2004.

There were 41 products in area 1 (excluding wine), which accounted for 27 per cent of the value of exports that are shown to have a revealed comparative advantage (figure Z), around US\$3.5 billion in 2004. Around 74 per cent of the value of exports in area 1 is in minimally transformed product lines, and a further 16 per cent of the value of exports is substantially transformed lines. Meat domi-

**figZ proportions of Australia's exports, by performance, 1994-2004**



nated the minimally transformed exports (90 per cent). Although bulk transformed food exports in area 1 were much smaller, they had a wider range of product lines, and included high proportions of dairy products, sugar, seafood and fruits and nuts.

Products in area 2 are also increasing their share of world trade; however, they are competing in market segments where there is relatively slow growth or even a shrinking world market. Around 49 per cent of the value of food product exports in which Australia has a revealed comparative advantage is accounted for by these products, approximately US\$6.5 billion in 2004. Around 66 per cent of the value of exports in area 2 were in bulk product lines (grains and pulses), with smaller amounts in the substantially transformed (19 per cent) and minimally transformed (14 per cent) categories in 2004.

In area 3 of figure Z, only 7 per cent of Australia's food exports in value terms are in product lines where Australia has a revealed comparative advantage, which was just below US\$1 billion in 2004. In the case of these product lines the market is growing relatively slowly or shrinking and Australia's market share is diminishing.

The product lines in area 4 were worth about US\$2.3 billion in 2004, or 17 per cent of the value of exports of commodities in which Australia was shown to have a revealed comparative advantage. Most of the product lines in this area are minimally transformed meat products (74 per cent). Substantially transformed products made up about 20 per cent of area 4, with the remainder of the product lines being from the bulk category. The growth in these product markets was lower in Australia than for the rest of the world. These product lines may represent an opportunity for Australian markets to expand and increase exports.

A word of caution is required on the revealed comparative advantage analysis presented above. The analysis is undertaken at the product level and should not be taken to infer the opportunities for any individual firm. At the individual firm level, it may be possible that exports are increasing even though they are operating in product lines for which it is assessed that Australia does not appear to have a revealed comparative advantage, or one in which the world market is shrinking. For example, a firm may be exploiting recent technological developments that significantly reduce costs, and thus increasing the relative efficiency of producing a product. Or the firm may be able to exploit certain scarce labor skills either at the management level or at the plant level that are unique to that firm.

Although elaborately transformed products account for only 3 per cent of the products in area 1, those products accounted for 49 per cent of the elaborately transformed products that were shown to have a revealed comparative advantage; the remaining 51 per cent were in area 2 (table 18). Across the minimally or substantially transformed products, the overwhelming majority of their exports were in areas 1 and 2.

table 18 **proportions of Australia's exports, by transformation, 2004**

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	<b>area 1</b>	<b>area 2</b>	<b>area 3</b>	<b>area 4</b>
	%	%	%	%
bulk	6	92	1	2
minimal transformation	45	15	10	30
substantially transformed	21	46	15	18
elaborately transformed	49	51	0	0
total	27	49	7	17

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# large food processing firms in australia's domestic market, 2002

table 19 largest fifty food and beverage corporations

	enterprise	total revenue	local production	food exports	exports as a
		2002	2002	2002	percentage of
		\$b	\$b	\$b	local production
					%
1	Fosters Group	5.16	2.79	0.56	20
2	Burns Philip/Goodman	4.82	2.13	0.14	7
3	Coca Cola Amatil	3.83	1.92	0.1	5
4	Southcorp	2.82	1.18	0.42	36
5	Australia Meat Holdings	2.71	2.71	1.8	66
6	Nestle	2.4	2.26	0.11	5
7	Murray Goulburn	2.01	2.01	1.3	58
8	George Weston	1.75	1.53	0.06	4
9	Lion Nathan	1.71	1.22	0.02	2
10	Cadbury Schweppes	1.59	1.51	0.08	5
11	Ridley	1.42	0.55	0.08	15
12	Dairy Farmers	1.35	1.35	0.05	4
13	Effem/Mars	1.34	1.34	0.4	30
14	Inghams Enterprises	1.22	1.22	0.01	1
15	Cargill Meat	1.14	1.14	0.11	10
16	National Foods	1.11	1.11	0.08	7
17	Bonlac Foods	1.05	1.05	0.39	37
18	Unilever, food only	0.89	0.89	0.07	8
19	BRL Hardy	0.87	0.72	0.36	50
20	Nippon Meat	0.83	0.83	0.75	90
21	Ricegrowers Co-op	0.79	0.79	0.48	64
22	Simplot	0.74	0.74	0.04	5
23	Arnott/Campbell	0.73	0.73	0.14	19
24	Parmalat Australia	0.68	0.68	0.03	4
25	Diageo Australia	0.68	0.68	0.03	4
26	Kraft Foods	0.67	0.67	0.19	28
27	Barlter Enterprises	0.66	0.66	0.01	1

continued...

table 19 largest fifty food and beverage corporations *continued*

	enterprise	total revenue	local production	food exports	exports as a
		2002	2002	2002	percentage of
		\$b	\$b	\$b	local production
					%
28	CSR Sugar	0.64	0.64	0.03	4
29	Orlando Wyndham	0.61	0.61	0.28	46
30	Tey's Bros	0.6	0.6	0.6	100
31	Manildra Group	0.54	0.54	0.05	10
32	Consolidated Meat (CPH)	0.54	0.54	0.43	80
33	Kellogg	0.51	0.51	0.08	16
34	Heinz Watties	0.49	0.49	0.05	10
35	Berri	0.49	0.49	0.04	8
36	Smiths Snackfoods	0.46	0.46	0	0
37	SPC Ardmona	0.45	0.45	0.18	40
38	Finasucre	0.42	0.42	0	0
39	Peters and Brownes	0.41	0.41	0.04	10
40	Golden Circle	0.4	0.4	0.04	9
41	Riverina	0.39	0.39	0.14	35
42	Bunge Industrial	0.37	0.37	0	0
43	Warrnambool	0.31	0.31	0.03	10
44	Baiada Poultry	0.29	0.29	0	0
45	Snack Foods	0.28	0.28	0	0
46	Tatura Milk	0.27	0.27	0.17	37
47	Mackay Sugar	0.26	0.26	0.01	4
48	McCain Foods	0.26	0.26	0.01	4
49	Sanitarium Health	0.25	0.25	0.04	16
50	Hamsdale	0.25	0.25	0	0
	<b>total</b>	54.46	43.9	10.03	
51	Sara Lee Coffee	0.25	0.25		
52	Castle Bacon	0.24	0.24		
53	Bega Co-op	0.19	0.19		
54	Green's Foods	0.16	0.16		
55	Norco	0.16	0.16		

Source: IBISWorld (2003).

## food manufacturing sector: cost structure and product distribution

### diagams

B1	food processing, 2001-02	54
B2	meat and meat products processing, 2001-02	55
B3	dairy products, 2001-02	56
B4	fruit and vegetable products, 2001-02	57
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B7	confectionery and soft drinks, 2001-02	60
B8	beer and malt, 2001-02	61
B9	wine, spirits and tobacco, 2001-02	62
B10	oils and fats, 2001-02	63



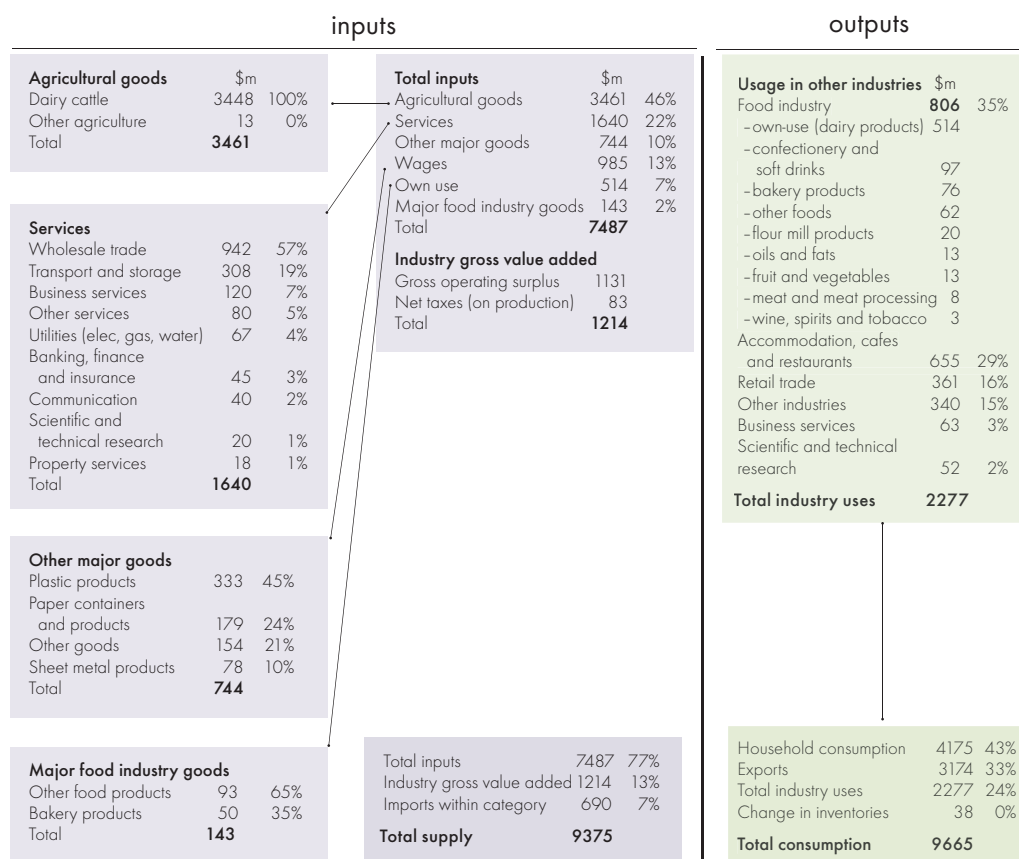
## B2 meat and meat products processing, 2001-02

- > Meat and meat products was the largest subsector in 2001-02.
- > Agricultural goods (including three of the top four individual inputs, beef cattle, poultry and sheep) were the largest input category, making up 52 per cent of total inputs.
- > Direct household consumption was, at 25 per cent, the lowest of all the subsectors examined, reflecting that meat and animal products such as fats and leather are consumed in a wide variety of other industries.
- > Labor value share was similar to the food processing industry average.

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### B3 dairy products, 2001-02

- > The dairy subsector had a number of similarities to meat and meat products, including a high level of agricultural inputs, high proportion of inputs as a proportion of the industry's value, close to average labor intensity and high exports.
- > The second largest individual input was wholesale trade (12 per cent), followed by plastic products (4 per cent).
- > Competing imports as a proportion of the industry's value (7 per cent) was higher than meat products, but lower than the sector average.





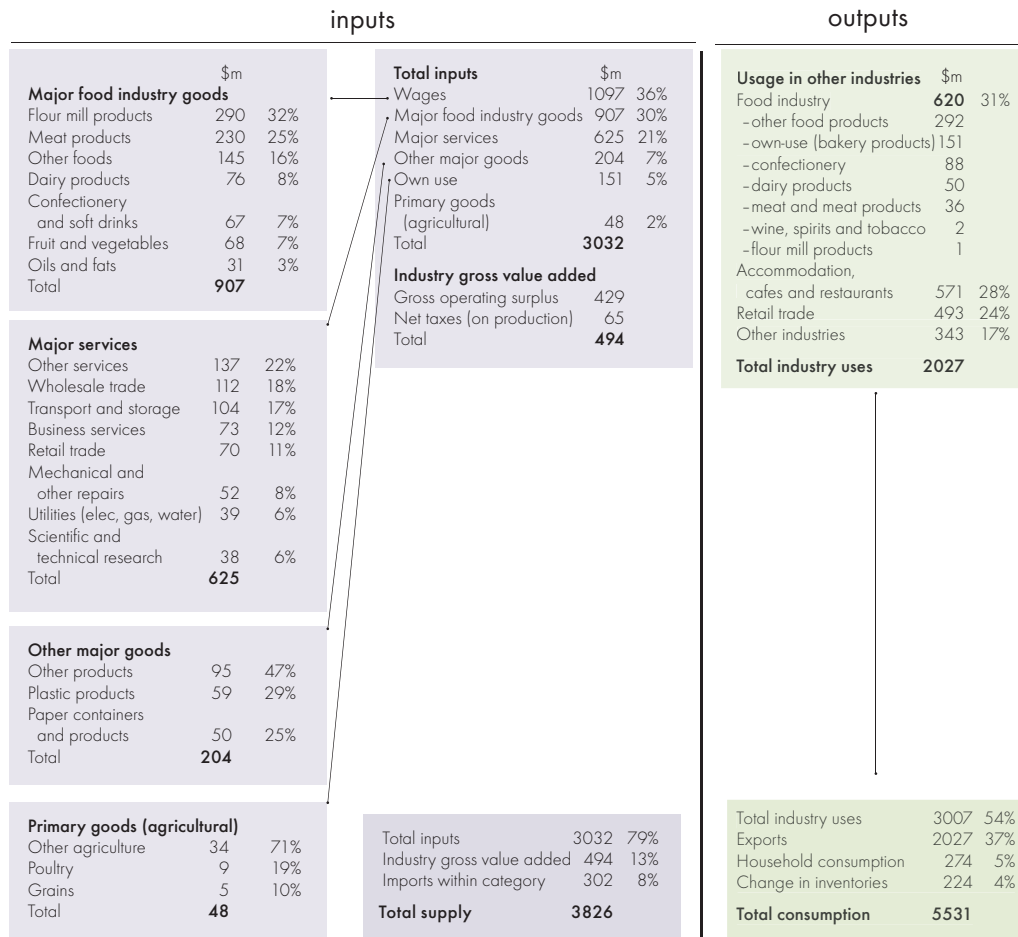
## B5 flour mill products and cereal foods, 2001-02

- > The top four individual inputs were grains (28 per cent), transport and storage (11 per cent), business services (5 per cent), wholesale trade (5 per cent). The major input sectors were major services and primary agricultural goods.
- > Use in other industries was the highest of all the subsectors analysed, largely due to its use in accommodation, cafes and restaurants and the food industry.

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## B6 bakery products 2001-02

- > The three largest individual inputs for bakery products were all products from food industries, which was the largest input category (30 per cent). Transport and storage were smaller than was the average for the food manufacturing sector. Wages were much larger than the industry average (36 per cent).
- > Household use of bakery products was high (54 per cent), and exports were the lowest of all the subsectors (4 per cent).



## B7 confectionery and soft drinks, 2001-02

- > None of the largest four individual inputs to confectionery and soft drinks were agricultural products or major food industry goods. Plastic products (8 per cent), sheet metal (7 per cent), business services (6 per cent) and accommodation, café, and restaurants (6 per cent) were the largest individual inputs.
- > Competing imports were higher than the food manufacturing sector average at 18 per cent.
- > Household consumption was higher than the average at 73 per cent, and both exports and use in other industries were low.
- > Within the other industries category of output, the food, retail trade and accommodation, cafes and restaurant industries accounted for more than 93 per cent of other industry use.

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Total inputs	\$m																																																																																																																																																																																		
Major services	1260	33%																																																																																																																																																																																	
Other major goods	973	25%																																																																																																																																																																																	
Wages	966	25%																																																																																																																																																																																	
Major food industry goods	326	9%																																																																																																																																																																																	
Own use	179	5%																																																																																																																																																																																	
Primary goods (agricultural)	127	3%																																																																																																																																																																																	
<b>Total</b>	<b>3831</b>																																																																																																																																																																																		
<b>Industry gross value added</b>																																																																																																																																																																																			
Gross operating surplus	828																																																																																																																																																																																		
Net taxes (on production)	72																																																																																																																																																																																		
<b>Total</b>	<b>900</b>																																																																																																																																																																																		
Usage in other industries	\$m																																																																																																																																																																																		
Food industry	482	40%																																																																																																																																																																																	
- own-use (confectionery and soft drinks)	179																																																																																																																																																																																		
- flour mill products	93																																																																																																																																																																																		
- other food products	80																																																																																																																																																																																		
- bakery products	67																																																																																																																																																																																		
- fruit and vegetables	16																																																																																																																																																																																		
- dairy products	15																																																																																																																																																																																		
- meat and meat products	15																																																																																																																																																																																		
- oils and fats	12																																																																																																																																																																																		
- wine, spirits and tobacco	5																																																																																																																																																																																		
Retail trade	392	32%																																																																																																																																																																																	
Accommodation, cafes and restaurants	265	22%																																																																																																																																																																																	
Other industries	77	6%																																																																																																																																																																																	
<b>Total industry uses</b>	<b>1216</b>																																																																																																																																																																																		
<table border="1"> <tbody> <tr> <td><b>Total supply</b></td> <td><b>5760</b></td> <td></td> </tr> </tbody> </table>			<b>Total supply</b>	<b>5760</b>		<table border="1"> <tbody> <tr> <td><b>Total industry uses</b></td> <td><b>4687</b></td> <td><b>73%</b></td> </tr> <tr> <td>Exports</td> <td>1216</td> <td>19%</td> </tr> <tr> <td>Household consumption</td> <td>446</td> <td>7%</td> </tr> <tr> <td>Change in inventories</td> <td>53</td> <td>1%</td> </tr> <tr> <td><b>Total consumption</b></td> <td><b>16931</b></td> <td></td> </tr> </tbody> </table>			<b>Total industry uses</b>	<b>4687</b>	<b>73%</b>	Exports	1216	19%	Household consumption	446	7%	Change in inventories	53	1%	<b>Total consumption</b>	<b>16931</b>																																																																																																																																																													
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## B8 beer and malt, 2001-02

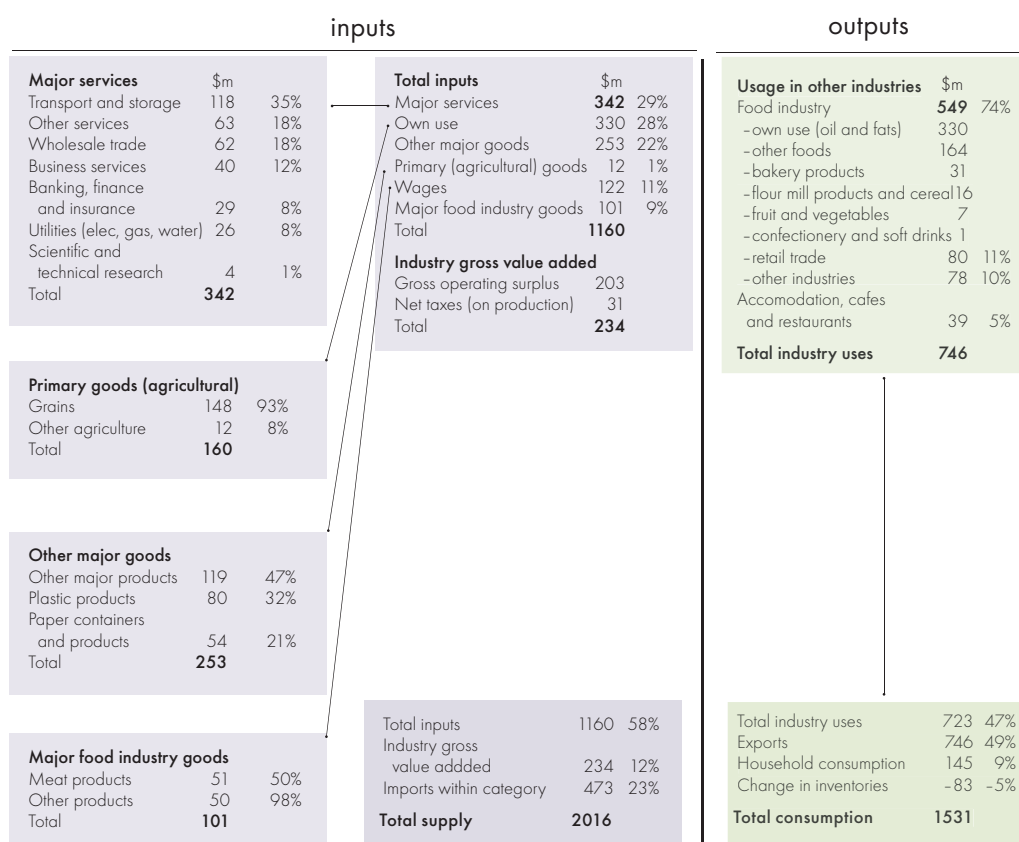
- > Major services were the largest input sector, although grains were the largest individual input (21 per cent).
- > Imports within the category were low (4 per cent).
- > Household consumption was high (63 per cent), and exports were low (8 per cent).
- > Accommodation, cafes and restaurants were the major source of industry use (71 per cent).

inputs			outputs																																																																																																							
<table border="1"> <tr><td><b>Major services</b></td><td>\$m</td><td></td></tr> <tr><td>Transport and storage</td><td>289</td><td>24%</td></tr> <tr><td>Wholesale trade</td><td>259</td><td>21%</td></tr> <tr><td>Banking, finance and insurance</td><td>206</td><td>17%</td></tr> <tr><td>Accommodation, cafes and restaurants</td><td>190</td><td>15%</td></tr> <tr><td>Business services</td><td>112</td><td>9%</td></tr> <tr><td>Utilities (elec, gas, water)</td><td>94</td><td>8%</td></tr> <tr><td>Other services</td><td>52</td><td>4%</td></tr> <tr><td>Mechanical repairs</td><td>24</td><td>2%</td></tr> <tr><td>Scientific and technical research</td><td>2</td><td>0%</td></tr> <tr><td><b>Total</b></td><td><b>1228</b></td><td></td></tr> </table>	<b>Major services</b>	\$m		Transport and storage	289	24%	Wholesale trade	259	21%	Banking, finance and insurance	206	17%	Accommodation, cafes and restaurants	190	15%	Business services	112	9%	Utilities (elec, gas, water)	94	8%	Other services	52	4%	Mechanical repairs	24	2%	Scientific and technical research	2	0%	<b>Total</b>	<b>1228</b>			<table border="1"> <tr><td><b>Total inputs</b></td><td>\$m</td><td></td></tr> <tr><td>Major services</td><td>1228</td><td>42%</td></tr> <tr><td>Primary goods (agricultural)</td><td>631</td><td>22%</td></tr> <tr><td>Other major goods</td><td>450</td><td>15%</td></tr> <tr><td>Wages</td><td>357</td><td>12%</td></tr> <tr><td>Own use</td><td>239</td><td>8%</td></tr> <tr><td>Major food industry goods</td><td>10</td><td>0%</td></tr> <tr><td><b>Total</b></td><td><b>2915</b></td><td></td></tr> <tr><td><b>Industry gross value added</b></td><td></td><td></td></tr> <tr><td>Gross operating surplus</td><td>306</td><td></td></tr> <tr><td>Net taxes (on production)</td><td>30</td><td></td></tr> <tr><td><b>Total</b></td><td><b>336</b></td><td></td></tr> </table>	<b>Total inputs</b>	\$m		Major services	1228	42%	Primary goods (agricultural)	631	22%	Other major goods	450	15%	Wages	357	12%	Own use	239	8%	Major food industry goods	10	0%	<b>Total</b>	<b>2915</b>		<b>Industry gross value added</b>			Gross operating surplus	306		Net taxes (on production)	30		<b>Total</b>	<b>336</b>			<table border="1"> <tr><td><b>Usage in other industries</b></td><td>\$m</td><td></td></tr> <tr><td>Accommodation, cafes and restaurants</td><td><b>646</b></td><td>71%</td></tr> <tr><td>Food industry</td><td>267</td><td>29%</td></tr> <tr><td>- own use (beer and malt)</td><td>239</td><td></td></tr> <tr><td>- other foods</td><td>18</td><td></td></tr> <tr><td>- wine, spirits and tobacco</td><td>6</td><td></td></tr> <tr><td>- soft drinks, syrups and cordials</td><td>2</td><td></td></tr> <tr><td>- dairy products</td><td>1</td><td></td></tr> <tr><td>- flour mill and cereal</td><td>1</td><td></td></tr> <tr><td>Other industries</td><td>2</td><td>0%</td></tr> <tr><td><b>Total industry uses</b></td><td><b>915</b></td><td></td></tr> </table>	<b>Usage in other industries</b>	\$m		Accommodation, cafes and restaurants	<b>646</b>	71%	Food industry	267	29%	- own use (beer and malt)	239		- other foods	18		- wine, spirits and tobacco	6		- soft drinks, syrups and cordials	2		- dairy products	1		- flour mill and cereal	1		Other industries	2	0%	<b>Total industry uses</b>	<b>915</b>	
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## B10 oils and fats, 2001-02

- > Oil and other foods input proportions were similar to the food manufacturing industry average, apart from competing imports, which were high (23 per cent).
- > Of the outputs, industry use was high (49 per cent), and exports were low (9 per cent).



# products in which Australia had a revealed comparative advantage in 2004

The following 159 product codes are products in which Australia was identified to possess a comparative advantage in 2004 – as identified in 2004, grouped by the level of processing.

## commodity classification list

HS code a	description	RCA	Area1
<b>bulk</b>			
H0-030232	tuna(yellow fin) fresh or chilled, whole	764	Area 1
H0-030239	tuna nes, fresh or chilled, whole	848	Area 1
H0-030791	aquatic invertebrates nes, fresh or chilled, live	918	Area 1
H0-080211	almonds in shell fresh or dried	277	Area 1
H0-080290	nuts edible, fresh or dried, nes	1593	Area 1
H0-080510	oranges, fresh or dried	290	Area 1
H0-080520	mandarin, clementine & citrus hybrids, fresh or dried	145	Area 1
H0-080610	Grapes, fresh	191	Area 1
H0-080920	Cherries, fresh	150	Area 1
H0-080930	Peaches, nectarines, fresh	104	Area 1
H0-080940	Plums, sloes, fresh	227	Area 1
H0-081040	Cranberries, bilberries, similar fruits, fresh	233	Area 1
H0-100110	Durum wheat	465	Area 1
H0-100300	Barley	2861	Area 1
H0-120220	Ground-nuts shelled, not roasted or cooked	211	Area 1
H0-100190	Wheat except durum wheat, and meslin	1681	Area 2
H0-100400	Oats	835	Area 2
H0-100810	Buckwheat	210	Area 2
H0-030624	Crabs, not frozen	267	Area 3
H0-070310	Onions and shallots, fresh or chilled	120	Area 3
H0-070410	Cauliflowers and headed broccoli, fresh or chilled	186	Area 3
H0-070920	Asparagus, fresh or chilled	346	Area 3
H0-070940	Celery, other than celeriac, fresh or chilled	112	Area 3
H0-080450	Guavas, mangoes and mangosteens, fresh or dried	136	Area 3
H0-080590	Citrus fruits, fresh or dried, nes	168	Area 3
H0-100700	Grain sorghum	196	Area 3

## commodity classification list

HO-100820	Millet	297	Area 3
HO-070610	Carrots and turnips, fresh or chilled	482	Area 4
<b>minimally transformed</b>			
HO-020220	Bovine cuts bone in, frozen	2595	Area 1
HO-020230	Bovine cuts boneless, frozen	2539	Area 1
HO-020311	Swine carcasses and half carcasses, fresh or chilled	292	Area 1
HO-020321	Swine carcasses and half carcasses, frozen	126	Area 1
HO-020322	Hams, shoulders and cuts, of swine, bone in, frozen	115	Area 1
HO-020422	Sheep cuts, bone in, fresh or chilled	3353	Area 1
HO-020430	Lamb carcasses and half carcasses, frozen	1637	Area 1
HO-020442	Sheep cuts, bone in, frozen	2223	Area 1
HO-020450	Goat meat, fresh, chilled or frozen	4466	Area 1
HO-020610	Bovine edible offal, fresh or chilled	1286	Area 1
HO-020621	Bovine tongues, frozen	4059	Area 1
HO-020622	Bovine livers, frozen	1737	Area 1
HO-020629	Bovine edible offal, frozen except livers and tongues	2851	Area 1
HO-020890	Meat and edible offal nes fresh, chilled or frozen	679	Area 1
HO-030349	Tunas nes, frozen, whole	1661	Area 1
HO-030799	Aquatic invertebrates nes, frozen or preserved	724	Area 1
HO-040110	Milk not concentrated nor sweetened < 1% fat	136	Area 1
HO-040130	Milk and cream not concentrated nor sweetened < 6% fat	273	Area 1
HO-090122	Coffee, roasted, decaffeinated	134	Area 1
HO-090140	Coffee substitutes containing coffee	181	Area 1
HO-091091	Mixtures of spices	120	Area 1
HO-110100	Wheat or meslin flour	349	Area 1
HO-110210	Rye flour	145	Area 1
HO-110220	Maize (corn) flour	124	Area 1
HO-110290	Cereal flour except wheat, meslin, rye, maize, rice	557	Area 1
HO-110319	Cereal groats or meal except wheat, maize, rice, oats	504	Area 1
HO-110412	Oats, rolled or flaked grains	852	Area 1
HO-110419	Cereals, rolled or flaked grains nes	101	Area 1
HO-110429	Cereals, hulled, pearled, sliced or kibbled nes	125	Area 1
HO-110610	Flour or meal of dried legumes	139	Area 1
HO-110710	Malt, not roasted	794	Area 1
HO-110720	Malt, roasted	689	Area 1
HO-150300	Lard stearin, oleostearin & oils, natural tallow oil	1800	Area 1
HO-151410	Canola, rape, colza or mustard oil, crude	387	Area 1
HO-020410	Lamb carcasses and half carcasses, fresh or chilled	208	Area 2
HO-020421	Sheep carcasses and half carcasses, fresh or chilled	2091	Area 2
HO-020441	Sheep carcasses and half carcasses, frozen	4167	Area 2
HO-020641	Swine livers, frozen	163	Area 2
HO-020690	Sheep, goat, ass, mule, hinnie edible offal, frozen	3957	Area 2

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**commodity classification list**

HO-110311	Wheat meal	467	Area 2
HO-150200	Bovine, sheep and goat fats, raw or rendered	1554	Area 2
HO-020210	Bovine carcasses and half carcasses, frozen	107	Area 3
HO-020443	Sheep cuts, boneless, frozen	2501	Area 3
HO-020500	Horse, ass, mule, hinnie meat, fresh, chilled or froze	173	Area 3
HO-020680	Sheep, goat, ass, mule, hinnie offal, fresh or chilled	619	Area 3
HO-030376	Eels, frozen, whole	134	Area 3
HO-030611	Rock lobster and other sea crawfish, frozen	3630	Area 3
HO-030613	Shrimps and prawns, frozen	165	Area 3
HO-030621	Rock lobster and other sea crawfish not frozen	4938	Area 3
HO-030729	Scallops other than live, fresh or chilled	445	Area 3
HO-040120	Milk not concentrated nor sweetened 1-6% fat	137	Area 3
HO-080620	Grapes, dried	168	Area 3
HO-090920	Coriander seeds	371	Area 3
HO-100620	Rice, husked (brown)	310	Area 3
HO-110230	Rice flour	394	Area 3
HO-120890	Flour or meal of oil seed, fruit, except mustard, soy	227	Area 3
HO-121020	Hop cones, ground, powdered or pelleted and lupulin	165	Area 3
HO-130213	Hop extract	143	Area 3
HO-150410	Fish-liver oils, fractions, not chemically modified	158	Area 3
HO-170310	Cane molasses	603	Area 3
HO-020130	Bovine cuts boneless, fresh or chilled	1942	Area 4
HO-020423	Sheep cuts, boneless, fresh or chilled	3183	Area 4
HO-040900	Honey, natural	270	Area 4
HO-110422	Oats, hulled, pearled, sliced or kibbled	243	Area 4
HO-120810	Soya bean flour or meal	109	Area 4
<b>substantially transformed</b>			
HO-030559	Dried fish, other than cod, not smoked	223	Area 1
HO-040221	Milk and cream powder unsweetened < 1.5% fat	621	Area 1
HO-040229	Milk and cream powder sweetened < 1.5% fat	2576	Area 1
HO-040291	Milk and cream unsweetened, concentrated	157	Area 1
HO-040299	Milk and cream nes sweetened or concentrated	359	Area 1
HO-040410	Whey	558	Area 1
HO-040610	Fresh cheese, unfermented whey cheese, curd	469	Area 1
HO-040620	Cheese, grated or powdered, of all kinds	120	Area 1
HO-040630	Cheese processed, not grated or powdered	969	Area 1
HO-040690	Cheese except fresh, grated, processed or blue-veined	318	Area 1
HO-071332	Beans, small red (Adzuki) dried, shelled	450	Area 1
HO-071339	Beans dried, shelled, nes	523	Area 1
HO-071340	Lentils dried, shelled	1197	Area 1
HO-071350	Broad beans and horse beans dried, shelled	2427	Area 1
HO-150600	Animal fats, oils, fractions not chemically modified nes	353	Area 1

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## commodity classification list

HO-150600	Animal fats, oils, fractions not chemically modified nes	353	Area 1
HO-160242	Swine shoulders & cuts thereof, prepared or preserved	220	Area 1
HO-160250	Bovine meat, offal nes, not livers, prepared/preserve	396	Area 1
HO-170210	Lactose and lactose syrup	137	Area 1
HO-170290	Sugar nes, invert sugar, caramel and artificial honey	220	Area 1
HO-200710	Homogenised jams, jellies, etc	187	Area 1
HO-200950	Tomato juice not fermented or spirited	181	Area 1
HO-210420	Homogenised composite food preparations	165	Area 1
HO-210610	Protein concentrates and textured protein substances	166	Area 1
HO-210690	Food preparations nes	105	Area 1
HO-040500	Butter and other fats and oils derived from milk	333	Area 2
HO-071010	Potatoes, frozen, uncooked steamed or boiled	203	Area 2
HO-071331	Urd, mung, black or green gram beans dried shelled	771	Area 2
HO-151610	Animal fats, oils, fractions, hydrogenated, esterified	133	Area 2
HO-151710	Margarine, except liquid margarine	410	Area 2
HO-200791	Citrus based jams jellies marmalade, etc.	371	Area 2
HO-200870	Peaches, otherwise prepared or preserved	142	Area 2
HO-200960	Grape juice or must not fermented or spirited	196	Area 2
HO-021020	Bovine meat salted, dried or smoked	350	Area 3
HO-040210	Milk powder < 1.5% fat	817	Area 3
HO-040390	Buttermilk, curdled milk, cream, kephir, etc.	239	Area 3
HO-040490	Natural milk products nes	102	Area 3
HO-050400	Guts, bladders and stomachs of animals except fish	267	Area 3
HO-071310	Peas dried, shelled	528	Area 3
HO-071320	Chickpeas, dried, shelled	1625	Area 3
HO-071390	Leguminous vegetables dried, shelled	161	Area 3
HO-110811	Wheat, starch	612	Area 3
HO-110900	Wheat gluten	1367	Area 3
HO-160290	Meat, meat offal and blood, prepared or preserved, nes	453	Area 3
HO-160590	Molluscs and shellfish nes, prepared or preserved	437	Area 3
HO-190410	Cereal foods obtained by swelling, roasting of cereal	142	Area 3
HO-200490	Vegetables nes and mixtures, prepared, frozen	108	Area 3
HO-200600	Fruits, nuts, fruit-peel, etc preserved by sugar	218	Area 3
HO-200840	Pears, otherwise prepared or preserved	908	Area 3
HO-200892	Fruit mixtures, otherwise prepared or preserved	282	Area 3
HO-200990	Mixtures of juices not fermented or spirited	400	Area 3
HO-210410	Soups and broths and preparations thereof	144	Area 3
HO-210500	Ice cream and other edible ice	166	Area 3
HO-021090	Meat and edible meat offal cured, flours, meals nes	106	Area 4
HO-200980	Single fruit, veg juice nes, not fermented or spirited	151	Area 4
HO-210220	Yeasts, inactive, dead unicellular organisms nes	117	Area 4
HO-210230	Baking powders, prepared	282	Area 4
HO-210390	Sauces nes, mixed condiments, mixed seasoning	153	Area 4

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**commodity classification list**


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**elaborately transformed**

H0-170410	Chewing gum containing sugar, except medicinal	185	Area 1
H0-180690	Chocolate/cocoa food preparations nes	141	Area 1
H0-190510	Crispbread	278	Area 1
H0-220410	Grape wines, sparkling	138	Area 1
H0-220421	Grape wines nes, fortified wine or must, pack < 2L	1210	Area 1
H0-220429	Grape wines, alcoholic grape must nes	684	Area 1
H0-220600	Fermented beverages nes (eg cider, perry, mead, etc)	178	Area 1
H0-220720	Ethyl alcohol and other spirits, denatured	129	Area 1
H0-180631	Chocolate, cocoa preps, block, slab, bar, filled, >2kg	409	Area 2

<sup>a</sup> Areas as defined in figure X.

Source: UNSD (2006).

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