# Project Documentation

## Overview

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| *Project Name* | Assessment Task 3: Visual Analytics |
| *Company* | This report examines Australia's trade trends through visual analysis of export and import data. |
| *Project Dates* | Start Date: 1988<br>End Date: 20254 |
| *Background* | Australian Open is a tennis competition held in Melbourne, VIC, Australia |
| *Objectives* | • Exploratory data analysis<br>• Data visualization |
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# Contents



## Introduction

This report examines Australia’s international trade trends from 1988 to 2024, focusing on ten main product categories classified under the Standard International Trade Classification (SITC) system. By analyzing export and import patterns across categories such as food, mineral fuels, chemicals, and machinery, the report provides a detailed view of how Australia's trade profile has evolved over nearly four decades.

The analysis is presented through three complementary lenses:

- Analytical trends reveal relative growth patterns over time, allowing comparison of category performance on a normalized scale.
- Raw-dollar values capture the actual scale of trade in Australian dollars (AUD), highlighting economic weight and significant value shifts.
- Statistical trends show the proportional share of each category within Australia’s total trade, helping to identify sectors gaining or losing prominence.

Together, these perspectives offer insights into structural changes in Australia’s economy, periods of volatility, and emerging dependencies. The findings aim to inform strategic understanding of Australia's trade resilience, strengths, and vulnerabilities in a changing global landscape.

## Data Exploration

The dataset collected is the Australian International Trade dataset extracted from ABS statistics data which contains over 30 years of trade value data between 1988 and 2024. The dataset has import and export values covering 10 main categories (0-9) and their respective subcategories.

Each dataset contains three rows of data head and 39 rows for each year from 1988 to 2024. It also contains 79 columns which represent main and subcategories and the total values.

You can see the detailed table explaining each subcategory and their series ID in the excel file.

## Data Preprocessing

The dataset provided consisted of two Excel sheets: the Export and Import datasets. To enable deeper analysis, I created three additional sheets: Raw-Dollar, Analytical, and Statistical.

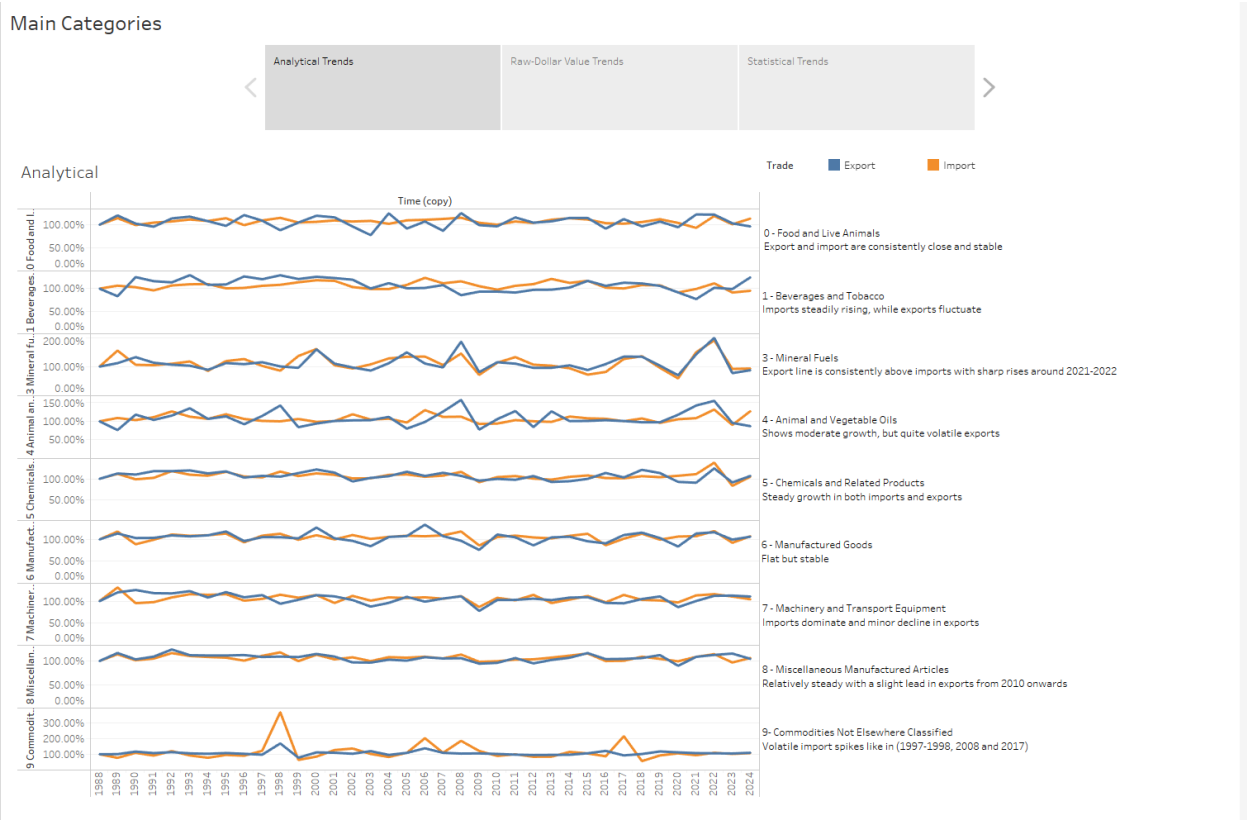
First, I created the Raw-Dollar sheet by cleaning the data (removing metadata rows like units and series IDs) and keeping the values in AUD millions as they appeared.

The analytical sheet shows relative changes rather than absolute values. Each category's trade value is divided by the year before and setting the base year 1988 divided by itself. This helps identify growth or decline trends over time, regardless of the original value scale, making it easier to compare patterns across categories.

For the statistical sheet, I calculated the percentage of share each subcategory contributed to its main categories and main categories to the total value. This was done by dividing the subcategory's value by the total of its parent category and multiplying by 100. This allowed me to see which subcategories were growing in importance and which were declining, even if their raw values remained stable. Together, these three sheets provided a comprehensive foundation for tableau graphs and dashboards and storyboards. This transformation made the data much more meaningful and visually comparable across decades of trade activity.

# Main Categories

## Analytical




This visualization illustrates the analytical trade trends across Australia's ten main export/import categories from 1988 to 2024. The data is normalized to show percentage movement over time, highlighting the relative volatility and alignment between exports (blue) and imports (orange) for each category.

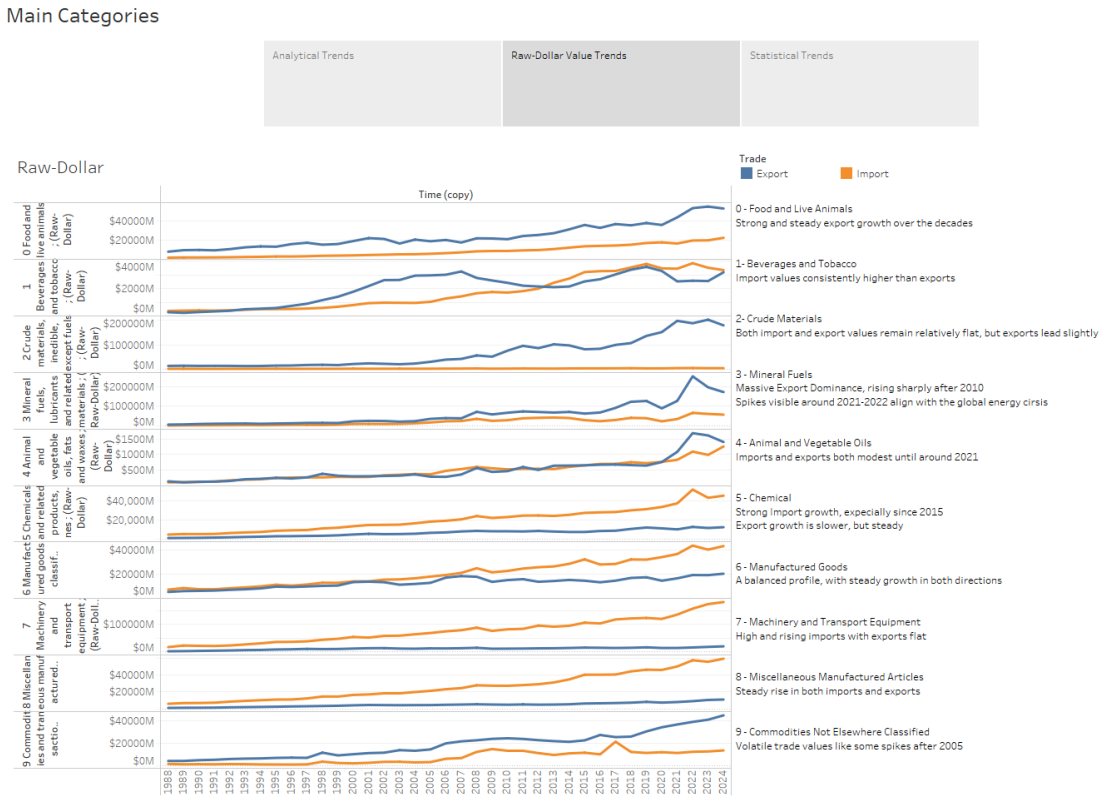
Key observations:

- Category 0 (Food and Live Animals) maintains a steady and balanced export-import pattern throughout the period.
- Category 3 (Mineral Fuels) shows a sharp export growth around 2021–2022, diverging from relatively stable imports, likely reflecting increased global demand and rising commodity prices.
- Category 9 (Commodities Not Elsewhere Classified) features noticeable spikes in imports during specific years (e.g., 1997 and 1998, 2008, 2017), suggesting irregular but significant trade events.

- Category 7 (Machinery and Transport Equipment) consistently records higher imports than exports, indicating strong domestic reliance on foreign machinery.
- Category 5 (Chemicals and Related Products) and Category 8 (Miscellaneous Manufactured Articles) show steady growth in both exports and imports, demonstrating expanding bilateral trade in manufactured goods.

This analytical view provides a high-level comparison of Australia's trade behavior across sectors, helping identify long-term trends, anomalies, and strategic trade imbalances.

## Raw dollar




This raw-dollar value visualizations provides a concrete representation of Australia's export and import values (in millions of AUD) across the ten main trade categories from 1988 to 2024. Unlike percentage trends, this chart focuses on actual trade volumes, making it easier to assess the scale and monetary importance of each category.

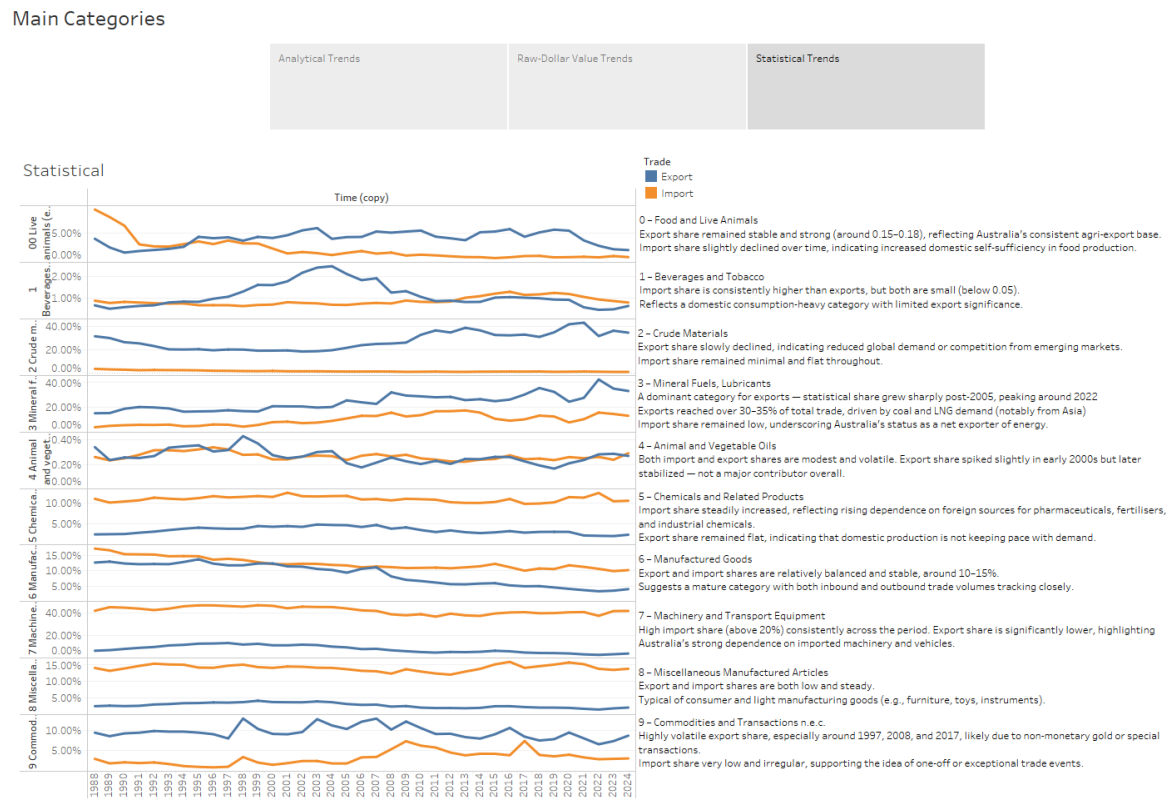
Key insights:

- Category 0 (Food and Live Animals) shows strong, consistent export growth, indicating long-term reliability in agricultural exports.

- Category 3 (Mineral Fuels) stands out for its massive export surge post-2010, peaking dramatically in 2021–2022 which is likely tied to global energy price shocks and increased demand.
- Category 5 (Chemicals) and Category 7 (Machinery and Transport Equipment) reveal a dominant import trend, with imports significantly outpacing exports, especially since 2015.
- Category 8 (Miscellaneous Manufactured Articles) and Category 6 (Manufactured Goods) present balanced trade patterns, growing steadily in both directions, reflecting robust bilateral trade.
- Category 9 (Commodities Not Elsewhere Classified) exhibits notable volatility, with random trade spikes after 2005, suggesting irregular commodity deals or reporting anomalies.

This chart offers a clear perspective on where Australia's economic weight lies in trade and reveals dependencies, like import reliance on machinery or export strength in fuels and agriculture.

## Statistical



This Statistical Trends dashboard displays each main category's share of Australia's total export and imports values over time (1988–2024). Unlike raw or absolute trends, this view normalizes trade values, showing how dominant or minor each category is relative to total trade in each year.

Key takeaways:

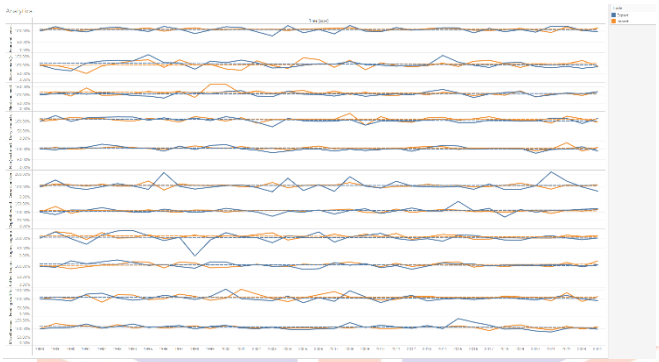
- Category 3 – Mineral Fuels, Lubricants is a standout export performer, with its share rising dramatically post-2005, reaching over 30% of total exports by 2022. This reflects growing global demand for coal and LNG, especially from Asia.
- Category 7 – Machinery and Transport Equipment shows consistently high import share (20%+), confirming Australia's strong reliance on importing high-value machinery and vehicles.
- Category 5 – Chemicals and Related Products shows steadily rising import share, signaling increased reliance on pharmaceuticals, fertilizers, and industrial chemicals.
- Category 0 – Food and Live Animals maintains a stable export share (~15–18%), showcasing the enduring role of agriculture in Australia's trade portfolio.
- Category 1 – Beverages and Tobacco and Category 2 – Crude Materials remain minor contributors, with low and flat shares across the board.
- Category 9 – Commodities N.E.C. displays irregular export share spikes (e.g., 1997, 2008, 2017), possibly due to one-off transactions such as non-monetary gold exports.

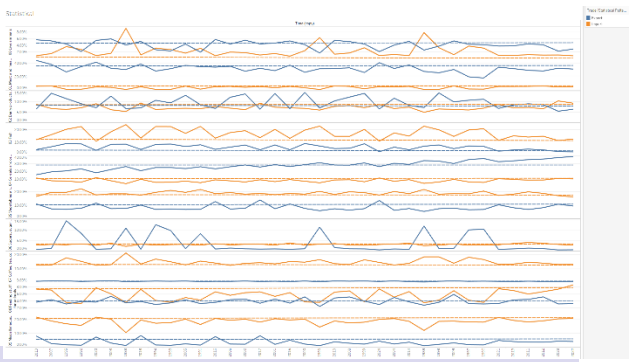
Overall, this dashboard offers a proportional view of how trade categories evolve in their significance, revealing long-term structural dependencies and emerging trade patterns.

Across Categories 0–9, Australia's exports reveal a clear shift from traditional sectors (e.g., wool, paper, tobacco) to high-growth areas such as gas, nonferrous metals, scientific equipment, and confidential commodities. The trends reflect industrial modernization, energy transitions, and changing global demand. While categories like food and apparel remain stable, the emerging pillars of export strength are now tech, mining, and knowledge-intensive goods.

# Subcategories

## Category-0



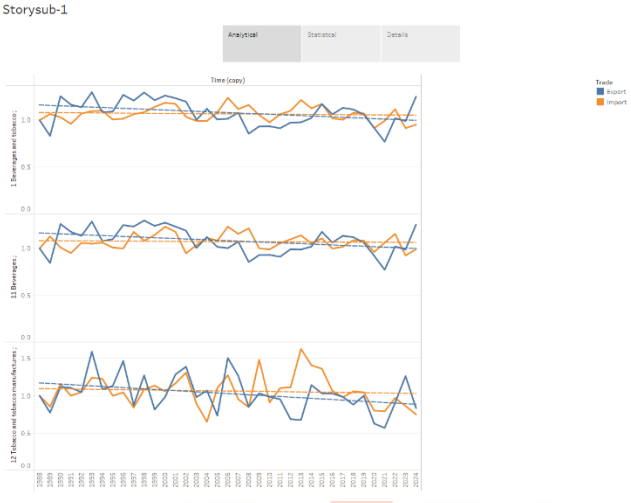


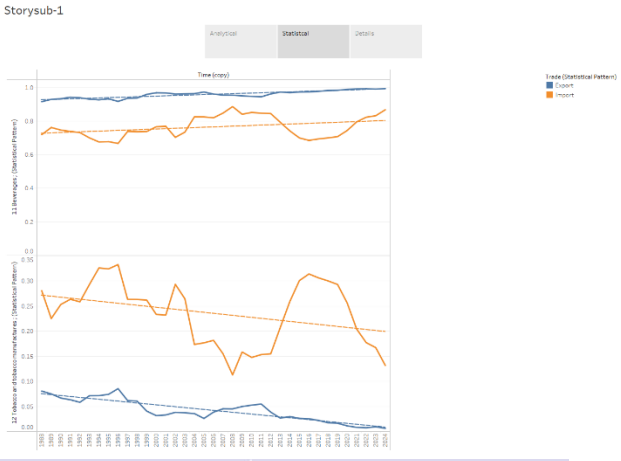
1. Meat and Meat Preparations
A dominant and growing export segment, consistently holding 20–30% of total food exports. Analytical trends show steady growth post-2000, driven by strong demand from Asia-Pacific (e.g., China, Japan). Reflects Australia's position as a top global meat exporter.
2. Sugars, Honey
Shows volatile growth with clear spikes and dips, both analytically and statistically. This reflects the category's sensitivity to climate, global pricing, and trade access shifts. It remains a minor but fluctuating contributor.
3. Cereals
Once significant but showing a gradual decline in statistical share since the early 2000s. Analytical trends also reflect mid-period peaks followed by decline, possibly due to droughts or rising global competition.

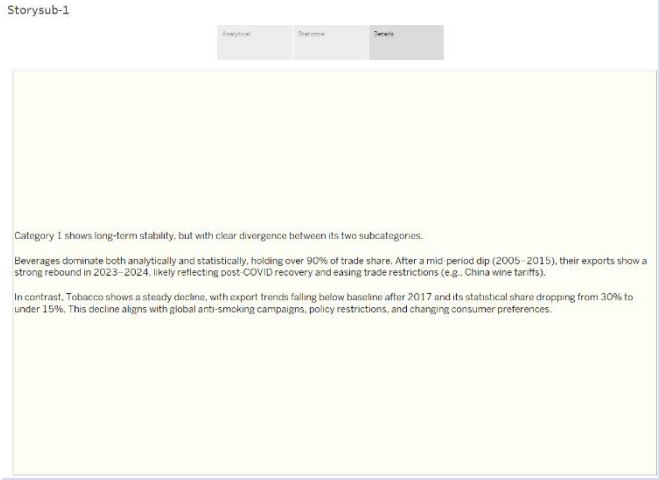
Fish and Seafood remains stable, suggesting a mature and saturated market.
Vegetables and Fruits show modest, steady growth.
Miscellaneous Edibles and Feedstuff remain minor contributors with limited export emphasis.

The **Food and Live Animals** category is led by strong and consistent **meat exports**, solidifying Australia's reputation as a global meat supplier. While **sugar and cereals** exhibit more volatile or declining patterns due to climate and competition, other subcategories like **seafood and fruits** reflect steady, mature markets. Overall, this category shows Australia's **agricultural strength**, with varying export dynamics across sub-sectors based on demand, weather, and global market shifts.

## Category-1

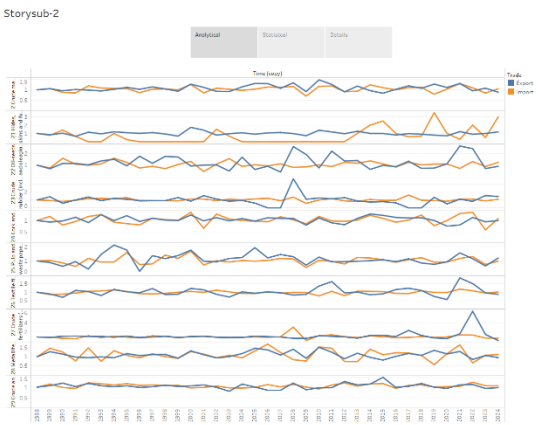


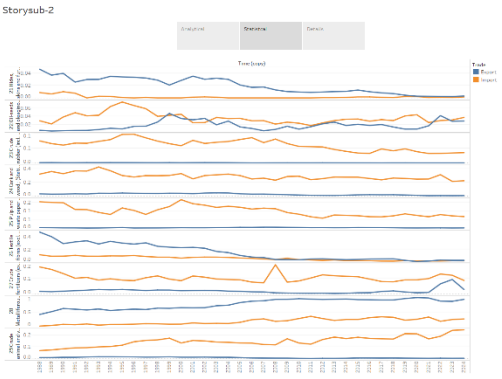



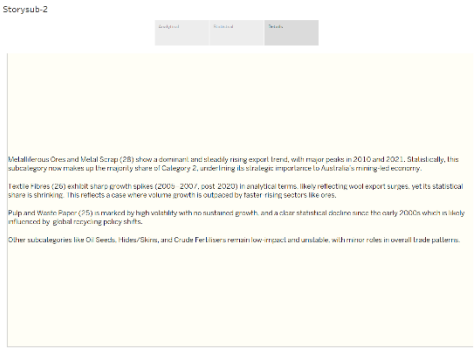




Category 1 is now clearly driven by Beverages, which continue to grow in relevance and export strength. Tobacco, once a notable contributor, has sharply declined in both value and share, reflecting a global shift away from tobacco products. The future of this category lies in leveraging Australia's premium beverage exports, particularly in Asian markets.

## Category-2

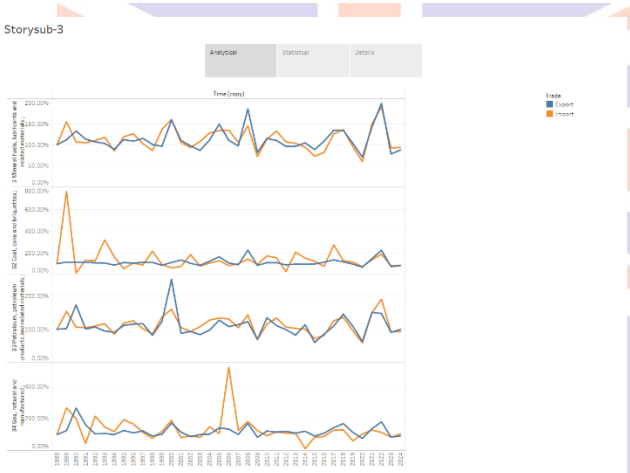


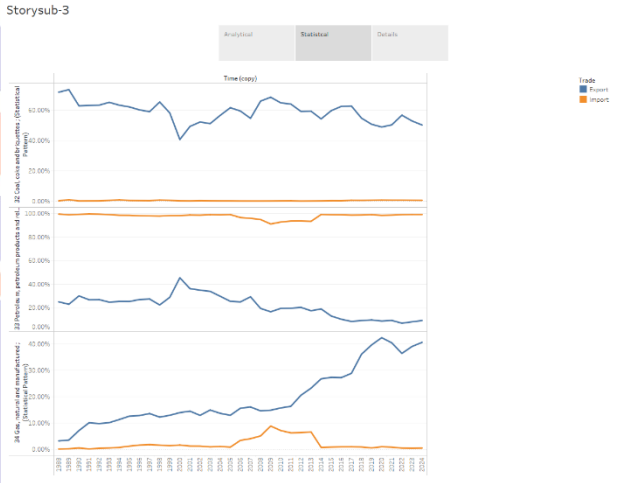



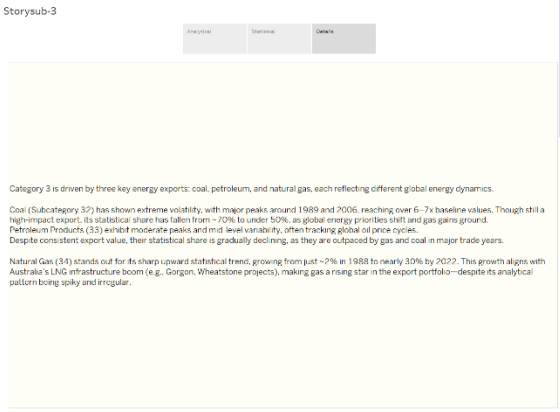



Category 2 is increasingly dominated by metal ores, which have become the core export driver due to sustained demand from global infrastructure investment. Traditional exports like wool and paper waste, while still active, have declined in importance, as rising competition, policy changes, and shifting market needs reshape Australia's export portfolio in this sector.

## Category-3



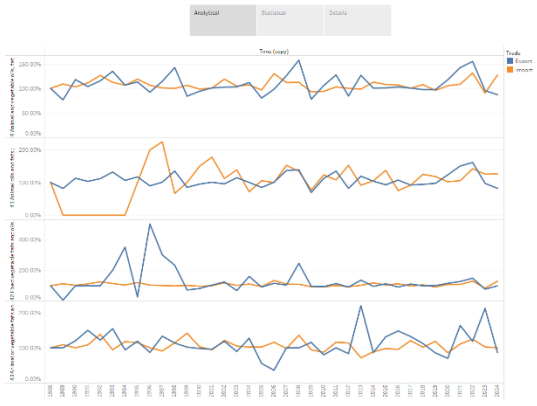




Category 3 is evolving from being coal-dominant to increasingly gas-driven, reflecting Australia's role in the global energy transition. While coal remains significant, it's no longer as dominant. Gas exports are expanding rapidly due to infrastructure investment and long-term demand from Asia. Petroleum products, though steady, are being overshadowed by larger shifts in energy trade. This category highlights the volatility and strategic importance of Australia's energy exports in a changing global landscape.

## Category-4

Storysub-4



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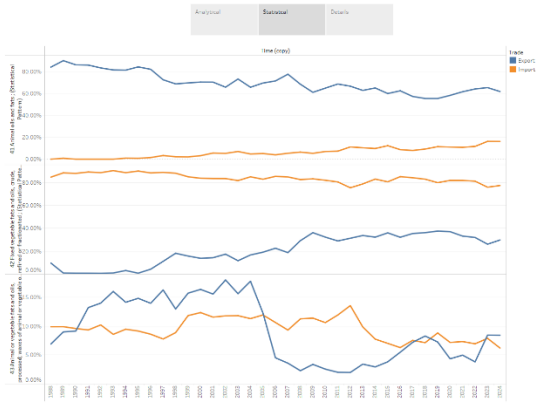


Storysub-4

Analytical | Statistical | Details

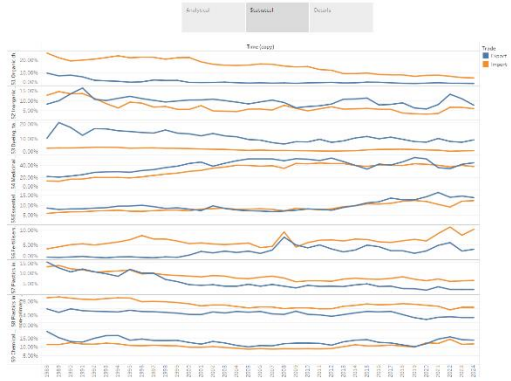
Category 4 overall shows a stable export trend with occasional volatility from individual subcategories.
Fixed Vegetable Fats and Oils (42) is the most volatile subcategory, with extreme spikes around 1995, and smaller surges in 2009, 2015, and 2023. These are likely driven by global price shocks, biofuel demand, and supply issues in major producer countries. Statistically, it grew from just ~5% in 1988 to nearly 30% by 2015, making it a rising component of the category.
Animal Oils and Fats (41), once dominant with ~85% share in 1988, have gradually declined below 60%. Analytical trends show modest fluctuation but overall stability, indicating this is now a mature, steady export with shrinking relative importance, possibly due to changing dietary preferences and trade demand.
Processed Animal or Vegetable Fats and Oils (43) has shown intermittent spikes (2005, 2016, 2021–2023). Statistically, it fluctuates widely, peaking in the 2000s, dipping post-2010, and rising again after 2020. This suggests sensitivity to industrial demand and regulatory or supply chain shifts.

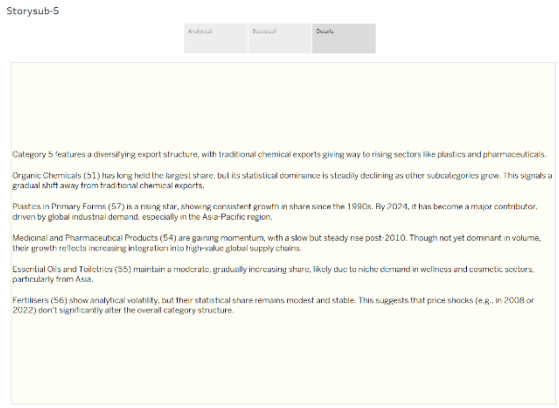
While Category 4 appears stable at the top level, its internal dynamics show a clear shift from traditional animal-based exports (41) toward plant-based oils (42), reflecting global trends in sustainability, biofuels, and dietary changes. Processed oils (43) remain unpredictable but potentially tied to manufacturing cycles and niche opportunities. This category highlights the subtle but important transition in Australia's edible oil and fat export landscape.

## Category-5

Storysub-5

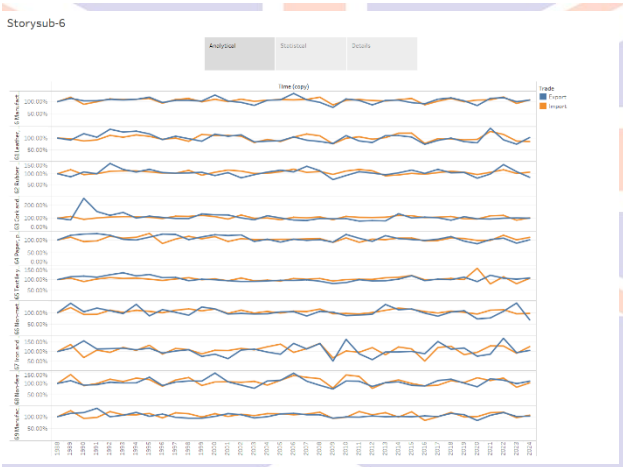
Storysub-5

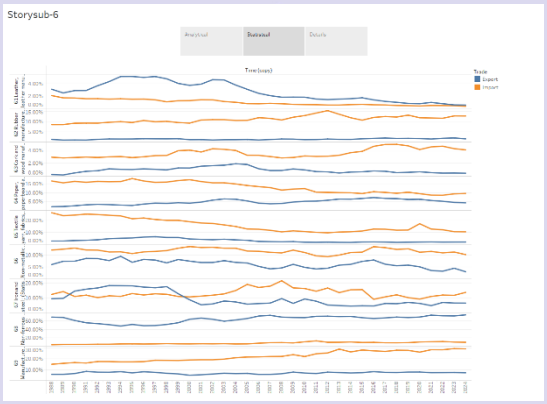


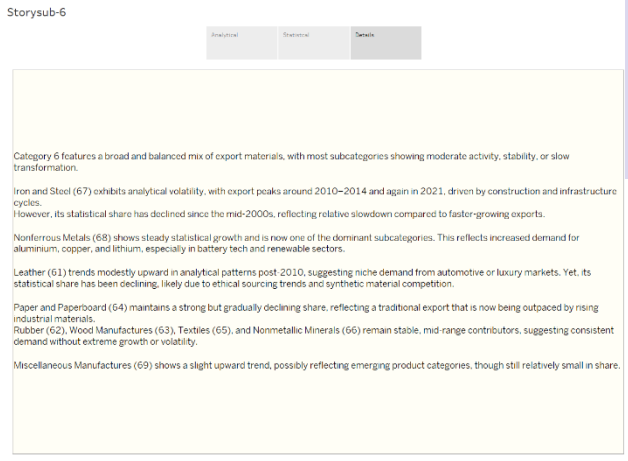



Category 5 is transitioning from a base of traditional chemicals to a more diverse and value-added export portfolio. While organic chemicals are in slow decline, plastics and pharmaceuticals are rising steadily in importance. Fertilizers remain reactive to global market events but don't shift the category's core. This category reflects Australia's expanding role in advanced materials and health-related exports.

## Category-6



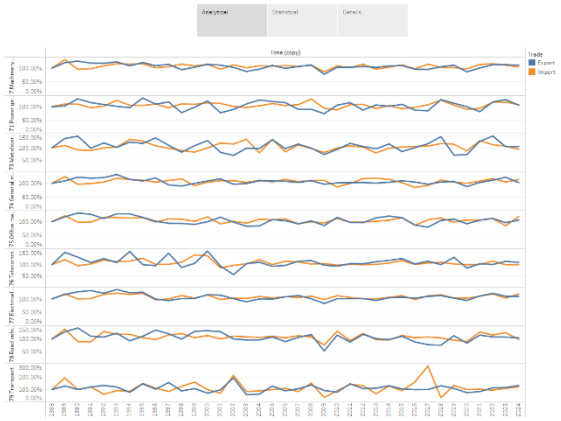




Category 6 demonstrates long-term stability with a visible shift in export leadership. Iron and steel, once dominant, are being surpassed by nonferrous metals due to their rising importance in high-tech and renewable industries. Meanwhile, traditional exports like leather and paper are declining in relative share, reflecting changing global demand and material innovation. This category showcases Australia's quiet transformation from basic materials to strategic industrial exports.

# Category-7

Storysub-7



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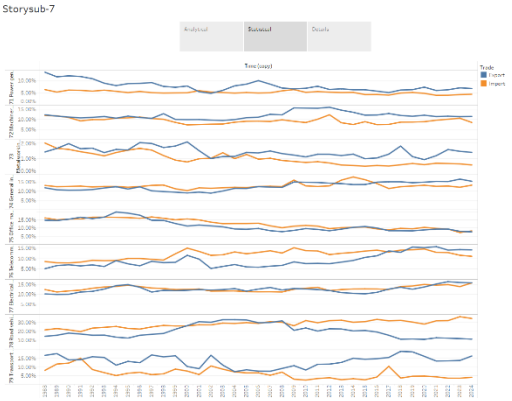


Storysub-7

Analytical | Statistical | Details

Category 7 shows a mature and steady export profile, with only a few subcategories showing consistent growth.
Power Generating Machinery (72) holds a stable lead, with a gentle upward trend analytically and statistical dominance over time. This reflects long term demand from energy, infrastructure, and mining sectors.

Electrical Machinery (77) is the most notable growth area, with a steady upward trend since 2010. Its rising share highlights Australia's increasing role in electronics, automation, and smart device manufacturing.

Industrial Machinery (74), though once dominant, has seen a decline in statistical share, possibly due to rising competition from Asia or a shift in export focus. Its analytical trend remains flat, indicating a mature, non-growing segment.

Road Vehicles (78) show a slight decline analytically, but a slowly rising share statistically since the 2000s—possibly reflecting export of automotive parts or assembled vehicles.

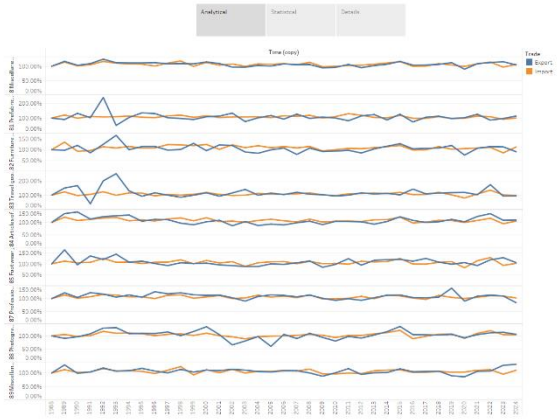
Metalworking Machinery (73) and Office/Telecom Equipment (75, 76) remain mid to low-tier contributors, stable but without strong momentum.

Other Transport Equipment (79) is highly volatile, with large spikes in select years (2000, 2018), reflecting irregular big-ticket items like aircraft or naval exports.

Category 7 is led by power and electrical machinery, with the latter becoming an emerging export strength. While traditional segments like industrial machinery are declining in share, high-tech and energy-related equipment are gaining ground. Vehicle exports are growing slowly, and project-driven transport equipment provides occasional boosts. Overall, the category reflects a gradual shift from heavy to high-tech manufacturing exports.

## Category-8

Storysub-8



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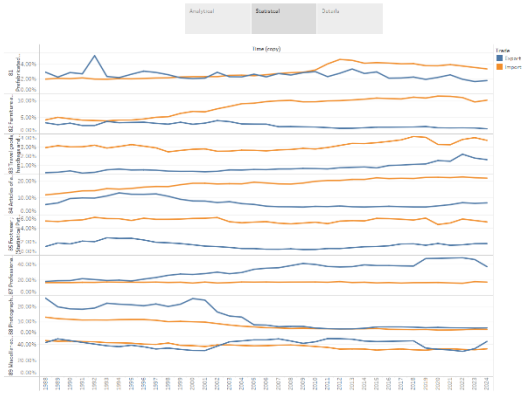

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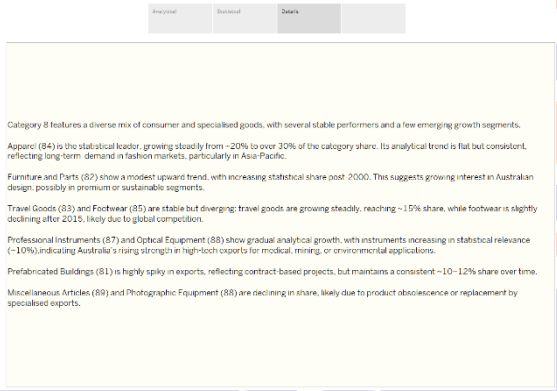
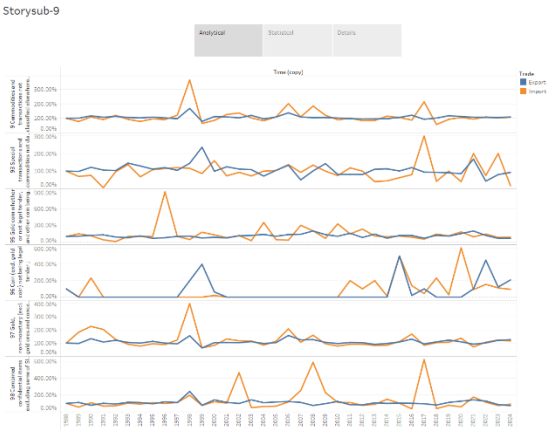



Category 8 is transitioning from traditional low-tech goods toward higher-value and niche exports. While apparel remains dominant, products like furniture, travel goods, and scientific instruments are becoming more important. The category reflects a diversifying export base, balancing fashion and consumer goods with growing specialized industrial and tech sectors.

## Category-9

Storysub-9



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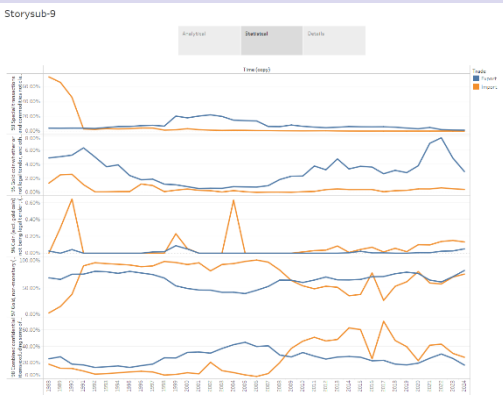
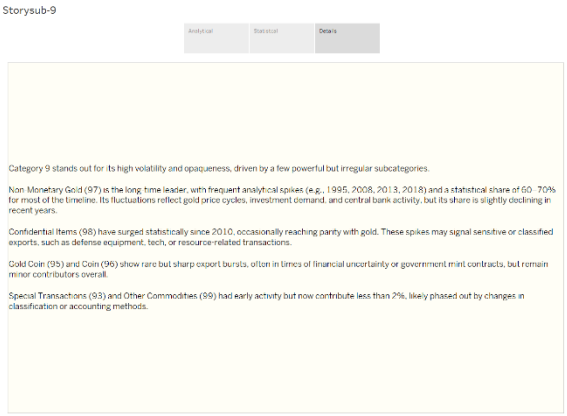
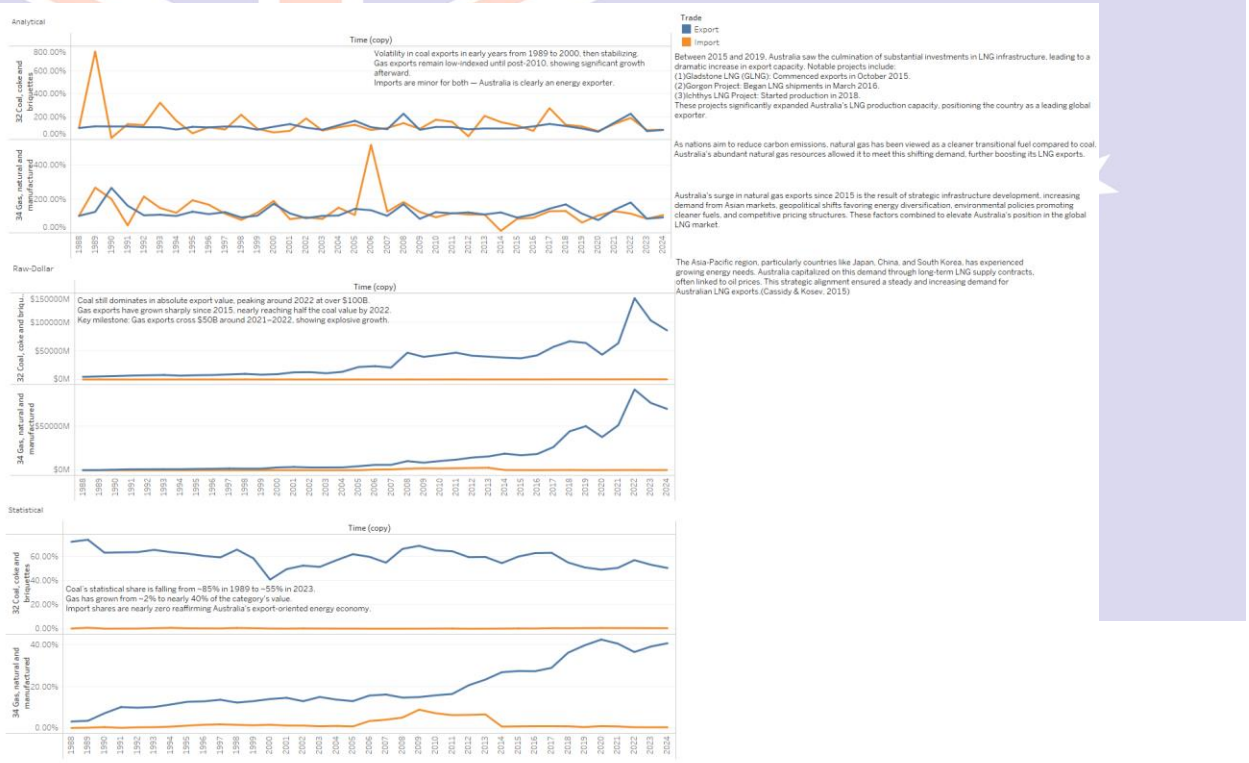





Category 9 reflects Australia's role in high value but irregular exports, dominated by gold and an increasing share of classified or sensitive transactions. While difficult to predict, these subcategories can cause major export value surges in specific years. The category highlights Australia’s importance in precious metals and potentially strategic exports, though its opacity limits detailed economic interpretation.

## Dashboard




This dashboard presents a focused analysis of Australia's energy exports, specifically comparing Coal (Subcategory 32) and Natural Gas (Subcategory 34) across three dimensions: analytical trends, raw-dollar values, and statistical share.

- Analytical Trends
  Coal exports exhibit sharp volatility between 1989–2000, later stabilizing around the index baseline. In contrast, gas exports remained low-indexed until post-2010, after

which they show accelerated growth, especially from 2015 onward, reflecting Australia's expanded LNG infrastructure.

- Raw-Dollar Values
  Coal remains dominant in absolute terms, peaking at over $108B in 2022. However, gas exports have risen rapidly, especially after 2015, crossing $50B by 2022, and approaching half the value of coal exports. This marks a dramatic shift in Australia's energy export composition.
- Statistical Trends
  Coal's share of the energy export category has dropped from ~85% in 1988 to ~55% in 2023, while gas has surged from ~2% to nearly 40%. Imports for both commodities are negligible, confirming Australia's energy exporter identity.
- External Factors
  The growth in gas exports is strongly linked to major LNG infrastructure investments completed between 2015 and 2019, including projects like Gladstone LNG, Gorgon, and Ichthys.

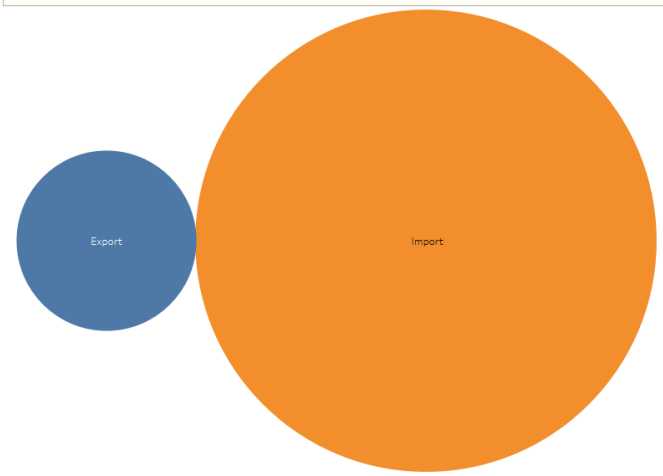
Rising gas demand from Asia-Pacific countries (e.g., China, Japan, South Korea) and a global shift to cleaner energy sources have further fueled this transition.

Australia's export landscape for mineral fuels is undergoing a structural transformation, with natural gas emerging as a major player alongside coal. While coal remains valuable, its relative dominance is diminishing, suggesting a rebalancing toward cleaner, infrastructure-driven exports that align with future energy trends.

# Product 56 (Fertilizers)

Title | Analytical Pattern | Raw-Dollar | Stats | External Factors

## Fertilisers and the Fight for Food:Volatility in a Changing World

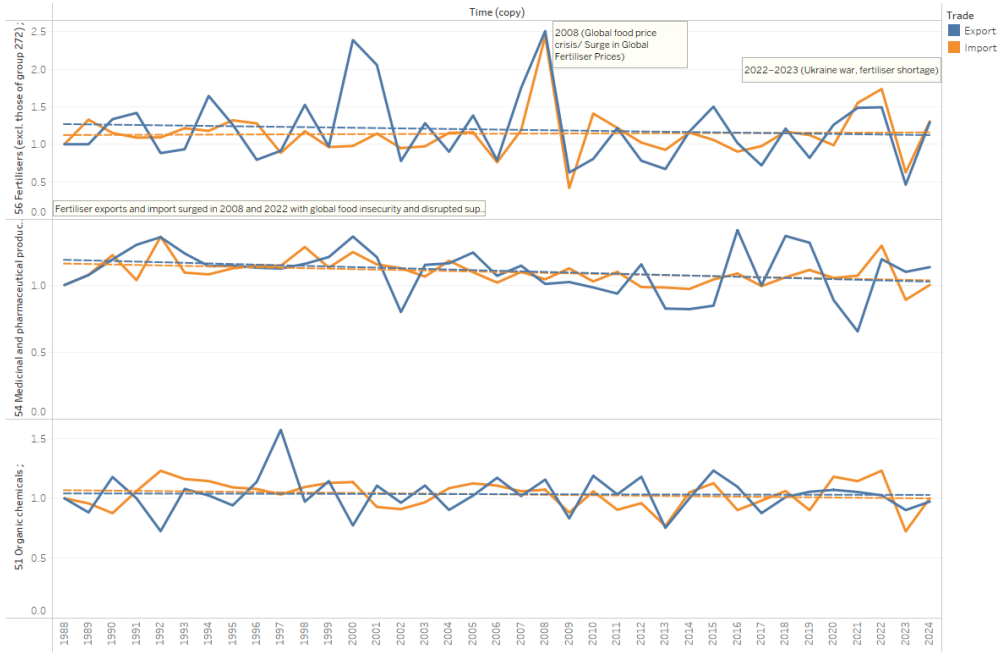



Trade
Export
Import

This story explores how Australia's fertiliser exports and imports have shown sharp shifts over the past three decades. By comparing trends with other chemical exports, we unpack how global agriculture, climate pressures, and geopolitical shocks shape this volatile but vital sector.

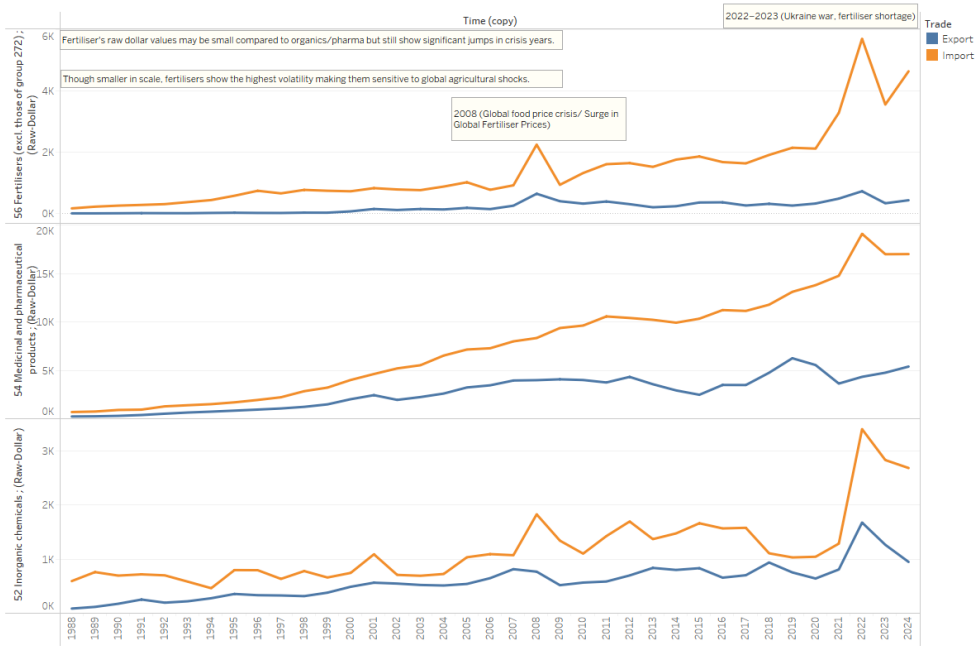
This is the average values of export and import of fertilisers in Australia

Title | Analytical Pattern | Raw-Dollar | Stats | External Factors

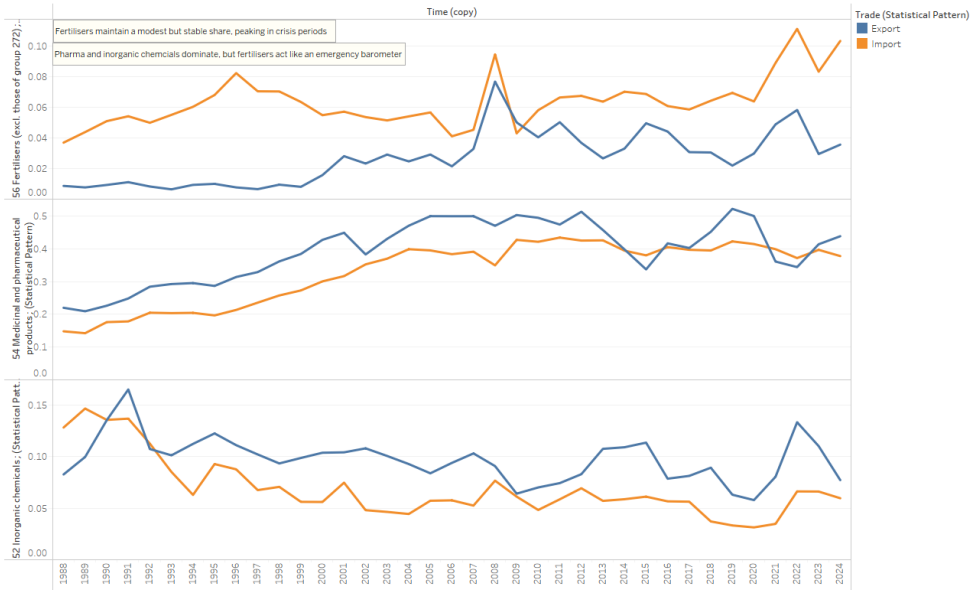



Trade
Export
Import

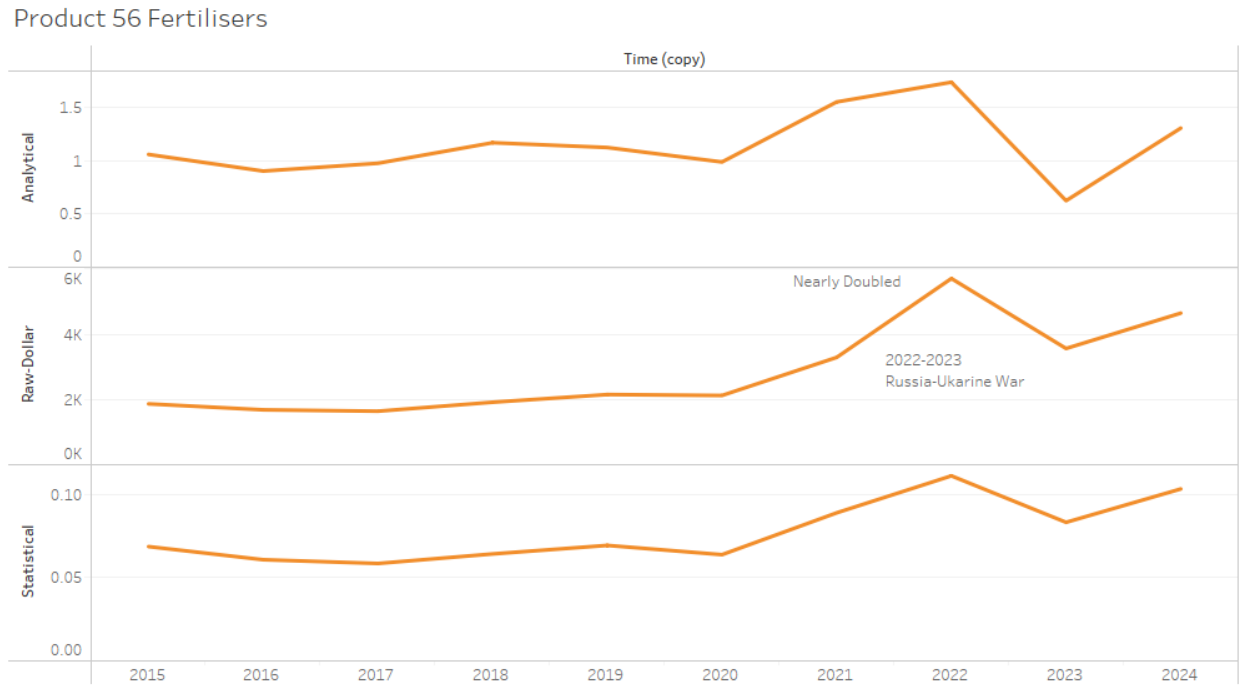
Title | Analytical Pattern | **Raw-Dollar** | Stats | External Factors




Title | Analytical Pattern | Raw-Dollar | **Stats** | External Factors




# Importing Fertilizers




2015–2020: Global trade was stable, prices moderate
2022–2023 spike: Driven by the Russia-Ukraine war, China's export bans, and global energy price surges (Department of Agriculture, Fisheries and Forestry, 2022).

Trend Recap

- Raw-Dollar: Grew from ~$2B to nearly ~$6B in 2022 (peak), before dipping slightly in 2023.
- Statistical Share: Increased from ~6% to ~9%.
- Factors: Geopolitical conflict (Russia-Ukraine war), export bans from China, energy price surges.

Gain/Loss Analysis (2015–2024):

**Losses**

- Financial strain due to soaring import costs.
- Strategic risk of overreliance on external suppliers for critical agricultural inputs.

**Gains**

- Policy awareness and rising urgency around supply chain resilience.
- Potential short-term benefit for importers/distributors who anticipated the surge.

Predicted Import Values

Year 2025

~$4.5B AUD

While prices ease slightly from 2022-2023 spike, but remain elevated due to lingering global supply chain disruptions and continued geopolitical instability like the Ukraine war, Australia continues to depend heavily on foreign fertilizers, especially nitrogen-based products

Year 2026 to 2029

~$4B AUD <Predicted Value < ~$5B AUD

Climate change will boosts food demand, farming demand rises, even with steady prices, more fertilizer is needed due to stronger local crop output

Fertilizer imports are likely to remain high but stabilized, settling between $4B–$5B AUD annually. The spikes seen in 2022–2023 were extraordinary, but the reliance on imports will persist, driven by Australia's agriculture sector, limited domestic capacity, and global market trends. Strategic supplier diversification and smart storage planning will be key to managing future risks.

## Conclusion

This report presents findings from a comprehensive data visualization process examining Australia's international trade trends, with a particular focus on the import and export of fertilizers (Subcategory 56 under Category 5 – Chemicals and Related Products). Using Tableau, the data was explored across three key visual formats: analytical trends, raw-dollar values, and statistical shares. These techniques enabled a multi-dimensional understanding of how trade flows have evolved over time, particularly between 2015 and 2024, with forward-looking estimates extending to 2029.

The analytical trend chart normalized values to a baseline index of 1.0, allowing a clear view of relative growth or decline. For fertilizers, the index remained relatively flat from 2015 to 2020, but spiked sharply in 2022–2023, reaching nearly 1.8. This aligned with global fertilizer supply chain shocks caused by the Russia–Ukraine conflict, export restrictions from China, and increased global energy prices, all of which drove up production and shipping costs. The raw-dollar trend reinforced this insight, showing fertilizer import values nearly tripled during this period, peaking at over $5.8 billion in 2022. The statistical chart further showed fertilizers gaining importance within the chemicals category, with their share rising from approximately 6% to 10% over the decade.

The visual techniques used in this project offered distinct strengths. Analytical charts allowed relative movement to be assessed independently of scale, helping to identify patterns such as the post-2020 surge. Raw-dollar charts provided context for economic significance, making the impact of value changes tangible. Statistical trends clarified how subcategories evolved within their parent categories, highlighting fertilizers' rising share of total chemical imports. These methods worked together to build a layered understanding of trade behavior.

The fertilizer imports trends also pointed toward strategic recommendations for the industry. Australia should invest in expanding local fertilizer manufacturing to reduce dependency on external sources. Establishing long-term trade agreements with alternative suppliers and building strategic stockpiles during periods of low global prices can improve resilience. Furthermore, promoting research and investment in bio-based and organic fertilizers will help future-proof the industry against price volatility and sustainability concerns.

In evaluating the visualization approach, both dashboards and storyboards offered complementary benefits. Dashboards allowed for interactive filtering, comparisons across multiple metrics, and deep exploration of data. However, they can become visually crowded when too much information is presented. Storyboards, by contrast, provided a

clear, linear narrative that was easy to follow and effective for presenting sequential insights. While less interactive, storyboards worked well for communicating key messages to non-technical audiences.

In conclusion, this visual analysis revealed critical trends in Australia's fertilizer import patterns, especially around the volatility introduced by global supply shocks. It also identified long-term structural risks and opportunities for industry improvement. By using a combination of analytical, dollar-based, and proportional visual tools, and by integrating dashboards with storyboards, this project demonstrated how thoughtful data visualization can support strategic trade insights and evidence-based decision-making.

## References

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