
International Trade Analytics

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1. Executive Summary

The report will analyse the Australian international trade from 1989 to 2024 using raw data, analytical and statistical pattern to identify major change, trends and outliers of both Australian export and import sectors. It will compare all 10 main categories as well as a focused analysis on Mineral Fuels, lubricants, and related materials categories with an in-depth exploration about its 3 subcategories especially Coal, Coke and Briquettes. Findings reveal that the export dominant subcategory is Coal, however, is at a gradual decline due to the global transition towards renewable energy. Additionally, the dominant import sector is petroleum with an increasing trend, which reveals Australia's strong reliance on external resources. A comparison between Tableau and AI will also be done to showcase its capabilities and further storytelling for in-depth examination.

0. Food and Live Animals
1. Beverages and Tobacco
2. Crude Materials, inedible, except fuels
3. Mineral Fuels, lubricants, and related materials
4. Animal and Vegetable Oils, fats, and waxes
5. Chemicals and Related Products
6. Manufactured Goods Classified Chiefly by Material
7. Machinery and Transport Equipment
8. Miscellaneous Manufactured Articles
9. Commodities and Transactions Not Classified Elsewhere in the SITC

2. Data preparation

The dataset was provided by the UTS subject, offering a 35-year insight into Australian trade data for both import and export values across 10 main categories and 67 subcategories. To ensure optimal analysis, the values were transformed for clearer and more meaningful interpretation by implementing Analytical and Statistical Patterns. This transformation improves the visualisations and storytelling created using Tableau.

2.1 Analytical Pattern

The analytical pattern helps visualise trends and patterns that measure year-by-year changes for both the main trading and subcategories. The formula was used to create the analytical dataset to examine the changes in both imports and exports by comparing them to their previous years.

$$\text{Changes (\%)} = \frac{VT}{VT-1} \times 100$$

- V = Value of the data point
- T = Year, therefore T-1 representing the previous year.

The analytical pattern will provide clear visualisation of growth surges and spikes for both imports and exports. These times of fluctuation will provide great understanding of correlation between data trends and external factors events. Additionally, the data for 1988 was not used for the analytical pattern.

2.2 Statistical Pattern

Statistical Pattern helps analyse and visualise categories against other imports and exports by revealing its relative proportion of each category. The following formula was used to find the statistical pattern:

$$\text{Ratio (\%)} = \frac{\text{Trade Component Total}}{\text{Group of Trade Component Total}} \times 100$$

Unlike analytical pattern, Statistical pattern focuses on long term changes and can highlight dominating or declining trades overtime.

3. Exploratory Data Analysis: Main Categories Overview

The line graph in figure 1 and Area line graph in figure 2 compares all the main categories' import and export throughout the change years between 1989 and 2024.

3.1 Analytical

The line graph in Figure 1 compares all of the main categories' imports and exports throughout the years between 1989 and 2024. Using this, we can identify periods of sudden spikes or drops in imports and exports and their correlation with economic changes or global events. Additionally, we can observe each category's overall trend, showing how its imports and exports have grown or declined over time, highlighting industries that have either dominated or experienced significant fluctuations.

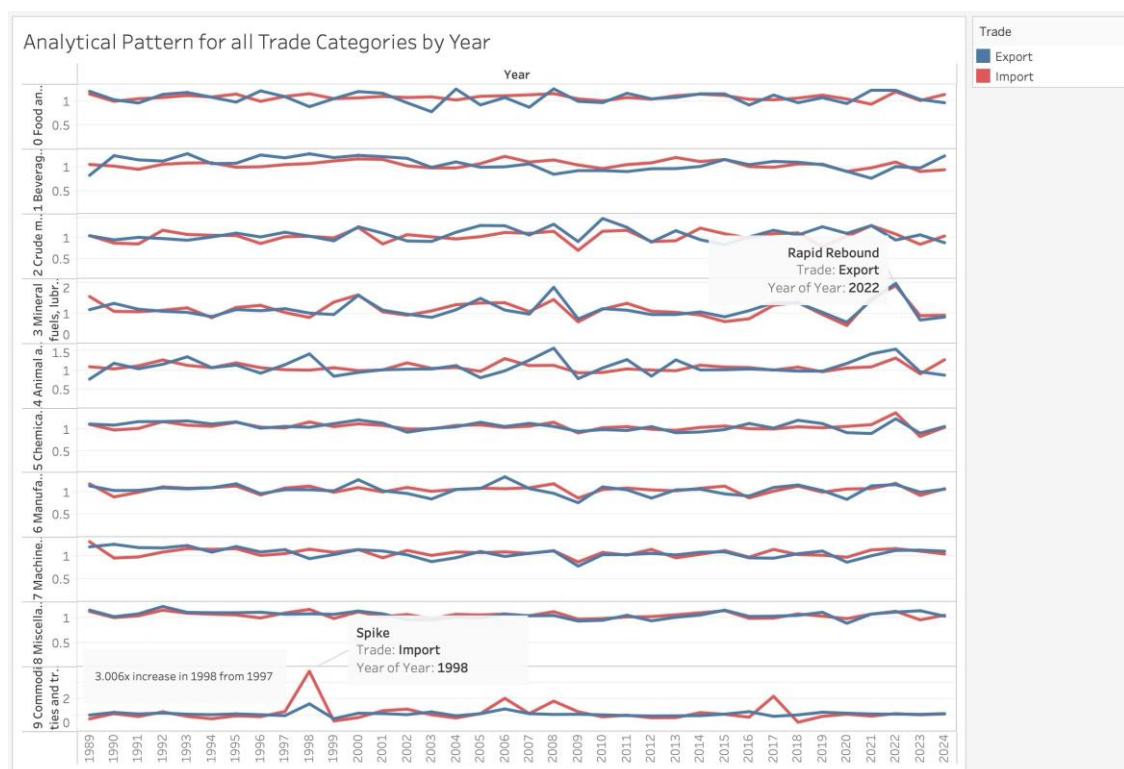


Figure 1

We can see their correlation of sudden change and fluctuation in both exports and imports in specific time periods across most of all the main categories this includes at around 1988, 2009 and 2022. Potential reason for these time periods includes.

- 1988: economic expansion due to the strength of the Australian dollar with higher demands for minerals
- 2009: The Global financial crisis may have collapsed global demand and prices resulting in sharp falls in Australian Exports.
- 2022: Due to the impact of Covid 19 with fluctuation with both imports and exports due to disruption of supply chain.

An exception is seen with Food and Live Animals, Animal and Vegetable Oils, Fats and Waxes, Manufactured Goods Classified Chiefly by Material, and Machinery and Transport Equipment, which show a smooth and consistent import/export trend despite year-to-year changes. This indicates that these categories are resilient and have less influence from global events or economic shifts. Therefore, it highlights these sectors as essential to Australian trade, maintaining constant demand despite external factors.

An outlier in Commodities and Transactions is shown in figure 1.1 in 1998. From 1.221 in 1997, it spiked with a 367x increase in 1998. One possible factor may have been to the favourable US to AUD exchange rates during this time. This may have influenced the large purchase of goods by the Australia during the 1998, which led to the sudden import spike.

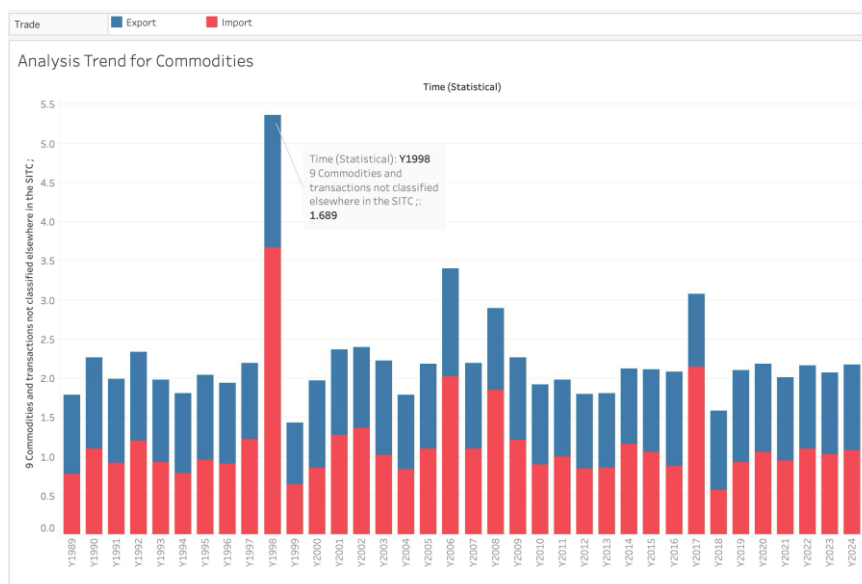


Figure 1.1

3.2 Statistical

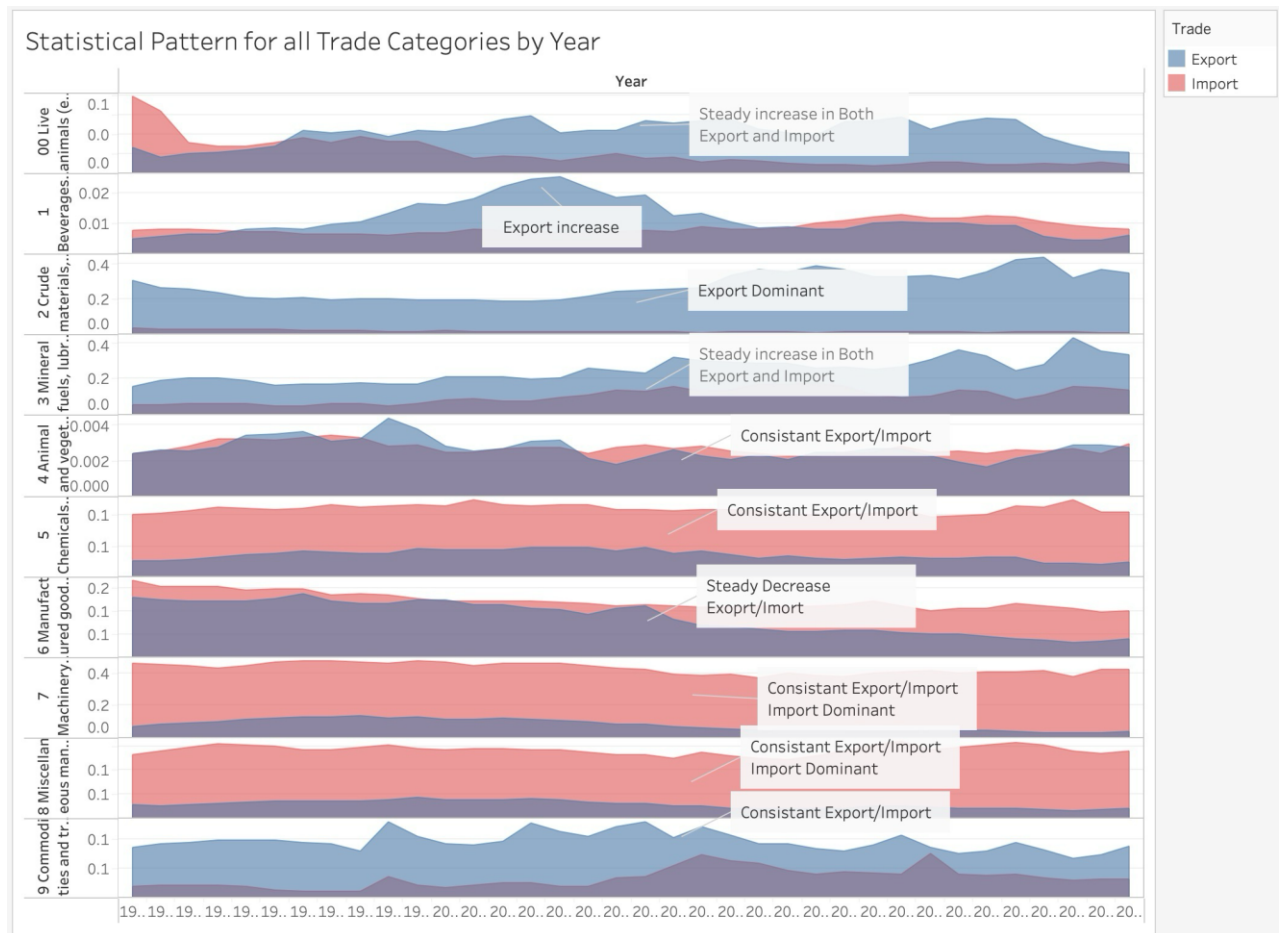


Figure 2

In figure 2, we can see the overall growth or decline patterns for all the main categories. The area chart graph easily points out the categories import or export ratio. For instance, sectors such as *Chemicals and Related Products*, *Machinery and Transport Equipment* and *Miscellaneous Manufactured Articles* dominate imports in these categories, while in contrast *Crude Materials, inedible, except fuels*, *Mineral Fuels, lubricants, and related materials* and *Commodities and Transactions Not Classified Elsewhere* dominates in exports. There is also a middle ground as shown in dashboard in categories *Chemicals and Related Products* and *Manufactured Goods Classified Chiefly by Material* which has a similar export to import ratio.

Import-dominant categories, as mentioned, indicate Australia's dependence on foreign resources in these industries. This is due to Australia's lack of local resources, manufacturing limitations, and higher domestic production costs, while countries such as China, Japan, and the United States have access to advanced machinery and cheaper labour, allowing for more cost-effective production. Additionally, these import-dominant categories also show a gradual decline in exports, suggesting Australia's heavy reliance on these goods and resources from overseas. On the other hand, Australia's export-dominant categories in Figure 2 reflect its abundance of natural resources. Crude Materials (inedible, except fuels) and Mineral Fuels, Lubricants and Related Materials are not only

export-dominant categories but are also gradually increasing year by year, further stabilising Australia's export economy.

On the other hand, categories such as *Food and Live Animals, Beverages and Tobacco, Animal and Vegetable Oils, fats, and waxes* displays a noticeable inconsistency year to year. There is also a common correlation as these categories are all perishable and consumables goods. This indicates that these industries are largely influenced by external factors which includes climate conditions, domestic demands, consumption trend and well as agricultural factors. As a result, causes both decline and incline for these specific categories.

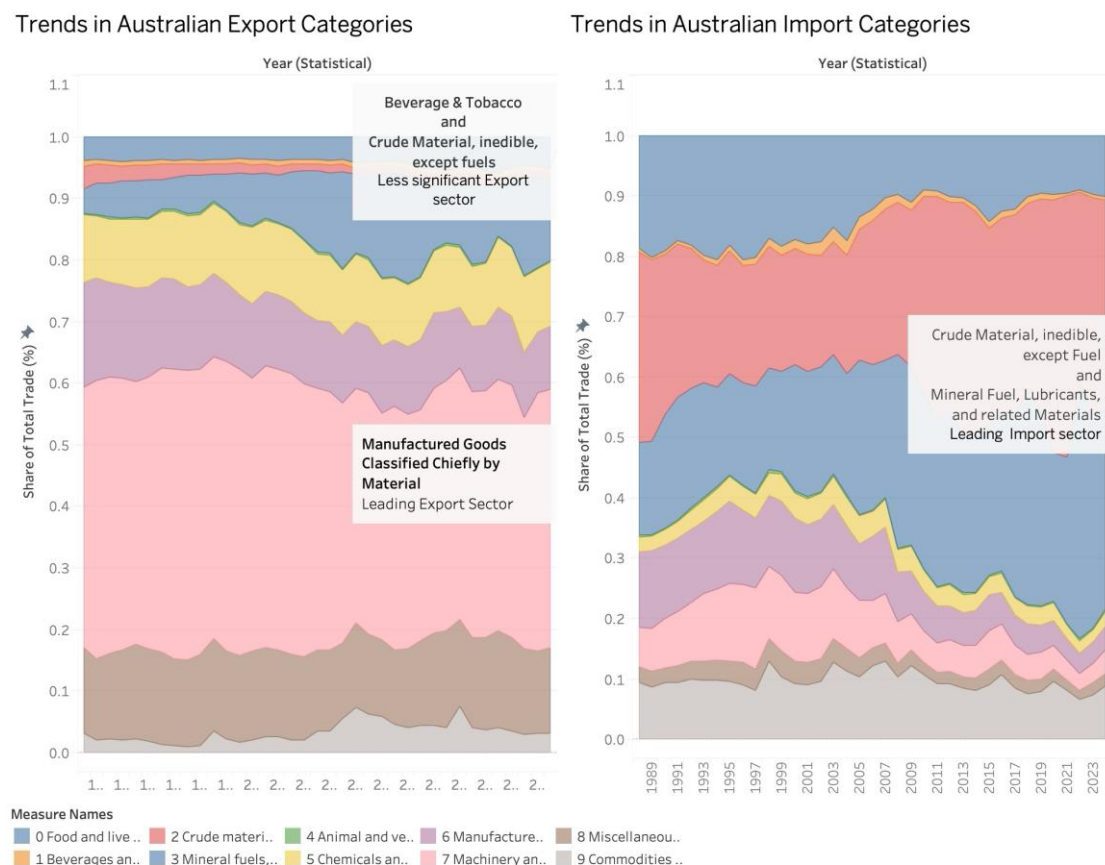
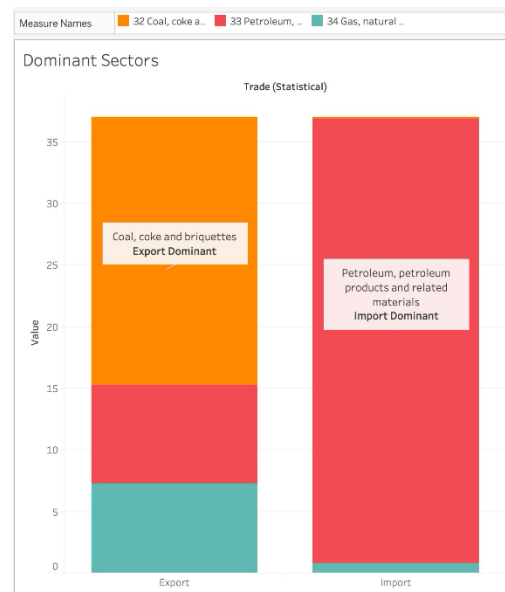


Figure 3

As shown in the stacked area graph in figure 3, visualises leading export category is Manufactured Goods Classified Chiefly by Material while the least is Crude Materials, inedible, except fuels and Beverages and Tobacco

The leading import category is Crude Materials, inedible, except fuels and Mineral Fuels, lubricants, and related materials. With the Beverages and Tobacco least significant importers being



4. Dashboard for Mineral Fuels, Lubricants, and related Material

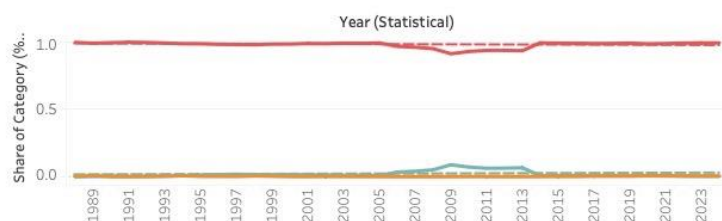
4.1 Dashboard 1 - Import

Australian Import Trend of Mineral Fuels, Lubricants, and related Material

Measure Names

- Avg. 32 Coal, coke and briquettes ; (Statistical)
- Avg. 33 Petroleum, petroleum products and related materials ; (Statistical)
- Avg. 34 Gas, natural and manufactured ; (Statistical)

Statistical Pattern of Australian Mineral Fuel, Lubricant and related material



Dominant Import category



Total import % of Mineral Fuel, Lubricant and related material



Analytical Pattern of Australian Mineral Fuel, Lubricant and related material

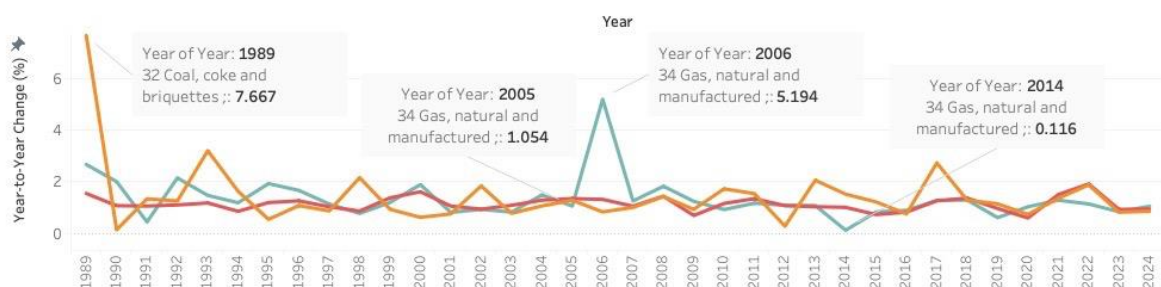


Figure 4

From the statistical pattern dashboard in figure 4, we can clearly see dominant import for the Mineral fuel subcategory is petroleum, petroleum products and related materials which makes up 97.65% of the import for the Mineral fuel subcategory. On the other hand, *Gas, Natural and Manufactured* makes up 2.05% and *Coal, Coke and Briquettes* make up 0.3%. This is due to their local abundance to meet its demand.

A clear structural break is shown in figure 4 between 2005 and 2013 as there is a sudden spike in *Gas, Natural and Manufactured*., with a corresponding dip in *Petroleum, petroleum projects and related material* within the same timeframe.

According to the [ABS](#) (2009) this may be due to the high demand for energy during to the mining era in 2006, which demanded for gas to fuel the mining machinery. They also states energy consumption was led by manufacturing (36%) and electricity supply (31%) which run via crude oil (petroleum), this sudden supply demand by have impacted its imports therefore cause the *Gas, Natural and Manufactured* to spike from change in ratio percentage of 105% to an 519% increase during this time.

There is another outlier seen in 1989 for *Coal, Coke and Briquettes*. However, by looking at the dataset, this initial spike in figure 4 which may be due to the large difference in ratio and not an external factor.

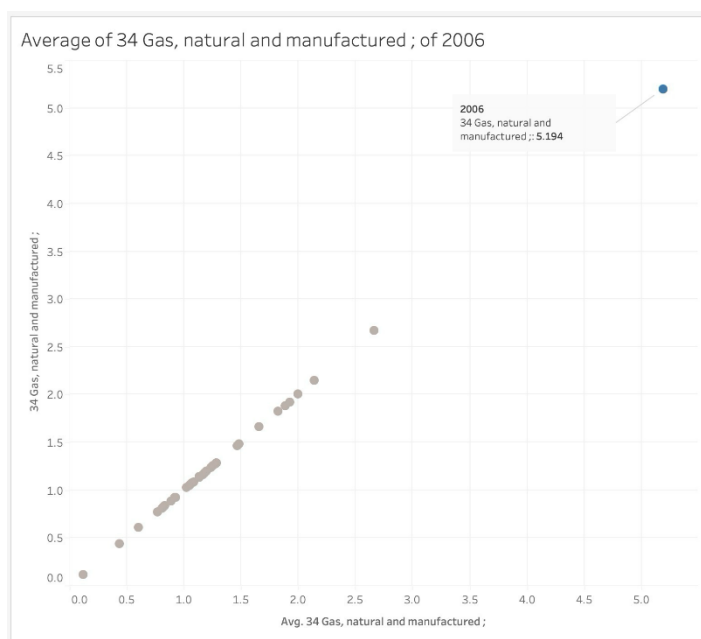


Figure 4.1 showcases 2006 import outlier of Gas and natural fuel.

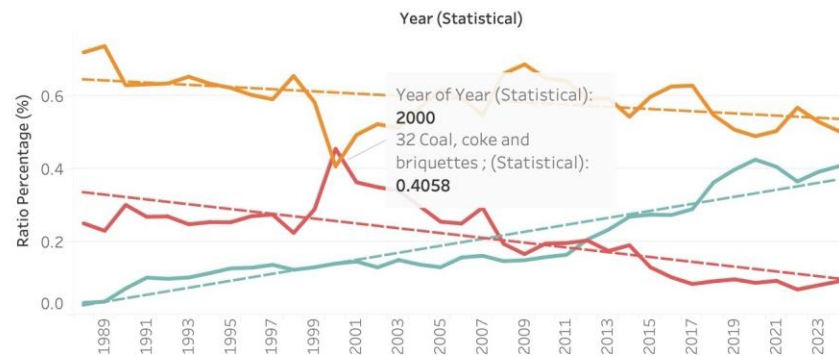
4.2 Dashboard 2 - Export

Export Analysis - Mineral Fuels, Lubricants, and related material

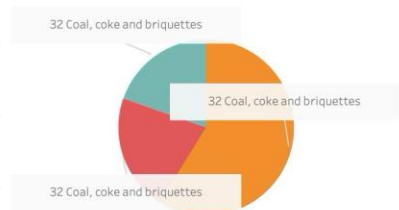
Measure Names

■ Avg. 32 Coal, coke and briquettes ; (Statistical) ■ Avg. 33 Petroleum, petroleum products and relat.. ■ Avg. 34 Gas, natural and manufactured ; (Statisti..

Export Trends of Mineral Fuels, Lubricants, and related material



Dominant Sector



Export Mineral Fuels, Lubricants, and related material

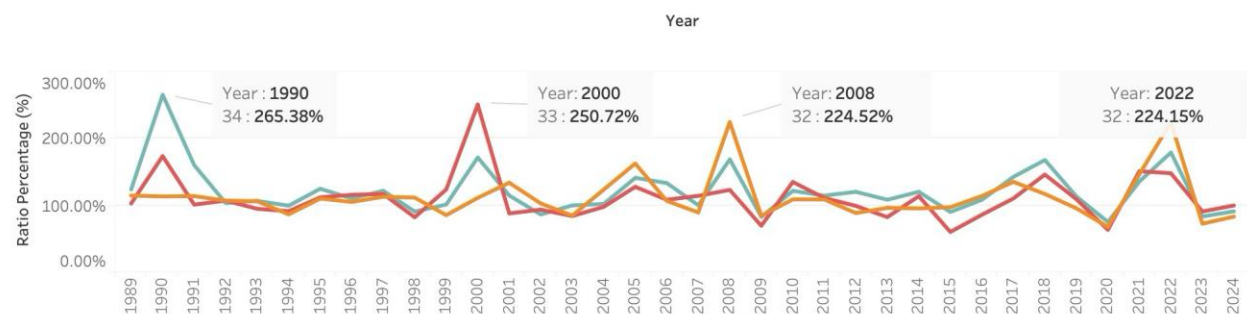


Figure 5

The leading export product for the Mineral Fuels, lubricants, and related materials category is Coal, coke and briquettes; with 58.8% while petroleum and gas have a similar export statistic of 21.5% and 19.6%. However, Coal, coke and briquettes; and petroleum have an overall decreasing trend as shown in figure 5 while gas 34 Gas, natural and manufactured; is steadily increasing year to year.

There is also a clear dip trend during 1999 to 2000s with a 40.58% drop within a single year. An article by [AME](#) (2000) suggested that one factor contributing to the dip was the global drop in coal prices, causing Australia's coal to cut back on exports as which led Japan as one of the main importers of Australian coal to reduce its purchase volumes and seek cheaper alternatives. Combined with Australia's high production and transport costs, this was one of the key reasons for the decline in coal exports during this period.

5. Storyboard for Mineral Fuels, Lubricants, and related Material

5.1 Export Trends for Sub-categories

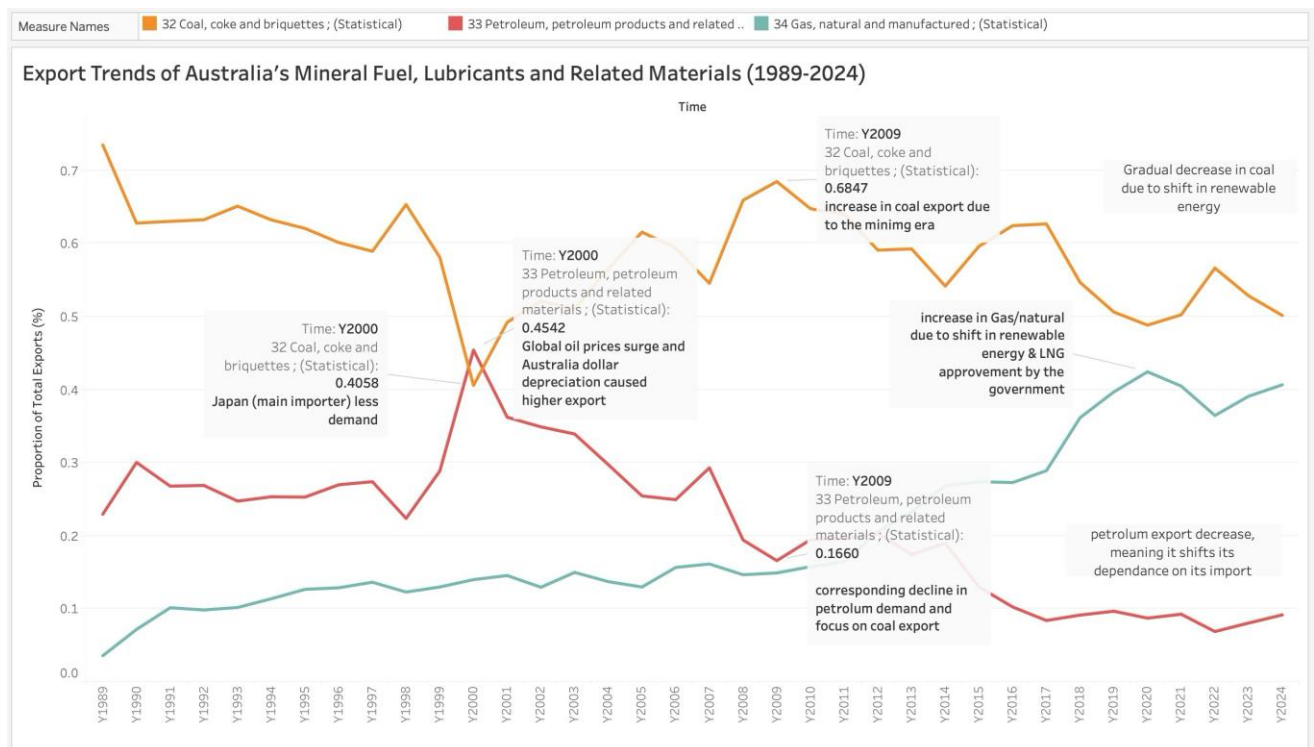


Figure 6

The storyboard in Figure 6 illustrates the long-term export trends of Australia's Mineral Fuels, Lubricants and Related Materials category from 1989 to 2024. This includes three major subcategories Coal (orange), Petroleum (red), and Natural Gas (teal). The chart highlights clear structural shifts in Australia's export composition over time, largely driven by global market forces, government energy policy, and the worldwide transition toward cleaner energy sources.

During the 1990s, coal remained the dominant export. However, in the 2000, there is a noticeable dip of coal's share as it dropped from 65% in 1998 to 40% in 2000, while petroleum surged from 22.38% to 45.42%. According to the Reserve Bank of Australia (2001), this shift was due to a global surge in oil prices as well as the depreciation of the Australian dollar, which made petroleum exports more competitive internationally. Additionally, Japan being one of Australia's largest coal importers, they have experienced reduced industrial demand also contributing to the temporary decline in coal exports in this time.

By 2009, Australia had entered a major mining and resource boom, which caused coal exports to peak at 68.47% of total mineral fuel exports. This was driven by strong coal demand from China and Japan due to their high energy requirements for rapid industrial growth during this period. Additionally, the Australian Government began approving and investing in LNG (Liquefied Natural Gas) infrastructure projects such as the Northwest Shelf Expansion and early LNG terminals. This turning point, marking a shift toward renewable and cleaner energy, explains the beginning of the growth in gas and natural fuel exports.

In 2010–2024, Australia further shifted away from coal export to natural gas fuel by supporting larger LNG projects. This includes Queensland Curtis LNG (QCLNG), Gladstone LNG (GLNG), and Australia Pacific LNG (APLNG) which further boosted its natural gas export. Consequently, we see a slow decline in coal export which suggests that international importers are also turning way from coal and into a more renewable source of fuel.

Petroleum exports on the other hand continues to decline as Australia became increasingly dependent on imported refined fuels with its currently contribution of 9.18% in 2024.

5.2 Import Trends for Sub-categories Valuation

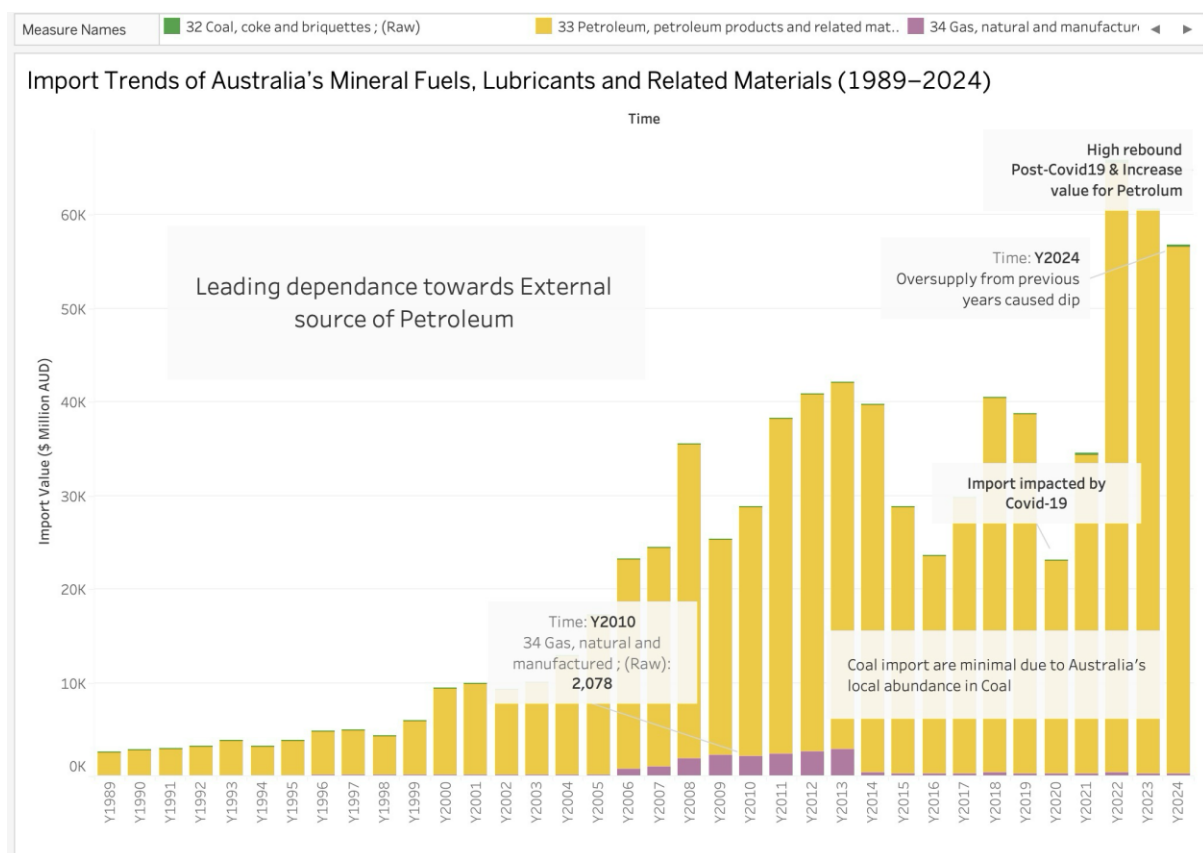


Figure 7

Figure 7 presents the second storyboard, illustrating the import trends of Australia's Mineral Fuels, Lubricants and Related Materials category between 1989 and 2024. The stacked bar chart highlights Australia's long-term dependence on imported petroleum while showing that coal and gas imports remain minimal due to the high local resources. The graph also captures the dominant import industry of petroleum and short-term impacts of gas and natural fuel while Coal is almost non-existent.

Throughout the 1990s, import values for mineral fuels were relatively low and stable as Australia was able to meet its local demand, with little reliance from external imports. Although petroleum was already imported in small quantities, its share began to gradually increase towards the 2000s

Around 2006–2013, the bar graph highlights the short-term impact of gas and natural fuel imports due to reduced domestic availability while LNG export terminals were under construction and upgrading. During this period, much of Australia’s gas output was redirected toward these projects, thus needed to import gas and natural fuel to temporarily meet its local.

From 2015 onward, petroleum accounted for nearly all mineral fuel imports, confirming Australia’s strong reliance on external fuel sources. Coal imports remained negligible due to Australia’s abundant local supply, while gas imports largely disappeared once LNG exports stabilised, and interstate gas pipelines improved.

During 2020, the impact of the COVID-19 pandemic caused a major disruption in global energy trade. Lockdowns and isolation led to a collapse in fuel demand and reduced industrial activity, causing petroleum imports to drop from \$38,357 million in 2019 to \$22,720 million in 2020. However, imports successfully rebounded as the economy recovered, rising to \$34,044 million in 2021 and \$65,082 million in 2022. This surge was due to increased prices and global fuel shortages, which countries like Australia had to rely on, explaining the high import value of petroleum.

6. Product Analysis - Coal, Coke and Briquettes

6.1 Coal, Coke and Briquettes Analysis

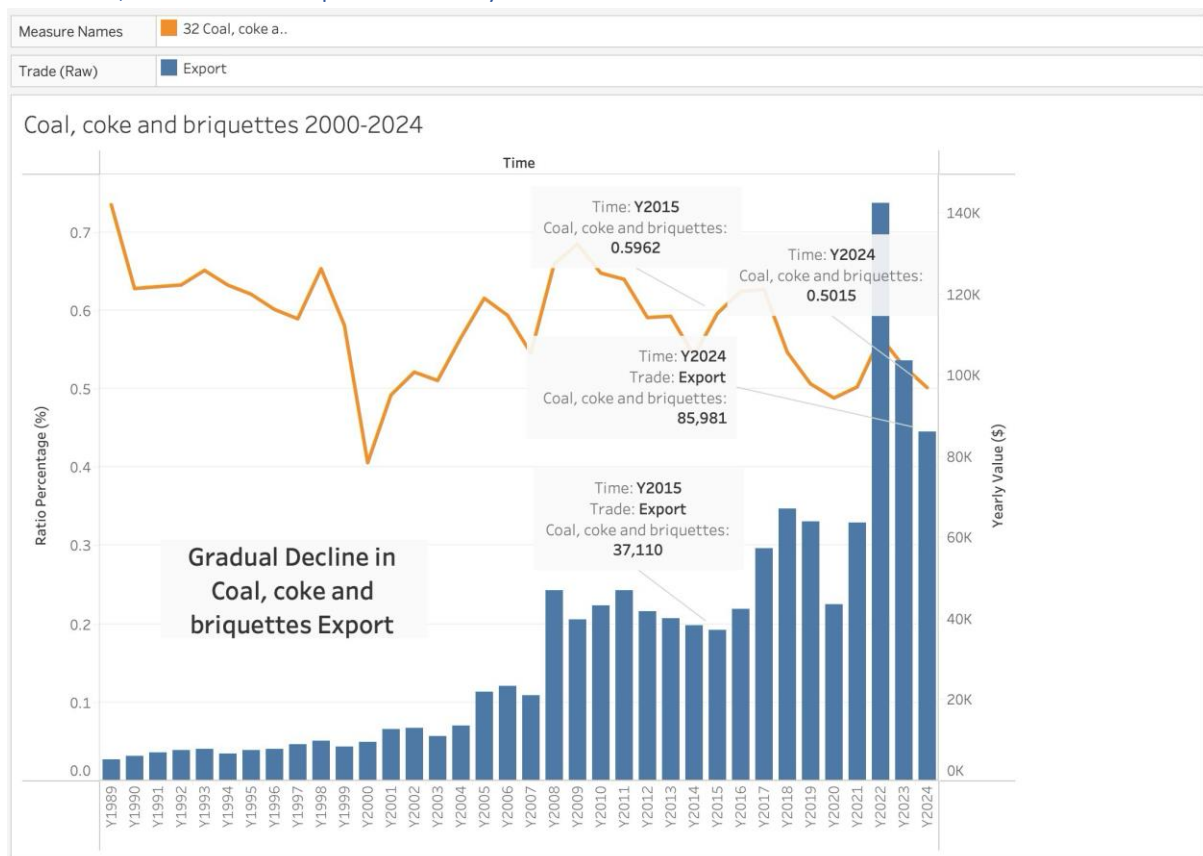


Figure 8

Trend (2015 and 2024)

Between 2015 and 2024, we can see that coal is gradually increasing in export value after the strong dip. This may from the recovery of covid-19 after all security measures and supply chain has recovered. Although the total dollar value of coal is increasing. Long term data in figure 8 suggests being declining through a dual axis graph, with the line graph representing coals ratio percentage of the category and the bar graph representing its valuation year by year. As a result, we can slowly see Australia's transition away from coal exportation towards a natural source. This is proved as shown in figure 8 as well as the growth of natural fuel in figure 9 year by year further supporting the case.

As a result, during 2015 coal was valued at \$37,110 million and after 10 years in 2024, it is valued at \$85,981. This would have gained \$48,871 million over the last 10 years, which shows to have been very successful.

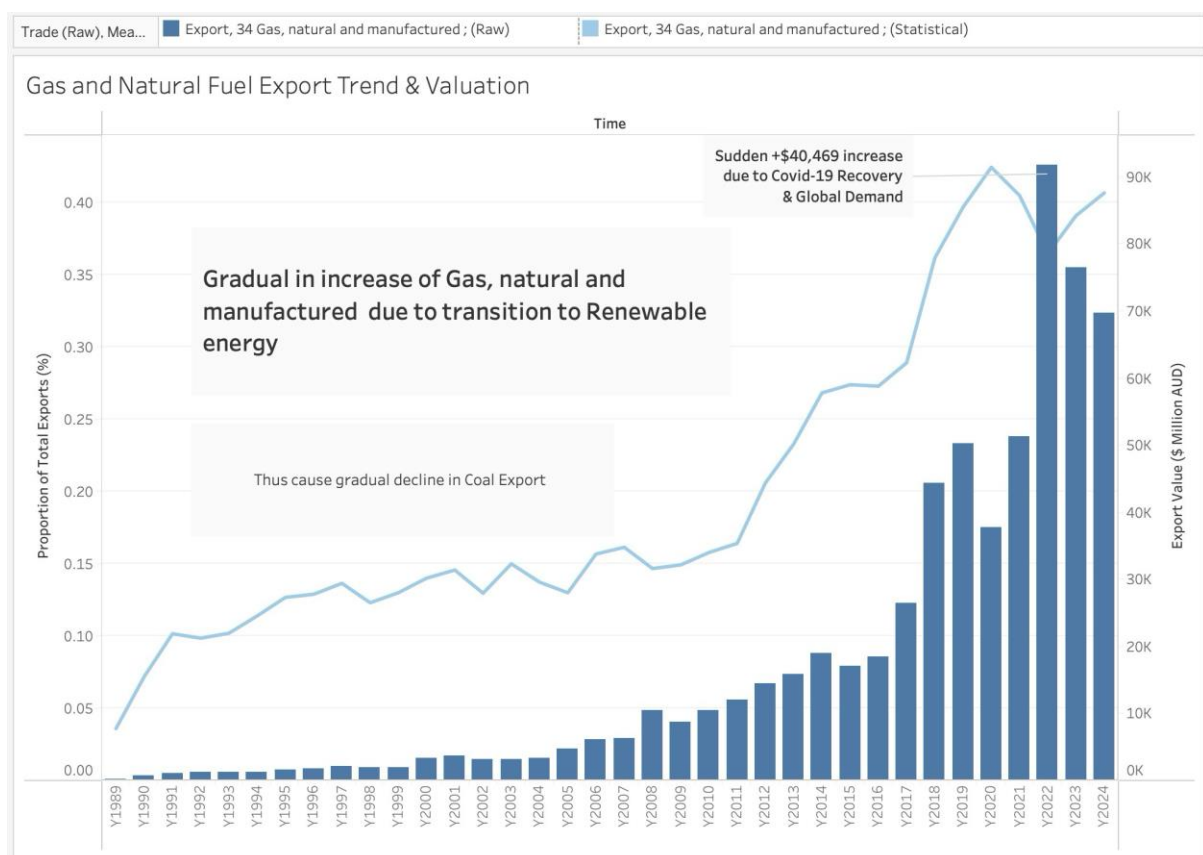


Figure 9

What will be your target for the next 5 years (2025 and 2029)

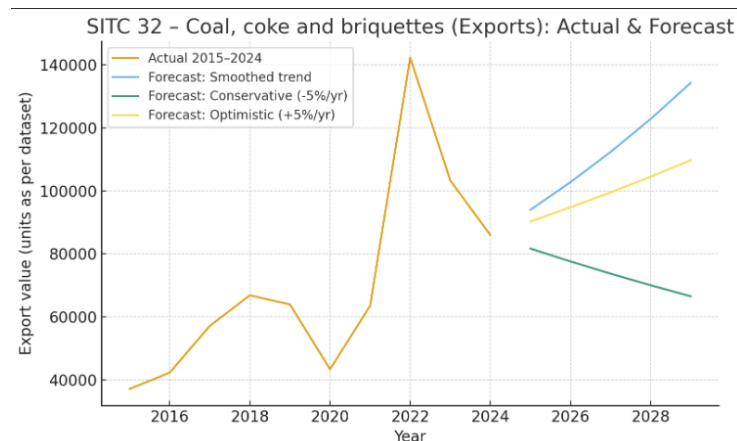
With an initial value of \$85,981 million in 2024 as shown in the dual axis graph in figure 9, it is projected that the prediction for 2029 will be approximately \$75,000 million. Although the decrease is gradual, coal exports are expected to decline at a slow rate due to the global transition toward renewable energy and international commitments to achieving net-zero emissions. Japan, the leading importer of Australian coal, has been progressively reducing its reliance on non-renewable energy sources. According to [ISEP](#), Japan's share of renewable energy increased from 15% in 2016 to 26.7% in 2024, to reach its goal of net-zero emissions by 2050. Similarly, other major coal-importing nations are pursuing renewable energy targets, which is likely to further reduce global coal demand and consequently decrease Australia's coal export volumes in the coming years.

6.2 AI Comparison

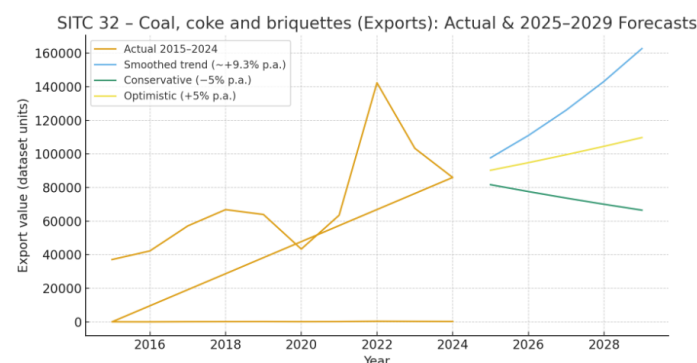
To compare the capability of AI, I have provided ChatGPT the pre-processed dataset and prompted the following:

“Can you give me a trend analyses between 2015 and 2024, forecast between 2025 and 2029 and a storyboard for the 32 Coal, coke and briquettes product”.

The following were the results.



When asking for further improvements it provided with the following:



AI summary analysis

1. Trend Analysis (2015-2024)
 - a. Overall trend: Strong upward growth with one significant outlier in 2022.
 - b. 2015–2018: Consistent rise as global demand for coal increased.
 - c. 2019: Minor dip (–4.3%).
 - d. 2020: Sharp drop (–32%) due to COVID-19 and global energy slowdown.
 - e. 2021: Quick rebound (+46%).
 - f. 2022: Exceptional export surge (+124%), likely due to energy crisis from global coal shortages.
 - g. 2023–2024: Normalisation, still higher than pre-2021 levels.
2. Forecast (2025–2029)
 - a. Smoothed trend: Likely path (steady recovery following 2022’s correction).
 - b. Conservative: Reflects falling global demand as renewable transitions accelerate.
 - c. Optimistic: Assumes sustained export opportunities in Asia and energy shortages.

6.3 AI Advantage/disadvantage

Advantages	Disadvantages
Speed and efficiency Can provide visual analysis within minutes with just a single prompt.	Lack of understanding AI may miss external factors that it isn't aware. This may include global events or policies that may influence the data trend
Pattern detection Can find outliers and patterns that might not be visible through manual analysis	Visualisation Limitation Unlike Tableau, AI can't freely change the data visualisation. This may include changing the colour, size, mark points, etc.
Scalability Although only one CSV file was used for this task, AI can view and compare multiple documents and datasets which allows for scalability potential.	Accuracy Risk Unable to accurately make prediction and analysis due to its reliance on automation and lack of correction
Cost & variety The use of AI is free unlike tableau which provides access to wider range of people. There are many versions and types of AI to choose from. This includes Chat-GPT, Claude, Grok, Co-pilot etc.	Lack of Flexibility AI only allow users to use prompts to generate visualisation and reasoning. It cannot pre-process the dataset or choose specific features or detail when making visualisations.

When comparing the storyboard analysis of AI and Tableau, it is clear that the use of Tableau is much more accurate and informative. Although AI generated storyboard did capture some key points correctly, such as the outlier export evaluation in 2022 and general shape of the line graph. Tableau allows much more manual control over data selection and pattern interpretation. This ensures a more accurate display of data visualisation and precise and in-depth analysis.

7. Conclusion & Recommendations

The visual analytics confirm that Australia's international trade structure includes products such as petroleum that are import-dependent due to more efficient and cheaper overseas sourcing. On the other hand, it is export-dominant in products such as coal, owing to its local availability and abundant resources compared to demand. However, it is clearly shown that coal exports are gradually declining due to the global transition toward renewable and low-emission energy sources. This includes Australia's largest coal importers, such as Japan, as well as Australia itself, investing more resources in LNG, renewable, and natural energy. Through data-driven visualisation and AI integration, this report demonstrates that Australia can better anticipate trade shifts and support a sustainable economic transition in line with global energy trends.

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