32146 Data Visualisation and Visual Analytics
Autumn Semester 2025
Assessment 3: Report

The Australian International Trade Analysis

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1. Executive Summary

1.1 Summary

This report delivers a comprehensive analysis of Australia's international trade patterns, drawing on more than 30 years of data from the Australian Bureau of Statistics (ABS), covering the period from 1988 to 2024. By transforming the raw import and export records into structured analytical and statistical tables, the study uncovers trends across 10 main categories and 67 subcategories. Particular focus is placed on Category 7 – Machinery and Transport Equipment, due to its persistent trade deficit and increasing reliance on imports.

To facilitate in-depth exploration and trend identification, two leading data visualisation tools—Tableau and Microsoft Power BI—were employed. These tools enabled the creation of interactive dashboards and the analysis of year-over-year changes, offering valuable insights into the structural dynamics of different trade sectors.

The findings culminate in a set of practical recommendations aimed at strengthening Australia's trade balance and supporting industrial self-sufficiency in a rapidly shifting global economy.

1.2 Tools Overview

To effectively explore, visualise, and interpret this extensive time-series dataset, the analysis utilised both Tableau and Microsoft Power BI—two of the most widely adopted tools in data analytics today. Each tool provides distinct advantages, and their combined use allows for a more comprehensive and efficient analytical process.

Tableau was chosen for its intuitive design features, particularly its strong capabilities in building dashboards and its native storyboard functionality, which made it ideal for presenting insights in a clear, narrative-driven format. Conversely, Power BI offered superior data transformation capabilities. With support from Power Query and DAX, Power BI excelled in managing large datasets and performing complex calculations and data modelling tasks.

Nonetheless, both tools have their limitations. Tableau has relatively limited support for scripting and advanced modelling, whereas the free version of Power BI does not support dashboard publishing, custom visuals, or storyboard creation. For this reason, a complementary approach was adopted: Tableau was primarily used for storytelling and dashboard presentation, while Power BI served as the backbone for advanced data preparation and metric development.

2. Data Preparation and Visualisation Strategy

To ensure effective analysis and presentation of over 30 years of international trade data, a structured workflow was adopted, combining comprehensive data preparation with tailored visualisation techniques. The process is summarised in two major phases:

2.1 Structured Data Transformation

a. Dataset Origin and Table Construction

This analysis is based on the Australian International Trade dataset published by the Australian Bureau of Statistics (ABS), covering the years 1988 to 2024. It includes detailed import and export records, organised across 10 main categories and 67 subcategories.

To streamline analysis, the dataset was transformed into three core tables:

The Combined Table merges import and export records into one unified structure, removing non-essential metadata while preserving key fields such as Year, Trade Type, Category, Sub-Category, and Trade Value (AUD millions).

The Statistical Pattern Table calculates each subcategory's proportional share of trade—both in total and within its main category—providing insight into structural dynamics.

The Analytical Pattern Table captures year-over-year (YoY) percentage changes, offering a lens on volatility and growth trends.

b. Integration in Tableau and Power BI

These tables were imported into Tableau, where links were established via the Year and Trade Type fields to support aligned, comparative analysis. Field types were standardised—Year was formatted as date, Trade Type retained as text, and all numerical values converted to appropriate integer or decimal formats.

To enable cross-filtering and trend modelling in Power BI, all tables were unpivoted to long format. Additional dimension tables (YearTable and TradeTypeTable) were constructed and linked using one-to-many relationships, enabling consistent filtering and time-series functionality across all data sources.

2.2 Visualisation Design and Encoding

a. Chart Types and Analytical Tools

A variety of visualisation formats were used to reveal patterns, including:

Line Charts – for trends in trade value and YoY change

Stacked Area and Ribbon Charts – for analysing subcategory structure and composition shifts over time

Pie Charts and Waterfall Charts – for comparing categorical contributions and decomposing change

Boxplots and Heatmaps – for exploring statistical variability and outliers

b. Visual Encoding and Interaction Strategy

To maximise interpretability and user interaction:

Growth trends were represented through slope changes, colour gradients, and ranking order

Composition ratios were visualised with stacked visuals and labelled colour blocks

Hierarchical relationships between main categories and subcategories were managed using interactive filters and slicers, allowing users to drill down into specific segments

Additionally, Power BI's support for R and Python scripting was leveraged to extend the visual toolkit, enabling the creation of custom plots or advanced statistical visualisations when built-in options were insufficient.

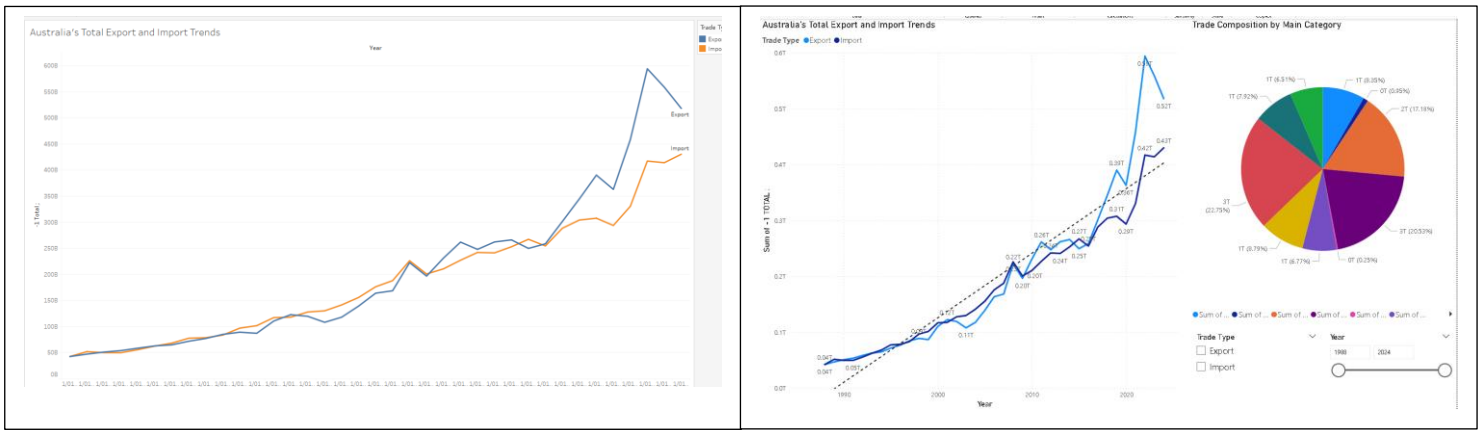
3. Findings & Insights

3.1Preliminary Trend Analysis – Overview

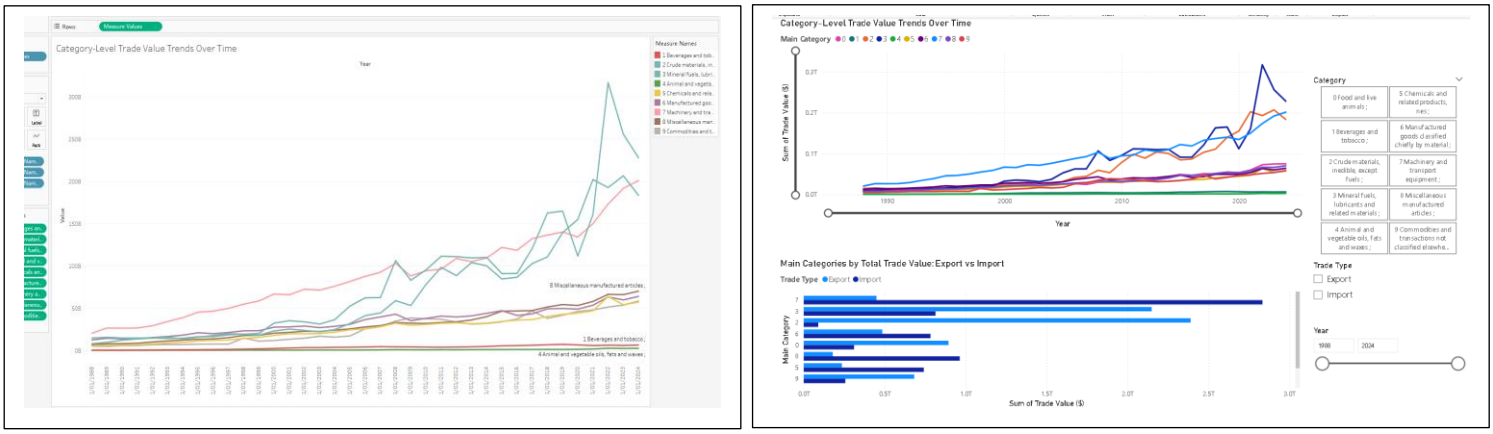
Australia's international trade has demonstrated strong and sustained growth from 1988 to 2024. As shown in the overall trade value line chart, both import and export volumes have followed an upward trajectory, with key accelerations occurring in the early 2000s, a surge around 2010, and a steep rise between 2020 and 2023.

A temporary downturn was observed during the Global Financial Crisis (2009) and again in 2020, corresponding to the COVID-19 pandemic. However, both periods were followed by strong rebounds. Particularly post-2020, export values began to outpace imports, indicating a growing trade surplus. This resilience highlights the

country’s successful diversification of export markets and its ability to adapt to global disruptions while sustaining a growing trade surplus (Australian Bureau of Statistics [ABS], 2024).



From a structural perspective, Category 7: Machinery and Transport Equipment consistently held the highest cumulative trade value, dominating both import and export flows. This was followed by Category 3 (Mineral Fuels, Lubricants and Related Materials) and Category 2 (Crude Materials). In contrast, categories such as Category 0 (Food and Live Animals) and Category 1 (Beverages and Tobacco) remained relatively stable in volume, reflecting their strong domestic demand and low volatility.



The composition chart reinforces this disparity, showing a heavy concentration in a few top categories. This highlights Australia's trade dependence on sectors like mining, energy, and machinery, raising concerns about structural vulnerability and the need for broader diversification.

3.2 External Disruptions and Market Resilience

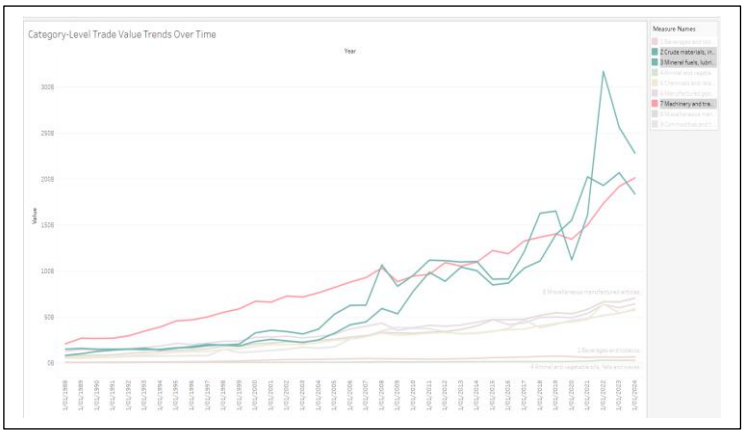
Between 2017 and 2018, Australia’s trade landscape was significantly affected by rising geopolitical tensions with China—its largest trading partner. The onset of the Australia–China trade war led to tariffs and import restrictions on key Australian exports such as coal, wine, and barley (Wikipedia, 2024). Despite this, Australia’s export performance remained strong, achieving record highs between 2021 and 2023.

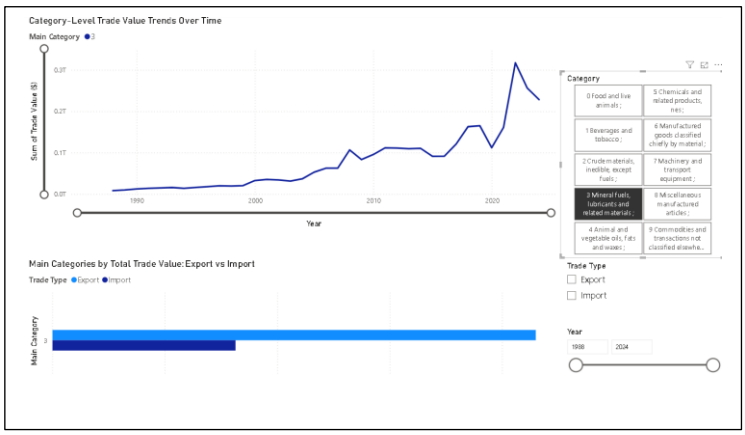
This resilience can be attributed to successful market diversification strategies, where exporters adapted by expanding into alternative markets. According to the Australian Bureau of Statistics (ABS, 2024), this adaptability enabled the economy to not only recover quickly but also maintain a growing trade surplus, underscoring the robustness of Australia’s trade ecosystem in the face of external shocks.

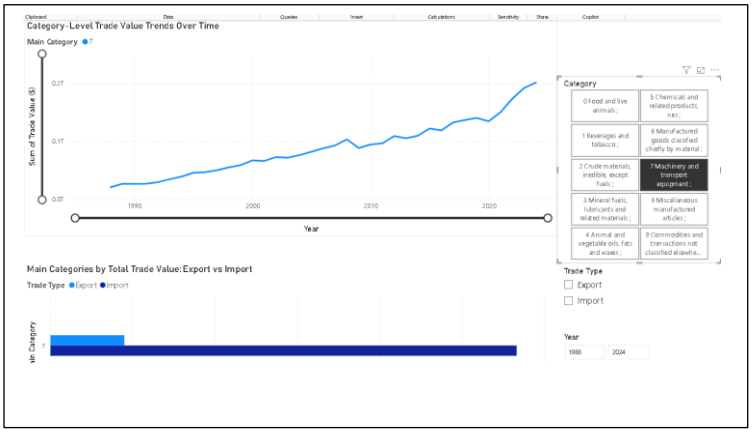
3.3 Analysis of the Top Three Trade Categories.

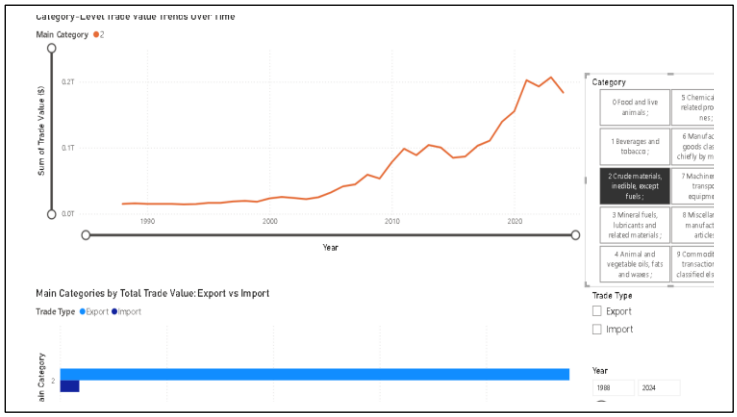
Category 7 – Machinery and Transport Equipment

This is Australia's largest trade category by total volume, demonstrating robust growth since 1988 and accelerating rapidly after 2020. However, imports have persistently outweighed exports, resulting in a chronic trade deficit and consistent capital outflows. This pattern reflects Australia's growing reliance on foreign-manufactured goods to satisfy domestic demand. According to Tuhin (2015), over 80% of Australia's imports are manufactured products, and such import dependence has negatively affected local employment and industrial sustainability. To address this, it is recommended that Australia reinvest in domestic manufacturing capacity—particularly in high-tech, high-value sectors like automotive and equipment manufacturing—to reduce trade vulnerabilities and enhance economic sovereignty.









Category 3 – Mineral Fuels, Lubricants and Related Materials

This category is heavily export-driven and has contributed significantly to Australia's trade surplus since the mid-2000s. As a resource-rich nation, Australia's competitive advantage in fossil fuels and natural gas has enabled it to dominate regional and global energy markets. Export earnings from this sector remain a major fiscal contributor, although they are susceptible to global energy price fluctuations and demand shocks (International Monetary Fund [IMF], 2020).

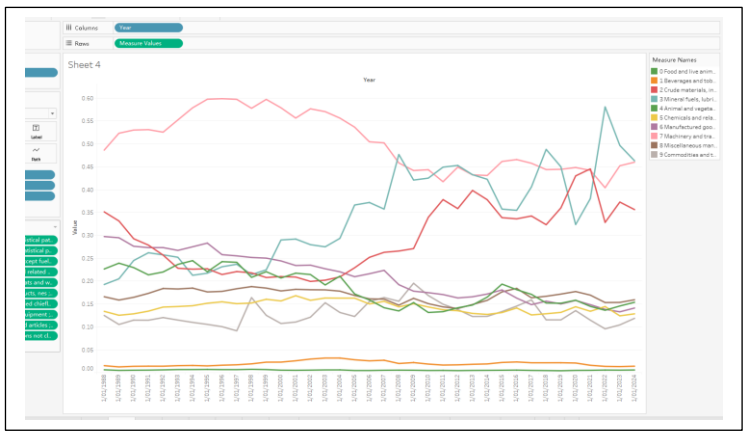
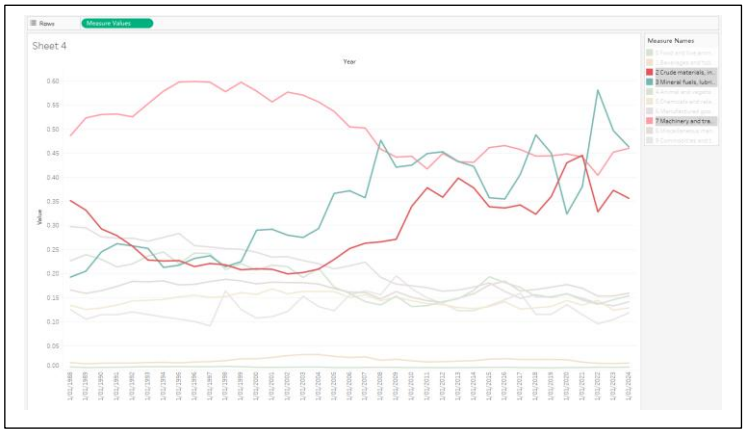
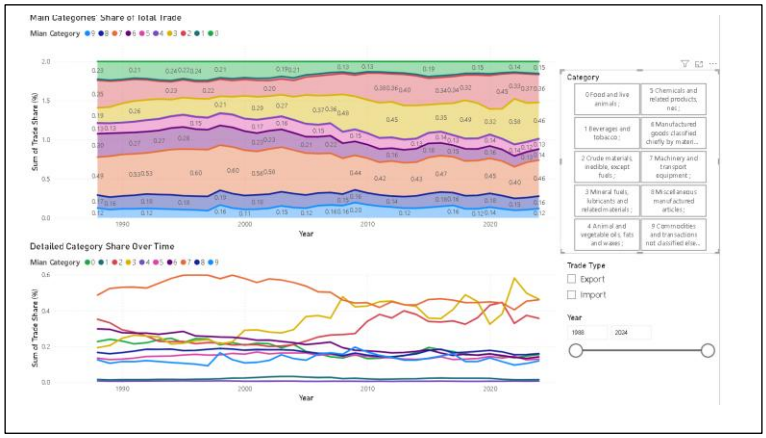
Category 2 – Crude Materials (Excluding Fuels)

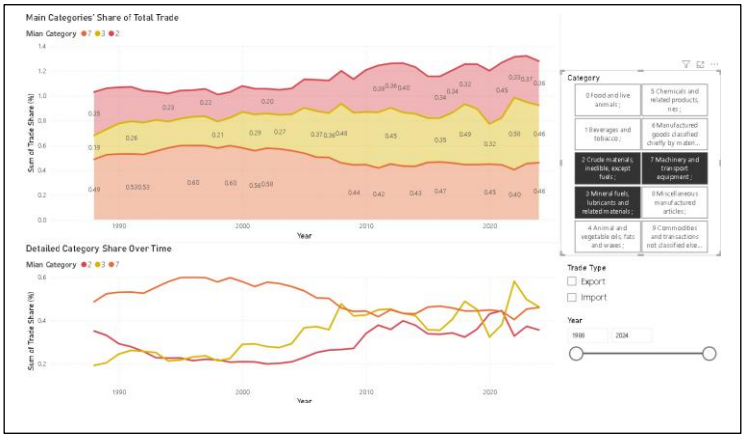
Though smaller in scale than Categories 3 or 7, this category has shown consistent export-led growth, reinforcing Australia's position as a key raw materials supplier. It plays a stabilising role in the trade structure, contributing to long-term surplus growth.

While Categories 2 and 3 bolster Australia's trade surplus through their resource-based advantages, Category 7 stands in stark contrast with its substantial and persistent trade deficit. This imbalance implies continuous capital leakage to foreign

markets, as Australia's industrial demand is overwhelmingly met by overseas suppliers. A structural trade deficit, especially in capital-intensive sectors like machinery and vehicles, not only reduces fiscal strength but also signals diminished industrial resilience (Obstfeld & Rogoff, 2009; IMF, 2020).
To prevent further erosion of industrial independence, Australia must re-prioritise strategic investment in Category 7. Reinforcing local manufacturing would not only help rebalance trade but also generate domestic employment and technological capabilities (Tuhin, 2015). A more balanced industrial policy is therefore essential to ensure national economic stability amid evolving global trade dynamics.

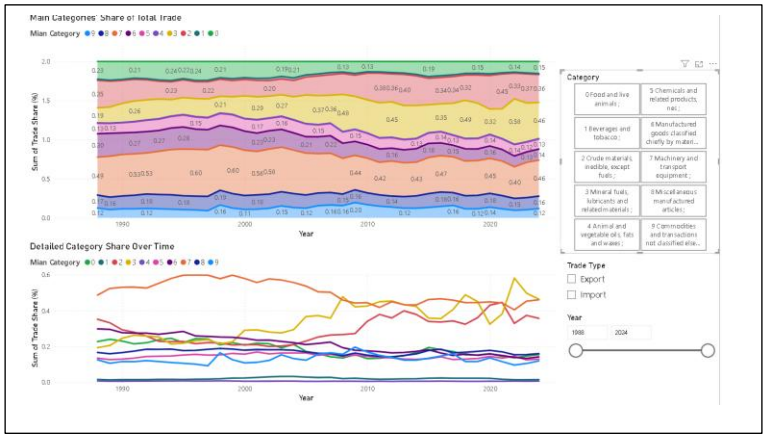
3.4 Overall Category Share Trends:

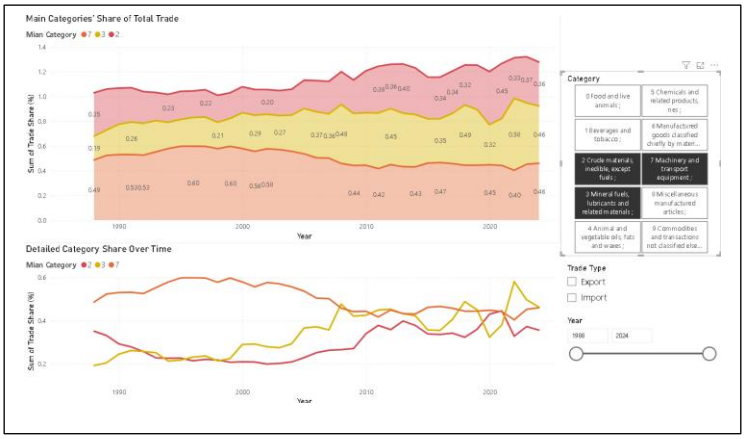






The stacked area chart reveals long-term structural patterns in Australia's trade composition from 1988 to 2024. Category 7—Machinery and Transport Equipment—consistently held the highest share of total trade, maintaining an average of approximately 45–50% throughout the period. While minor fluctuations occurred, its dominant position underscores its role as a cornerstone of Australia's international trade (Australian Bureau of Statistics [ABS], 2024).
Categories 3 (Mineral Fuels, Lubricants and Related Materials) and 2 (Crude Materials, Inedible, Except Fuels) also contributed significantly to trade shares. Category 3 experienced notable growth, particularly between the 1990s and 2015, before showing a relative decline post-2020. This shift may reflect broader global trends such as the transition to renewable energy and price volatility in fossil fuel markets (Department of Industry, Science and Resources, 2023).

Meanwhile, Category 2 started from a high base in the 1980s but declined steadily, indicating a gradual reduction in Australia's reliance on raw material exports. This aligns with national objectives to move up the value chain in global trade.





Other categories, including 6 (Manufactured Goods Classified Chiefly by Material), 5 (Chemicals), and 0 (Food and Live Animals), maintained stable but secondary roles. Their limited share growth suggests they have not been central drivers of trade dynamics over the long term. Notably, Category 9 (Commodities Not Elsewhere Classified) and Category 1 (Beverages and Tobacco) contributed the least to trade, indicating minimal strategic weight within the national trade portfolio.

3.5 Year-over-year (YoY) growth rates and volatility.

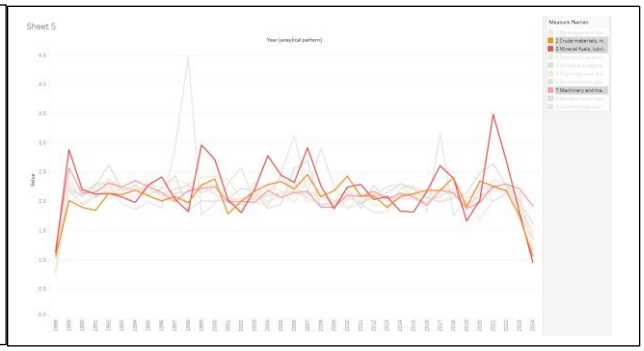
The line chart displaying annual Year-over-Year (YoY) change ratios across all main trade categories provides key insights into the stability and volatility of Australia's international trade from 1988 to 2024.

Overall Growth Stability:

Most trade categories cluster around a YoY ratio of 1.0, indicating relatively stable growth trends on a year-to-year basis. This consistency reflects the maturity of many sectors and the resilience of Australia's trade system to moderate economic fluctuations (Australian Bureau of Statistics [ABS], 2024).

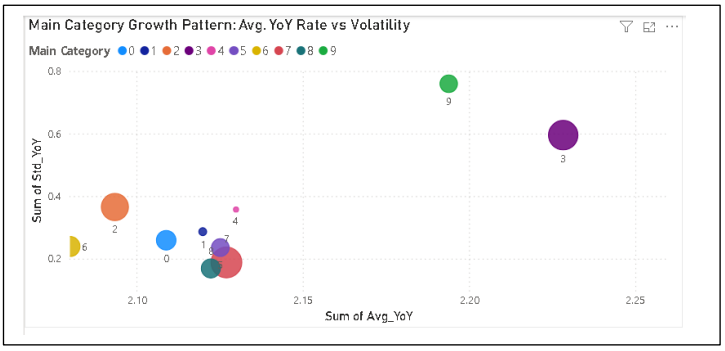
Volatile Spikes and Dips:

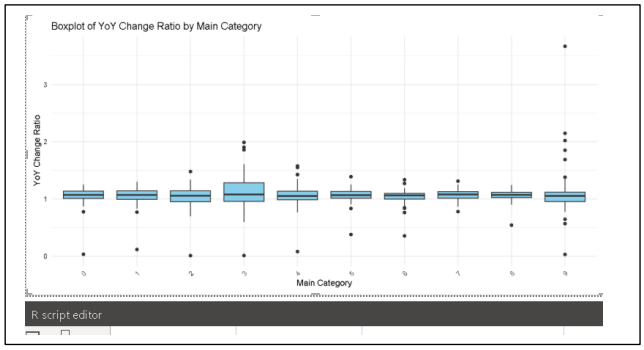
Sharp increases or declines in specific years—particularly around 2012 and 2019—highlight the impact of external economic shocks. These may include commodity price fluctuations, changes in global demand, or geopolitical tensions, such as the Australia–China trade dispute initiated in 2018 (Wikipedia, 2024).



High Variability Categories:

Categories 3 (Mineral Fuels, Lubricants and Related Materials) and 9 (Commodities Not Elsewhere Classified) exhibit significantly higher volatility compared to others. This behaviour suggests their greater sensitivity to international energy markets and speculative commodity flows, both of which are vulnerable to global economic uncertainty and regulatory shifts (Department of Industry, Science and Resources, 2023).





Bubble Chart – Avg. YoY Rate vs Volatility
This plot compares average growth rates (X-axis) against standard deviation (Y-axis), with bubble size reflecting relative category size.
Category 3 (Mineral Fuels) stands out with both high average growth and high volatility, reinforcing its role as a key yet volatile export sector.
Category 9 (Miscellaneous Commodities) also shows high volatility, possibly due to inconsistent trade volumes or diverse product groupings.
Category 7 (Machinery & Transport Equipment) sits near the middle with moderate growth and stability, but its deficit-heavy trade balance remains a policy concern.

Boxplot of YoY Change Ratios by Category
This chart shows the distribution and spread of YoY ratios:
Categories 3 and 9 have wider interquartile ranges and more outliers, confirming their higher volatility.
Categories like 0 (Food), 6 (Manufactured goods), and 7 (Machinery) display narrower ranges, suggesting steadier trends.

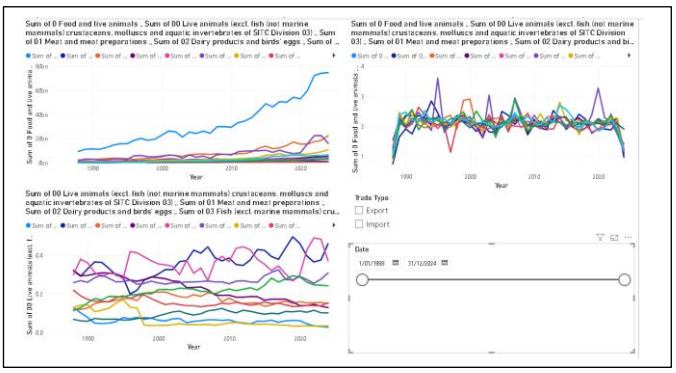
These visualisations collectively show that:
Australia's trade is anchored by stable, moderate-growth categories such as food, manufactured goods, and machinery.
High-growth sectors like mineral fuels (Category 3) drive economic surpluses but expose the country to external volatility.
Policymakers should focus on strengthening resilient sectors like Category 7 by boosting domestic manufacturing capacity while diversifying away from volatile exports to stabilise long-term economic performance. According to Tuhin (2015), over 80% of Australia's imports are manufactured goods, and import competition—particularly from low-wage countries—has had a statistically significant negative impact on domestic manufacturing employment. In contrast, exports have a positive correlation with job creation.

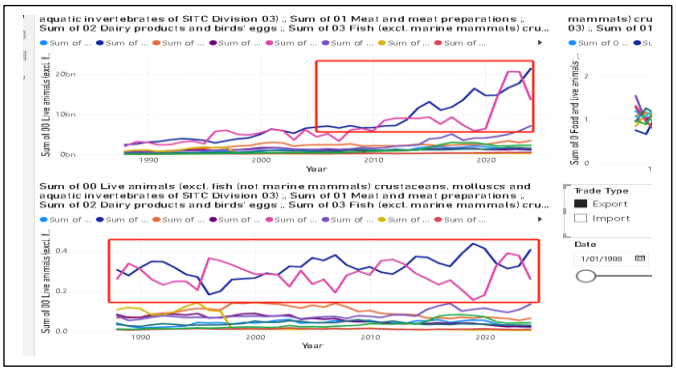
This evidence suggests that sustained reliance on imports, especially in high-value categories like machinery, leads not only to capital outflows and trade imbalances but also undermines local industry employment and capacity. Tuhin's findings reinforce the strategic importance of boosting domestic production capabilities in sectors like Category 7 to mitigate structural trade deficits and reduce vulnerability to external shocks.

4. Relationship Between Main Category and Subcategories

Category 0 – Food and Live Animals
Within Category 0: Food and Live Animals, export performance is largely driven by a few dominant subcategories. Among these, Subcategory 01: Meat and Meat Preparations has demonstrated consistent growth in both export value and trade

share since 2010. This sustained rise reflects its increasing role in Australia's agricultural export strategy.



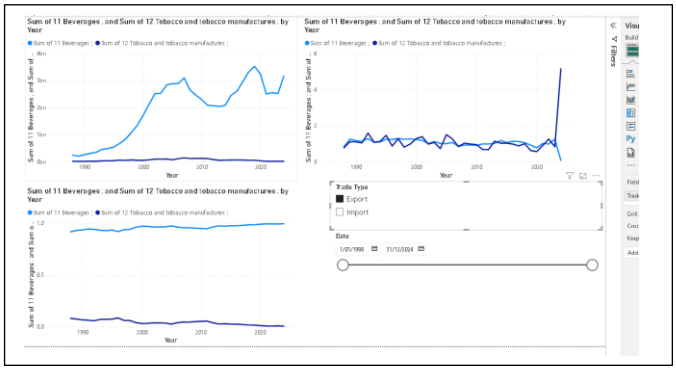


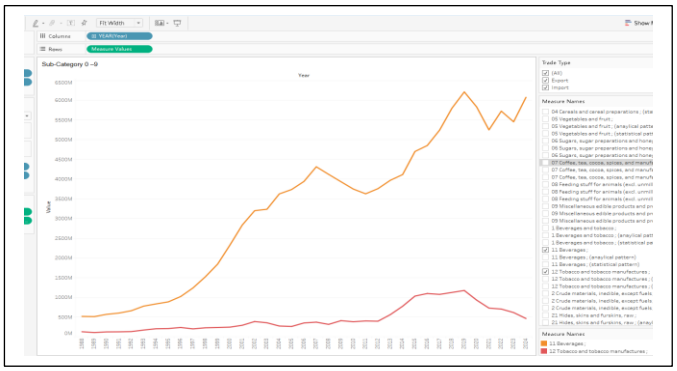
In contrast, Subcategory 04: Cereals and Cereal Preparations, although still significant in absolute terms, has declined in relative share, indicating a shift in the trade composition within this category. Notably, cereal export values have remained stable, suggesting that their reduced share is due more to the accelerated growth of other subcategories than a fall in demand.

This divergence mirrors broader structural patterns in Australian agriculture. As the Department of Agriculture reports, cereals are a key input in meat production—used as livestock feed—making meat and grain exports closely linked. Seasonal variability, changing global demand, and supply chain developments jointly shape their export trajectories (ABARES, 2025).

Australia's growing export focus on higher-value agricultural goods, such as processed meat, signals a strategic pivot. This trend is bolstered by enhanced investment in biosecurity, processing infrastructure, and trade agreements to support market access and premium positioning.

Category 1 – Beverages and Tobacco





Category 1 consists of two subcategories: "11 Beverages" and "12 Tobacco and Tobacco Manufactures."

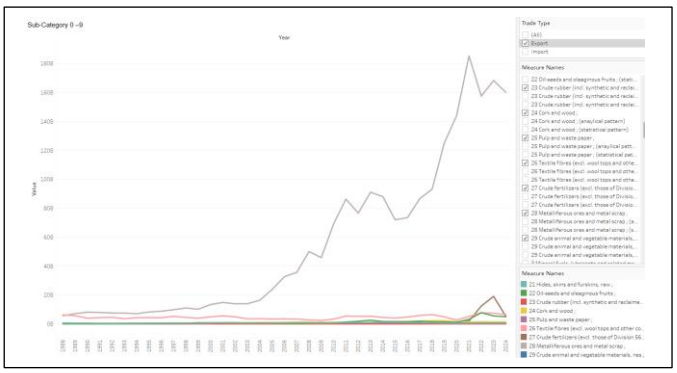
This category exhibits a highly concentrated structure, with beverages overwhelmingly dominating both export and import values. Since the early 1990s, the beverage trade has shown a steady upward trajectory, especially in exports, while tobacco has maintained a minor and volatile share, showing a further decline post-2015.

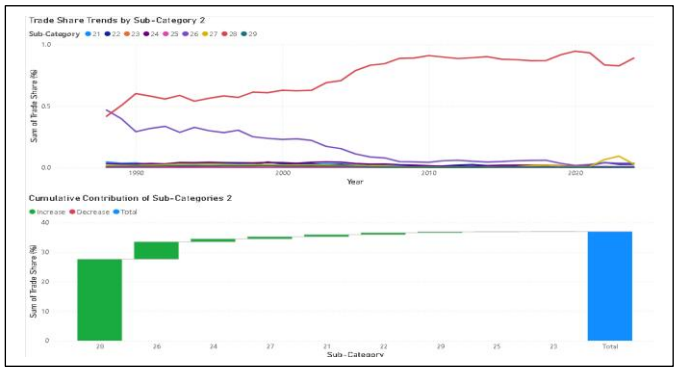
From 2000 to 2020, the export value of beverages increased significantly, affirming Australia's growing stature in the global beverage industry. Imports, by comparison, have remained modest, suggesting a net export surplus in this segment.

Australia is globally recognized for its wine production and exports. In 2023, it exported beverages, spirits, and vinegar, with wine representing the majority share. Major export destinations included China, the United States, and the United

Kingdom, confirming Australia's integration into high-demand international markets (TrendEconomy, 2023).
In stark contrast, the tobacco trade is subject to strict government regulation. As per the Australian Border Force, tobacco imports require valid permits and are restricted to licensed importers. The Tobacco and Other Products Act 2023 criminalizes unauthorized importation, sale, or possession. Additional measures such as high taxation, advertising bans, and plain packaging laws further suppress trade volume (Australian Border Force, 2023).
This regulatory asymmetry between subcategories explains the significantly larger trade value for beverages. While the beverage sector operates within a competitive, export-oriented framework, the tobacco trade remains tightly constrained due to public health priorities.

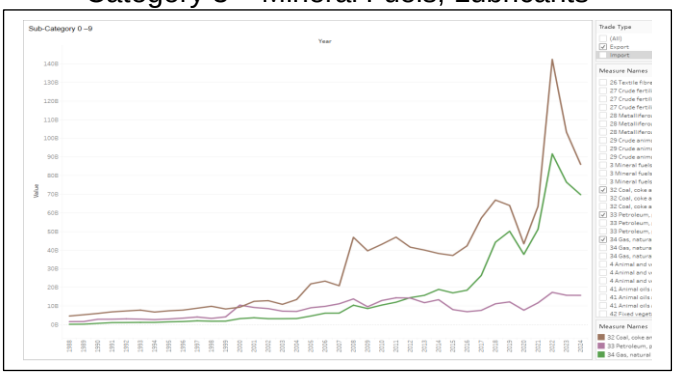
Category 2: Crude Materials (Inedible, Except Fuels)

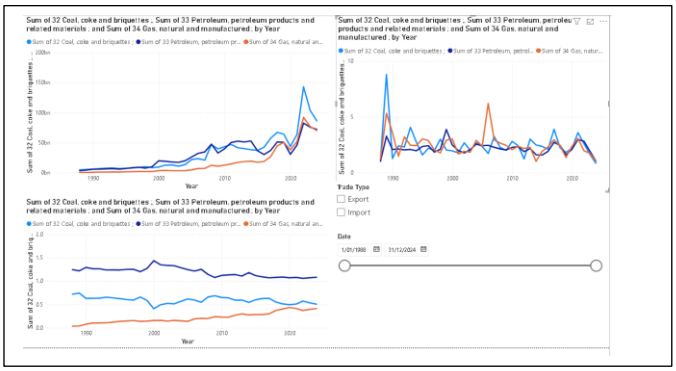




Australia's exports in Category 2 – Crude Materials (Inedible, Except Fuels) are heavily concentrated in Subcategory 28: Metalliferous Ores and Metal Scrap, which has experienced consistent growth since the early 2000s. As of recent years, this subcategory accounts for over 90% of the total export value within Category 2, reflecting an extreme structural dependency.
By contrast, other historically relevant subcategories—such as 26: Textile Fibres—have shown persistent declines in both export value and share, contributing minimally to current trade performance.
The surge in metalliferous ore exports has been strongly correlated with demand from Asian markets, particularly China. According to the Australian Bureau of Statistics, the Export Price Index increased by 3.8% in 2023, primarily due to a 21.4% rise in metalliferous ore prices, driven by global supply chain disruptions and sustained Chinese demand (ABS, 2023).
While this price-driven growth boosts export revenue, it also heightens economic vulnerability, as the category's overreliance on a single commodity makes it susceptible to price shocks and geopolitical tensions.

Category 3 – Mineral Fuels, Lubricants

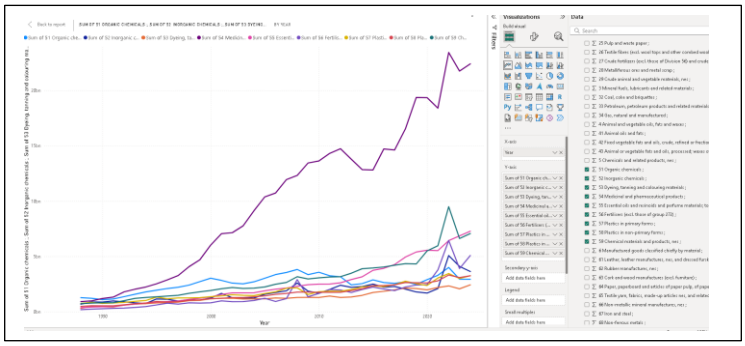


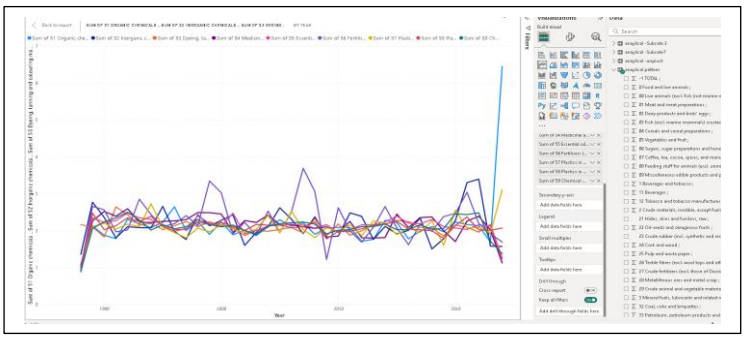


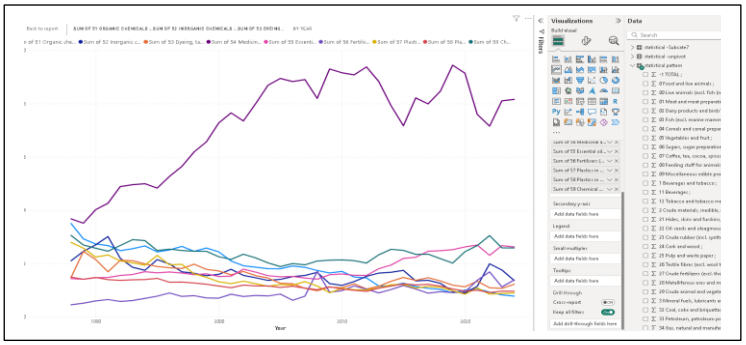
Category 3 – Mineral Fuels, Lubricants, and Related Materials is characterised by a high concentration in three dominant subcategories: 32 – Coal，33 – Petroleum and Petroleum Products， and 34 – Natural Gas.
These subcategories have collectively driven Australia's export growth in energy commodities, particularly since the early 2000s. Coal led the category for much of the observed period, but natural gas and petroleum have demonstrated accelerated growth, especially after 2010. In recent years, they have significantly narrowed the gap with coal, reshaping the internal structure of energy exports.
Shared trend analysis reveals a divergence among these energy sources:
Coal's share has slightly declined, reflecting broader global efforts to decarbonise and transition to cleaner fuels.
Natural gas has steadily gained share, underpinned by increased global demand for liquefied natural gas (LNG) and Australia's expanded export infrastructure.
Petroleum has remained relatively stable in both trade value and share, indicating consistent demand without major structural shifts.
Following the COVID-19 pandemic, global economic recovery—particularly led by China's fiscal stimulus measures—triggered sharp increases in commodity prices. This post-2020 rebound significantly boosted the export values of iron ore, coal, and LNG, reinforcing their importance in Australia's resource-driven trade portfolio (Australian Bureau of Statistics, 2021).

Category 4 – Animal and Vegetable Oils, Fats and Waxes
Category 4 – Animal and Vegetable Oils, Fats and Waxes is primarily driven by two upstream subcategories:41 – Animal Oils and Fats and 42 – Fixed Vegetable Fats and Oils.
These subcategories have demonstrated steady export growth in absolute value since the early 2000s, with a noticeable surge after 2018–2020—particularly in Subcategory 42, indicating increasing global demand for plant-based oil products.
In contrast, Subcategory 43 – Processed Fats and Oils has remained consistently low in both export value and share, showing minimal growth throughout the observed period. This structural gap points to an underdeveloped capacity for value-added processing within this category.
The third chart's stable share pattern reinforces the entrenched structure of this export category: upstream, low-processed commodities dominate trade performance, while downstream, higher-value processed products remain marginal.
This imbalance may reflect limited industrial investment in domestic food processing, as well as reliance on bulk commodity exports rather than vertically integrated production chains.

Category 5 – Chemicals and Related Products
Category 5 – Chemicals and Related Products displays a relatively diversified export structure, with Subcategory 54 – Medicinal and Pharmaceutical Products emerging as the dominant component in both value and growth over the past two decades.
Other subcategories such as Organic Chemicals (51), Inorganic Chemicals (52), and Fertilisers (56) also contribute moderately, though they remain relatively stable in value and share.

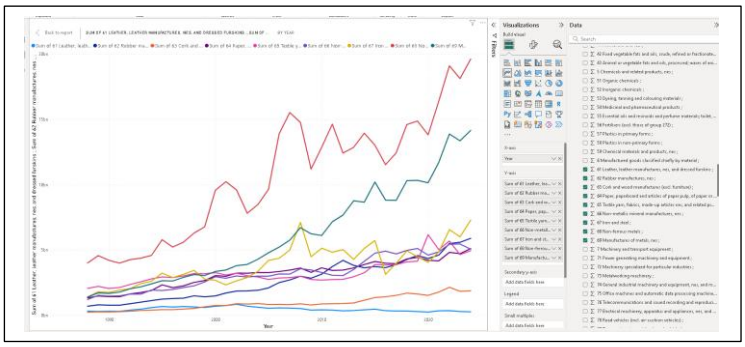


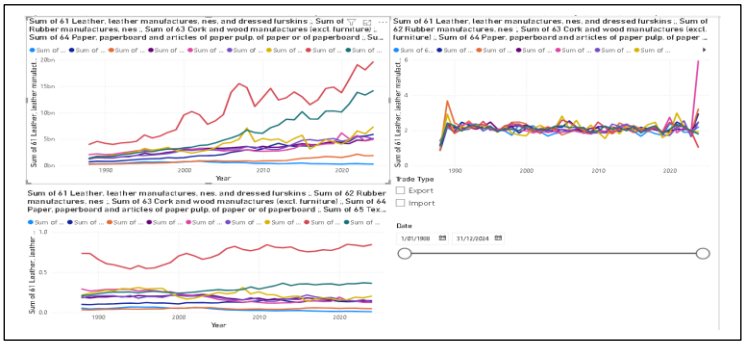




The sustained growth in pharmaceutical exports reflects rising global demand for health products, Australia's strong reputation in high-quality manufacturing, and continued investment in advanced production facilities. Although exports dipped slightly during the 2020–2021 pandemic period—likely due to global supply chain disruptions—the sector rebounded by 2023. Key export markets include the US, China, and New Zealand, with the United States alone accounting for over half of medicinal exports in 2017–18 (Medicines Australia, 2019). This growth is supported by strategic investments, international trade agreements, and the expansion of manufacturing capabilities such as AstraZeneca's North Ryde facility, alongside Australia's robust research infrastructure and favourable intellectual property protections.

Category 6 – Manufactured Goods Classified Chiefly by Material





Exports in Category 6 – Manufactured Goods Classified Chiefly by Material are primarily driven by Subcategory 68 – Non-Ferrous Metals and Subcategory 69 – Manufacturers of Metals, both of which have demonstrated strong and sustained growth since the early 2000s. Among them, non-ferrous metals remain the leading contributor in absolute export value, while manufactured metal goods have gained a share in recent years—indicating rising international demand for processed metal products.

In contrast, other subcategories such as cork (63) and textile yarns (65) have experienced stagnant or declining growth in both value and share. Export share data reinforces this divergence, with Subcategory 68's share steadily increasing over the past two decades, while the others have remained flat or declined, suggesting a structural concentration within the category toward higher-value metal commodities and finished products.

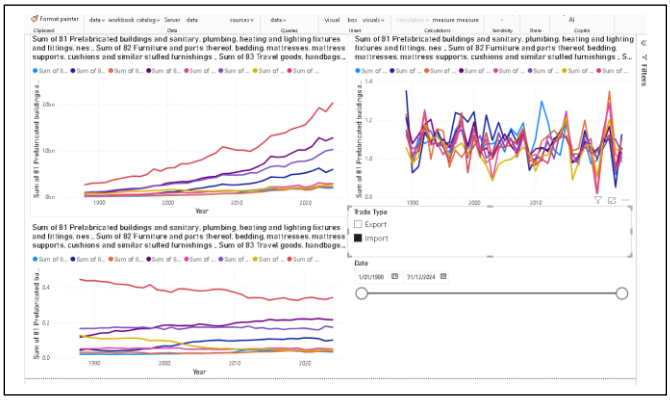
Category 8 – Miscellaneous Manufactured Articles

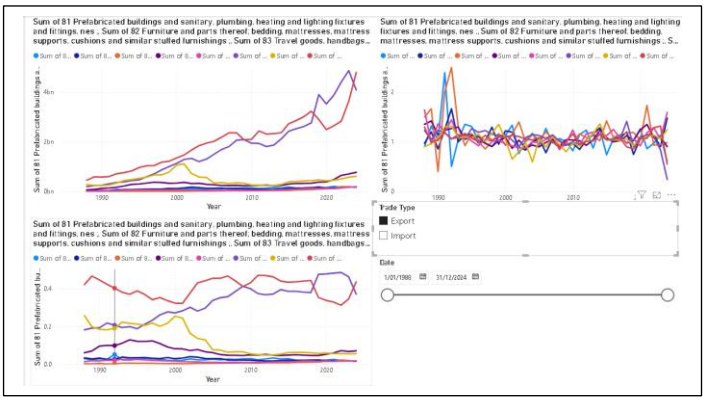
Category 8 – Miscellaneous Manufactured Articles is led by Subcategory 89 – Miscellaneous Manufactured Articles and Subcategory 87 – Professional, Scientific, and Controlling Instruments, both of which have shown strong and steady export growth since the early 2000s. Subcategory 89 in particular experienced rapid

acceleration post-2015, reaching over $25 billion in export value by 2023, reflecting growing international demand for diversified and high-value manufactured goods. While absolute export values surged, export share data indicates a slight plateau for Subcategory 89 in recent years. This suggests that Subcategory 87 has proportionally expanded, contributing more significantly to the overall export structure.

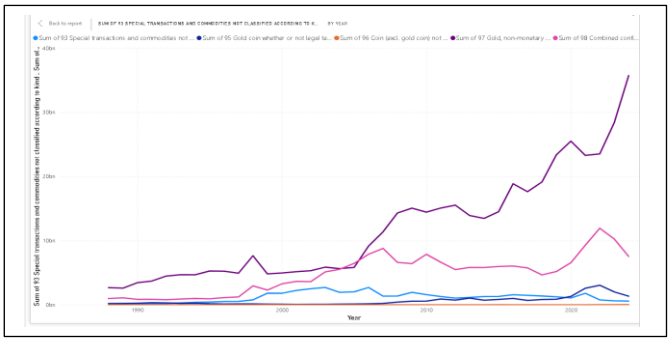
On the import side, Category 8 values have remained more stable and evenly distributed, lacking the dramatic export increases. The import share of Subcategory 89 has modestly declined, while Subcategories 87 and 84 (Clothing Accessories) have gained weight, reflecting shifts in import demand.

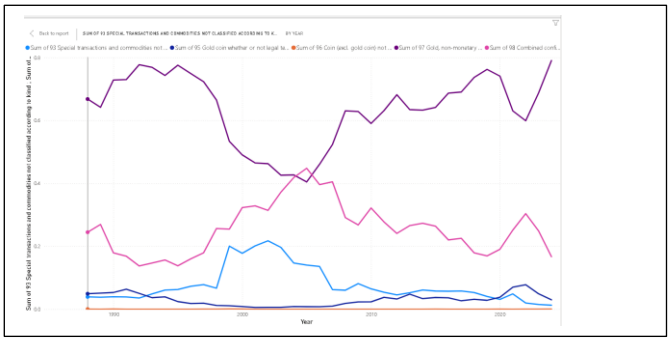
This divergence between export growth and import stability signals a strengthening of Australia's domestic capacity in value-added manufacturing, particularly in technical and scientific sectors. It aligns with the broader national industry.





Category 9 - Commodities and transactions not classified elsewhere in the SITC





Category 9 – Commodities and Transactions Not Elsewhere Classified is overwhelmingly dominated by Subcategory 97 – Gold, Non-Monetary (Excluding Gold Ores and Concentrates). Since the mid-2000s, this subcategory has demonstrated a strong and sustained upward trend, frequently contributing more than 70% of the total exports within this category, as illustrated in both volume and share charts.

The sharp increase in non-monetary gold export value since 2005 aligns with broader national trends, in which mining—especially gold—has been a central pillar of Australia’s post-COVID economic recovery (Minerals Council of Australia, 2021). Although the share of Subcategory 97 experienced temporary declines around 2010 and 2018, these dips were matched by a relative rise in Subcategory 98 – Confidential Transactions. Gold exports then rebounded, regaining dominance after 2020.

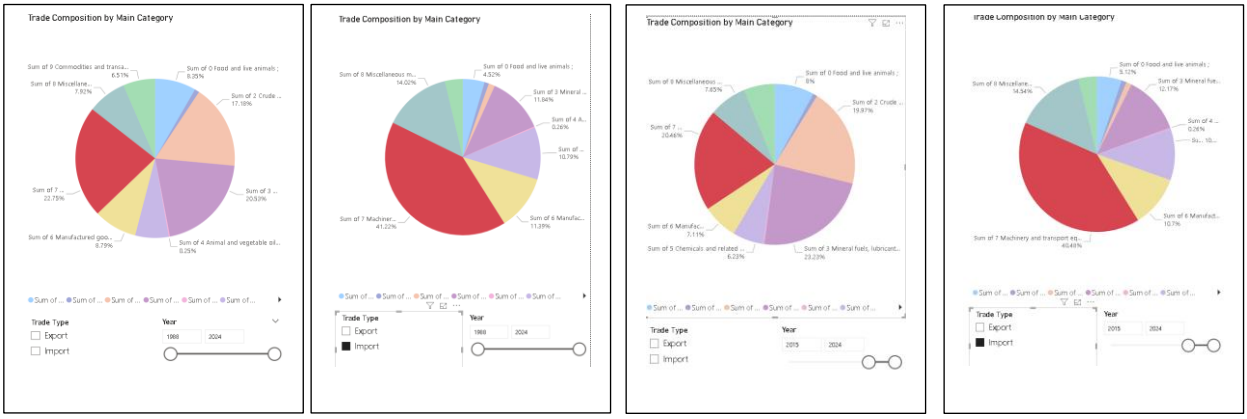
Interestingly, Subcategories 97 and 98 appear to follow an inverse pattern—when the export share of one increases, the other typically declines. While this mirror-like relationship is consistently observed, its underlying explanation remains unclear.

Therefore, further investigation is recommended to clarify the classification and reporting logic behind Subcategory 98, particularly its possible role in concealing sensitive export data.

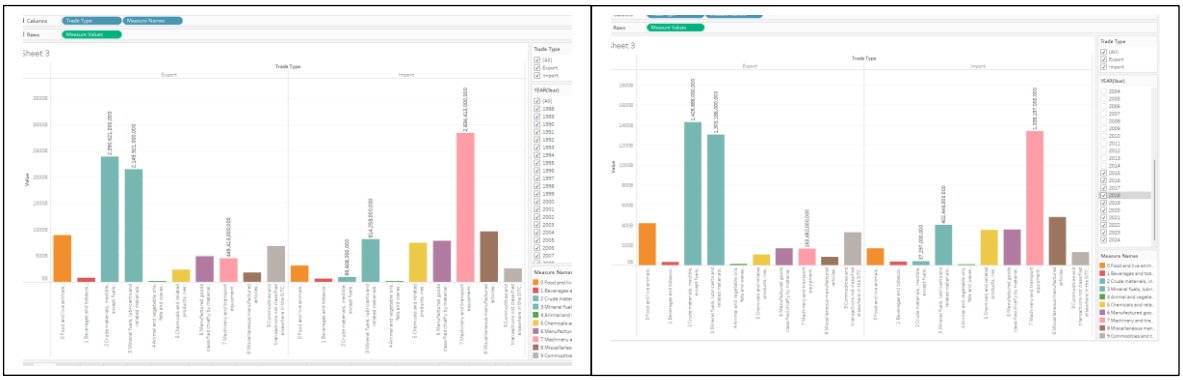
5. Focus on Category 7 and Subcategory 78

Category 7—Machinery and Transport Equipment

Returning to Category 7 – Machinery and Transport Equipment, it has remained Australia's largest trade category by combined import-export value since 1988. However, over the most recent decade (2015–2024), it has been overtaken by Category 3 (Mineral Fuels, Lubricants, and Related Materials) in total trade volume. Visual analytics indicate that Category 3 is export-dominated, while Category 7 is driven almost entirely by imports. This divergence is economically significant: persistently high import levels can result in trade imbalances, downward pressure on the Australian dollar, and increased dependence on foreign supply chains—factors that can weaken long-term national economic resilience (Obstfeld & Rogoff, 2009; International Monetary Fund [IMF], 2020).

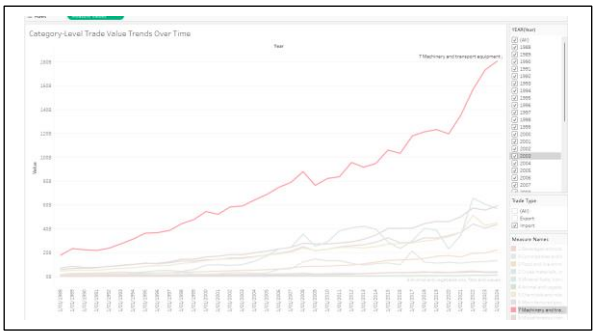
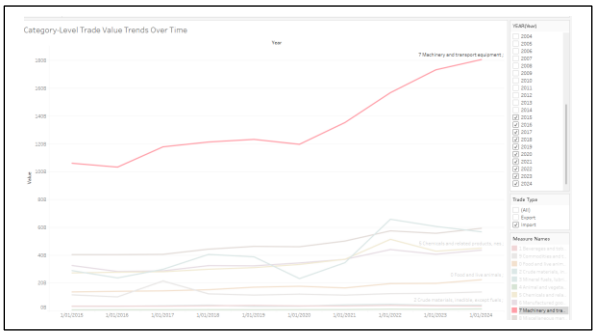


Given these structural implications, Category 7 warrants targeted policy attention. Both historical and recent trade visualisations support this argument. For example, Category 7's average share of total trade was 22.75% during 1988–2024, slightly declining to 20.46% over the 2015–2024 period. More notably, in terms of imports alone, Category 7 accounted for 41.22% of all imports between 1988–2024 and continued to dominate with a 40.48% share during the past decade—far surpassing any other category. In absolute terms, Category 7's import value peaked at AUD 28.84 billion in 2024, while exports remained modest at just AUD 4.49 billion, highlighting a persistent trade imbalance and structural reliance on imported machinery and vehicles.

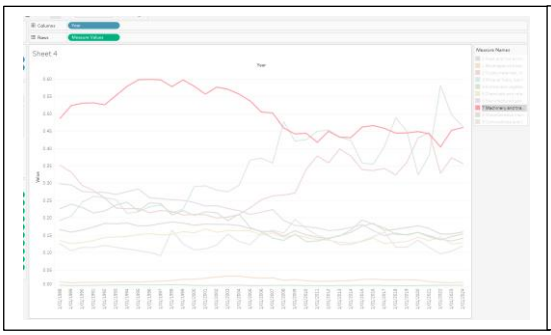
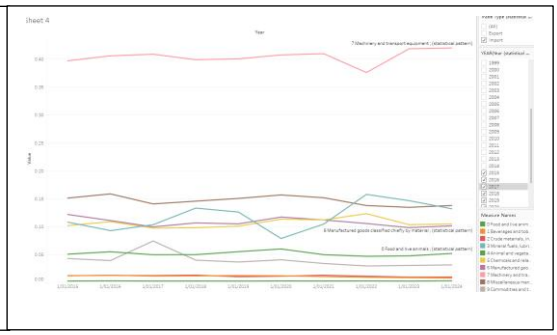


The long-term trend for **Category 7 imports from 1988 to 2024** illustrates a **sustained and steep upward trajectory**. As depicted in the first chart, import values rose from approximately **AUD 20 billion in 1988** to nearly **AUD 180 billion by 2024**.

This growth was relatively steady, with **notable acceleration after 2018**, reflecting increased dependency on foreign-sourced capital goods and transport technologies.

During the most recent decade (2015–2024), this upward trajectory continued but with visible inflection points. According to the second chart, growth was moderate from 2015 to 2018, plateaued around 2019–2020, and then surged post-2020—likely driven by increased investment in post-COVID economic recovery, infrastructure development, and industrial renewal. From a baseline of AUD 100 billion in 2015, values rose sharply in the following years.

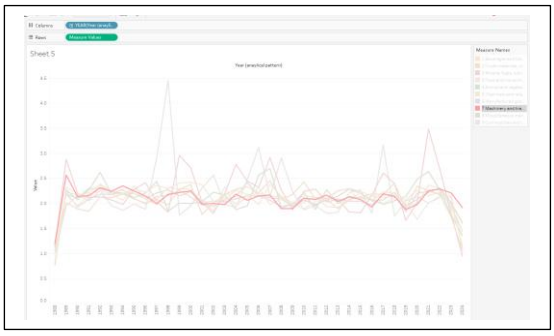



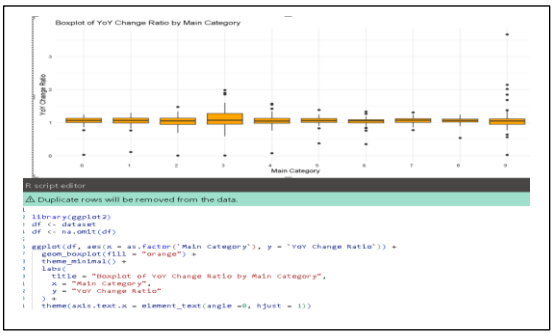
From a trade share perspective, Category 7 has consistently maintained a dominant role in Australia's import composition. As the first trade share chart illustrates, its share peaked at nearly 60% in the early 2000s, followed by a gradual decline over the next two decades. A major inflection point occurred around 2008, likely associated with the export boom in Category 3 – Mineral Fuels and Commodities. However, despite this relative contraction, Category 7's trade share remains robust, particularly when analysing imports independently from exports.

Focusing specifically on the decade from 2015 to 2024, Category 7 has consistently held the highest import share, averaging around 40%, which is substantially higher than any other trade category during this period. In comparison, other major import categories such as Category 6 (Manufactured Goods Classified Chiefly by Material) and Category 8 (Miscellaneous Manufactured Articles) recorded lower shares of approximately 15% and 10%, respectively. This persistent dominance underscores Australia's continued reliance on imported machinery and transport equipment, a trend that remained resilient even amid COVID-19-related global supply chain disruptions.
A notable inflection point occurred in 2021 when Category 7's share rebounded following a brief decline in 2020. This dip was likely a result of delayed international shipments and short-term demand shocks. Since then, the share has steadily recovered and stabilised above 40%, reaffirming the category's central role in Australia's import profile and reflecting renewed investment activity and post-pandemic economic momentum.

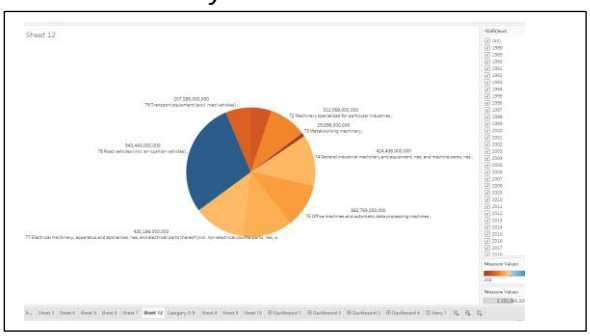
Year-over-year (YoY) growth trends confirm that Category 7 – Machinery and Transport Equipment has maintained a relatively stable growth pattern over the long

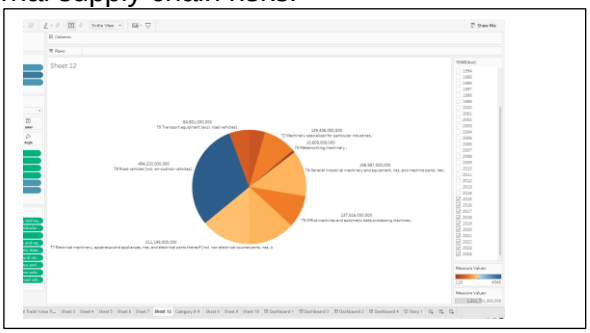
term. In contrast to other categories that have experienced volatile spikes or abrupt downturns, Category 7's annual growth ratios tend to cluster within a narrow range, with most years recording values close to 2.0. This indicates a steady and sustained rise in import value, rather than erratic fluctuations.



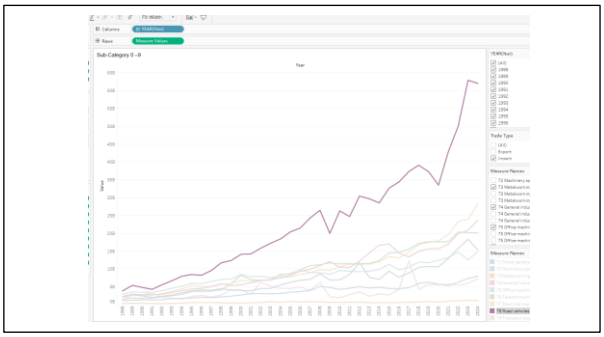


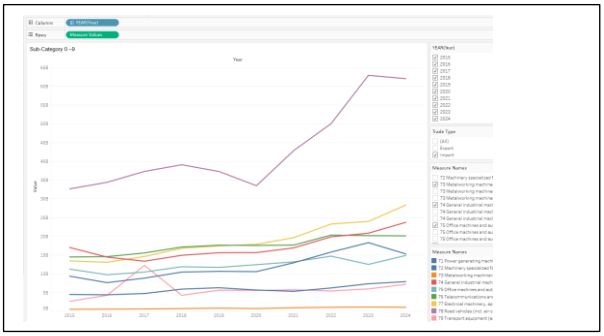
The boxplot comparison further reinforces this finding: Category 7 displays a narrow interquartile range and a median growth ratio near 1.0, reflecting predictable year-to-year changes with relatively few outliers. While this stability demonstrates structural reliance on imported machinery, it also raises concerns about Australia's long-term vulnerability to trade imbalance and external supply chain risks.





In the full-period view from 1988 to 2024, Subcategory 78 – Road Vehicles recorded a cumulative import value of AUD 943.4 billion, significantly outpacing other major subcategories such as Electrical Machinery (AUD 430.2 billion) and General Industrial Machinery (AUD 424.4 billion). This dominance has persisted in the recent decade (2015–2024), during which Subcategory 78 continued to lead with AUD 454.2 billion in total imports (Australian Bureau of Statistics [ABS], 2024).
The consistent dominance of Subcategory 78 highlights Australia's long-standing reliance on foreign road vehicle supply, possibly driven by a limited domestic automotive manufacturing base and strong consumer demand. Despite shifts in other machinery segments, Subcategory 78 has shown resilience, with minor fluctuations but no major displacement in ranking.

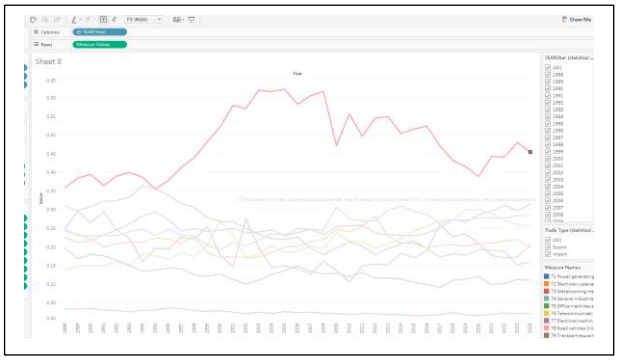


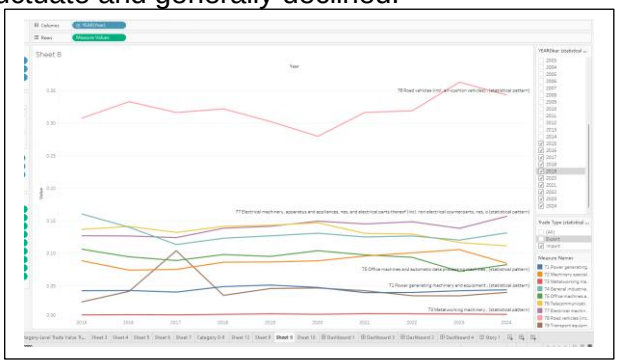


Over the long term (1988–2024), Subcategory 78 has shown a clear and sustained upward trajectory, establishing itself as the single largest contributor to imports within Category 7. From modest levels in the late 1980s, road vehicle imports expanded

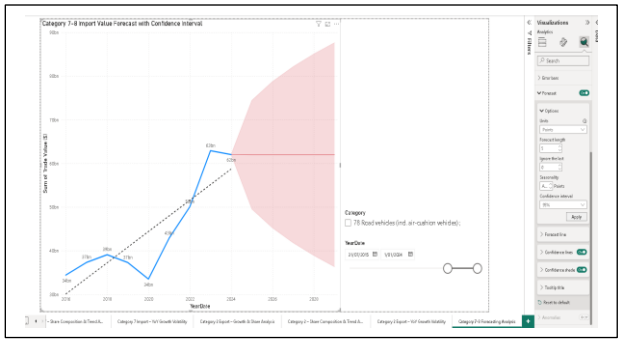
steadily, with notable accelerations in the early 2000s and particularly after 2020. The most striking surge occurred between 2020 and 2023, when annual import values soared past AUD 65 billion, reflecting heightened domestic demand, and increased vehicle growing dependence on foreign automotive supply.
Focusing on the most recent decade (2015–2024), the trend remains consistent, with Subcategory 78 outpacing all other subcategories in both volume and rate of growth. While categories such as 75 (Office machines), 76 (Telecom equipment), and 77 (Electrical machinery) displayed moderate increases, none matched the sharp rise of road vehicles. Even amid the temporary dip around 2019–2020—likely linked to pandemic-related disruptions—Subcategory 78 rebounded quickly, continuing its upward momentum.

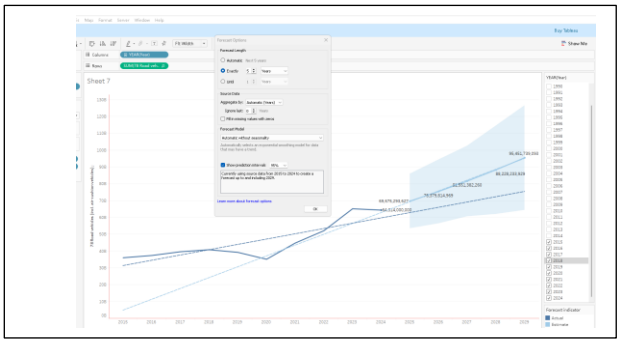
Subcategory 78 has consistently held the largest share within Category 7 (Machinery and Transport Equipment). From 1988 to the mid-2000s, its import share steadily increased, peaking above 60% around 2004. However, post-2005 marks a clear inflection point, as the share began to fluctuate and generally declined.





From 2015 to 2024, Road Vehicles (78) maintained a leading position within Category 7 but with a more moderate share—hovering between 30–35%, however, it still represented a significant portion of the category's composition, underscoring its ongoing relevance to Australia's import profile.
Based on the forecasting analyses visualized in Power BI and Tableau, the projected import values for Subcategory 78 – Road Vehicles (including air-cushion vehicles) show continued growth beyond 2024, but with varying degrees of confidence and trajectory depending on the modelling platform.
In Power BI, the forecast line (based on a time-series trend) suggests a plateau of around 62–63 billion AUD post-2024, with a wide confidence interval indicating substantial uncertainty—ranging approximately from 50 billion to over 85 billion AUD by 2029. This highlights potential volatility and the need for cautious policy planning. Notably, the forecast levels off rather than accelerating.





In Tableau, the exponential smoothing model presents a more optimistic forecast, projecting values to exceed AUD 95 billion by 2029 under its upper confidence bound. Even the conservative estimate suggests continued growth, with the median forecast ranging between AUD 75–80 billion. This outlook reflects the strong momentum observed during 2021–2023, marked by sharp increases in import activity.

In summary, both forecasting tools indicate an upward trajectory, but Tableau suggests stronger long-term growth potential. Decision-makers should weigh both scenarios carefully, considering macroeconomic factors such as electric vehicle (EV) demand, automotive supply chain adjustments, and trade policy shifts. It is recommended that scenario-based forecasting be integrated into strategic planning for Category 7 import management.

Subcategory 78 – Road Vehicles remain the dominant subcategory within Category 7, consistently accounting for the largest portion of Australia's imports in this category. According to ABS (2024) media releases, the import value of road vehicles surged significantly in 2023, driven by growing consumer demand and the transition to electric and low-emission vehicles (Australian Bureau of Statistics, 2024).

Following the end of domestic vehicle production by major manufacturers such as Holden, Ford, and Toyota (finalised by 2017), Australia has become entirely reliant on imported vehicles, increasing its exposure to international supply chain risks. Nevertheless, government-backed initiatives—including diversification funding and investment in advanced manufacturing—have preserved competitiveness in some areas, particularly design and R&D capabilities (Department of Industry, Science, Energy and Resources, 2020).

Despite these efforts, Australia's automotive logistics face structural cost disadvantages compared to Europe. These disadvantages stem from greater shipping distances and a lack of domestic backhaul volume, leading to higher delivery costs and increased vulnerability to global freight disruptions (L.E.K. Consulting, 2021).

Industry Recommendations
Domestic Resilience: Support the re-establishment of niche, high-tech vehicle assembly or component manufacturing, particularly for electric vehicles, by leveraging existing R&D strengths.

Strategic Infrastructure Investment: Expand port capacity and inland freight corridors to reduce bottlenecks and lower logistics costs.

Sustainability Transition: Continue import incentives for EVs while fostering domestic retrofitting and servicing industries to grow alongside.

Diversification Support: Encourage existing automotive supply chain firms to pivot towards high-value exports, such as precision components and software for autonomous and EV technologies.

Advantages and Disadvantages of Dashboard and Storyboard Methodologies
Using dashboards and storyboards in this project has both benefits and limitations. One main advantage of dashboards is that they allow users to interact with the data. Users can filter by year, trade type, or category, and quickly see trends and patterns. This is useful for finding key issues, such as Australia's heavy imports of road

vehicles in Category 7. Dashboards also help users compare different categories clearly and visually.
Storyboards are helpful because they show a step-by-step story. They guide the viewer from the overall trade trends to more detailed parts, like Subcategory 78. This makes the data easier to understand, especially for people who are not experts.

However, there are also disadvantages. Dashboards can become confusing if they have too many filters or charts. This might make it harder to understand the key message. Storyboards, on the other hand, are less flexible. They follow one fixed path, so users cannot explore the data freely or find other possible insights.
In summary, using both dashboards and storyboards together can be very effective. Dashboards allow for exploration, while storyboards provide clear communication. If designed well, they can work together to support both analysis and storytelling.

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