DVVA Assignment 3]

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Executive Summary

This report analyses Australia's import and export trends from 1988 to 2024, focusing on major and subcategories of traded goods, with particular attention to mineral fuels and petroleum products. The analysis uses Excel and Tableau to calculate category ratios, clean data, and visualise long-term trade movements. Findings show that machinery and transport equipment dominate imports, while crude materials and mineral fuels lead exports. The data also highlight Australia's dual position as a major exporter of raw energy resources and importer of refined petroleum. Over time, both imports and exports rise significantly, reflecting economic growth, global market shifts, and the post-pandemic recovery. The petroleum subcategory analysis reveals volatility between 2020 and 2022 due to supply chain disruptions and international conflicts. AI-based forecasting suggests potential future increases in petroleum import values, demonstrating how artificial intelligence can complement human analysis for trade prediction and decision-making.

Data Preparation

Ratio Calculations

To gain further insight into the raw dollar value trends, calculations were used to retrieve the ratios of the categories. For the main categories, a percentage of the total was calculated as MAIN_CATEGORY/TOTAL* **100.** This was implemented through the Excel equations in the Excel application.

Additionally, in Tableau for the subcategories ratio, new calculation objects were created with a similar equation: SUB_CATEGORY/MAIN_CATEGORY* **100.** This was able to retrieve the ratio of the subcategory to the main category to analyse changes over time.

Row Removal

Some rows of the original spreadsheet were removed from the data as they did not contribute any value. These rows were Series ID, as it did not affect the analysis, and the unit, as they were all in the same unit of millions AUD.

All Main Categories

The main Categories included in this dataset are:

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, nes

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

Main Categories Overview

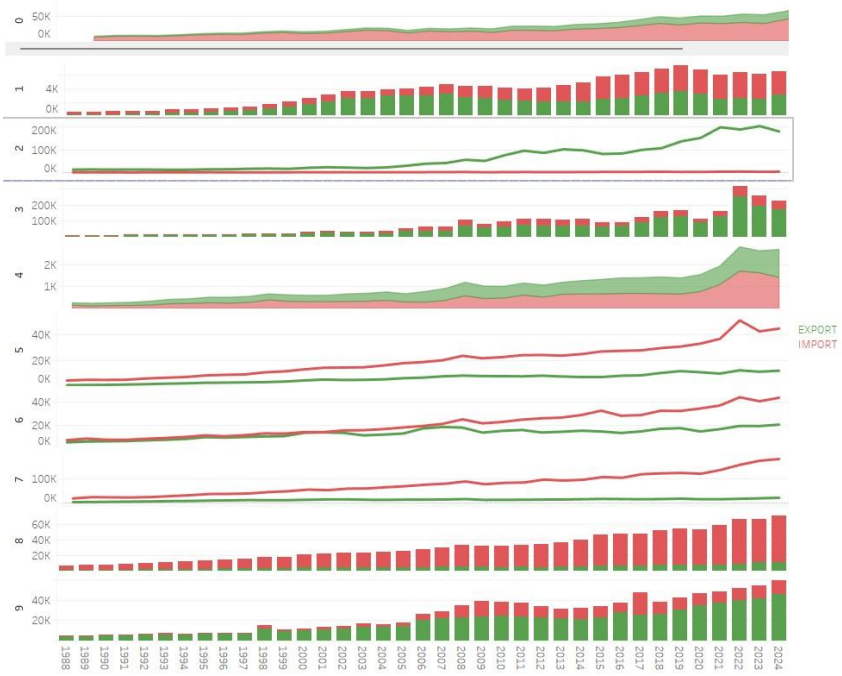


Figure 1

The figure above displays all the main categories with their raw dollar values overlaid on each other, with exports in green and imports in red. It provides a general overview of how the markets have functioned since 1988 and highlights areas where one type of trading is more favoured over the other, such as category 7 (Machinery and Transport Equipment), which is rarely exported but imported at a high rate. The graphs in this figure also show a relatively continuous growth in volume across all trading categories over the years, with most categories experiencing a bounce back after the pandemic, displaying strong markets.

Import Main Categories

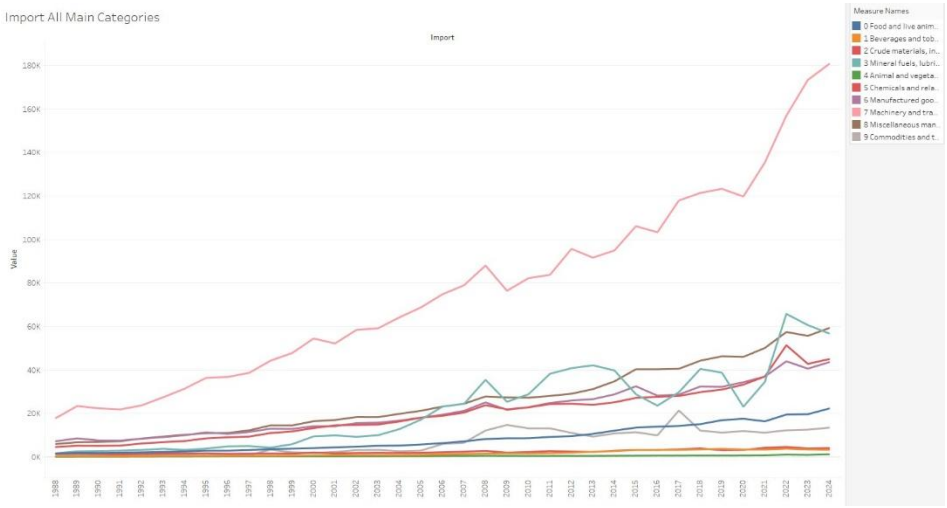


Figure 2

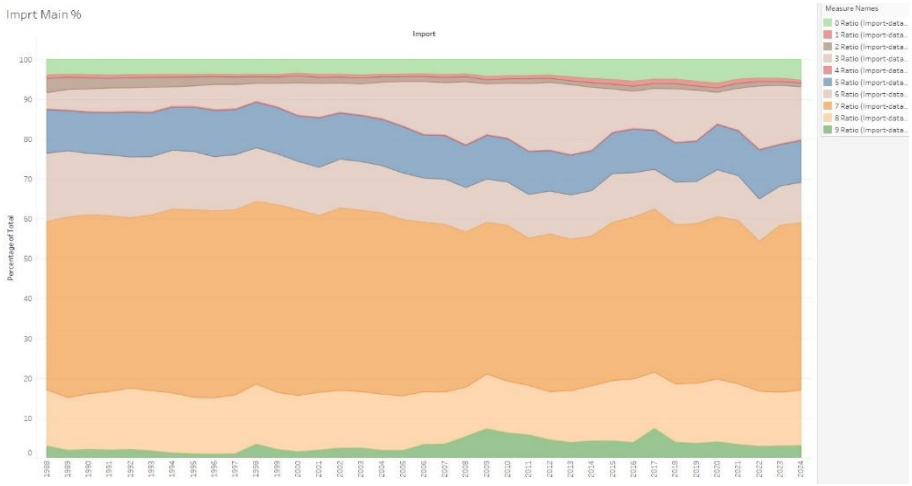


Figure 3

Figure 1 shows the total value of Australia's imports in Australian dollars from 1988 to 2024, broken down by major product categories. Machinery and transport equipment account for the largest share of imports throughout the period, exhibiting steady growth and a sharp increase after 2020. This rise likely reflects higher demand for vehicles, electronics, and industrial equipment, as well as global supply chain recovery and increased investment following the COVID-19 pandemic. Other categories, such as manufactured goods, chemicals, and food items, also rise over time, but at a slower rate.

Figure 2 presents each category as a percentage of total imports, highlighting changes in their relative importance. Machinery and transport equipment consistently account for the largest share, though their dominance fluctuates slightly across the years. Some

smaller categories, such as food, live animals, and beverages, maintain stable shares, suggesting limited change in Australia's reliance on these imports. The post-2020 increase in machinery's share aligns with global technological demand, infrastructure projects, and renewed consumer spending.

Together, these graphs show that while the overall import value has grown significantly since the late 1980s, Australia's import structure remains concentrated in machinery and transport-related goods, underscoring the country's dependence on high-value industrial and consumer technology products.

Export Main Categories

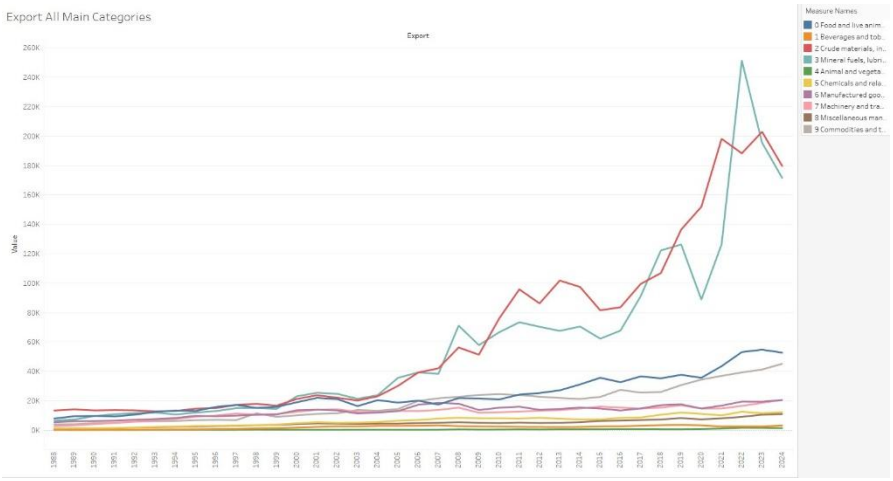


Figure 4

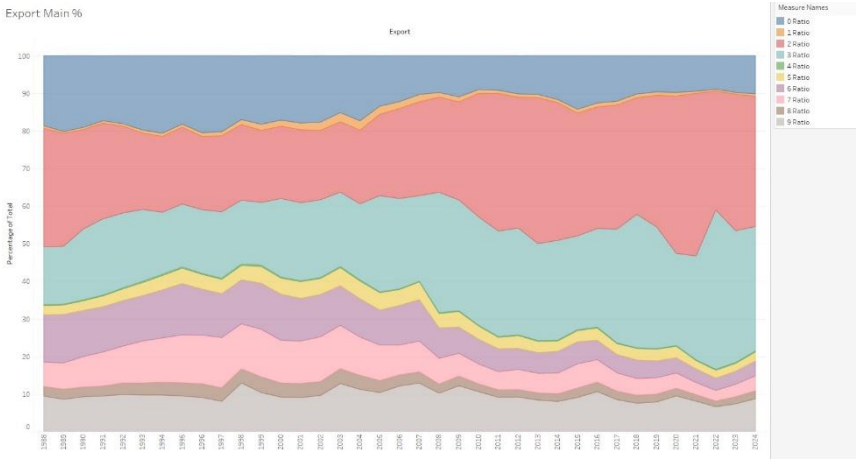


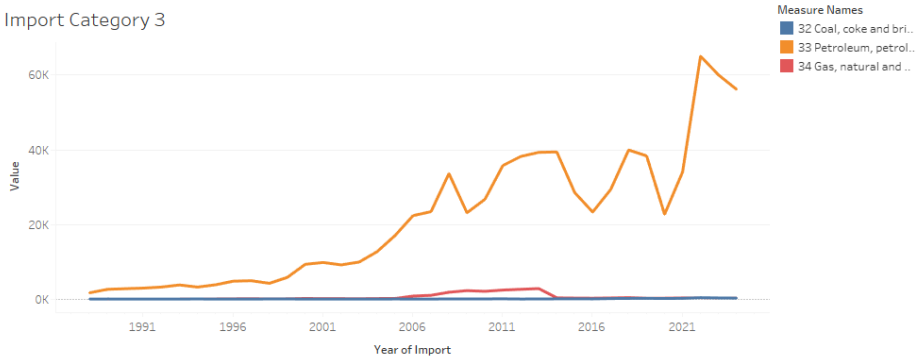
Figure 5

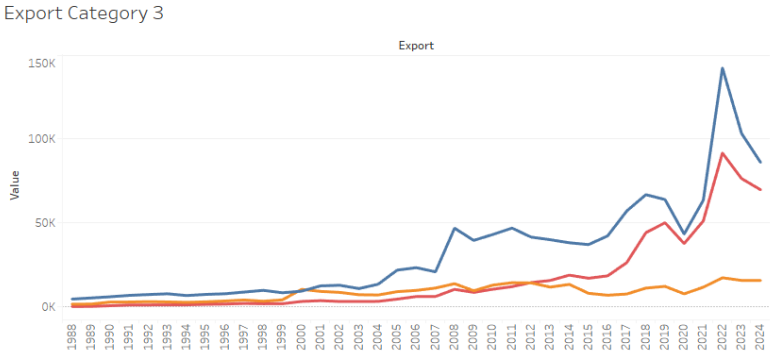
Figure 4 shows Australia's total export values in Australian dollars from 1988 to 2024, divided by major categories. Crude materials and mineral fuels dominate the export value throughout the period, with a notable increase in mineral fuels between 2021 and 2022. This sharp rise is likely due to higher global energy prices and increased demand during the post-pandemic recovery, as well as international supply disruptions. Crude

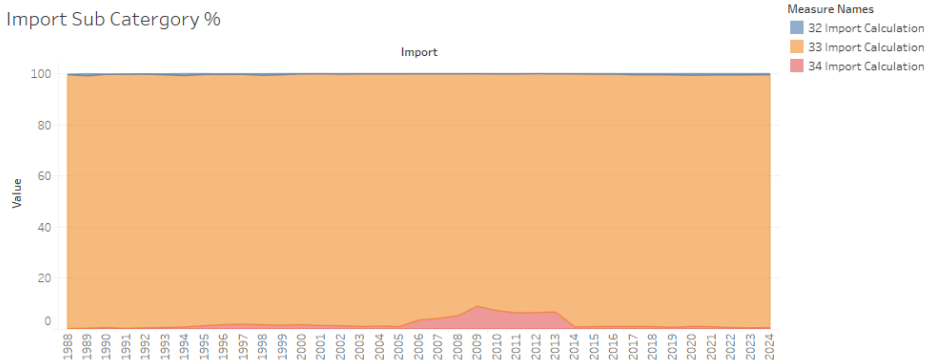
materials remain consistently strong due to Australia's large mining sector and demand from major trading partners, such as China.

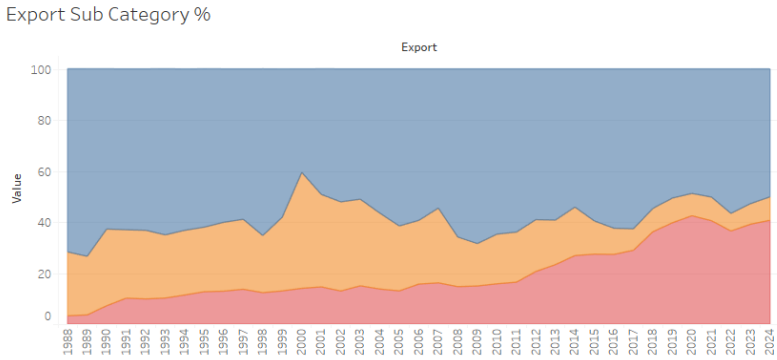
Figure 5 presents each export category as a percentage of total exports, showing how its relative importance changes over time. While mineral fuels and crude materials hold the most significant shares, the 2021–2022 surge caused mineral fuels to account for a significantly greater proportion of total exports temporarily. Other categories, such as food, manufactured goods, and chemicals, stay relatively stable, contributing smaller but steady shares. Overall, these graphs highlight Australia's heavy dependence on resource-based exports and the influence of global market shifts on the country's trade profile.

Subcategories of Main Category









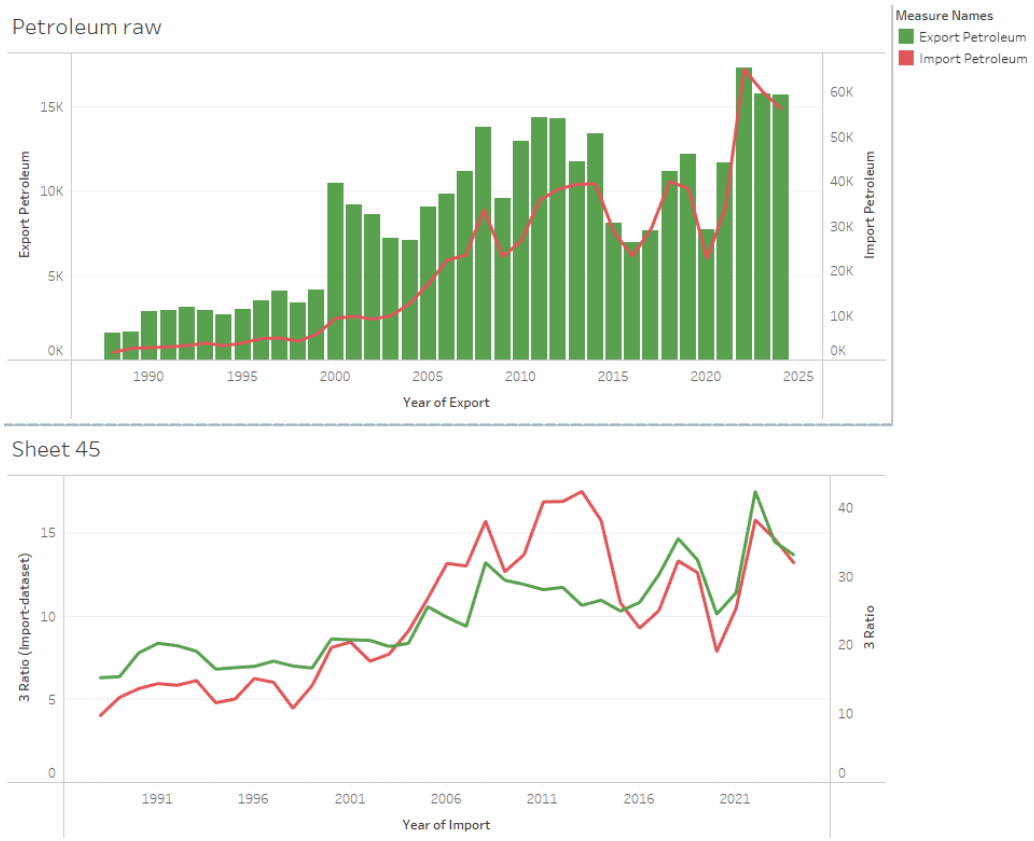
The graphs illustrate Australia's imports and exports of mineral fuels, including coal, petroleum products, and natural gas, from 1988 to 2024.

In the import graph, petroleum and related products are the dominant exports. Imports gradually increased from the early 1990s and then surged sharply between 2020 and 2022 before declining slightly. This rise is likely due to higher global oil prices, energy supply disruptions, and increased domestic demand as the economy reopened following COVID-19 restrictions. The latter decline may be due to falling oil prices and a partial return to normal trade levels. Imports of coal and natural gas remain very low, as Australia is a major producer of these resources domestically.

The export graph shows a different trend. Exports of mineral fuels—particularly coal and natural gas—have grown strongly since the early 2000s, becoming one of Australia's largest export sectors. A significant spike occurred between 2021 and 2022, with coal and gas exports reaching record highs. This surge was driven by global energy shortages and rising prices following the Russia–Ukraine conflict, which boosted demand for Australian energy exports. After 2022, exports declined slightly as prices stabilised and international supply adjusted.

Overall, the data highlights Australia's position as a major energy exporter and net importer of refined petroleum. While exports benefit from strong global demand for raw fuels, imports reflect Australia's domestic dependence on processed petroleum products, highlighting a contrast between the country's raw resource strength and its limited refining capacity.

Petroleum Comparison



The two graphs illustrate Australia's petroleum imports and exports over time, showing both their monetary values and relative ratios.

In the top graph, the green bars represent the export value of petroleum, while the red line shows the import value, both measured in Australian dollars from 1988 to 2025. The visual combination of bars and a line graph is effective because it allows for a direct comparison between the two variables, showing not only their individual trends but also their changing relationship over time. Petroleum exports increased steadily from the early 1990s, peaking around 2021–2022, while imports rose even more sharply during the same period. This pattern reflects a growing domestic dependence on refined petroleum products despite Australia exporting large amounts of raw fuel. The sharp spike around 2021–2022 aligns with global energy market volatility and higher oil prices, which were caused by supply chain disruptions and geopolitical tensions.

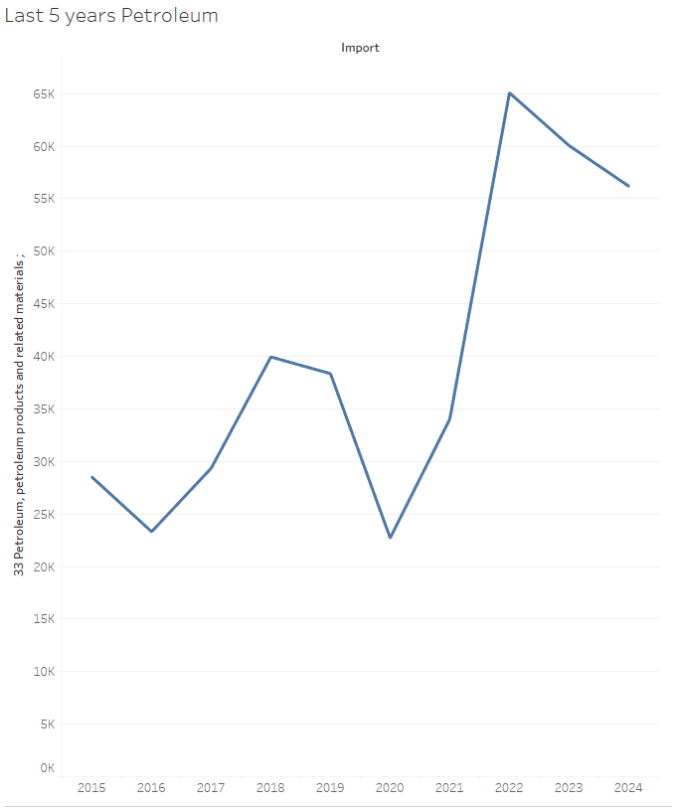
The bottom graph shows the ratio of imports and exports over time. Using ratio lines helps highlight the balance between trade values rather than their absolute numbers. The upward trend in both lines until the mid-2000s indicates a widening trade imbalance, with imports increasing faster than exports. The fluctuations that follow indicate shifts in trade patterns associated with changes in global demand, fuel prices,

and domestic refining capacity. The peak ratios around 2020–2022 again underline the impact of international oil market instability on Australia's trade position.

Overall, these graphs utilise clear dual-axis and ratio-based visualisation techniques to effectively display both the absolute trade values and the relative balance between petroleum imports and exports, providing a detailed view of how Australia's energy trade has evolved over time.

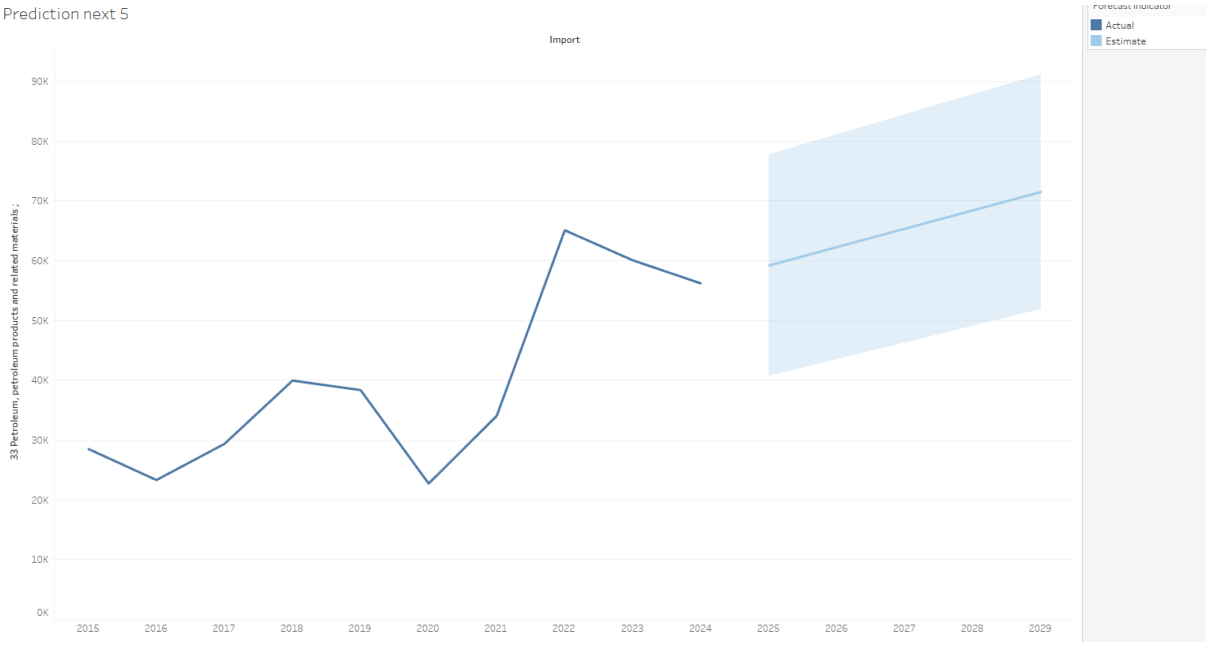
Petroleum Product Changes

Last 5 Years of Petroleum Imports



The last 10 years of petroleum imports have exhibited significant fluctuations in value. It shows a large dip in 2020, followed by a considerable increase leading up to 2022. This is likely due to the rise in prices following the pandemic.

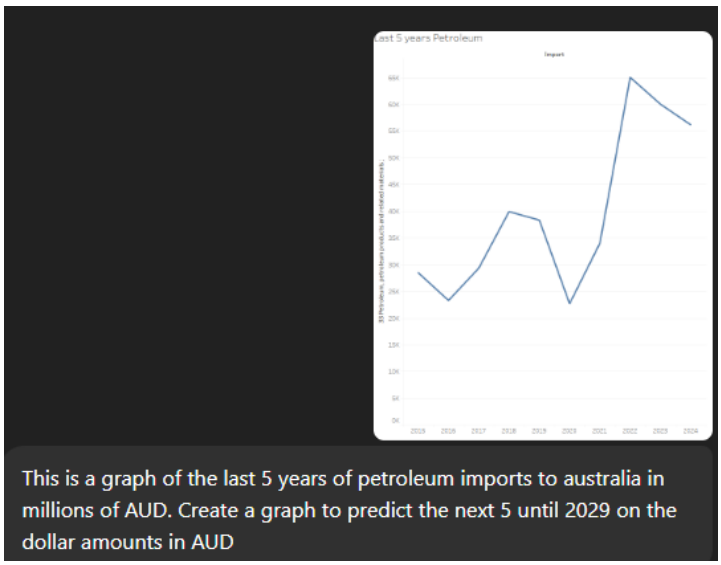
My Prediction for the next 5 years.



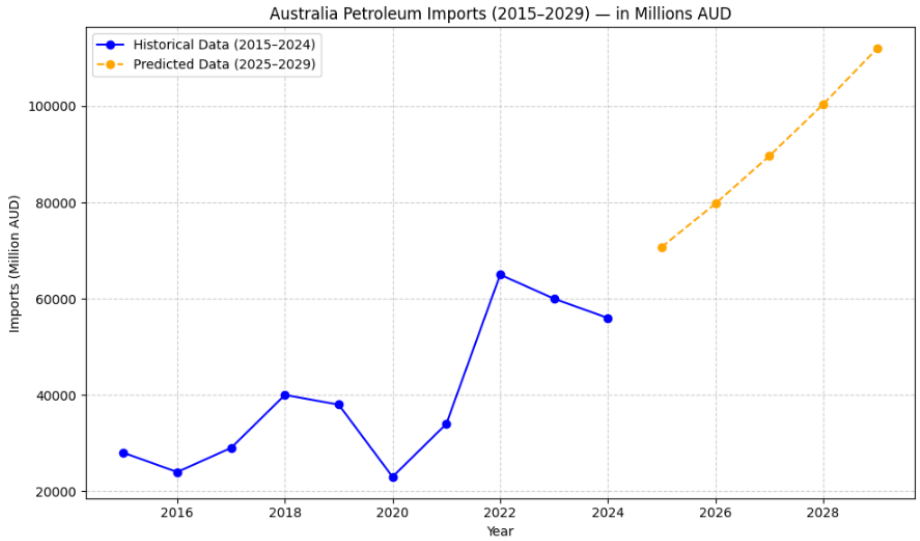
I think over the next 5 years, the price will steadily increase due to rising prices and ongoing global/economic circumstances, but will still exhibit a bit more stability compared to the previous 10 years.

AI Analysis

I asked ChatGPT the same question with an image of the graph (see below)



It produced Python code leading to this graph below:



This predicts another sharp increase in prices, nearly doubling over the next 5 years. This is likely due to the pattern shown, where a drastic increase follows a dip.

From using AI to analyse this graph, I can say that AI offers significant advantages in data analysis, such as speed, consistency, and the ability to detect complex patterns across large datasets, making it a powerful tool for forecasting trends like petroleum imports. However, it lacks human context, creativity, and understanding of real-world factors such as political shifts or economic policies. While AI can quickly identify patterns and make data-driven predictions, humans excel at interpreting those results, understanding underlying causes, and adjusting for unforeseen changes. Overall, AI provides efficiency and precision, while human insight ensures relevance and depth. The best outcomes often come from combining both strengths.

Conclusion

Australia's trade profile is shaped by consistent dependence on machinery and energy-related products. Imports continue to rely heavily on high-value manufactured goods and refined fuels, while exports remain driven by natural resources, particularly mineral fuels and raw materials. The sharp post-2020 fluctuations underscore how global crises can significantly impact national trade patterns. AI-assisted analysis enhances understanding of these trends but cannot replace human interpretation. Overall, the findings indicate that while Australia maintains a strong export performance in raw resources, its limited refining capacity sustains an ongoing reliance on petroleum imports. This structural imbalance affects its long-term trade resilience.