



THE UNIVERSITY
of ADELAIDE

WORKING PAPER 12
WICKES, ADAMS & BROWN

Measuring diversification in Australian Goods Exports, 2001–2021: Policy and Technical Considerations

Institute for International Trade

Measuring diversification in Australian Goods Exports, 2001–2021: Policy and Technical Considerations

Executive summary / 01

Introduction / 02

Literature review / 04

Product Diversification: International Studies / 04

Territorial or Combined Territorial/Product Diversification: International Studies / 04

Related Studies on Australia / 05

Measuring Export Concentration/Diversification / 06

Geographical concentration/diversification, 2001–2020 / 08

Australia's wagon is hitched to China star / 08

Geographical concentration has increased over recent years / 10

Product concentration in Australian goods exports to the world, 2001–2020 / 11

The top goods exports have mostly been minerals or rural products / 12

Many other countries have less concentrated goods exports / 12

Product Concentration and Diversification in Australian Goods Exports to China, 2001–2020 / 15

Australian exports to China by product have become more concentrated / 15

Australia's export growth has been along the intensive margin, but not the extensive margin / 16

Conclusions / 20

Annex 1: The Impact of Confidentiality in Australian Statistics / 22

Annex 2: Concentration and Diversity in Australia's services exports / 23

References / 24

Executive summary

Export diversification has emerged as a significant issue in Australia over the past two years. This paper explores shifts in diversification over time, focusing on trends over the past two decades using a suite of measures.

Geographical export concentration:

Unlike in the half century to 2000 when increasing Australian export diversification was linked to new opportunities across East Asia, a range of measures show increasing export concentration since the beginning of the twenty-first century. This reversal is underpinned by China's growing economic weight and heavy industrial phase of development, which has turbocharged demand for Australian resources.

Ron Wickes was Director of the Trade Analysis Section of the Department of Foreign Affairs and Trade (DFAT), 1999-2008.

Mike Adams is a former DFAT economist with extensive international trade experience.

Nicolas Brown headed DFAT's branch responsible for analysis and strategic advice about trade and economic issues, 2003-2008.

This change is not just an iron ore story. Even with iron ore excluded from imports of all of Australia's major trading partners, China was still the fastest growing market for remaining products, particularly liquefied natural gas (LNG), between 2010 and 2020. The United States was the second fastest.

Product concentration: Product concentration in Australia's total merchandise exports has increased over time. This applies to our merchandise exports by product to all our major markets. Australian exports are now more concentrated than those of many other countries.

On a range of measures, Australian exports to China have become more concentrated over the past two decades. The biggest increases occurred in the first decade of the century as the contours of the bilateral trading relationship evolved in resources and energy. Increases were markedly weaker in the second decade as trading patterns generally became more settled. Taking the period as a whole, the range of Australian goods exports to China has at best stagnated, notwithstanding that our aggregate share in China's merchandise imports more than doubled.

At one level, these trends support the well-established narrative of Australia's strong comparative advantage in mineral resources and (less prominently) in agriculture products. But at another level, the narrowing breadth of Australia's goods exports to China reflects the fine balance between factors working to increase product range – like rising middle class incomes on demand for more sophisticated goods and services – and factors working in the

opposite direction like China's increasing self-sufficiency in manufactures. This narrowing raises difficult questions in relation to the overall impact of the China-Australia Free Trade Agreement (ChAFTA) on Australia's export trade.

Policy implications: The trend towards greater concentration of goods exports by product and market reflects policies that have supported our pronounced comparative advantage in land-based commodities. But increasing concentration also poses risks for Australia. Some are specific to particular markets – for example, why is Australia's share of the ASEAN and South Korean markets falling even as their share of world imports continues to rise? Others are of a more general kind – for example, are some powerful countries using economic coercion as part of their normal trade policy 'toolbox'? And still others are specific to the growing share of primary products in Australia's goods exports – for example, how far can Australia depend on the continuation of high commodity prices? But whatever their form, Australia would benefit greatly from trade diversification.

This is not to downplay our critically important trade relationship with China. Rather, diversification, along with strategies to revitalise the open international trading system and boost domestic productivity, must underpin Australia's trade policy in an increasingly uncertain international environment.

Introduction

This project grew out of high level Australian political interest, and broader public interest, in Australia lessening its dependence on the Chinese market in response to China blocking sales on a range of important Australian commodities from mid-2020.¹

Coercion, however, is only a small part of this analysis, which focuses instead on a range of measures of concentration and diversification of Australian exports. This covers markets, products and specific products going to specific markets particularly over the last couple of decades.

What the analysis reveals is that Australian goods exports have become both more geographically concentrated and more concentrated around a narrowing range of resources and energy commodities. This shift is not just an iron ore story. Even with iron ore excluded from imports of all of Australia's major trading partners, China was still the fastest growing market for remaining products between 2010 and 2020. The United States was the second fastest. Similarly, this shift is not just a China story: increasing product concentration can be observed across all our major markets.²

At one level, growing specialisation is predictable. Comparative advantage is the cornerstone of international trade theory. Early in the nineteenth century, David Ricardo observed that differences in comparative, not absolute, advantage in terms of labour costs per unit of output underpinned trade gains across countries as they specialised in different products and exports based

on their relative cost advantages. Later in the century, John Stuart Mill and Alfred Marshall added demand to international trade theory. And by the middle of the twentieth century, Eli Heckscher and Bertil Ohlin explained trade between countries in terms of inter-country differences in the relative abundance of capital, labour and skills leading to product specialisation (Sen 2010).

In Australia's case, the narrowing focus on markets and products reflects, once again, our pronounced comparative advantage in land-based products, as well as our capacity to adapt to changing international risks and opportunities: the relative decline in trade with the United Kingdom, the rise of Japan and the East Asian 'tigers', deepening links in services and investment with the United States, and dramatic growth of trade with China. So why has Australia now decided to diversify its trade against the current of Ricardian comparative advantages that have created heavy trade dependencies with China?

One part of the answer is Australia's response to Chinese economic coercion. Geopolitics has always had a role in trade. The role fluctuates over time but



has been increasing for some years with multipolarity and as great power tensions ripple around the world. Export diversification is a standard policy response to economic coercion (Adams, Wickes & Brown 2022).

Another, and arguably more important, part is that increasing openness to trade and specialization increases exposure to external sectoral shocks. Diversification can contribute to more predictable and balanced development by lessening these shocks and reducing volatility in export earnings. There is now a strong consensus

¹ Ideally, the project would span goods imports and exports, services and investment but this was not practical at this time because of data limitations, especially in relation to services, and because of practical considerations in relation to length.

² While not considered here, this also applies to varying extents to Australia's markets for services and to inward and outward direct investment.



across Australia that geographic diversification, globally and regionally with countries like India, Vietnam, and Indonesia, is manifestly in Australia's interests by increasing access to growth markets and by potentially providing more options for preventing, dealing with and recovering from external shocks. This, of course, assumes an underpinning policy environment that enables the economy, and specific sectors, to adjust flexibly to changing circumstances. There also appears to be an emerging consensus that the Australian Government has a major role to play in product diversification as we adjust to climate change and rapidly transforming technologies.

The paper is organised as follows. It starts with an overview of the economic literature on the determinants of export concentration and diversification. Measures of export concentration and diversification used in the analysis are reviewed next. This is followed by quantitative analyses of geographical and product concentration in Australian exports to the world and to China between 2001 and 2020. Finally, some conclusions and policy considerations are presented.

Literature review

There is a substantial body of literature related to diversification and concentration of exports, both international and Australian.

Product Diversification: International Studies

A number of studies, mostly econometric, address the determinants of product diversification. There is a degree of commonality in the factors they identify, but individual studies are also noteworthy for aspects which they highlight. Not surprisingly, several papers find that the stage of development (measured by per capita income) has an important impact: see, for example, Parteka and Tamberi (2011). Imbs and Wacziarg (2003), in an influential paper, postulate a U-shaped relationship for employment and value-added by sector, with diversification occurring for most of the development process, followed by greater specialisation at high levels of income. This idea has been supported in some of the trade literature.

Parteka and Tamberi find robust evidence that increases in the size of an economy (measured by either gross domestic product or population) result in increased diversification of manufacturing trade. Agosin, Alvarez and Bravo-Ortega (2011) find some evidence that human capital has an impact. Parteka and Tamberi find that distance to major markets results in a decrease in export diversification, but that membership of free trade agreements increases it. Bebczuk and Berrettoni (2006) conclude that increasing the

proportion of manufactures in exports encourages diversification. Giri, Quayyum and Yin (2019) argue that natural resource abundance discourages movement into exporting new products.

There are differences on the important policy issue of how trade openness impacts on export diversification. Agosin and his co-authors (2011) find evidence that openness encourages greater specialisation across a number of specifications, though many of the results are only weakly significant. Bebczuk and Berrettoni (2006) report that the export/GDP ratio is associated with increased concentration. But Parteka and Tamberi (2011) find that freer trade promotes diversification, as do de Ferranti et al. (2002) and Giri, Quayyum and Yin (2019). It seems likely that impacts depend on specific circumstances. Unilateral liberalisation can contribute to more economic dynamism, which is then reflected in export activity across a wider range of products. On the other hand, removing domestic distortions can encourage specialisation in line with existing patterns of comparative advantage.

Openness to foreign direct investment (FDI) is examined by Bebczuk and Berrettoni (2006). Their work suggests that the net FDI/GDP ratio may have a positive impact on diversification. It is likely that the impact depends on the type of FDI, with efficiency-seeking, export-oriented investment the most conducive to diversification. A study published by the World Bank gives the example of Costa Rica, which was able to build 'an impressive and dynamic cluster in electronics', with help from foreign investment, particularly by Intel (de Ferranti et al. 2002). FDI focusing on the exploitation of natural resources may promote diversification if it leads to exports of new commodities but

can, in other circumstances, promote further specialisation. This is also true of investment aimed at serving domestic or regional markets or which aims to acquire strategic assets through mergers and acquisitions (WTO/OECD 2019, Ch. 5).

Territorial or Combined Territorial/Product Diversification: International Studies

A Statistics Canada report (2018) explores both product and territorial diversification for Canada using the Hirschman-Herfindahl Index. The Canadian study is less detailed than the present paper, though it also looks at trade diversification and concentration at the provincial level, which remains an issue to be explored in Australia. There is also a huge volume of literature that employs gravity models – perhaps the most successful models in international economics – to look at trade flows to particular countries.

Another growing body of work explores explanations for the observed patterns of trade using the concepts of extensive and intensive margins – concepts discussed in the next section. Hummels and Klenow (2005) find that larger economies export more in absolute terms than smaller economies because they export a wider variety of products than because they export more of each good. They also find that larger economies export more of any given product to more countries perhaps because of the fixed costs of exporting. Relatively new international data on the costs of transporting goods between markets help to explain – especially when goods cross frontiers on a number of occasions – why value chains have a pronounced regional bias, limiting the possibilities for diversifying over a wider set of markets (OECD 2016).

Related Studies on Australia

In the case of Australia, there is some literature which looks at diversification/concentration as one component of a long-term historical perspective on the Australian economy, for example Krause (1984), Maddock and McLean (1987) and McLean (2014). A very substantial volume of work has looked specifically at the historic shift in the main Australian export markets to East Asia and policy implications from this. See, for example, Garnaut (1989) and East Asia Analytical Unit (1992).

Among more recent work, the Productivity Commission (2021) has explored the degree of concentration of Australian exports and imports and associated risks. Laurenceson and others (2021) have looked at how Australia's pattern of export concentration

compares with some other economies, concluding that Australia's export mix is unusually concentrated by product, but not by market.

There is now also a substantial literature on Chinese economic coercion as it has applied to Australia since mid-2020, including by the authors of the present paper (see Wickes, Adams and Brown 2021). Submissions to the Parliamentary Inquiry into Diversifying Australia's Trade and Investment Profile (2021) provide a range of perspectives on these issues and offer a good selection of views on possible policy responses. However, there is, to our knowledge, no study that addresses the measurement of export trade concentration and diversification for Australia over the past two decades, which is our current focus.



Measuring Export Concentration/ Diversification

Export concentration/diversification can be measured in many different ways. In this paper, we use several simple indicators, along with two indices widely used by economists – the Hirschman-Herfindahl (HH) index and the Theil index (in practice, the Relative Theil index).

The simplest measures we use are appropriate in looking at concentration/diversification both by territory and product. Typically, we present data for:

- The share that the top destination (commodity) has in Australia’s total merchandise exports, as well as the share for the top 10 and top 25.
- The number of country destinations (products) that exceed a threshold of one per cent of exports.
- The number of country destinations (products) that account for at least some exports.³

While these measures are useful, they do not give an overall measure of trade diversification/concentration. We therefore use two specialised indices that can also be applied to both territorial and product liberalisation. The HH Index has its origins in an index developed by Hirschman in a 1945 publication (Hirschman 1945). Using our terminology, Hirschman’s original index takes the form

$\sqrt{\frac{\sum_{i=1}^N (x_i/X)^2}{N}}$ where x_i represents exports to country or commodity i , N is the total number of countries (commodities) and X is total exports. Herfindahl (1950) independently proposed a similar index, albeit without the square root sign. The Hirschman Herfindahl index⁴ used here is given by: $\frac{(\sum_{i=1}^N (x_i/X)^2) - \frac{1}{N}}{1 - \frac{1}{N}}$

Inclusion of $1/N$ in the numerator and the denominator ensures that the index ranges between zero (which represents the case of perfectly even distribution of the x_i), to one, where exports are concentrated on a single country or commodity (so that $x_i = X$ for some i and is zero otherwise). Statistics Canada takes the view that an HH index of equal to or more than 0.25 defines highly concentrated exports, although the value of the index can depend on the degree of disaggregation of the categories (Statistics Canada 2018).

The second index we use is the **Relative Theil Index**. Its parent, the Theil index is derived from a more general class of

entropy indices that measure departures from equality. It is given by $\frac{1}{N} \sum_{i=1}^N \frac{x_i}{X} \ln\left(\frac{x_i}{X}\right)$ where \bar{X} is the mean of the x_i . It has a somewhat similar form to the HH index but uses a natural logarithm to replace one element in the squared term. It is zero where each x_i is equal to \bar{X} (because $\ln(1)$ is zero). In the case of complete concentration, where $x_i = X$ for some i , it is not defined because the other terms, each $\ln(0)$, are not defined. If, however, the other x_i are given very small values, it is approximately equal to $\ln(N)$ (see Bellù and Liberati 2006). The Relative Theil index divides the value of the Theil index by $\ln(N)$ so that it ranges from zero (for a perfectly even distribution) to approximately one (for almost complete concentration). It is given by $\frac{1}{N \cdot \ln(N)} \sum_{i=1}^N \frac{x_i}{X} \ln\left(\frac{x_i}{X}\right)$. The fact that it ranges from zero to approximately one makes it easier to interpret than the Theil index itself.

For each of these indices, the principal time-period examined is 2000 (or in some cases 2001) to 2020. On some occasions, where an historical perspective is particularly important, time series going back as far as 1950 are used.

In exploring geographical concentration and diversification, we make some use of the concept of export intensity. Roughly speaking, this is a measure of the relative strength of the trading relationship, so that a country’s (A’s) export relationship with

³ There is considerable literature addressing why many countries do not trade with one another, or trade only a limited number of commodities, and what this means for modelling international trade. See for example, Hummels and Klenow (2005); Helpman, Melitz and Rubinstein (2008); and Santos Silva, Tenreiro and Wei (2014). The second of these sources estimates that globally around half of country pairs do not trade with each other, though the estimates are now dated.

⁴ This is sometimes known as the Herfindahl index or the Herfindahl-Hirschman index. Hirschman (1964) made clear his own claim to paternity in a letter to the *American Economic Review*.

Box 1: Intensive and Extensive Margins

The intensive and extensive margins of trade can be defined in different ways. For example, some definitions focus on country markets (where the extensive margin might be counted by the number of markets a country has and the intensive margin by overall sales per market). Others look at individual firms (where the extensive margin might be the number of firms that export and the intensive margin the overall value of trade per exporting firm). Increasing the extensive margin in these definitions involves adding new markets or bringing new firms to exporting.

Here we follow Hummels and Klenow (2005) who define the two margins in terms of product varieties exported by a country relative to another country or group of countries with which it is being compared. In our case, using ITC Trade Map data on China's imports, we compare China's imports from Australia with its imports from the Rest of the World (ROW).

The definition of the extensive margin is complex, but it can be thought of as a weighted count of the number of varieties Australia exports to China (or China's imports from Australia). The weights are their importance in China's imports from ROW. More technically the extensive margin is a ratio, with the numerator the value of China's imports from ROW of those commodities that Australia exports there. The denominator adjusts this by China's total imports from ROW.

The intensive margin compares China's imports from Australia across all the product varieties it imports from Australia relative to the value of China's imports of the same product varieties from ROW. (The denominator for the intensive margin is the same as the numerator for the extensive margin.)

Growing exports along the extensive margin can involve adding to the number of product varieties of Australian exports or may reflect changes in the weights (composition) of ROW's exports to China. Growth along the intensive margin involves adding to the market share of the product varieties Australia exports to China.

Intensive and extensive margins for exports can be thought of as a way of describing and decomposing export intensity as defined earlier. The product of intensive and export margins of one country with respect to another is also approximately the product of the country's market share in world exports and its export intensity with the other country.⁵

Analysis of intensive and extensive margins can be applied to assessing a country's total exports or exports to any trading partner or combination of trading partners. Variations in exports can be decomposed into changes in exports across existing product lines (along the intensive margin) and changes in the product varieties traded (along the extensive margin). Intensive margin increases can, for instance, indicate increases in competitiveness, while extensive margin increases can be associated with exporting entrepreneurship and innovation.

A country with a large share of exports in a small market would have a large intensive margin and a small extensive margin ('big fish in a small pond') whereas a small share spread across many products in a large market indicates a low intensive margin and a large extensive margin ('small fish in a big pond') (Carrere, Cadot and Strauss-Kahn 2011).

another (B) is said to be intensive if the share of A's exports directed to B is higher than would be expected from B's share of world imports. More formally, the export intensity of A with respect to B, or $EI_{A,B} = \frac{X_{A,B}/X_A}{M_B/(M_W - M_A)}$, where $X_{A,B}$ is country A's exports to B, X_A is A's exports to the world, M_B is B's imports from the world, M_A is A's imports from the world and M_W is world imports. So, if the share of a country's exports directed to another country is the same as that country's share of world imports (slightly adjusted as indicated), the export intensity is one

and is greater or less than one as its share is greater or smaller. Drysdale has shown that export intensity can in turn be written as the product of bias (which captures a range of factors that cause countries to trade more intensively with one another such as common membership of free trade agreements and cultural similarities) and the complementarity of trade between them (Drysdale and Garnaut 1982).

We also examine diversification of Australia's exports within the China market, making use of the concepts of intensive and extensive margins of trade.

Here, growth along the intensive margin means adding to exports of the varieties already exported to China – in our case, predominantly iron ore and major energy commodities - compared with exports of the same group of product varieties by the Rest of the World. Growth along the extensive margin, on the other hand, can be associated with entrepreneurship and innovation in the sense of adding new products or varieties to the export mix. The definitions of these concepts as used here are discussed in Box 1.

⁵ In mathematical terms, from the preceding definition, $EI_{A,B} \approx (X_{A,B}/X_A)/(M_B/M_W)$. The product of intensive ($IM_{A,B}$) and extensive ($EM_{A,B}$) margins is the ratio of total exports of country A to country B relative to country B's total imports from ROW; that is $IM_{A,B}EM_{A,B} = (X_{A,B}/X_{AWB}) \cdot (X_{AWB}/M_B) = X_{A,B}/M_B$, where X_{AWB} is ROW's exports of the product varieties exported by country A to country B. It follows that $IM_{A,B}EM_{A,B} \approx EI_{A,B} \cdot X_A/M_W$.

Geographical concentration/ diversification, 2001–2020

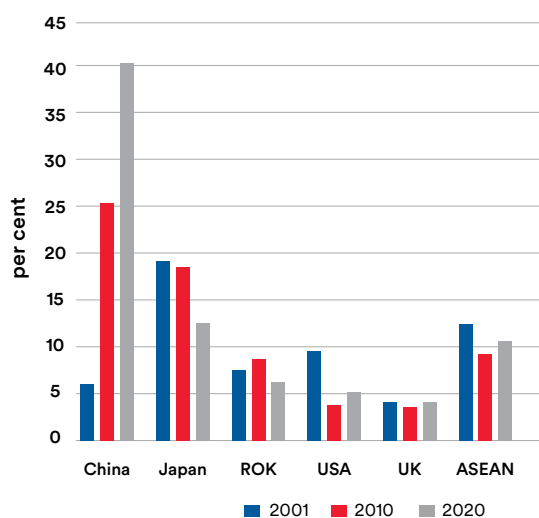
The direction of Australian merchandise exports has been transformed over the past two decades, just as it has in earlier periods of Australian history. In the early 2000s, the Chinese market was typically seen as a hedge against excessive reliance on exports to Japan, which was then by far Australia’s largest market. In 2000, Japan took around 3.6 times Australia’s merchandise exports to China. But China’s growth and the expansion of its import market were to surpass all expectations. China overtook Japan as the biggest export destination for goods from Australia in 2009 and was more than three times the size of the Japanese market by 2020. By that time, China took over 40 per cent of Australian merchandise exports (Figure 1).

Australia’s wagon is hitched to China star

The surge in China’s share of Australia’s exports resembles in some respects the earlier surge in Japan’s share during its rapid growth and industrialisation in the 1960s and 1970s, when it overtook the United Kingdom as Australia’s biggest market for goods. China’s share is higher than the share ever reached by Japan but is still below the United Kingdom’s during some periods of Australian history.⁶ It also is below some of Australia’s peers: Canada, for example, directed 73 per cent of its merchandise exports to the United States in 2020.

Shares of Australia’s exports to a specific country can be written as the product of that country’s share of (slightly adjusted) world imports and Australia’s export intensity with that country. Within this general framework, the rise in China’s share in Australian merchandise exports can be seen to result from an approximately threefold increase in China’s share of world imports between 2001 and 2020 and a more than doubling of Australia’s export intensity with China (Figure 2). A simpler and more specific explanation is that China’s crude steel production grew from 152 million tonnes (Mt) in 2001 to 1065 Mt in 2020 (or around 57 per cent of the world total), and that Australia became the increasingly

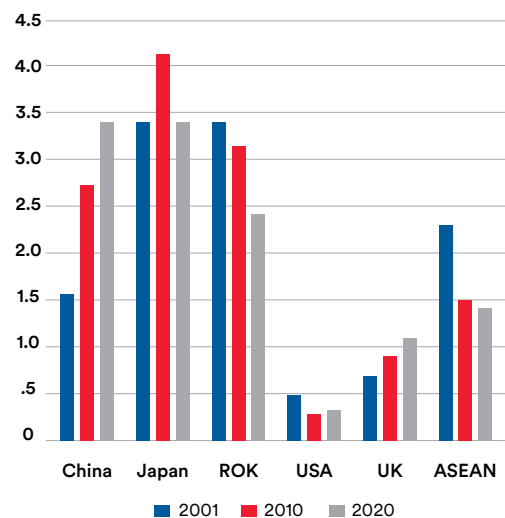
Figure 1: Changing Shares of Australian Merchandise Exports Since 2001



Source: Department of Foreign Affairs and Trade online direction of trade data.

Note: The five countries identified here were the top five goods export markets for Australia in 2020. ASEAN is included because of its significance as an export market.

Figure 2: Australian Export Intensities



Source: Authors’ calculations, based on Department of Foreign Affairs and Trade direction of trade and ITC Trade Map data.

⁶ For example, more than half of Australia’s exports were directed to the United Kingdom at the beginning of the twentieth century

Table 1: Territorial Concentration for Australian Merchandise Exports up to 2000-01

	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01
Share of Biggest, %	32.3 (UK)	23.6 (UK)	27.0 (Japan)	26.9 (Japan)	27.4 (Japan)	19.7 (Japan)
Share of 10 Biggest, %	80.7	74.8	71.5	63.9	70.3	68.3
Share of 25 Biggest, %	97.6	88.5	88.3	86.7	91.3	88.3
No. of Significant Destinations	14	15	17	21	20	20
No. of Destinations	51	55	57	58	58	58

Source: Authors' calculations based on Department of Foreign Affairs and Trade historical direction of trade data.

Note: The 10 and 25 biggest destinations do not include ships' stores. Significant destinations are those taking more than, or equal to, one per cent of Australia's total merchandise exports in a given year and also do not include ships' stores. Destinations are any in the database given a positive value, no matter how small. In practice, this means any value recorded as A\$1000 or more.

Table 2: Territorial Concentration for Australian Merchandise Exports from 2000

	2000	2005	2010	2015	2019	2020
Share of Biggest, %	19.7 (Japan)	20.3 (Japan)	25.1 (China)	30.3 (China)	38.2 (China)	40.6 (China)
Share of 10 Biggest, %	68.7	70.9	79.0	78.1	82.4	82.6
Share of 25 Biggest, %	87.8	89.4	92.5	92.7	95.1	96.2
HH Index	0.07	0.08	0.12	0.13	0.18	0.19
Relative Theil Index	0.41	0.42	0.48	0.49	0.54	0.54
Number of Significant Destinations	20	18	14	15	14	15
Number of Destinations	217	214	216	217	215	217

Source: Authors' calculations based on Department of Foreign Affairs and Trade direction of trade data.

Note: 'Other' is not included in the top 10, the top 25, or the number of significant destinations. The number of destinations registers any destination given a positive value, no matter how small. Comparisons over time should be made with caution given that DFAT data does not include estimates of some important commodities that are confidential by country in ABS releases, though the biggest such commodity, LNG, is now estimated.

dominant supplier of the iron ore needed to sustain China's steel production. Growth of other exports, particularly liquefied natural gas (LNG), also played an important, though lesser, role.

Because of the sharp rise in China's share, the share of some other key markets for Australian merchandise exports declined between 2001 and 2020, sometimes despite a strong export performance by Australia. Japan's share fell from approximately 19 to 12 per cent between 2001 and 2020, mainly because of its slow growth and declining share of world imports. But its share of Australia's exports

remained about 3½ times the value that would be expected given its global market share. ASEAN's share declined from 12.5 per cent in 2001 to 10.5 per cent in 2020. This occurred despite its growing share of world imports. Part of the reason may well be that, while Australian exports of iron ore and metallurgical coal to ASEAN grew quickly, the absence of steel industries there on the scale of those in Northeast Asian economies resulted in significantly lower trade intensities (Adams, Brown and Wickes 2020, Ch. 2). The Republic of Korea's share also declined, again despite increasing its share of world imports.



⁷ Between 1995 and 2000, Australian passenger motor vehicle exports increased more than three-fold in US dollar terms, with the Gulf Cooperation Council (GCC) – especially Saudi Arabia, the United Arab Emirates and Kuwait – the largest destination. By 2001, auto exports to the GCC stood at A\$1.9 billion and increased to A\$2.1 billion by 2006. Exports fell to A\$1.2 billion by 2009 and still further in 2017. Ford, Holden and Toyota factories closed over 2016 and 2017.

⁸ Although Tables 1 and 2 are from different Department of Foreign Affairs and Trade sources, they give almost the same results on most indicators for 2000-01 (in Table 1) and 2000 (in Table 2). This occurs because the top destinations are virtually the same for the two years. The principal difference is that the number of destinations is much smaller in Table 1 because it focuses on a longer historical period when fewer countries were identified in trade statistics.

⁹ The magnitude of geographical concentration in the past two years is overstated because of high commodity prices, especially of iron ore. Australia's services exports also helped to diversify overall export trade. On some measures, China overtook the United States as a destination for services exports in 2010, reflecting strong growth in education and tourism services. China accounted for 17 per cent of Australia's services exports by 2020 and the United States for 11 per cent on a balance of payments basis. This still represented a more diversified distribution than for merchandise trade. The HH index for services exports was 0.06 in 2020, well below that for goods.

Geographical concentration has increased over recent years

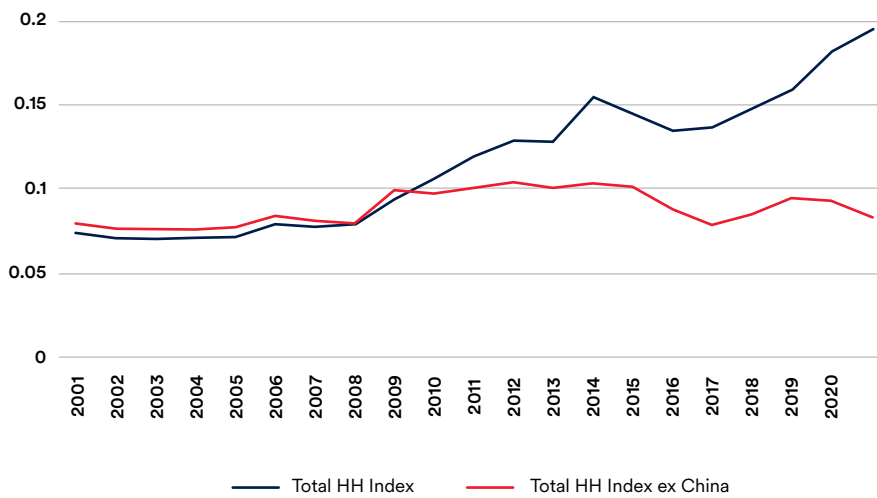
Unlike in the half century to 2000 when decreasing export concentration (Table 1) was linked to new opportunities in East Asia and later in domestic manufacturing, especially of passenger motor vehicles,⁷ a range of measures shows increasing Australian export concentration since the beginning of the twenty-first century

(Table 2).⁸ The HH index increased from 0.07 in 2000 to 0.19 in 2020, and the number of significant destinations fell from 20 in 2000 to 15 in 2020.⁹

The combination of China's growing economic weight, rapid growth and heavy industrial phase of development powered Australia's exports and increased their geographical concentration in the years following the Global Financial Crisis (Figure 3). Iron ore played a key part but this is not just an iron ore story. Even when

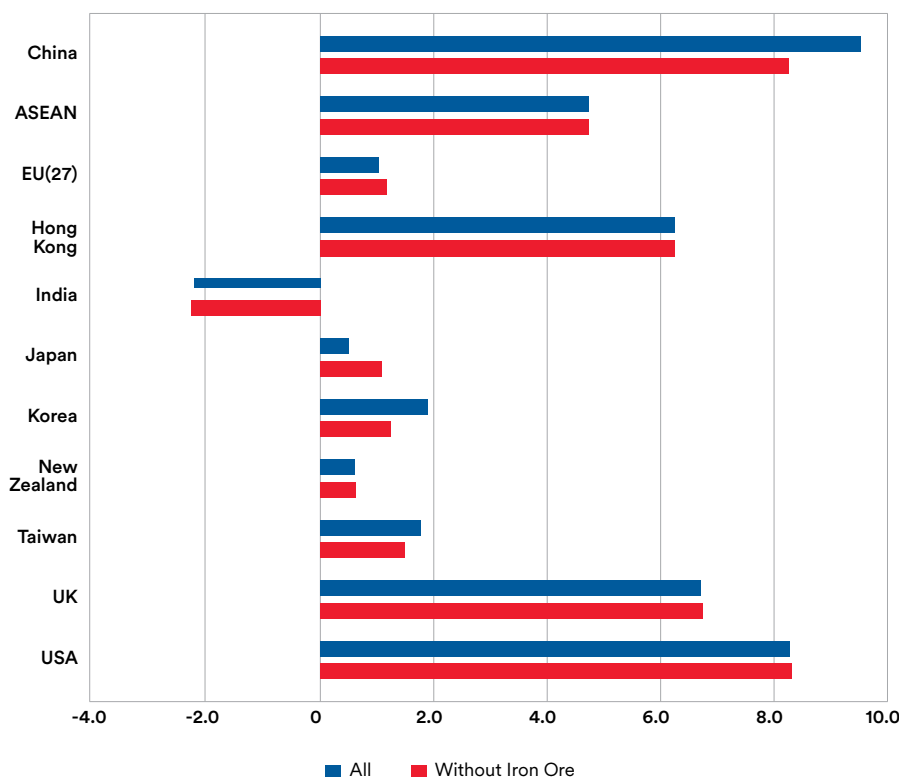
it is excluded from imports of Australia's major trading partners, China was still, with the United States, the fastest growing market for the remaining products between 2010 and 2020 (Figure 4) – a fact that does not change with changing end dates. For example, if the period 2011-19 is chosen, China's imports of non-iron ore goods from Australia grew faster than any of the countries or regions shown in Figure 4, and indeed faster than China's own imports of iron ore from Australia.

Figure 3: Merchandise Export Concentration, Australia: Geographic



Source: Authors' calculations, based on Department of Foreign Affairs and Trade direction of trade and ITC Trade Map data.

Figure 4: Growth Rate of Imports from Australia: 2010-20, per cent



Source: Authors' calculations from ITC Trade Map data.

Note: Growth rates are compound annual rates, based on data in Australian dollars.

The individual economies identified here were the top nine non-ASEAN goods export markets for Australia in 2020. ASEAN and the EU (27) have been added as groups because of their significance as export markets.

Product concentration in Australian goods exports to the world, 2001-2020

Over 30 per cent of Australian total goods exports at the 4-digit HS level were iron ore in 2020, while the biggest 10 exports in that year made up over 70 per cent of the total (Table 3). Concentration has increased over time: in 2001, the biggest export (then coal) accounted for only about 10 per cent of the total. The share of the next nine products has also grown rising from about 32 per cent in 2001 to almost 40 per cent in 2020. But the share of the next 15 commodities contracted. The number of significant products (defined as those amounting

to at least one per cent of the total) also fell. The overall increase in concentration is reflected in the HH and the relative Theil indices over the two decades (Table 3). They increase even when iron ore is excluded, but the increase is much weaker (Table 4).

Australian merchandise exports to the world are also highly concentrated by product to country of destination. In recent years, the top 25 exports by commodity and destination have accounted for over half of all merchandise exports and have been dominated by

resources to our largest markets. In 2020, iron ore to China accounted for 23 per cent of total exports, and LNG and coal for a further five per cent. LNG, coal and iron ore to Japan; gold to the United Kingdom, Switzerland and the United States; iron ore, coal and natural gas to South Korea; and coal to India, Taiwan and Vietnam amounted to another 20 per cent. Beef exports to Japan, the United States and China (1.6 per cent) and wool to China (0.5 per cent) stood out as the exceptions to an otherwise resources-dominated picture.¹⁰

Table 3: Product Concentration for Australian Merchandise Exports to the World

	2001	2005	2010	2015	2019	2020
Share of Biggest, %	10.2 (Coal)	15.7 (Coal)	21.4 (Iron ore)	19.2 (Iron ore)	24.2 (Iron ore)	30.8 (Iron ore)
Share of 10 Biggest, %	42.5	48.4	64.9	60.4	69.7	70.4
Share of 25 Biggest, %	61.4	65.7	75.8	73.0	79.5	80.1
HH	0.03	0.05	0.09	0.07	0.11	0.13
Relative Theil	0.37	0.41	0.50	0.47	0.53	0.55
Number of Significant Products	18	17	13	14	10	12
Number of Products	1223	1216	1189	1193	1183	1182

Source: Authors' calculations based on ITC Trade Map data.

Note. See pp.6-7 for discussion of the analytical indices used in the table. Data are based on products defined at the 4-digit HS level, making over 1200 items in all. Significant products are those accounting for more than or equal to 1 per cent of Australia's total merchandise exports in the year in question. Products not elsewhere classified are included as one item in the number of products but are not counted in the top 10, top 25 or the significant products. Total products include those where there were some exports recorded, no matter how small. In practice this means a recorded value in the Trade Map database of at least A\$1000. For the Relative Theil indices, for commodities where Australian exports were zero for the year, the zero values were replaced by a very small number (A\$1) to make it possible to calculate logarithms.

¹⁰ Data for exports by product to country are based on calculations from the ITC Trade Map and DFAT, 'Composition of Trade, Australia'.

The top goods exports have mostly been minerals or rural products

The top ten goods exports for Australia have mostly been minerals, with iron ore and coal consistently in the top two places.

There have been exceptions. Gold (which is sometimes classified as a manufactured product and sometimes left unclassified) was consistently in the top ten. In 2001, it was joined by unwrought aluminium and passenger motor vehicles, and in 2005 by medicaments. Passenger motor vehicles dropped out of the top ten by 2010 as the industry went into terminal decline. By 2010, only gold remained in the top group. Among agricultural products, wheat and wool were in the top ten in 2001, but wool (once Australia's main export) dropped out by 2005. In 2015, wheat was joined by frozen beef. In 2020, frozen, fresh or chilled beef and lamb were among the top ten.

The dominance of minerals and energy and to a lesser extent rural products reflects Australia's comparative advantage in land-based commodities. According to the WITS database, Australia's revealed comparative advantage in minerals was 17.2 by 2019, up from 11.9 in 2001. For fuels, it was 2.6 and for animal products

2.9 in 2019.¹¹ A closely related way of picturing Australia's comparative advantage can be derived by plotting the share of different sectors in total merchandise exports for both Australia and the world. Figure 5 shows this at the 2-digit HS level. The ratio of points on the two curves gives Australia's revealed comparative advantage in the sectors in question.

Shifts in the share of exports of specific goods in Australia's merchandise exports can be explained by changes at both the global and Australian levels. For iron ore, for example, a key driver was the expansion of world steel production: China accounted for almost 90 per cent of the increase. World imports of iron ore in tonnes rose more than three-fold between 2001 and 2019. At the Australian level, revealed comparative advantage in iron ore increased from 28.9 in 2001 to 45.8 in 2015, but eased to 38.0 by 2020. This reflected the development and expansion of operations by the two big miners, BHP and Rio, as well as the development from 2003 of what was to become a major new player, Fortescue Metals. Reflecting its competitiveness in supplying iron ore, Australia's share of imports in the huge China market increased from 41 per cent in 2001 to almost 61 per cent in 2020 in volume terms.

Many other countries have less concentrated goods exports

Australian exports are more concentrated than those of many other countries. Figure 6 shows, for 24 economies, the share of the single biggest exports in merchandise exports and the share of the top 10 exports for 2020. For the biggest export, only Papua New Guinea (petroleum gas) and the Philippines (electronic integrated circuits and parts) had a bigger share than Australia, although Norway (crude oil) came close. The share of the top 10 exports for Australia exceeded that of all the countries examined except Papua New Guinea. New Zealand's exports were quite concentrated, but the shares of the biggest export and the top ten exports in the total were appreciably below Australia's. Canada's shares also were well below Australia's.

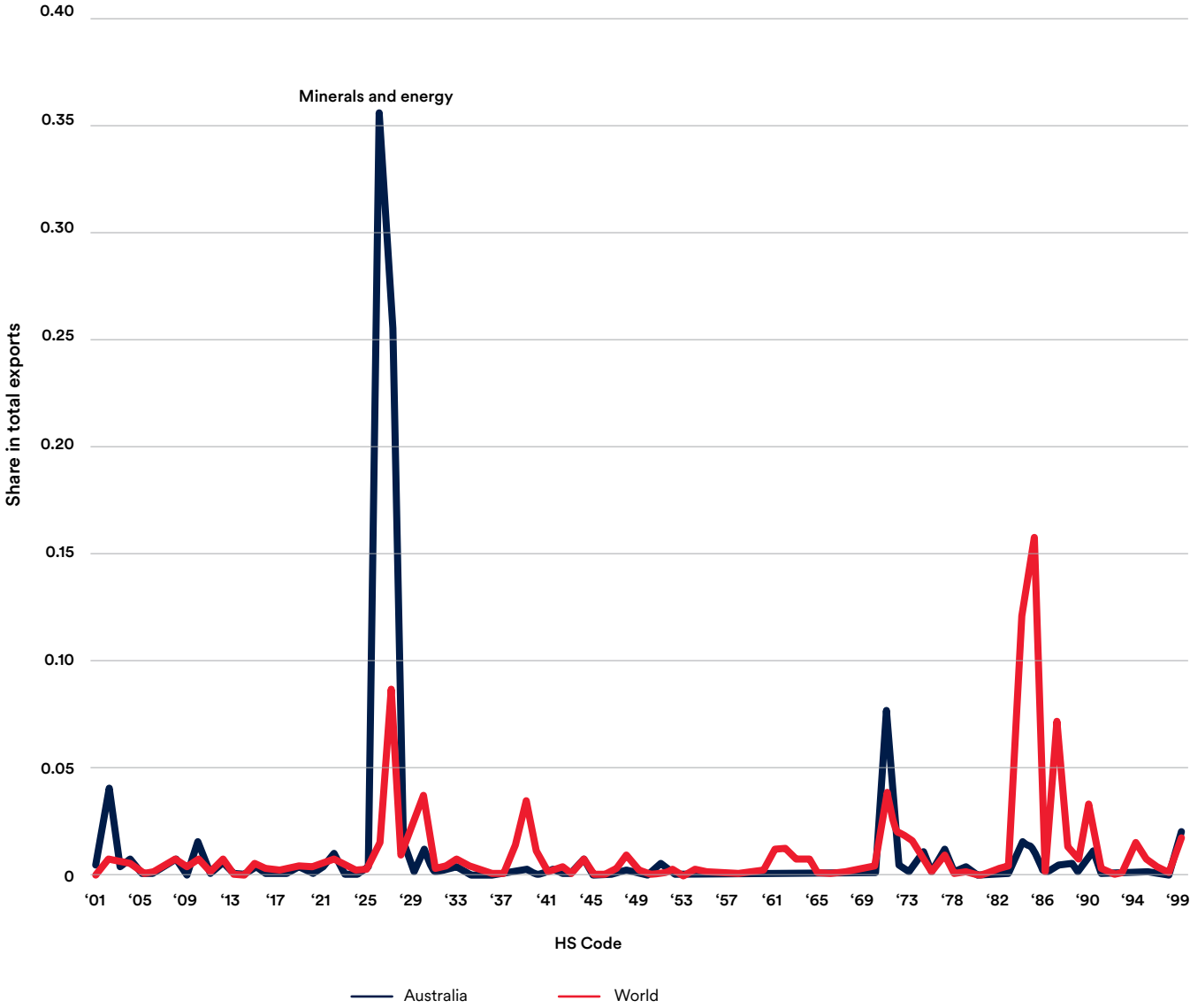
Table 4: Product Concentration for Australian Merchandise Exports less Iron Ore

	2001	2005	2010	2015	2019	2020
HH	0.03	0.04	0.05	0.04	0.05	0.04
Relative Theil	0.37	0.40	0.46	0.43	0.49	0.47

Source: Authors' calculations based on ITC Trade Map data.
Note. As for Table 3.

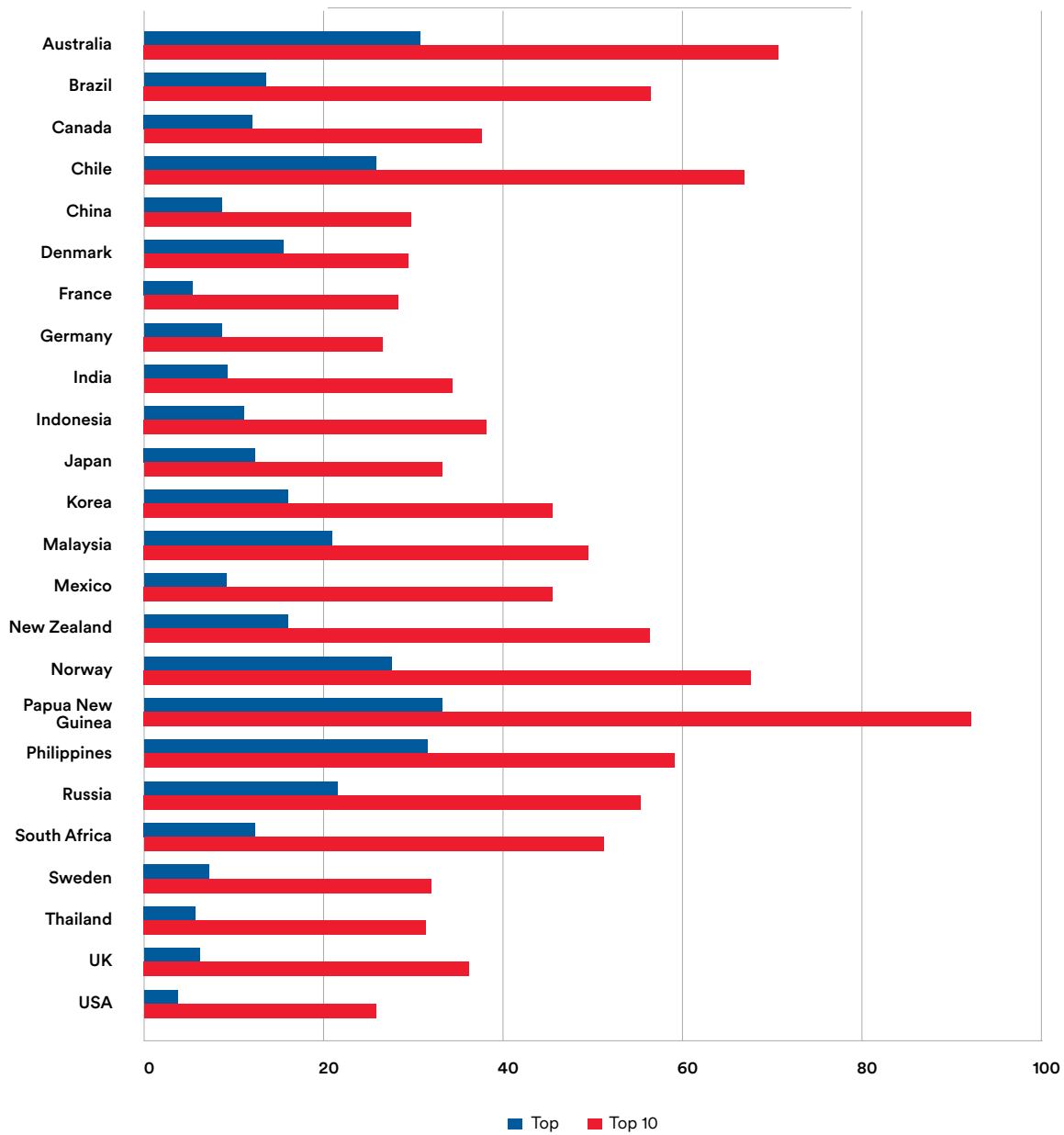
¹¹ A reading above one indicates a revealed comparative advantage in the sector or product under review

Figure 5: Distribution of Australian and World Exports



Source: ITC Trade Map.
 Note: Shares of total exports are expressed as ratios.

Figure 6: Share in Merchandise Exports, 2020, per cent



Source: Authors' calculations from ITC Trade Map data.

Note: Papua New Guinea's data are mirror data, estimated from partner country imports.

A broad range of developed and developing countries was used in this chart to underline the prominence of Australia's single biggest goods export.

Product Concentration and Diversification in Australian Goods Exports to China, 2001-2020

Product concentration in Australian goods exports to China is a well-known story: it is about iron ore and other major commodities like LNG and coal. This is reviewed first. But there also is a less well-known story about concentration and diversification in some small Australian trades: rapid growth in some, and contraction, even elimination, in others.

Australian exports to China by product have become more concentrated

On a range of measures, Australia's trade with China has become more concentrated as trade has increased (Table 5). The share of iron ore has increased from around 19 per cent of merchandise exports in 2001 to 62 per

cent in 2020. The share of the next nine biggest products halved, falling from around 49 per cent to 24 per cent. The share of the 15 products after that also contracted and the number of significant exports (those accounting for one per cent of more of the market) more than halved. Both the HH and Relative Theil indices also show an appreciable rise in market concentration.

Table 5: Product Concentration for Australian Merchandise Exports to China

	2001	2005	2010	2015	2019	2020
Share of iron ore, %	18.6	34.4	58.9	47.6	51.8	62.2
Share of iron ore, natural gas and coal, %	21.4	40.8	69.4	58.6	73.2	78.8
Share of 10 Biggest, %	67.9	71.6	84.2	81.3	83.2	86.5
Share of 25 Biggest, %	83.6	85.5	93.1	91.7	93.1	93.5
HH	0.08	0.14	0.36	0.25	0.29	0.40
Relative Theil	0.52	0.57	0.70	0.66	0.69	0.74
Number of Significant Products	20	13	12	13	10	8
Non-zero exports	793	838	837	839	852	805

Source: Authors' calculations based on ITC Trade Map data.

Note. See pp.6-7 for discussion of the analytical indices used in the table. Data are based on products defined at the 4-digit HS level, making over 1200 items in all. Data include a number of estimates based on Chinese import data where export data are confidential (see Annex 1). Significant products are those accounting for more than or equal to 1 per cent of Australia's total merchandise exports in the year in question. Products not elsewhere classified are not included in the top 10, top 25 or the significant products. Products with non-zero exports include those where there were some exports recorded, no matter how small. In practice this means a recorded value in the Trade Map database of at least A\$1000. For the Relative Theil indices, for commodities where Australian exports were zero for the year, the zero values were replaced by a very small number (A\$1) to make it possible to calculate logarithms.

Table 5 further suggests that the biggest increase in concentration occurred in the first decade of the century, as the contours of the bilateral trading relationship evolved in resources and energy, and that the trend was markedly weaker in the second as trading patterns generally became more settled. For example, the share of iron ore in Australia's merchandise exports to China advanced from about 19 per cent in 2001 to 59 per cent in 2010: it was just above this at 62 per cent in 2020. The HH and Relative Theil indices also showed very strong growth between 2001 and 2010 and much slower growth between 2010 and 2020.

Table 6 breaks down the HH index to give the contributions of different commodities to the total. The index gives greatest weight to commodities that have a large share of the market. It is therefore not surprising that iron ore dominates the decomposition of the index, with its contribution rising from 41 per cent in 2001 to 96 per cent in 2020. Table 7 further underlines the significance of iron

ore by presenting the HH and Relative Theil indices calculated without iron ore. A shift towards increased concentration between 2001 and 2020 is still apparent, but it is very weak compared to the one shown in Table 5.

Table 8 draws together data on the relevant variables and sheds some light on what drove the rising share of iron ore in Australia's exports to China and what explains differences in these drivers over the two decades. China's steel production increased about four-fold between 2001 and 2010 but at a slower pace of 67 per cent in the next 10 years. Changes in the volume of China's iron ore imports reflected these differing rates of growth, rising from 92.3 million tonnes in 2001 to 618.5 million tonnes in 2010 and then to 1170.1 million tonnes in 2020.

Australia's share of China's import market for iron ore was about the same in 2010 as it had been in 2001 but increased by about 18 percentage points in the following period to 2020. The unit values of those exports were much higher in 2010 than

they had been in 2001 and rose much more modestly over the next decade (though they were to soar in 2021).¹²

Australia's export growth has been along the intensive margin, but not the extensive margin

At a global level, ITC Trade Map data, classified at the HS 6-digit level and with over 6,000 commodities, show that expanding resources exports along the intensive margin has basically driven Australia's rising share of world merchandise exports from around one per cent at the turn of the century to 1.5 per cent currently. The intensive margin for total exports rose from around 0.011 in 2001 to 0.015 in 2020. The extensive margin was 0.97 in 2020, much the same as in the early 2000s. When iron ore, natural gas and coal are removed from the calculations, the intensive margin decreased from 0.009 in 2001 to 0.007 in 2020.

Table 6: Commodities Making a Significant Contribution to the HH Index in Table 5

	2020
2001	Iron ore, HS 2601 (40.8%); wool, HS5101 (29.1%); alumina, etc., HS2818 (20.1%); barley, HS1003 (3.0%)
2005	Iron ore (83.1%); alumina, etc. (8.0%); wool (4.4%)
2010	Iron ore (96.8%); coal, HS2701 (2.2%).
2015	Iron ore (90.9%); gold, etc., HS7108. (4.9%); coal (2.8%)
2019	Iron ore (91.4%); LNG, etc, HS2711 (5.2%); coal (2.8%)
2020	Iron ore (96.2%); LNG, etc. (2.4%); coal (1.1%)

Source: Authors' calculations from ITC Trade Map data.

Note. Figures in parentheses are commodity contributions to the HH index as a share of the total HH index for that year. It is theoretically possible for these to add to more than 100% because of the correction for the number of commodities included in the HH index (see pp.6-7). A significant contribution is one that adds more than 0.002 to the index.

Table 7: Product Concentration for Australian Merchandise Exports to China less Iron Ore

	2001	2005	2010	2015	2019	2020
HH	0.08	0.06	0.07	0.08	0.11	0.11
Relative Theil	0.50	0.48	0.51	0.53	0.56	0.55

Source: Authors' calculations based on ITC Trade Map data.

Note. As for Table 5.

¹² Services exports are not discussed here in any detail, though they have added to the diversity of Australian exports to China. See Annex 2.

Australia's intensive margin in China with respect to ROW more than doubled from less than 0.030 in 2001 to 0.075 in 2020. Three commodities – iron ore, natural gas and coal – accounted for 78 per cent of merchandise exports in 2020, compared with 18 per cent in 2001. Removing them dramatically reduces intensive margins and market shares from the mid-2000s. From 2015 to 2019, the intensive margin for total exports less iron ore, natural gas and coal to China averaged 0.024. In 2020, China's trade coercion drove it sharply lower, by 28 per cent, to 0.019 and back to levels seen in the 2000s. The intensive margin for total exports, which included buoyant iron ore exports, fell by just 3 per cent (Figure 7).

Australia's extensive margin in China with respect to ROW was 0.793, in 2020 – much the same as in the early 2000s

- after having risen above 0.8 through the mid- to late- 2000s, reaching 0.847 in 2013. This indicates that increases in the breadth of our exports to China have not been sustained, notwithstanding our aggregate share in China's merchandise imports more than doubling to over five per cent over this period.

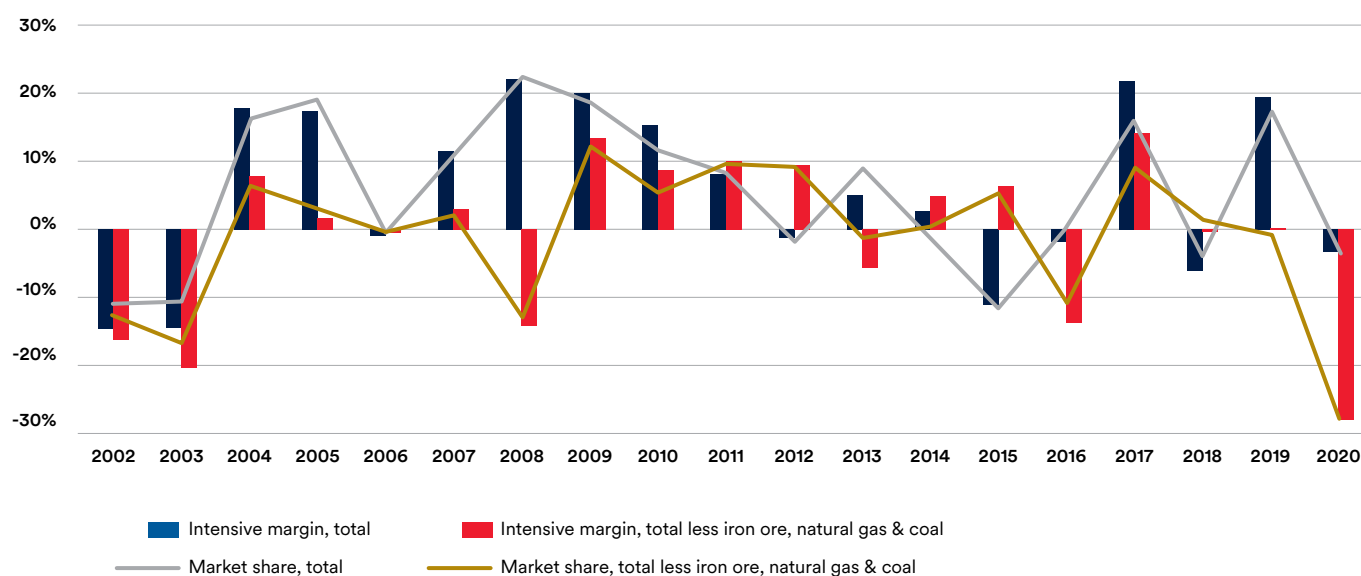
Taken together, the evolution of the intensive and extensive margins and market shares in exports supports the well-established narrative of Australia's strong comparative advantage in mineral resources and (less prominently) in agriculture products. Growth in key resources exports predominantly along the intensive margin reflects our increasing competitiveness in these sectors. It also reflects China's huge investment in infrastructure, geographical proximity, our reputation as a reliable

supplier and capacity to expand production to meet China's demands, and strong export price rises.

Margin analysis also lends support to a less well-established and more controversial narrative. The range of commodities exported to China has at best stagnated, the extensive margin decreasing from 0.847 in 2013 to 0.795 and 0.793 in 2019 and 2020 respectively.

A number of factors are at play here, some working to increase the extensive margin, others reducing it. In the case of the former, for example, China's imports of natural gas from Australia beginning in 2006, along with substantial increases in natural gas imports from the rest of the world, initially added to the extensive margin. Some smaller Australian exports to China, many of which China imports in

Figure 7: Australian Merchandise Exports to China: Changes in Intensive Margins and Market Share



Source: ITC Trade Map

Table 8: Drivers of Australia's Growing Iron Ore Exports to China

	2001	2005	2010	2015	2019	2020
World steel production, million tonnes (China's share)	851.1 (151.6)	1144.1 (353.2)	1435.3 (638.7)	1625.1 (803.8)	1874 (995.4)	1878 (1064.8)
China's iron ore imports, million tonnes	92.3	275.2	618.5	953.2	1070.6	1170.1
Australia's share of China's imports of iron ore, % by volume	41.1	40.8	42.9	63.7	62.1	60.9
Unit values for Australia's exports of iron ore to China, A\$/tonne	33.9	46.2	119.5	61.9	112.2	129.4

Sources: Authors' calculations from ITC Trade Map and World Steel Association 2020; 2021.

Table 9: Small 2015 Exports and their Value in 2020 A\$ million

HS	Abbreviated Commodity Description	2015	2020
2609	Tin ores and concentrates	0.0	83.5
7504	Powders and flakes, of nickel (excluding nickel oxide sinters)	0.0	280.8
9508	Roundabouts, swings, shooting galleries and other fairground amusements; travelling circuses, etc.	0.0	34.9
7208	Flat-rolled products of iron or non-alloy steel, of a width >= 600 mm, hot-rolled, not clad, plated, coated	0.0	15.5
1104	Cereal grains otherwise worked, e.g. hulled, rolled, flaked, pearled, sliced or kibbled; germ of cereals	0.4	45.6
1003	Barley	0.9	503.8
1004	Oats	1.0	43.4
9033	Parts and accessories for machines, appliances, instruments or other apparatus in chapter 90, n.e.s.	1.7	48.4
1904	Prepared foods obtained by the swelling or roasting of cereals or cereal products, e.g. corn flakes; cereal flakes, worked grains	2.8	29.0
3502	Albumins, incl. concentrates of two or more whey proteins containing by weight > 80% whey proteins, albumates or other albumin derivatives	3.3	42.4
3926	Articles of plastics and articles of other materials of heading 3901 to 3914, n.e.s.	3.9	30.4
8518	Microphones and stands therefor (excluding cordless microphones with built-in transmitter); loudspeakers, headphones, etc.	4.2	25.1

Source: ITC Trade Map data.

Note: This table captures 4-digit HS products that were less than A\$5 million in 2015 and had exports in 2020 of at least A\$15 million.

Table 10: Annual Growth of Selected Commodities A\$ million for 2015 and 2020; average annual growth per cent, 2015 to 2020

HS	Abbreviated Commodity Description	2015	2020	AAG
8803	Parts of aircraft and spacecraft of heading 8801 or 8802, n.e.s.	5.1	28.7	41.3
0303	Frozen fish (excluding fish fillets and other fish meat of heading 0304)	5.2	26.9	39.2
3504	Peptones and their derivatives; other protein substances and their derivatives, n.e.s.; hide powder	5.8	24.3	33.0
3402	Organic surface-active agents (excluding soap); surface-active preparations, washing and cleaning preparations	5.9	19.7	27.2
3923	Articles for the conveyance or packaging of goods, of plastics; stoppers, lids, caps, etc.	7.5	26.1	28.5
3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators	8.5	32.0	30.4
8413	Pumps for liquids, whether or not fitted with a measuring device; liquid elevators	8.6	25.8	24.6
0809	Apricots, cherries, peaches incl. nectarines, plums and sloes, fresh	8.9	71.1	51.7
3401	Soap; organic surface-active products and preparations for use as soap, washing; paper, etc. covered with soap	10.6	39.9	30.4
2505	Natural sands of all kinds, whether or not coloured	13.5	83.8	44.1
8479	Machines and mechanical appliances having individual functions, not specified or included elsewhere	14.5	40.7	23.0
0307	Molluscs, fit for human consumption, even smoked, whether in shell or not, live, fresh, chilled, or in pellets	15.8	60.6	30.8
0306	Crustaceans, whether in shell or not, live, fresh, chilled, frozen, dried, salted or in brine, smoked, steamed	16.9	453.5	93.2
0806	Grapes, fresh or dried	17.0	292.3	76.6
8471	Automatic data-processing machines and units thereof; magnetic or optical readers, transcribers	17.1	70.0	32.6
0713	Dried leguminous vegetables, shelled, whether or not skinned or split	22.3	56.4	20.4
3304	Beauty or make-up preparations and preparations for the care of the skin, incl. sunscreen; manicure, pedicure preparations	26.1	166.9	44.9
1502	Fats of bovine animals, sheep or goats (excluding oil and oleostearin)	26.9	67.6	20.2
2936	Provitamins and vitamins, natural or reproduced by synthesis, incl. natural concentrates, derivatives, etc.	32.9	404.3	65.1
8105	Cobalt mattes and other intermediate products of cobalt metallurgy; cobalt and articles thereof, incl. scrap	42.2	123.6	24.0

Source: ITC Trade Map and Chinese Customs data.

Note: This table captures 4-digit HS items with a 2015 value of between A\$5 million and A\$50 million, with an average annual growth rate of greater than 20 per cent between 2015 and 2020. Statistics for natural sands are estimated from China's import data.



large amounts from third countries, have also grown rapidly from zero or very low levels and added to the extensive margin.

Table 9 looks at cases where exports to China were less than A\$5 million in 2015 and at least A\$15 million in 2020 (implying an average annual growth rate of at least 25 per cent and often much higher). It finds 12 4-digit commodities in this category. Table 10 looks at larger trades, with a 2015 value of between A\$5 million and A\$50 million, along with an average annual growth rate of at least 20 per cent per annum. It identifies 20 commodities of this kind. Rapid increases in incomes and the emergence of a strong Chinese middle class have opened up a range of opportunities for products ranging from beauty treatments to provitamins and vitamins to processed foods and less processed foods including fresh fruit and

crustaceans. At the same time, growing demand for range of 'new' metals like cobalt reflect China's position as a large refiner and user of these products in multiple applications.

In the case of forces reducing the extensive margin, there are many trades where Australia had a significant presence in the Chinese market but where this has atrophied or where the importance (or weighting) of these trades in China's imports from ROW has lessened. This applies especially to manufactured goods as China has become more self-sufficient and export oriented. Examples include data processing machines; internal combustion engines; various types of wires, bars, rods and flat rolled metals; wastepaper and other waste products, and even carded and combed wool.

How to interpret these divergent trends is not straightforward. A somewhat negative interpretation could be that the China-Australia Free Trade Agreement (ChAFTA) has had little overall impact on Australia's presence in world exports to China: new trades that have sprung up have been more than compensated by others that have disappeared. A more positive interpretation may be that the slight downward trend in the extensive margin would have been more pronounced had ChAFTA not entered into force at the end of 2015. Deteriorating bilateral relations in recent years have presented an obvious set of challenges even for small, innovative Australian exporters. And China's continued shift from manufacturing-led export growth towards services and domestic consumption-led growth has presented others.

Conclusions

Australia's merchandise exports have become more concentrated over at least the past couple of decades in our principal markets, our product range and in specific commodities going to specific markets.

At one level, these outcomes have much to recommend them. They coincide with Australia's return as a trading nation. This stands in stark contrast to much of the second half of the previous century when imports and exports as a share of GDP fell¹³ but export diversity increased. This increase was particularly prominent in the 1970s and 1980s as Australian governments searched for new markets in economies like Korea, Taiwan, Singapore, and the Middle East to address declining shares in trade with the United Kingdom and later Japan and United States and worsening problems with the external account (EPAC 1986; BIE 1989; EPAC 1991a; Schedvin 2008, pp. 289–307.)

More specifically, the trend to greater concentration since the start of this century, and arguably from the 1990s, reflects policies that have supported our pronounced comparative advantage in land-based commodities, particularly resources and energy. As a country, we have grown rich exchanging commodities for manufactures and services. We have been fortunate over recent years in that the commodities we sell on international markets have commanded high prices and more than pay for the goods and services

we need to import. And services have increasingly been added to our offerings on international markets, offsetting to some degree narrowing product and market concentration in goods exports. At another level, however, this narrowing concentration in goods exports poses risks for Australia in an increasingly uncertain international economic and security environment (Adams, Wickes and Brown 2022). Risks (and opportunities) come in multiple forms. Some are specific to particular countries or regions. Others are of a more general kind. And still others are specific to the growing share of primary products in Australia's goods exports (Box 2). But whatever their form, Australia would benefit greatly from trade diversification.

Diversification does not mean downplaying our critically important trade relationship with China. Rather, diversification, along with strategies to advance the open international system through the World Trade Organization (WTO) and deep, comprehensive FTAs, must underpin our trade policy and be complemented by a broad suite of policies to boost domestic productivity. Together, this broad approach will better enable Australian firms to access more export markets and source cheaper and perhaps higher quality inputs needed in domestic manufacturing. Over time this offers the best prospect for generating more value-added activities spinning off from agriculture and mining, as well as more value-added services across the board.

The key imponderable is whether Australia pursues domestic and international reforms that prepare the ground for sustainable product and market export diversification or, like in the 1970s and early 1980s, waits for reform to be forced on us by major threats to our living standards and development.

¹³ Australia's openness to international trade has changed enormously over the past 70 years. Imports and exports as a proportion of GDP peaked at over 50 per cent during the Korean War boom and reached a low point of 25 per cent in 1972. Openness was below 30 per cent for most of the 1960s and 1970s, started rising particularly in the 1990s and has been above 40 per cent since the early 2000s. It was 44 per cent in 2020.

Box 2: Watchpoints for Risks

Risks at country/regional level: For example: while China has not intensified coercion against Australia over the past year or so, there are obvious risks in services – education and tourism – and possible long-term risks to major Australian goods exports, including iron ore. Is China starting to diversify its sources of supply of key commodities as part of its geopolitical re-positioning in much the same way as Australia is doing? Is there any compelling evidence that India might abandon its self-sufficiency policies anytime soon or will it continue to disappoint as a market? Why is Australia's share of the ASEAN and South Korean markets falling even as their share of world imports continues to rise? Is the Phase One Agreement between the United States and China a possible template for future trade negotiations not only for them but for other great powers? Is there any compelling evidence globally or in relation to China that Australia is significantly expanding the range of its commodity exports or are we stuck with being a 'big fish' in many resources and other primary products and a minnow in the big goods pond beyond?

Risks of a more general kind: For example: there are risks from trade coercion and the generalisable fear that powerful countries are using it as part of their normal trade policy 'toolbox' (Adams, Wickes and Brown 2022). There are broader geopolitical risks: how will the contest between the United States and China play out in trade and investment terms and what are the practical implications of the United States reaching out to allies? Does reaching out foreshadow genuine give and take in working out common positions or could it be more akin to the US leading and others falling into line? There are risks (as well as opportunities) arising from carbon abatement and efforts to pursue global net zero emissions. There are risks too from rising protectionism – from high income countries increasingly using non-tariff barriers (NTBs) and from a growing range of economies using industry subsidies and state aid to promote desired structural change (Evenett and Fritz 2021).

Risks associated with the growing share of primary products in exports: For example, import demand for primary products tends to increase more slowly as foreign real incomes rise compared to manufactures and services. Is growth in Australia's key mineral exports to China likely to slow not only because China's economy is projected to grow more slowly than in the recent past, but also because its income elasticity of demand for energy and metals should decline, assuming historical relationships found elsewhere in Northeast Asia, Europe and North America apply? And how far can Australia depend on the continuation of high commodity prices? The idea that commodity prices move in long cycles is appealing with the most recent largely driven by China's emergence as a major economic power. But the long-term trend in commodity prices is unknown. What is known, however, is that commodity prices are typically much more volatile than for manufactures.

Annex 1: The Impact of Confidentiality in Australian Statistics

Confidentiality affects a good deal of Australian trade data and is probably the main reason why Australia ranks well down the list of countries on reliability and accuracy of trade statistics, despite having a fine statistical agency that works with well-documented procedures.

For the present exercise, confidentiality adds significantly to problems in analysing trends in concentration and diversification over time.

LNG is the most notable item affected by confidentiality. Its absence from Australian export statistics by country largely accounts for the fact that 2020 exports to China recorded by the Department of Foreign Affairs and Trade (which now estimates LNG exports) are almost A\$17 billion higher than the ITC Trade Map total.

In some tables in the present paper, Australian exports of four-digit HS items are estimated from China's imports of these items with adjustments to allow for freight insurance and other costs. Data estimated in this way are used for all the years examined (2001, 2005, 2010, 2015, 2019, 2020, and 2021) to give a consistent series for the items affected, even where confidentiality involves suppression of the data for only part of this time.

The data estimated in this way are for wheat (HS1001), sugar (HS1701), salt (HS2501), natural sands (HS2005), manganese ores and concentrates (HS2602), zirconium and a variety of other ores (HS2615), crude oil (HS2709), LNG and other gaseous hydrocarbons (HS2711), alumina and related products (HS2818), nickel mattes and other intermediate nickel products (HS7501), unwrought nickel (HS7502), and nickel flakes/powders (HS7504). In most years, the totals for Australian exports to China estimated in this way are close to those of the Department of Foreign Affairs and Trade, though the two data sets differ substantially in 2015.

Annex 2: Concentration and Diversity in Australia's services exports

Services exports provide additional diversity in Australian exports both in terms of markets and product offerings. The sector, however, is highly concentrated on some measures and has become increasingly so since the start of the century.

Education services and tourism accounted for 48 per cent of Australia's total services exports in 2001 and for 62 per cent in 2019 – the year before Covid - with education alone making up 40 per cent. The HH index advanced from 0.13 to 0.19 over these years mainly because of expanding trade in education services.

China dominated both education services and tourism in 2019, though with significant contributions from India, ASEAN and Nepal in the case of education services and from India, ASEAN, the United States, the United Kingdom and New Zealand in the case of tourism. China was not prominent in other significant, but much smaller, trades (measured on a balance of payments basis) like in transport, financial services, telecommunications, and 'other' business services. And Australia, again on a balance of payments basis, was not a prominent provider to China or other countries of services linked to maintenance and repair, construction, insurance and pensions, and provision of government goods and services.

But this last observation comes with a large caveat: Australia's balance of payment statistics do not cover services provided by Australian commercial presence abroad through Australian owned foreign affiliates. This 'foreign affiliates trade' is often substantial – it can exceed trade across international borders - and sometimes may be the only practical option to deliver specific services (or goods) to specific markets given regulatory constraints. Unfortunately, Australia, unlike countries like the United States, does not collect statistics on foreign affiliates trade on a regular basis.

What exists is fragmentary material for specific years and industries that shows, for example, that Australian legal services are not delivered in the main via foreign affiliates unlike, say, financial services and insurance that are (Bingham 2018). Further, a one-off survey for 2018-19 by the Australian Bureau of Statistics shows that 275 Australian parent companies had a controlling interest in over 5000 foreign affiliates spread across manufacturing, mining and services. In the case of

services, it showed a particular focus on the United States, the United Kingdom and New Zealand and substantial trades (in the order of \$90 billion) in insurance and pension services, financial services, other business services, and construction services, among others.

What these data suggest is that services trade is a good deal more diversified than suggested by balance of payments data. They also underline the need for more comprehensive data on Australia's trade in services collected on an annual basis.

References

- Adams, M, N Brown & R Wickes 2020, *ASEAN: New Frontiers: South and East Asia: 04 Trade Agenda*, Minerals Council of Australia, Canberra, February.
- Adams, M, R Wickes & N Brown 2021, 'Geostrategic tensions manifesting as trade conflict: policy recommendations for rebuilding Australia-China relations', Policy Brief 13, Institute for International Trade, University of Adelaide, August.
- Adams, M, R Wickes & N Brown 2022, 'Australia's response to Chinese economic coercion: towards a comprehensive strategic approach to export diversification', Policy Brief 17, Institute for International Trade, University of Adelaide, July.
- Agosin, M, R Alvarez & C Bravo-Ortega 2011, 'Determinants of Export Diversification Around the World: 1962-2000', Central Bank of Chile Working Papers, No. 605.
- Australian Bureau of Statistics (ABS) 2021, *Australian National Accounts: National Income, Expenditure and Product*, 1 December.
- Bebczuk R & N Berrettoni 2006, 'Explaining Export Diversification: an Empirical Analysis, CAF Research Program on Development Issues, at Variable (caf.com) last accessed 10 January, 2022.
- Bellù L & P Liberati 2006, Describing Income Inequality: Theil Index and Entropy Class Indexes, Food and Agriculture Organization of the United Nations (FAO), EASYPol Module 051, at EASYPOL MODULE 051 Theil index and Entropy class indexes (fao.org) last accessed 17 February 2022.
- Bingham, F 2018, 'Australia's foreign affiliates trade in services', Department of Foreign Affairs and Trade, August.
- Bureau of Industry Economics (BIE) 1989, 'Trade Performance of Australian Manufacturing Industry', Information Bulletin 15, Canberra.
- Cadot, O, C Carrère & V Strauss-Kahn 2011, 'Export Diversification: What's Behind the Hump?', *The Review of Economics and Statistics*, Vol. 93, No. 2, May, pp.590-603.
- Carrere, C, O Cadot & V Strauss-Kahn 2011, 'Trade diversification: drivers and impacts', in: Jansen M, Peters R. & Salazar-Xirinachs J-M, *Trade and Employment: from Myths to Facts*, ILO-EC International Labour Office - European Commission, Geneva, 253-307.
- Chinese Customs (General Administration of Customs) Database, at. <http://english.customs.gov.cn/Statistics/Statistics?ColumnId=7> last accessed 7 August 2022.
- De Ferranti D, G Perry, D Lederman & W Maloney 2002, *From Natural Resources to the Knowledge Economy*, World Bank, Washington, D.C.
- DFAT 2022, various trade statistics databases, including time series direction of trade and pivot tables, at <https://www.dfat.gov.au/trade/resources/trade-statistics/trade-statistics> last accessed 9 August 2022.
- Drysdale, P & R Garnaut 1982, 'Trade intensities and the analysis of bilateral trade flows in a many-country world: a survey', *Hitotsubashi Journal of Economics*, Vol. 22, No.2, February, pp.62-84.
- East Asia Analytical Unit (Department of Foreign Affairs and Trade and Austrade) 1992, *Australia's Business Challenge: South-East Asia in the 1990s*, Commonwealth of Australia, Canberra.
- Economic Planning Advisory Council (EPAC) 1986, 'Medium to longer-term Trends Affecting Australia's Economic Growth', Commonwealth of Australia, February.
- EPAC 1991, 'Improving Australia's international competitiveness', Council Paper No. 45, Canberra, January.
- Elhiraika, A & M MBate 2014, 'Assessing the Determinants of Export Diversification in Africa', *Applied Econometrics and International Development*, Vol, 14-1.
- Evenett S & J Fritz 2021, *Subsidies and Market Access: towards an inventory of corporate subsidies by China, the European Union and the United States*, 28th Global Trade Alert, Centre for Economic Policy Research, London.
- Garnaut, R 1989, *Australia and the Northeast Asian Ascendancy: Report to the Prime Minister and the Minister for Foreign Affairs and Trade*, Australian Government Publishing Service, Canberra.
- Giri, R, S Quayyum & R Yin 2019, 'Understanding Export Diversification: Key Drivers and Policy Implications', IMF Working Paper, WP/19/105, May.
- Herfindahl, O 1950, *Concentration in the U.S. Steel Industry*, Unpublished doctoral dissertation, Columbia University.
- Helpman, E, M Melitz & Y Rubinstein 2008, 'Estimating Trading Partners and Trading Volumes', *Quarterly Journal of Economics*, Vol. 123, No. 2, May, pp.441-487.
- Hirschman, A 1945, *National Power and the Structure of Foreign Trade*, Berkely.
- Hirschman, A 1964, 'The Paternity of an Index', *The American Economic Review*, Vol. 54, No.5, September, p.761.
- Hummels, D & P Klenow, 2005. 'The Variety and Quality of a Nation's Exports', *American Economic Review*, 95, No.3, 704-723.
- Imbs, J & R Wacziarg 2003, 'Stages of Diversification', *The American Economic Review*, Vol. 93, No.1, March, pp.63-86.
- International Monetary Fund (IMF) 2021, World Economic Outlook Database, IMF: World Economic Outlook (WEO) Database, October 2021 - knoema.com last accessed 16 February 2022.

International Trade Centre (ITC) Trade Map Database, at Trade Map - Trade statistics for international business development last accessed 9 August 2022.

Krause, L 1984, 'Australia's Comparative Advantage in International Trade', in R Caves & L Krause (eds.), *The Australian Economy: A View from the North*, Allen and Unwin, Sydney, pp.275-311.

Laurenceson J, T Pantle, P Toner & R Green 2021, *Australia's export mix, industrial base and economic resilience challenge*, Australia-China Relations Institute, November.

Maddock, R & I McLean 1987, 'The Australian economy in the very long run', in R Maddock & I McLean (eds), *The Australian economy in the long run*, Cambridge University Press, Cambridge, 1987, pp.1-29.

McLean, I 2014, *Why Australia Prospered: The Shifting Sources of Economic Growth*, Princeton University Press, Princeton & Oxford.

OECD 2016, 'Statistical Insights: New OECD database on International Transport and Insurance Costs', at Statistical Insights: New OECD database on International Transport and Insurance Costs - OECD accessed 6 August 2022.

Parliament of the Commonwealth of Australia 2021, *Pivot: Diversifying Australia's Trade and Investment Profile*, Joint Standing Committee on Trade and Investment Growth, Canberra, February.

Parteka, A & M Tambari 2011, 'Export Diversification and Development – Empirical Assessment', Università Politecnica delle Marche, Dipartimento di Scienze Economiche and Sociali, Quaderni di Ricerca n. 359.

Productivity Commission 2021, *Vulnerable Supply Chains*, Study Report, July.

Santos Silva, J, S Tenreiro & K Wei 2014, 'Estimating the extensive margin of trade', *Journal of International Economics*, Vol. 93, pp.67-75.

Schedvin, B 2008, *Emissaries of Trade: a history of the Australian Trade Commissioner Service*, Commonwealth of Australia, Canberra.

Sen, S 2010, 'International Trade Theory: a review of the literature', Levy Economics Institute of Bard College, Working Paper No. 635, November.

Statistics Canada 2018, *Measuring Canadian export diversification*, Ministry of Industry, Measuring Canadian export diversification (statcan.gc.ca) last accessed 17 February 2022.

Wickes, R, M Adams & N Brown 2021, 'Economic Coercion by China: the impact on Australia's merchandise exports', Working Paper 04, Institute for International Trade, Adelaide University, July.

World Integrated Trade Solution (WITS) 2013, *Online Trade Outcomes Indicators: User's Manual*, The World Bank, Version 1.0, September.

WITS Database, at International Trade Indicators |WITS (worldbank.org) last accessed 10 January 2022.

World Steel Association 2020, *2020 Steel Statistical Yearbook* and previous issues, at <https://worldsteel.org>

World Steel Association 2021, *2021 World Steel in Figures*, at <https://worldsteel.org>

World Trade Organization/Organisation for Economic Cooperation and Development 2019, *Aid for Trade at a Glance 2019: economic diversification and empowerment*, OECD Publishing, Paris.

This paper may be cited as
'Wickes, R., M. Adams and N. Brown (2022) 'Measuring diversification in Australian Goods Exports, 2001-2021: Policy and Technical Considerations', *Institute for International Trade*, WP12 30 Nov

Further enquiries

The University of Adelaide SA 5005 Australia

enquiries future.ask.adelaide.edu.au

phone +61 8 8313 7335

free-call 1800 061 459

web adelaide.edu.au

facebook facebook.com/uniofadelaid

twitter twitter.com/uniofadelaid

snapchat snapchat.com/add/uniofadelaid

instagram instagram.com/uniofadelaid

wechat UniversityOfAdelaide

weibo weibo.com/uniadelaid

Disclaimer The information in this publication is current as at the date of printing and is subject to change. You can find updated information on our website at adelaide.edu.au. The University of Adelaide assumes no responsibility for the accuracy of information provided by third parties.

© The University of Adelaide
November 2022. CRICOS 00123M

Kaurna acknowledgement

We acknowledge and pay our respects to the Kaurna people, the original custodians of the Adelaide Plains and the land on which the University of Adelaide's campuses at North Terrace, Waite, and Roseworthy are built. We acknowledge the deep feelings of attachment and relationship of the Kaurna people to country and we respect and value their past, present and ongoing connection to the land and cultural beliefs. The University continues to develop respectful and reciprocal relationships with all Indigenous peoples in Australia, and with other Indigenous peoples throughout the world.