Appendix:

Data Exploration:

Data exploration is the process of examining and analyzing a dataset to understand its structure, content, and relationships between variables. It involves using statistical and visual methods to identify patterns, trends, outliers, and relationships within the data.
The goal of data exploration is to gain a deeper understanding of the data, uncover insights, and generate hypotheses for further analysis. This process is an essential step in the data analysis workflow and helps to guide subsequent steps such as data cleaning, feature selection, and model building.

For the analysis purpose, we will be using **The Australian International Trade dataset** extracted from **ABS Statistics** data contains over 30 years of data between 1988 and 2022. The dataset has import and export information, including 10 main categories and 67 sub-categories. Each sub-category involves multiple industries' performances on productivity and resources.

Below is the data dictionary for The Australian International Trade dataset:

Attribute Name	Type	Description
Year	5 character format in YYYYY, Quantitative	Year of Tournament
Trading Pattern	Binary, Categorical	Divides data by trading pattern, either Export or Import
0 to 98 (From C to CA)	Numeric	Import and export in Million Dollars(AUD), for all 10 main categories and 67 sub-categories
-1 TOTAL ;	Numeric	Total Trading(Import and Export) for the given year

Data Preparation:

Data preparation is an important step in the data analysis process, as the quality of the results obtained from data analysis depends heavily on the quality of the data used. Data preparation is the process of cleaning, transforming, and organizing raw data into a format suitable for analysis.
Any inconsistency in the data can greatly hamper the analysis and visualization of the data which may result in making bad decisions for the management.

To solve this problem additional sheets have been created to facilitate further analysis:

1. Percentage Sheet(Percentage of total)
2. Ratio Change Sheet(Percentage change compared to the previous year)

These sheet has also been segmented as Export Sheet and Import Sheet for simplification purposes.

Data Dictionary for Percentage Sheet

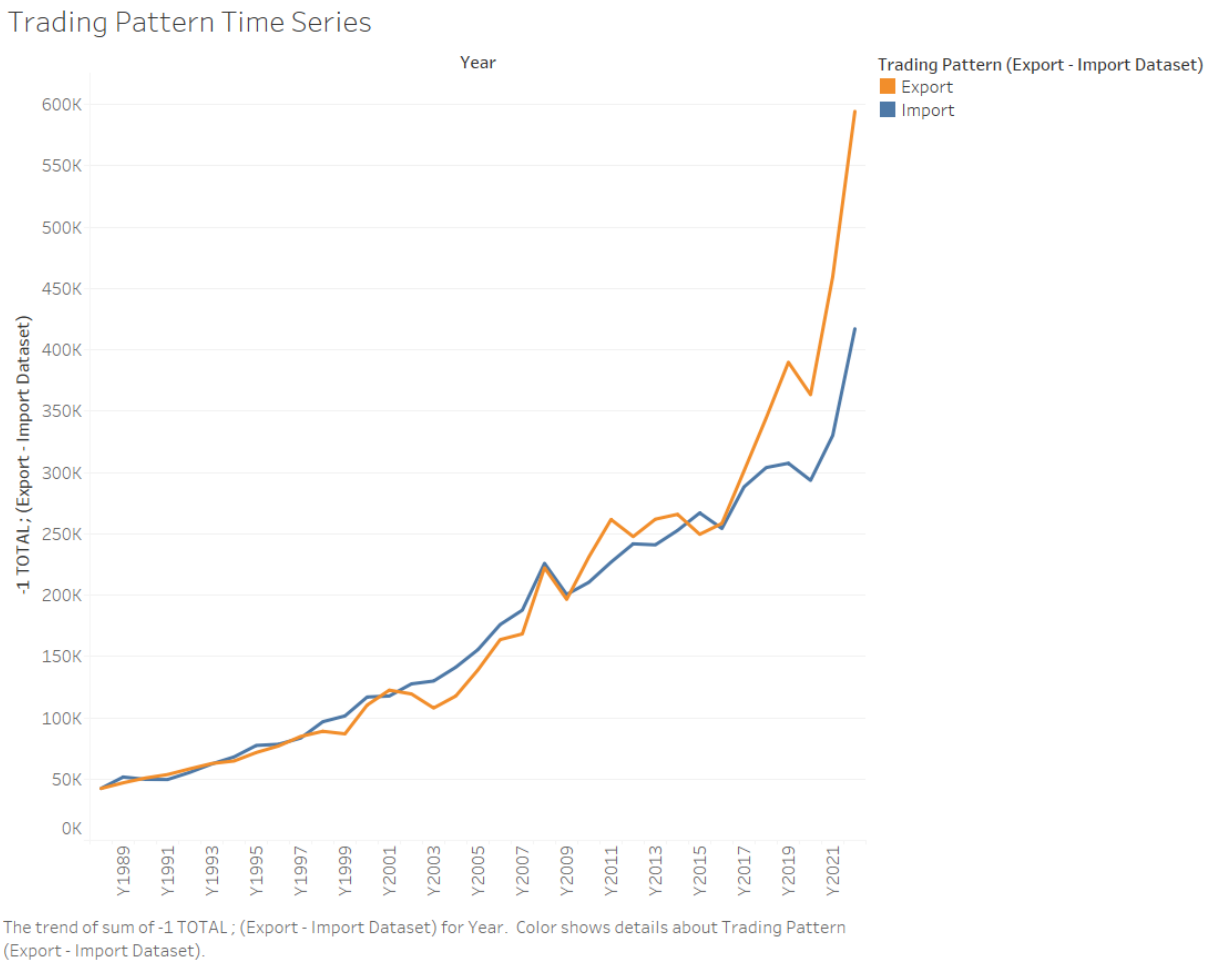
Attribute Name	Type	Description
Year	5 character format in YYYYY, Quantitative	Year of Tournament
Trading Pattern	Binary, Categorical	Divides data by trading pattern, either Export or Import
0 to 98 (From C to CA)	Integer	Percentage of **-1 TOTAL ;**
-1 TOTAL ;	Integer	Total Percentage (100%)

Data Dictionary for Ratio Change

Attribute Name	Type	Description
Year	5 character format in YYYYY, Quantitative	Year of Tournament
Trading Pattern	Binary, Categorical	Divides data by trading pattern, either Export or Import
0 to 98 (From C to CA)	Integer	Percentage change compared to previous year
-1 TOTAL ;	Integer	Percentage change compared to previous year

Trading Pattern:

The first visualisation used to analyze the trading pattern (Export and Import) over the years from 1998 to 2022 is shown in the figure below:



Visualization Technique:

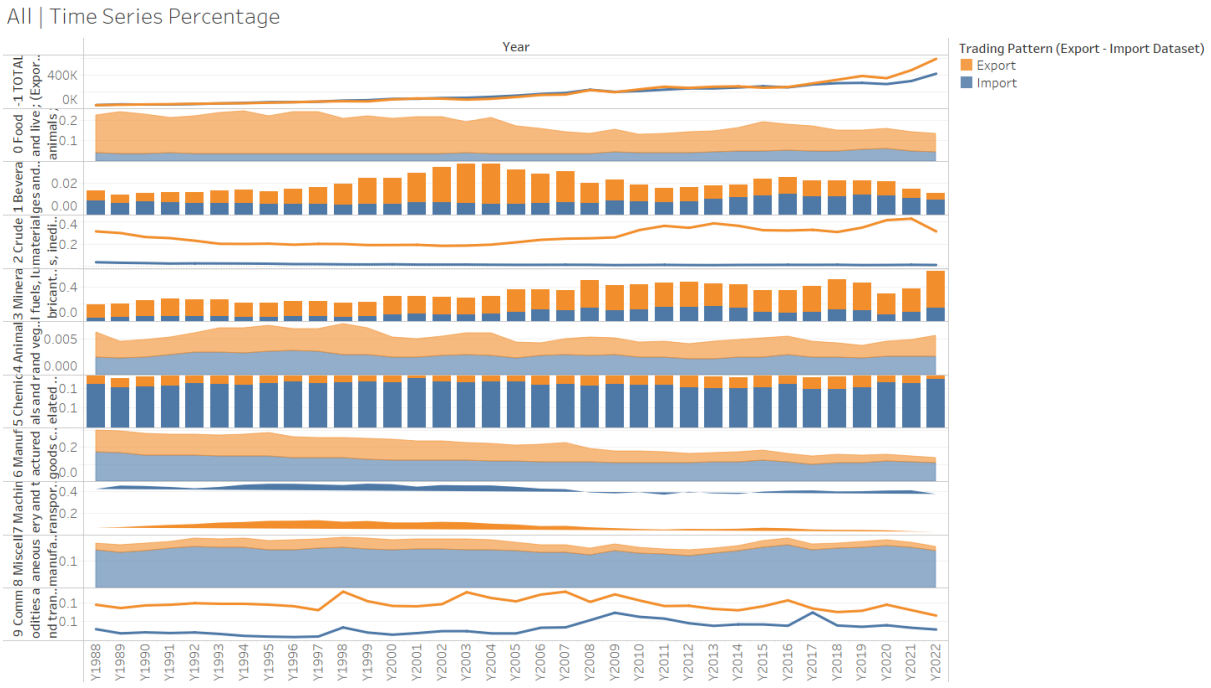
Time Series (Line Chart)

Findings:

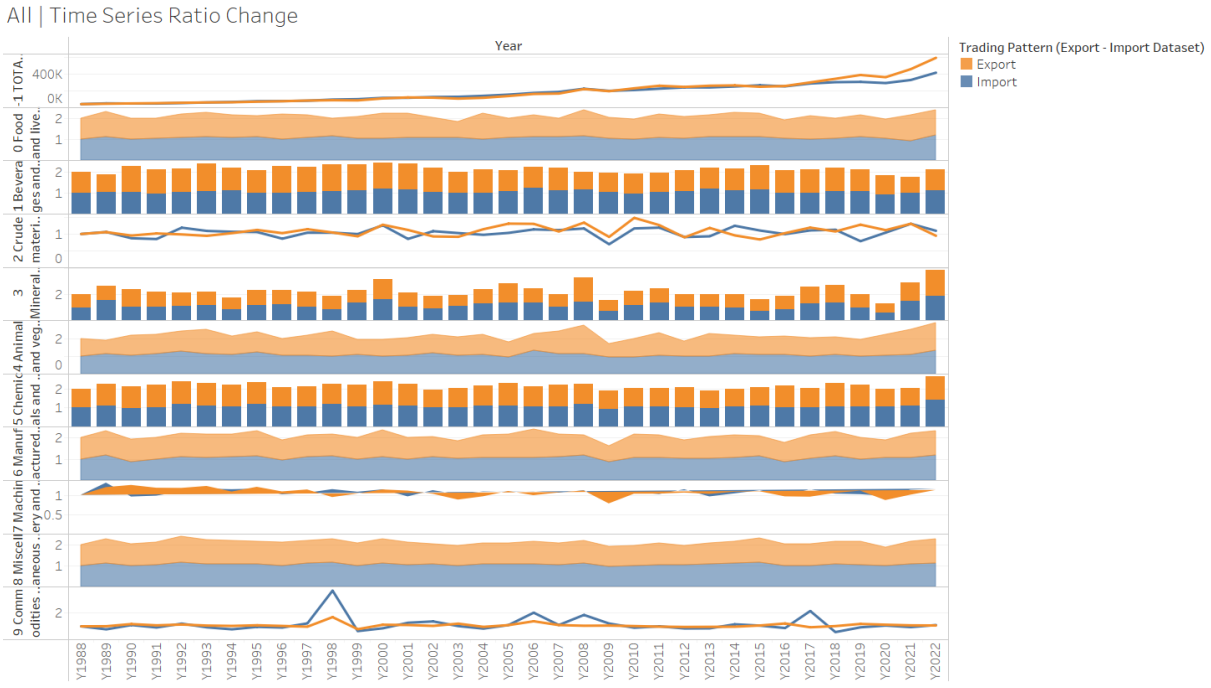
Both Export and Import have been increasing over the period of time. The year 2022 sees the highest growth in trade in terms of volume(millions)

All Main Categories:

The visualisation used to analyze the analytical pattern in import and export for all main categories of the dataset between 1988 to 2022 is shown in the figure below:



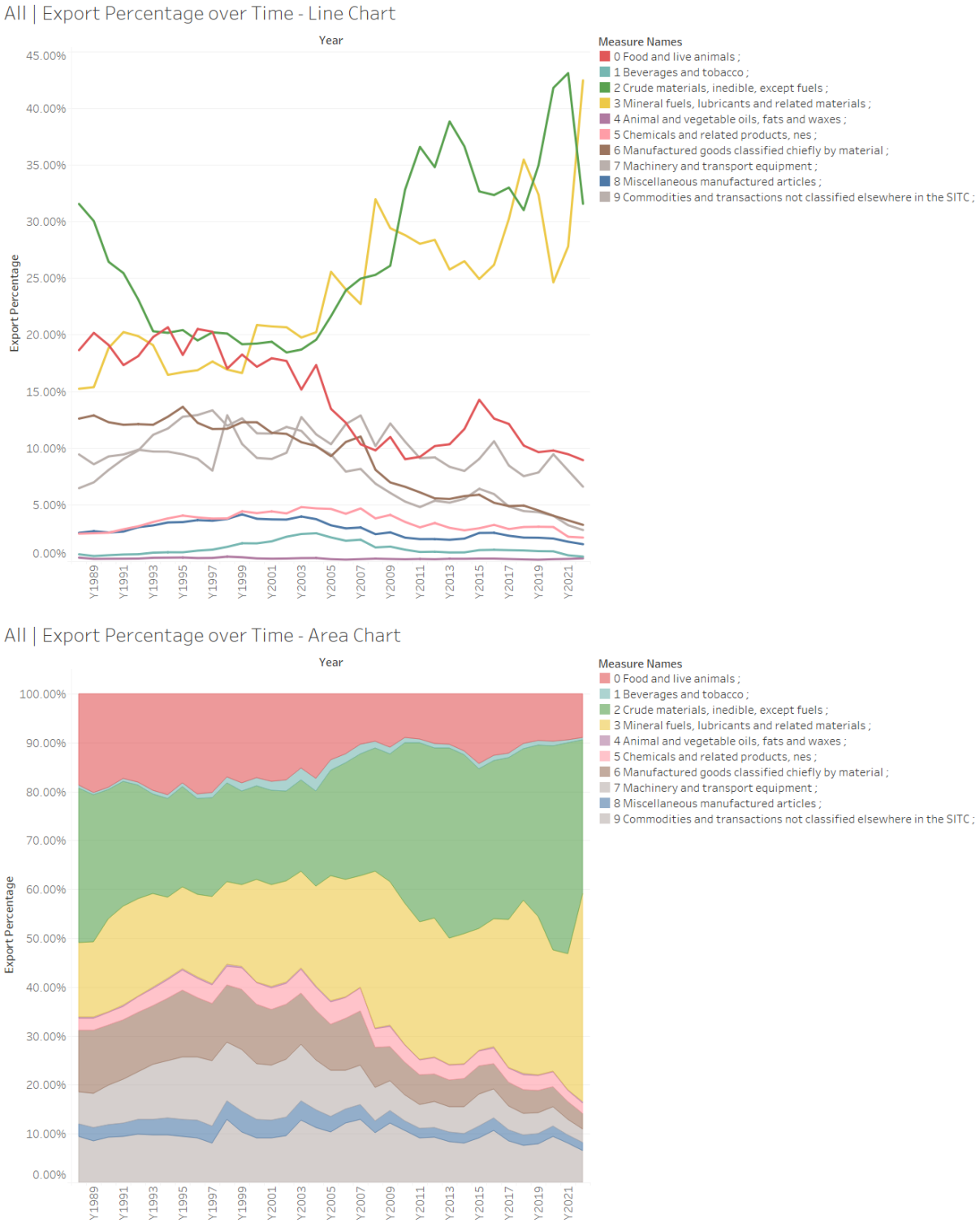
The visualisation used to analyze the statistical pattern in import and export for all main categories of the dataset between 1988 to 2022 is shown in the figure below:



Visualization Technique:

Time Series (Line Chart, Area Chart, Column Chart, Polygon Chart)

The visualisation used to analyze the analytical pattern in Export for all main categories of the dataset between 1988 to 2022 is shown in the figure below:



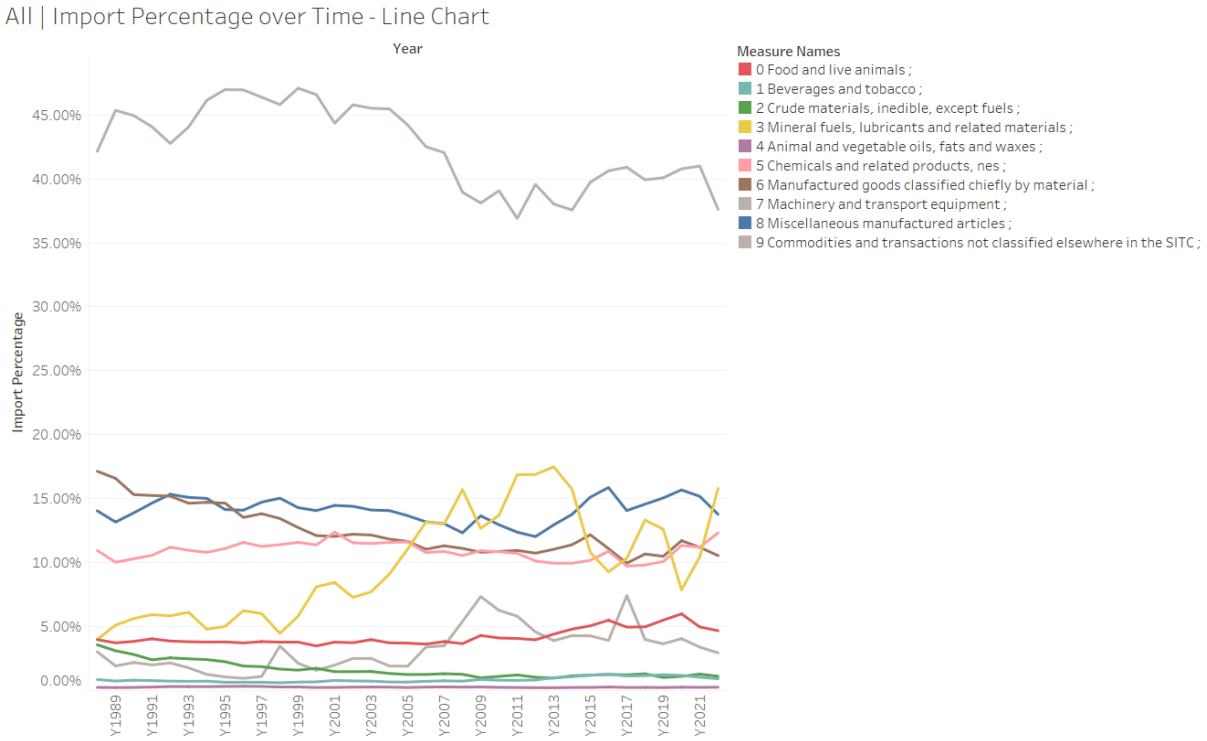
Visualization Technique:

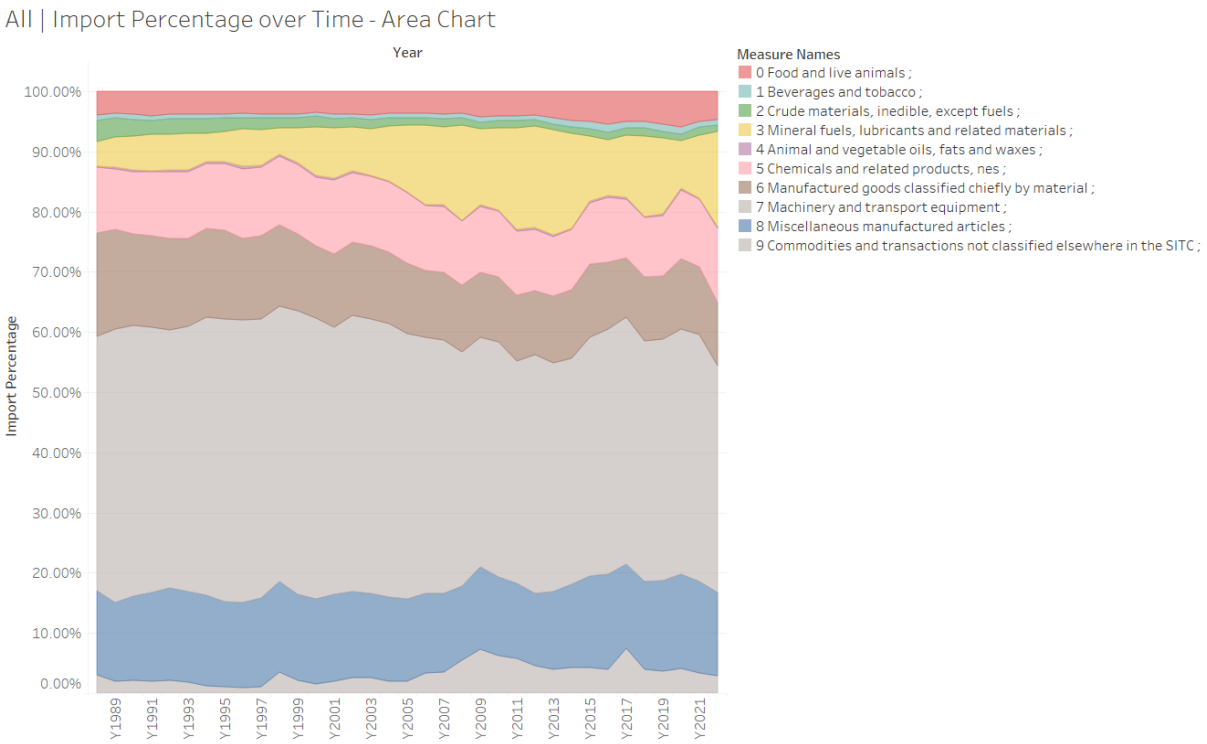
Time Series (Line Chart, Area Chart)

Findings:

- 2 Crude materials, inedible, except fuels and 3 Mineral fuels, lubricants and related materials is traded exported in higher volume compared to other resources.
- 5 Chemicals and related products, nes and 8 Miscellaneous manufactured articles are traded in lower volume compared to other resources.

The visualisation used to analyze the analytical pattern in Import for all main categories of the dataset between 1988 to 2022 is shown in the figure below:





Visualization Technique:

Time Series (Line Chart, Area Chart)

Findings:

- 2 Crude materials, inedible, except fuels and 3 Mineral fuels, lubricants and related materials are traded and exported in higher volume compared to other resources.
- 5 Chemicals and related products, nes and 8 Miscellaneous manufactured articles are traded in lower volume compared to other resources.

SubCategory Overview:

Category 9 Commodities and transactions not classified elsewhere in the SITC; is a mysterious category. It typically includes goods and services that do not fit into the other defined categories of the SITC classification. These commodities and transactions often involve unique or specialized items or trade activities.
To investigate and analyze the main category **9 Commodities and transactions not classified elsewhere in the SITC** its 5 sub-categories, a few dashboards will be configured. The sub-categories are as follows:

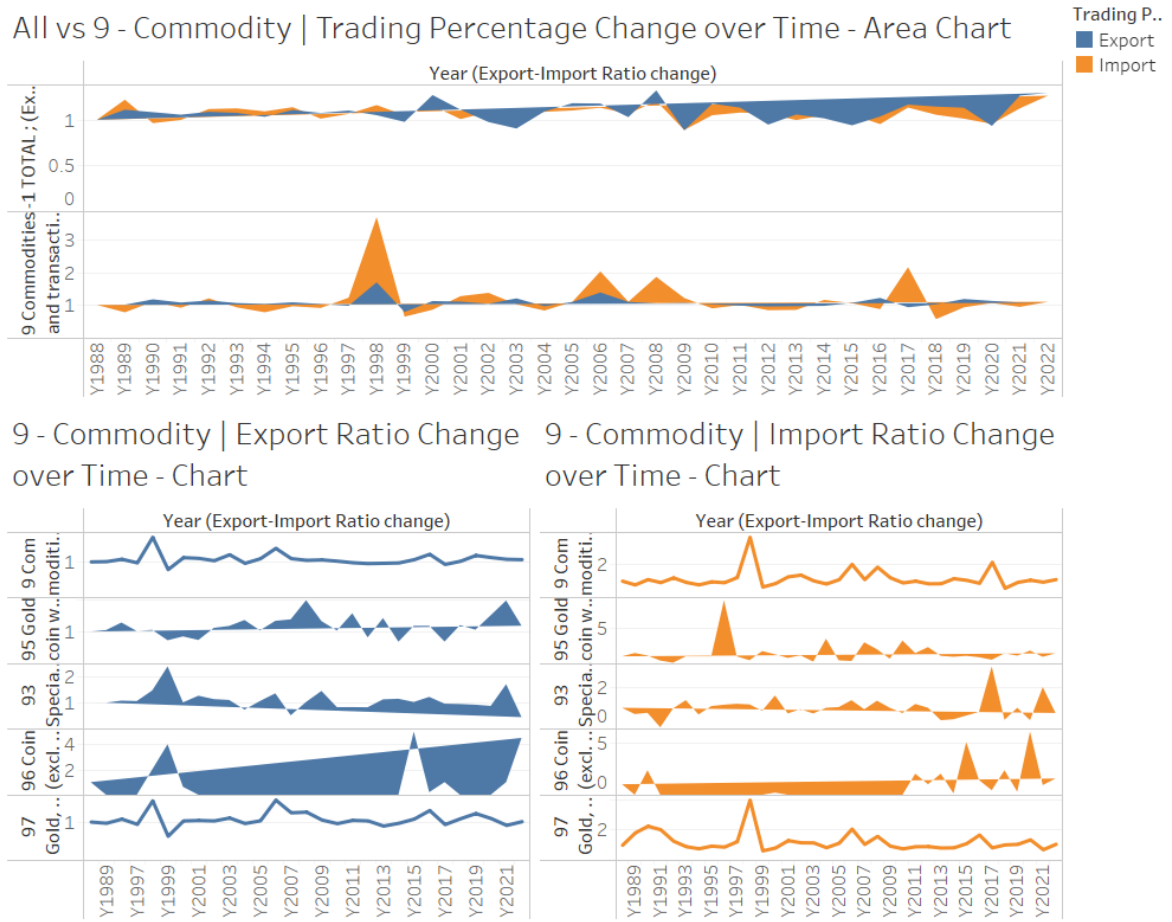
- 93 Special transactions and commodities not classified according to kind
- 95 Gold coin whether or not legal tender, and other coin being legal tender
- 96 Coin (excl. gold coin) not being legal tender
- 97 Gold, non-monetary (excl. gold ores and concentrates)

- 98 Combined confidential items excluding some of SITC 28099 (exports only) and some of SITC 51099 (imports only);

Dashboard:

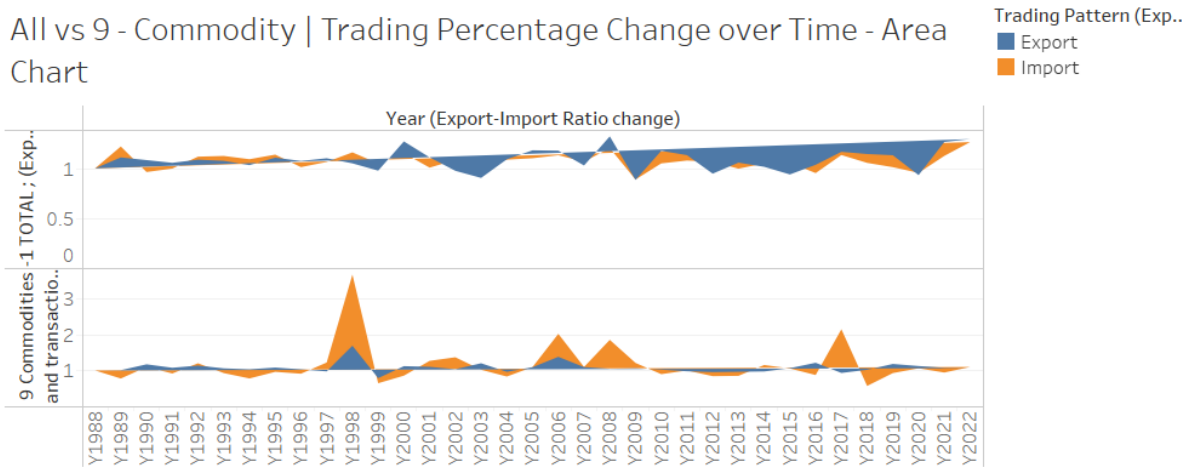
The dashboard is powerful visualization techniques that combine multiple worksheets into a single place for easier and meaningful analysis of multiple data. We can get a quick overview, compare, monitor and make live changes which will be reflected in the data.

Dashboard 1: Ratio changes in Australia's Trade for 9 Commodities and transactions not classified elsewhere in the SITC



The chart on the top consists of two polygon charts that show the import and export total's yearly change for All categories and Category 9.
The two charts on the bottom consist of polygon charts that show the import and export yearly change for all subcategories of Category 9.

Dashboard 2: Changes and Trends in Australia's Trade for 9 Commodities and transactions not classified elsewhere in the SITC



9 - Commodity | Export-Import Percentage | Table

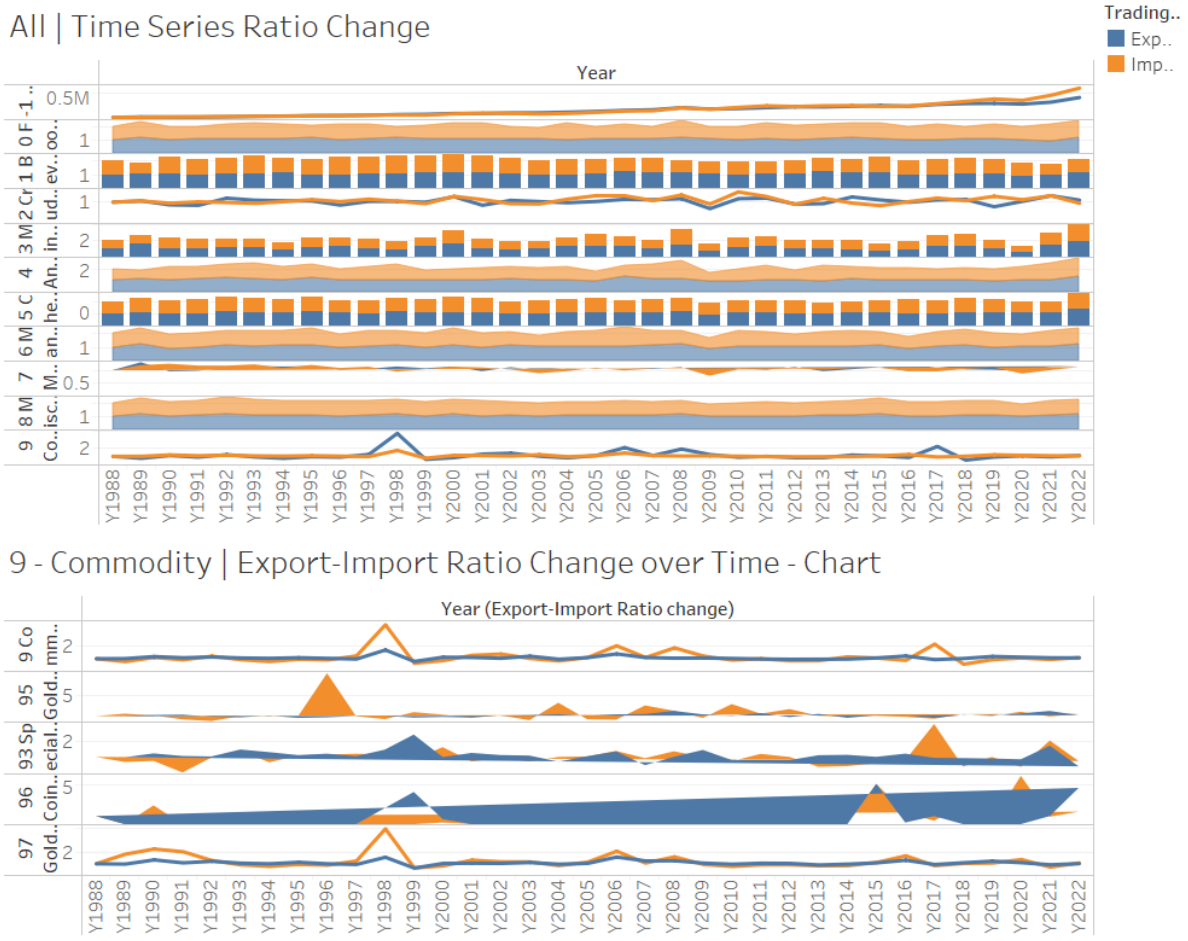
Year	Trading ..	93 Sp..	95 Go..	97 Go..	98 C
Y1988	Export	0.37%	0.46%	6.31%	2.3
	Import	2.20%	0.04%	0.25%	0.5
Y1989	Export	0.33%	0.44%	5.51%	2.3
	Import	1.26%	0.05%	0.37%	0.2
Y1990	Export	0.37%	0.49%	6.76%	1.6
	Import	0.99%	0.06%	0.86%	0.2
Y1991	Export	0.37%	0.60%	6.89%	1.5
	Import	0.06%	0.02%	1.74%	0.1
Y1992	Export	0.35%	0.50%	7.67%	1.3
	Import	0.05%	0.00%	1.99%	0.1
Y1993	Export	0.47%	0.35%	7.46%	1.4
	Import	0.06%	0.00%	1.61%	0.1

9 - Commodity | Export - Import Percentage over Time - Table

Year (Ex..	Trading ..	9 Comm..	93 Speci..	95 Gol
Y1988	Export	100.00%	100.00%	100.0
	Import	100.00%	100.00%	100.0
Y1989	Export	100.72%	98.08%	104.5
	Import	77.43%	69.63%	147.0
Y1990	Export	117.05%	121.57%	121.9
	Import	109.75%	75.73%	112.0
Y1991	Export	107.43%	105.91%	128.4
	Import	91.39%	5.68%	39.2
Y1992	Export	113.50%	103.05%	90.0
	Import	120.04%	96.43%	9.0
Y1993	Export	105.80%	145.32%	76.8
	Import	92.57%	137.04%	100.0

This dashboard compares different data types.
The chart on the top consists of two **polygon charts** that show the import and export total **yearly change** for All categories and Category 9.
The two charts on the bottom consist of **table charts** that show the import **yearly change** and export **yearly percentage** for all subcategories of Category 9.

Dashboard3: Ratio changes in Australia's Trade for 9 Commodities and transactions not classified elsewhere in the SITC



The chart on the top consists of a combination of charts ie polygon, line, column, and area charts that show the import and export total yearly change for all main categories.
The chart on the bottom consists of polygon charts that show the yearly trading pattern change for all subcategories of Category 9.

Storyboard:

A storyboard is a feature in Tableau that allows us to create a sequence of visualizations using different worksheets and dashboards to tell a data-driven story and present insights in a meaningful format.
I created 5 story points in total. Let's take a look at it.

Story 1

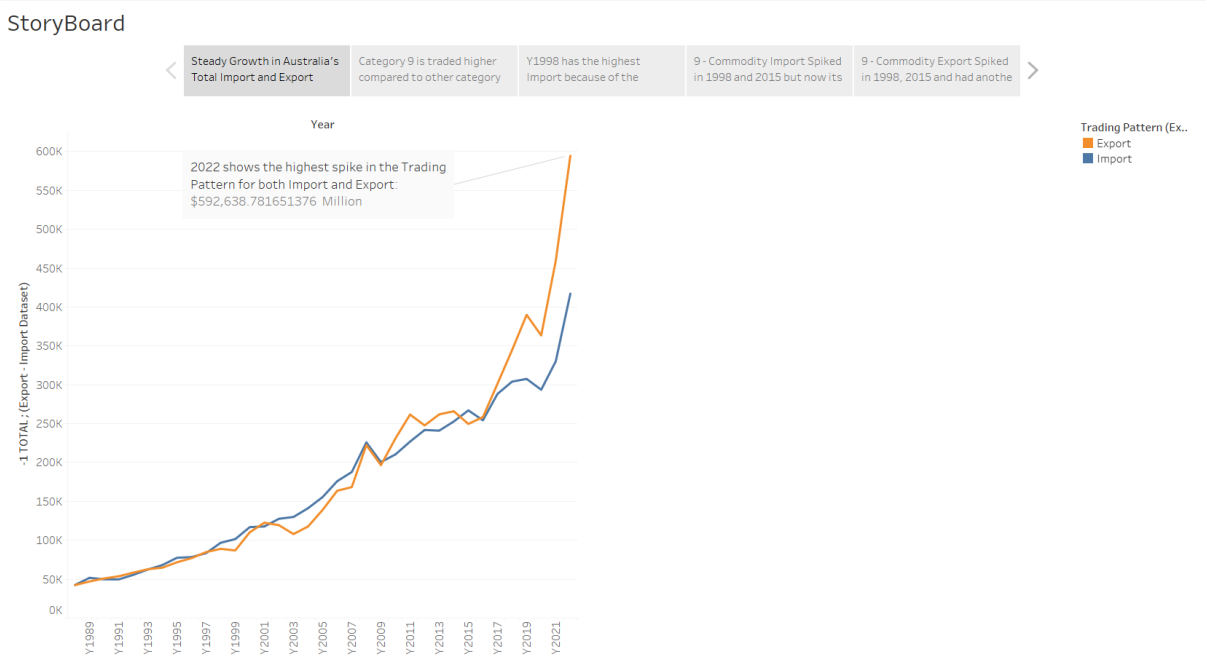


Figure shows: Steady Growth in Australia's Total Import and Export

Story 2

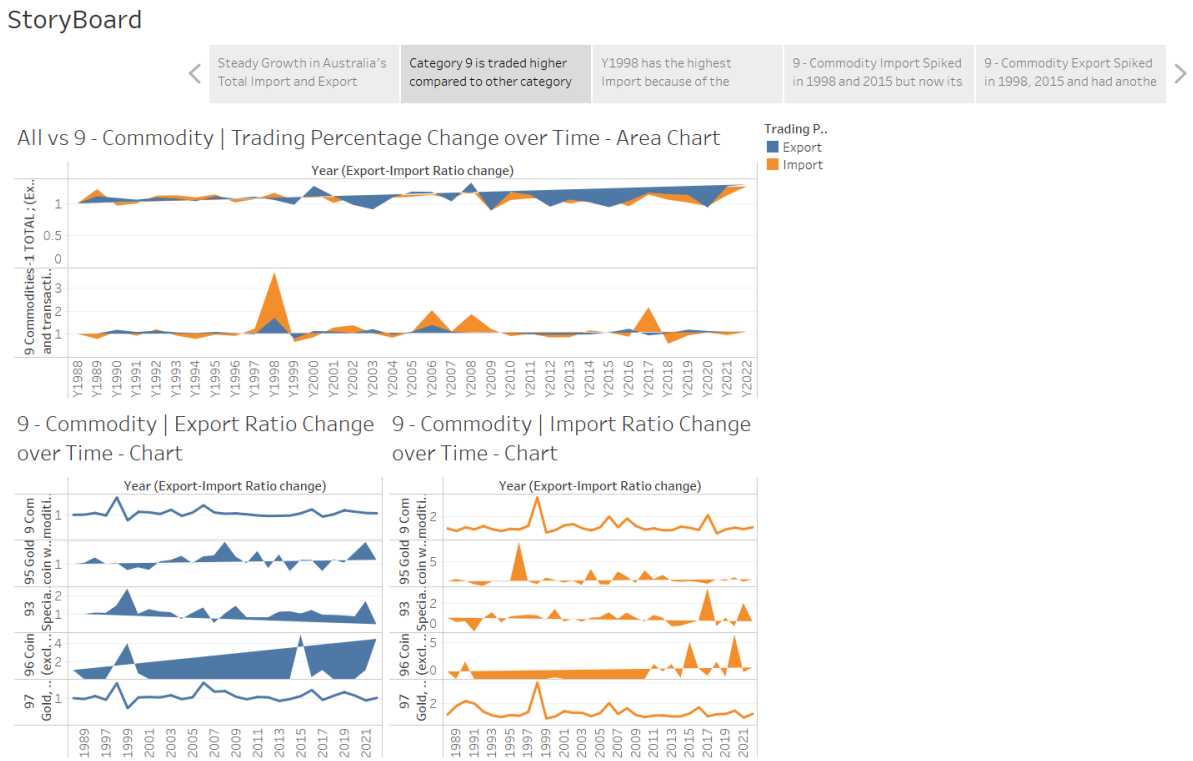


Figure shows: Category 9 is traded higher compared to other categories

Story 3

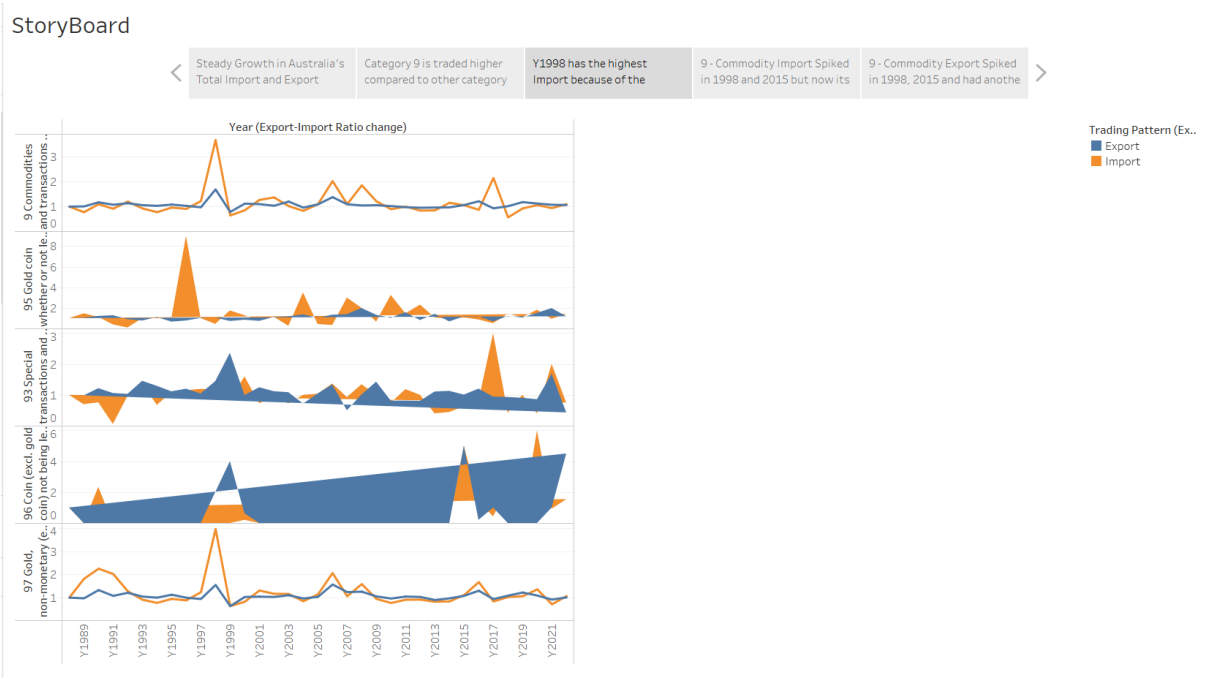


Figure shows: Y1998 has the highest Import because of the increase in the import of 97 Gold, non-monetary (excl. gold ores and concentrates) ;

Story 4

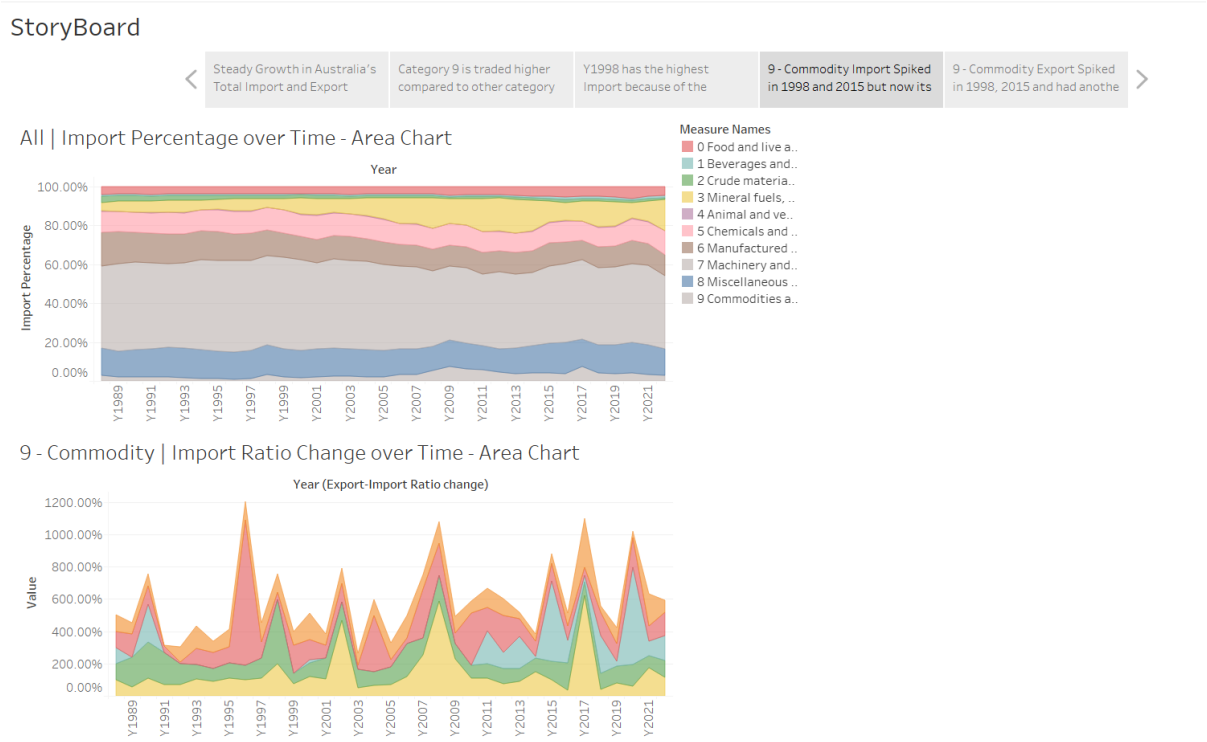


Figure shows: 9 Commodities and transactions not classified elsewhere in the SITC Import Spiked in 1998 and 2015 but now it's in a downward trend

Story 5

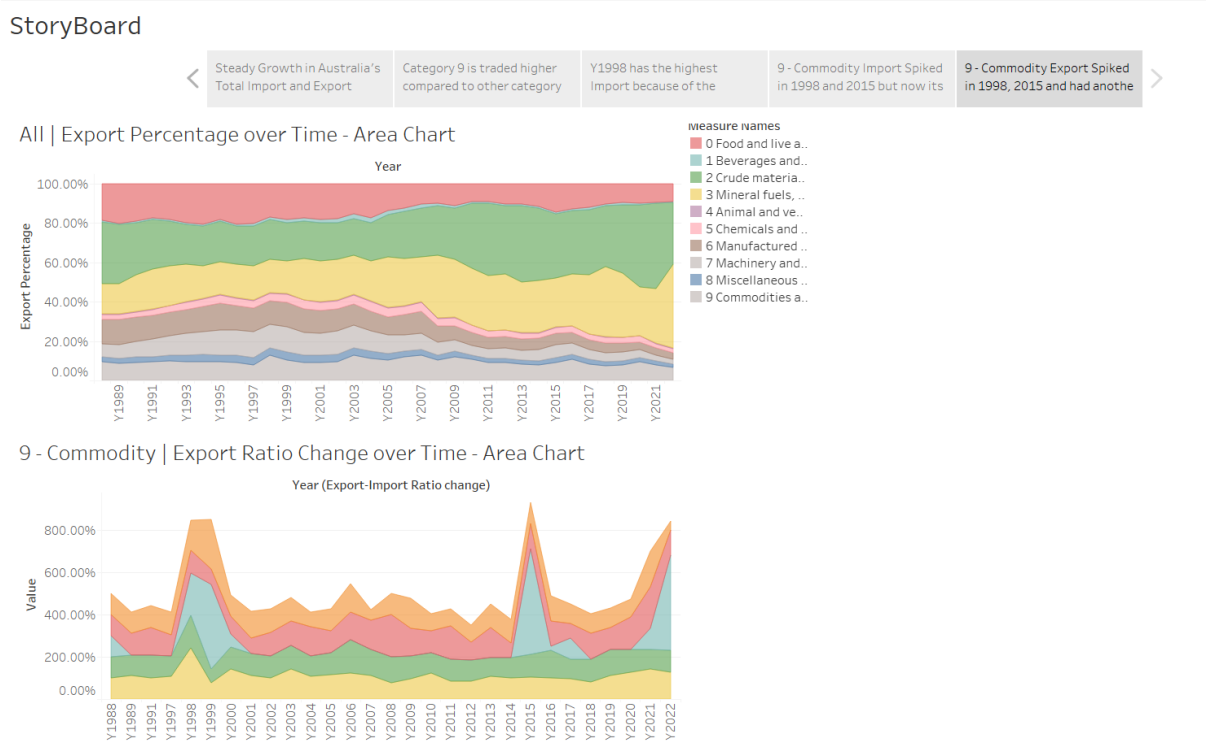


Figure shows: 9 Commodities and transactions not classified elsewhere in the SITC Export Spiked in 1998, 2015 and had another spike in 2022

Summary of Advantages:

Dashboard

Dashboards in Tableau offer several advantages that can greatly enhance data analysis and visualization. Here are four key advantages of using dashboards in Tableau:

Data Consolidation and Centralization: Dashboards allow you to consolidate multiple visualizations, charts, and data sources into a single, centralized view. Instead of toggling between various worksheets or reports, users can access all relevant information in one place. This consolidation simplifies data exploration, analysis, and decision-making by providing a comprehensive overview of the key metrics and insights.

Interactive Data Exploration: Tableau dashboards are highly interactive, enabling users to explore and interact with data dynamically. Users can filter, drill down, and highlight specific data points or dimensions to gain deeper insights. By interacting with the visualizations on the dashboard, users can ask questions, test hypotheses, and uncover patterns or trends that may not be immediately apparent. This interactivity promotes a more exploratory and iterative approach to data analysis.

Customization and Personalization: Dashboards in Tableau can be customized to meet specific user requirements and preferences. Users can design and arrange visualisations, charts, and other elements to suit their needs. This flexibility allows individuals to focus on the metrics and dimensions most relevant to their roles or areas of interest. Additionally, users can create filters, parameters, and calculations within the dashboard, enabling them to tailor the data analysis to their specific requirements and explore different scenarios.

Real-Time Monitoring and Collaboration: Dashboards provide real-time or near-real-time monitoring of key metrics and performance indicators. By connecting to live data sources, users can monitor and track changes as they occur, enabling proactive decision-making and quick response to trends or anomalies. Dashboards also facilitate collaboration and sharing of insights within teams or across an organization. Users can share interactive dashboards with colleagues or stakeholders, enabling them to explore the data independently, provide feedback, and collaborate on data-driven initiatives.

Overall, Tableau dashboards offer the advantages of data consolidation, interactive exploration, customization, and real-time monitoring, which collectively improve data analysis, decision-making, and collaboration. By presenting data in a visually appealing and user-friendly format, dashboards empower users to extract actionable insights and drive business outcomes effectively.

Storyboard

Storyboarding in Tableau offers several advantages that can enhance the presentation and communication of data insights. Here are four key advantages of using storyboards in Tableau:

Storytelling and Narrative Flow: Storyboards provide a narrative structure to your data analysis, allowing you to tell a compelling story. By arranging visualizations in a specific order, adding annotations, and guiding the audience through a logical sequence, you can create a cohesive and engaging narrative that highlights key insights and discoveries. Storyboards help to communicate the context, background information, and the main message you want to convey, making it easier for the audience to understand and remember the story behind the data.

Emphasis on Key Findings: With storyboards, you can emphasize and focus on the most important findings or trends within your data. By carefully selecting and arranging visualizations, you can direct the audience's attention to critical insights and discoveries. Storyboards enable you to highlight key points, supporting evidence, and relevant context, ensuring that your audience grasps the significance of the data and its implications.

Visual Appeal and Engagement: Storyboards in Tableau allow you to create visually appealing and interactive presentations. You can incorporate charts, graphs, maps, images, and other visual elements to enhance the aesthetics and engagement of your storytelling. With customizable layouts, fonts, colours, and transitions, you can design a visually captivating and professional-looking storyboard that captures the audience's attention and keeps them engaged throughout the presentation.

Efficient Communication and Collaboration: Storyboards serve as a concise and efficient means of communicating data insights to various stakeholders. Whether you are presenting to clients, colleagues, or decision-makers, storyboards provide a clear and structured format that can be easily shared and understood. By encapsulating the key findings and supporting visuals in a single storyboard, you can facilitate discussions, feedback, and collaboration around the data. Additionally, storyboards can be saved, exported, or published, allowing you to distribute the insights widely or present them in meetings and reports.

Overall, storyboards in Tableau enable you to transform raw data into a compelling narrative, highlighting key insights and engaging the audience effectively. By leveraging the advantages of storytelling, visual appeal, and efficient communication, you can enhance the impact and understanding of your data analysis.

Executive Summary:

The Interactive charts, dashboards, and storyboards focus on exploring the Australia International Trade dataset, which includes 35 years of dataset between 1988 and 2022. The dataset has import and export information, including 10 main categories and 67 sub-categories. Each sub-category involves multiple industries' performances on productivity and resources.

The tools I have used for exploratory and visualization purposes are mainly Excel and Tableau. The different charts and graphs that help us analyze the given datasets are

1. Line Chart
2. Column Chart
3. Area Stack Chart
4. Polygon Chart

Conclusion:

The Interactive charts, dashboards, and storyboards have effectively revealed the trends and patterns in the Australia International Trade dataset. The analysis provides us with the following insights:

- Australia has a positive balance of Trade ie overall Export is higher than Import
- 2 Crude materials, inedible, except fuels and 3 Mineral fuels, lubricants and related materials accounts for over 70% of total export for 2022 whereas 7 Machinery and transport equipment and 3 Mineral fuels, lubricants and related materials accounts for over 50% of total imports.
- Category 9 Commodities and transactions not classified elsewhere in the SITC is traded in higher volume compared to other categories
- Both Import and Export for 9 Commodities and transactions not classified elsewhere in the SITC are in a downward trend for 2022.
- Out of all the subcategories, 96 Coin (excl. gold coin) not being legal tender Export ratio is the most inconsistent.