



32146 Data Visualisation and Visual Analytics - Autumn 2024

Assessment Task 3

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Table of Contents

<i>Executive Summary</i>	3
<i>Data Preparation</i>	3
Statistical Pattern (Ratios)	3
Analytical Pattern (Changes).....	4
Combining the dataset in tableau.....	4
<i>All Main Categories Analysis</i>	4
<i>Dashboard</i>	8
<i>Storyboard</i>	9
<i>Summary of advantages</i>	14
<i>Conclusion</i>	14

Table of Figures

Figure 1 Adding Dataset to Tableau	4
Figure 2 Analytical pattern for all Main Categories	5
Figure 3 Statistical Pattern for all Main Categories	5
Figure 4 Area Chart of Raw Dollar Value Trend for all Main Categories	6
Figure 5 Bubble Chart for all Main category based on Trade type.	6
Figure 6 Area Chart and Line Chart for All Main Category Import Ratio	7
Figure 7 Area and Line chart for all Main category Export Ratio	7
Figure 8 Dashboard 1- All Main Categories Trade	8
Figure 9 Dashboard 2- Sub Category Trade	9
Figure 10 Storyboard: Export Composition of all Main Categories	10
Figure 11 Storyboard: Import Composition of all Main Categories	11
Figure 12 Storyboard: Trend of Total Trade	11
Figure 13 Storyboard Sub-category trade	12
Figure 14 Storyboard: Change and trend of Food and Live animals Category.	13
Figure 15 Storyboard: Bubble chart of sub-categories.	13

Executive Summary

The report focuses on exploring the dataset of Australian International Trade which is extracted from ABS Statistics containing over 30 years of data between 1988 and 2023. Australia has strong international trade of various commodities over the years in either export or import trade. The dataset includes international trade of Australia from the year 1988 to 2023, includes both import and export data for over 30 years. This report focuses on summarising the key findings about Australian trade. The dataset contains 10 main categories and 67 sub-categories, the data is measured in Australian Dollars (In Millions). This report will provide evaluation of each category with the help of patterns calculated in excel and visualizations created in Tableau.

The 10 main categories include:

0. Food and live animals
1. Beverages and tobacco
2. Crude materials, inedible, except fuels
3. Mineral fuels, lubricants, and related materials
4. Animal and vegetable oils, fats and waxes
5. Chemicals and related products, nes
6. Manufactured goods classified chiefly by material.
7. Machinery and transport equipment
8. Miscellaneous manufactured articles
9. Commodities and transactions not classified elsewhere in the SITC.

Based on the recent transformation in Australia's in Food Industry, I have selected Category-Food and live animals as my Main Category to be further analysed.

Data Preparation

Data preparation is an important step to prepare data to be presented in more meaningful way for visualization and can be used for conducting an analysis. This step ensures to identify significant differences between the magnitudes of categories and sub-categories, making it difficult to visualise the data. For in-depth analysis of patterns, it can be facilitated with the help of Statistical Approach (Ratio sheet) and Analytical Approach (Change sheet).

Statistical Pattern (Ratios)

The statistical pattern refers to the find percentage of every category and sub-category's export-import for the year 1988 to 2023. It highlights the relationships between the variables in dataset.

Using the formula different patterns, trends and distributions are identified. Category 'i' ranges from 0 to 9

$$\text{Percentage_Ratio}_{(i-\text{import})} = \text{sub-total}_{(i-\text{import})} / \text{total}_{(\text{import})} * 100$$

$$\text{Percentage_Ratio}_{(i-\text{export})} = \text{sub-total}_{(i-\text{export})} / \text{total}_{(\text{export})} * 100$$

For sub-category the formula is:

$$\text{Percentage-Sub}_{(j-\text{import})} = d_{(j-\text{import})} / \text{sub-total}_{(j-\text{import})} * 100$$

$$\text{Percentage-Sub}_{(j-\text{export})} = d_{(j-\text{export})} / \text{sub-total}_{(j-\text{export})} * 100$$

Where 'j' is the range of sub-category (such as 1 to 10) and d is data at sub-category at 'j' position. All the data in Statistical approach are in percentage.

Analytical Pattern (Changes)

The analytical pattern is used to measure the change in pattern every year for specific category and sub-category. To get these patterns the data of current year is divided with the previous year. The row with year 1988 is deleted because is not possible to calculate a value for the year 1988 as there is no previous data available.

The formula to calculate the yearly change:

$$\text{Ratio_Change}_{(i)} = d_{(i)} / d_{(i-1)} * 100$$

Where 'i' is the year for categories and sub-categories.

Combining the dataset in tableau

The excel sheet has combined Dollar trend dataset along with statistical and analytical pattern calculated above are also in separate dataset. These three excel files are added in tableau and connected with a relationship. The dimension 'Year' and 'Trade Type' are linked from each dataset as shown in the Figure 1.

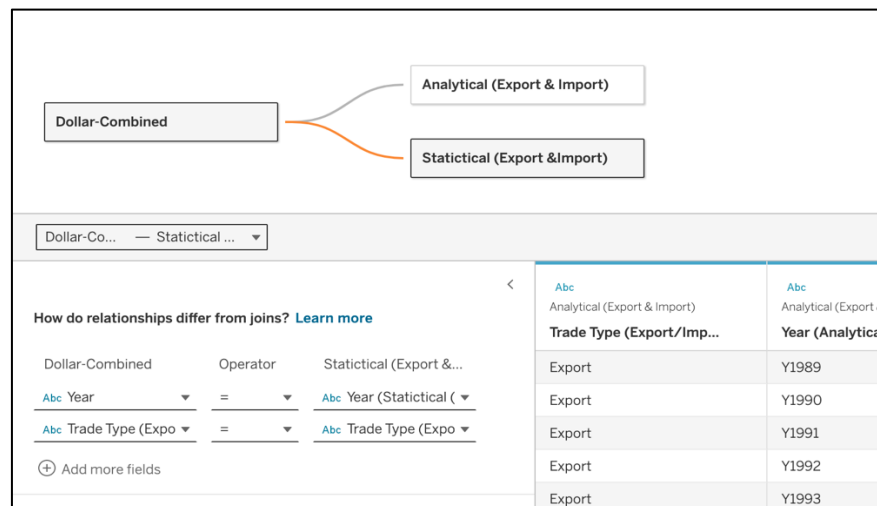


Figure 1 Adding Dataset to Tableau

All Main Categories Analysis

The first analysis is a visualization of analytical pattern of all main categories of their import and export trade for the year 1988 to 2023. Using Time series chart as shown in Figure 2, the analytical pattern is visualized of all main categories and the trade type is differentiated with the help of different colour (Orange for import and blue for export). The horizontal axis represents the year from 1988 to 2023. The vertical axis represents all the main categories from the analytical calculations in percentage. To highlight the analytical percentage increase, reference line is created which indicates the change ratio of 100% for each category.

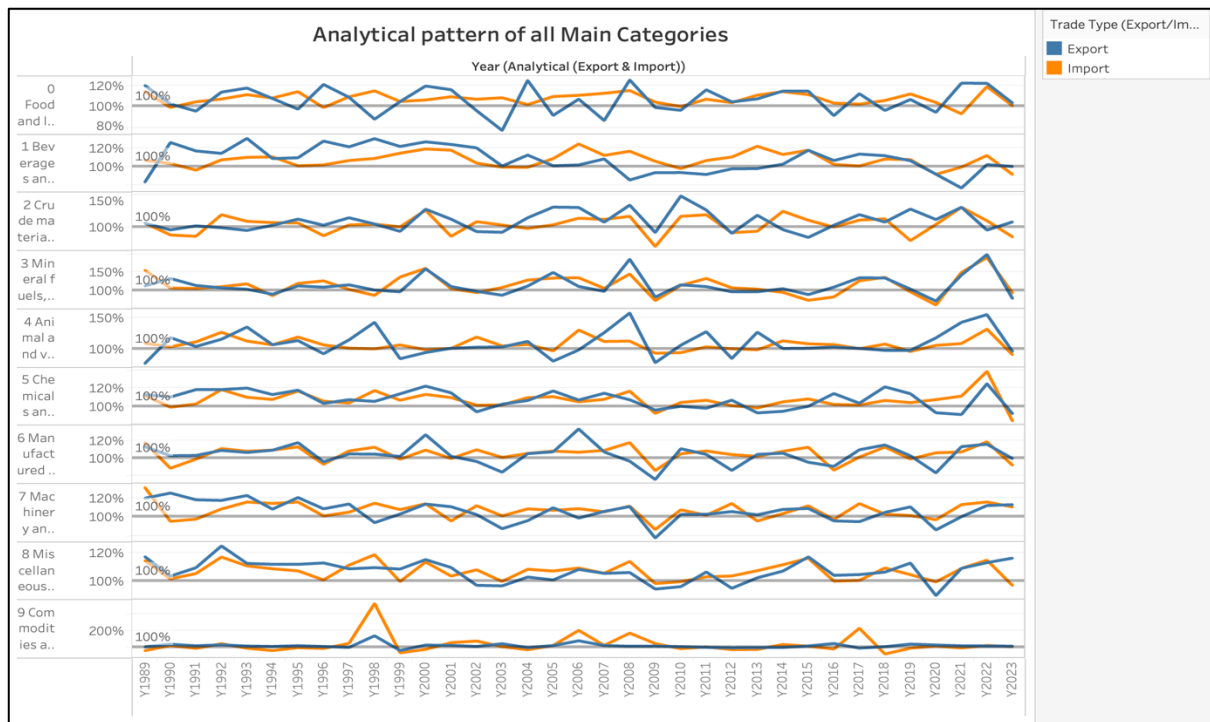


Figure 2 Analytical pattern for all Main Categories

The second visualization is also a time series chart to analyse the statistical pattern of import and export trade over the year 1988 to 2023. Using Time series chart as shown in Figure 2, the statistical pattern is visualized for all main categories and the trade type is differentiated with the help of different colour (Orange for import and blue for export). The horizontal axis represents the year from 1988 to 2023. The vertical axis represents all the main categories from the statistical calculations in percentage. The visualization contains multiple graphs such as bar graph, polygon visualization, circles, and line chart.

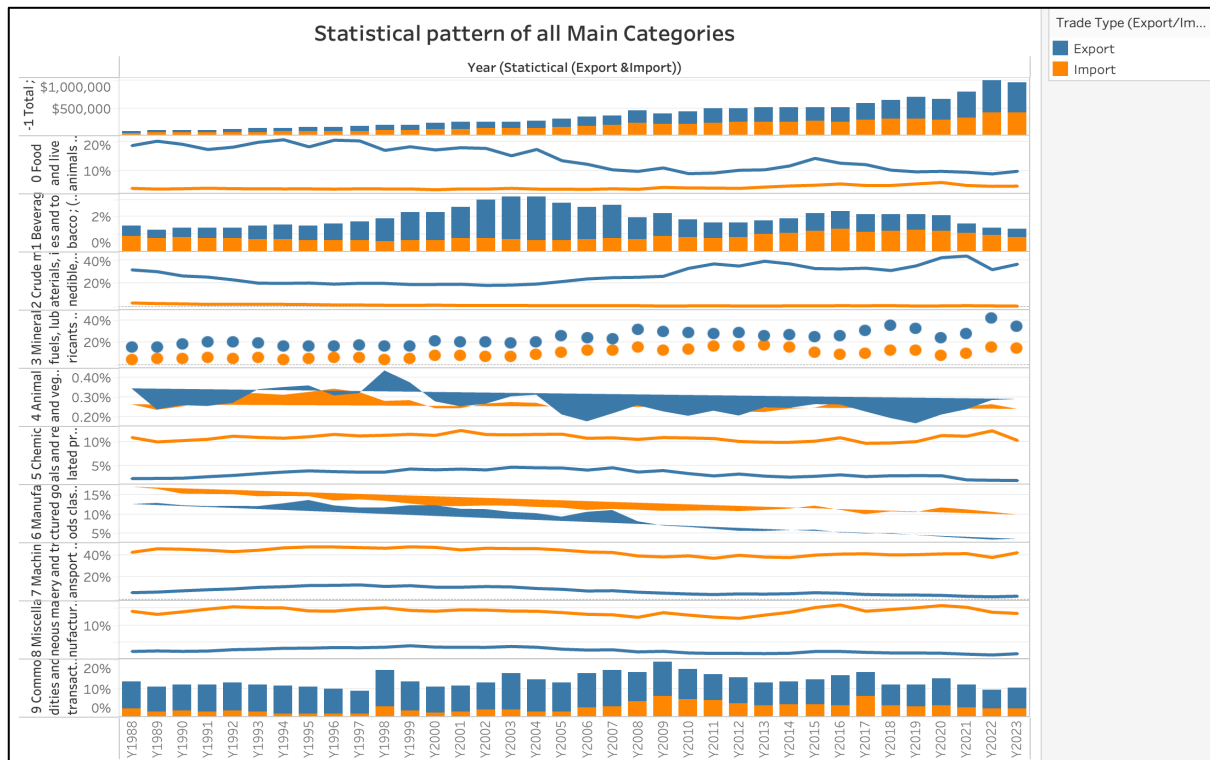


Figure 3 Statistical Pattern for all Main Categories

The third visualization is an area chart of all main categories in dollars (\$) for export and import trade type. This visualization technique has better way to portray the two separate trade type for all categories with Dimension value.

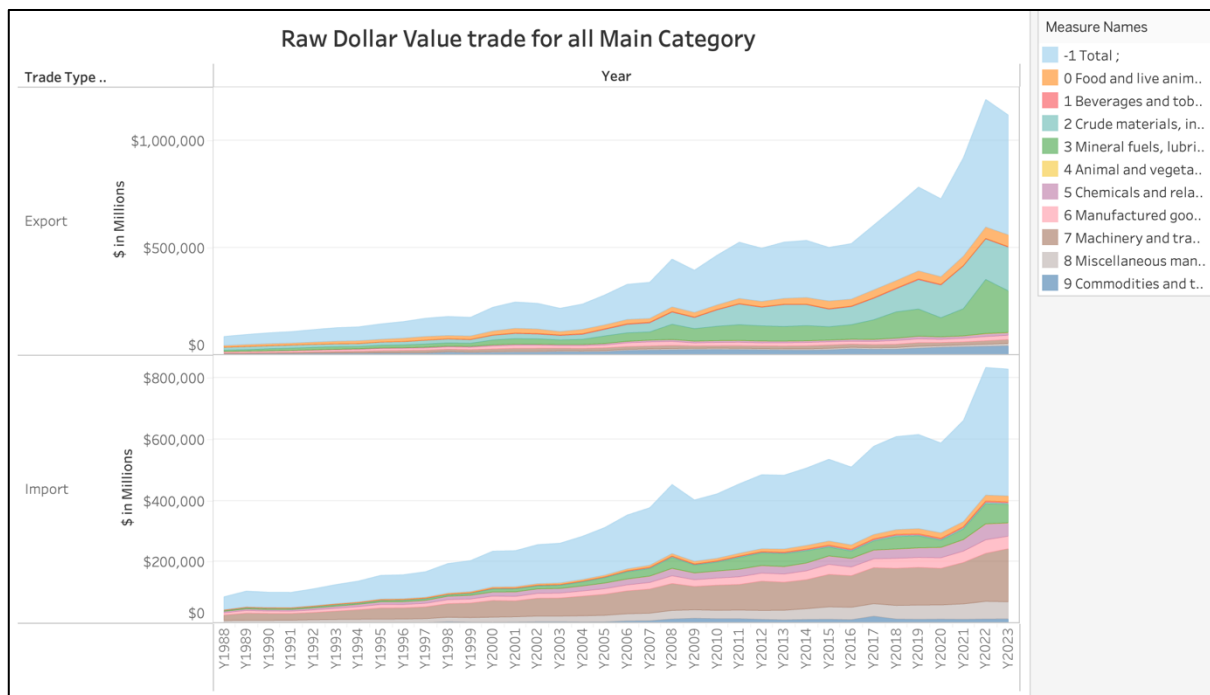


Figure 4 Area Chart of Raw Dollar Value Trend for all Main Categories

To Simplify the Australian International Trade and get insight on which Category has more trade. Bubble chart is used to differentiate the Main category trade based on size of the circle and using colour differentiator to separate different Categories. As seen in the Figure 5, Trade type is used as column with filter of export and Import. Dimension such as categories are identified and based on their value the size of the bubble chart helps to differentiate these categories from each other.

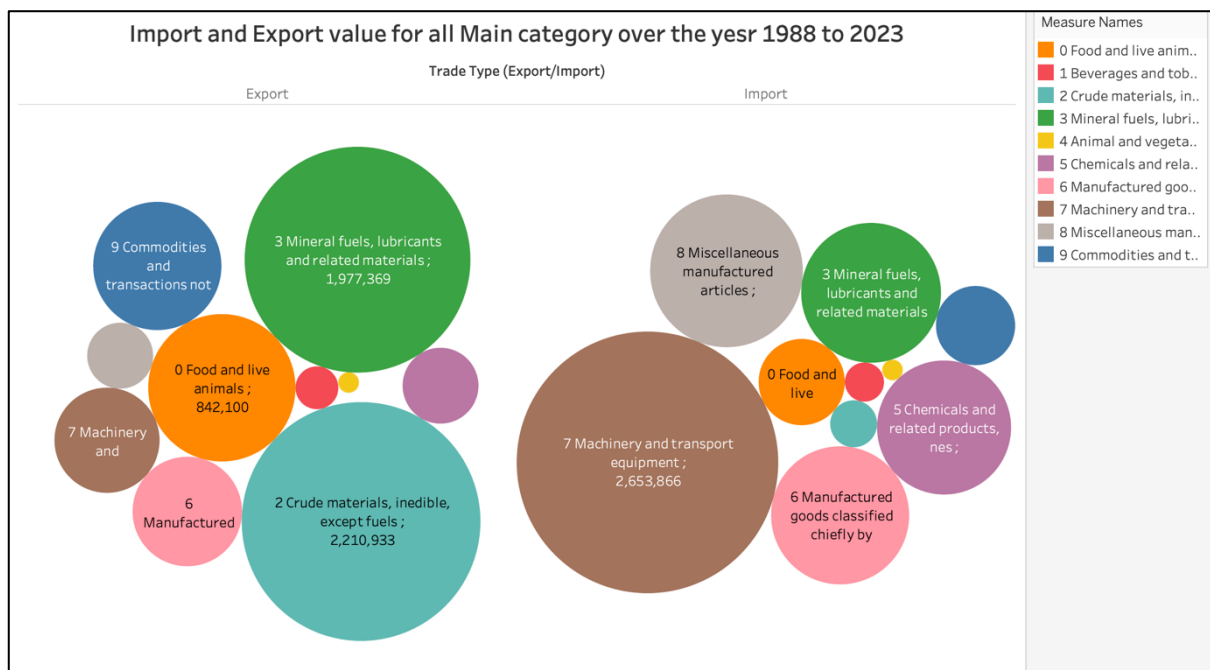


Figure 5 Bubble Chart for all Main category based on Trade type.

The Import Ratio for all categories are shown in the figure below with the help of line and area chart. In both the chart Horizontal Axis showcase the year from 1988 to 2023. The Statistical patterns are used to analyse the Import ratio over the years for all Main categories. The Area chart includes summation of all the main category values which results in 100% maximum value on Vertical axis. The line chart focuses on showcasing the Import Ratio in percentage which also highlights how many categories overlap each other. Example: My selected Main category – ‘Machinery and transport equipment’ overlaps with ‘Chemicals and related products, nes’ and ‘Manufactured goods classified chiefly by material’ from 2005 onwards.

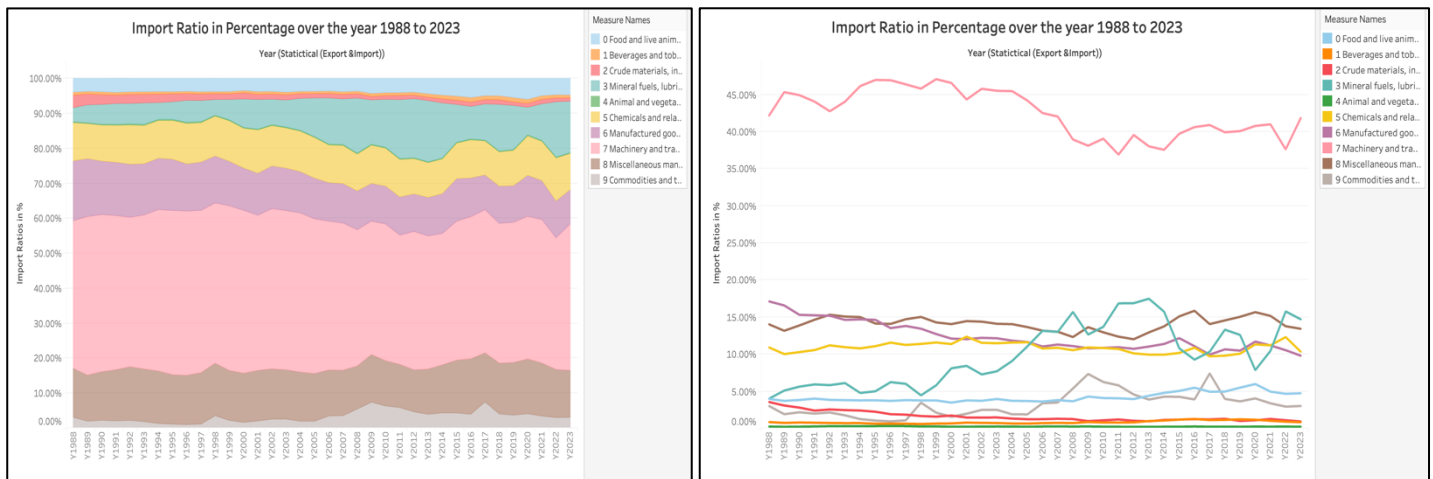


Figure 6 Area Chart and Line Chart for All Main Category Import Ratio

The Export Ratio for all categories are shown in the figure below with the help of line and area chart. In the below figure, Same as Import Ratio, Horizontal Axis showcase the year from 1988 to 2023. The Statistical patterns are used to analyse the export ratio over the years. for all Main categories. The Area chart includes summation of all the main category values which results in 100% maximum value on Vertical axis. From the below figure, the export of category ‘Crude materials, inedible, except fuels’ is larger than other category, following up is the category ‘Mineral fuels, lubricants and related materials’. Category ‘Crude materials, inedible, except fuels’ had maximum of 43.25% export in the year 2021 and significantly dropped next year in 2022 at 31.71%. The drop is 26.68% in the ‘Crude materials, inedible, except fuels’ category in 2022 and 2021.

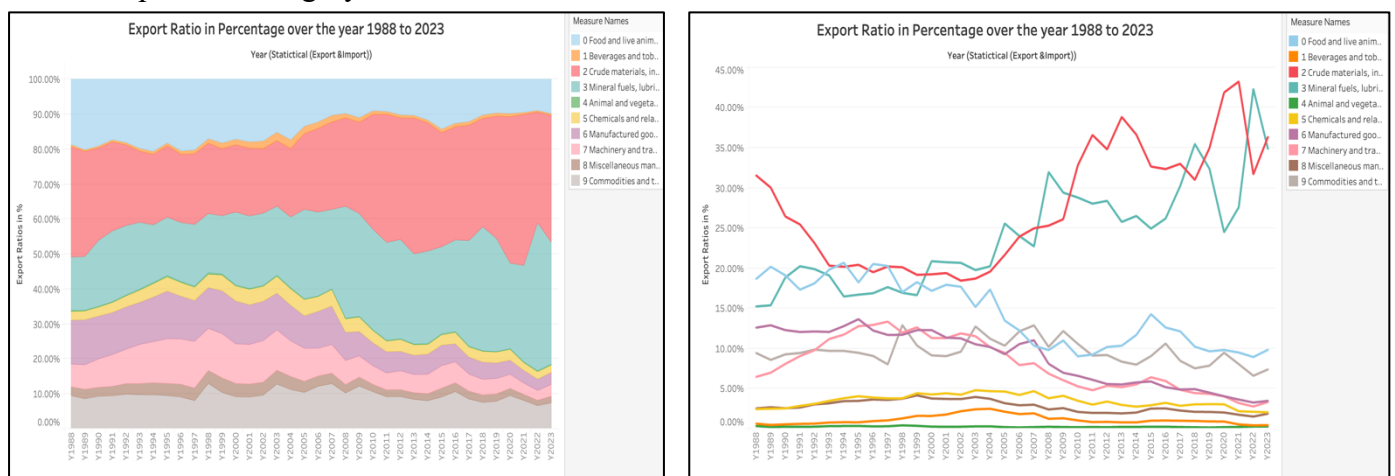


Figure 7 Area and Line chart for all Main category Export Ratio

Dashboard

To Highlight the Main categories trade ratio for import and export over the years 1988 to 2023. The dashboard shows the flow of export and import of all the main categories The year filter can be modified to look for data for a single year or combination of different years making it interactive. The colour differentiator for all the main categories in dashboard charts makes it easy to identify which main category to look for. The Machinery and Transport Equipment category has highest Import trade over the years and Crude Materials, inedible, except fuels has highest export from Australia.

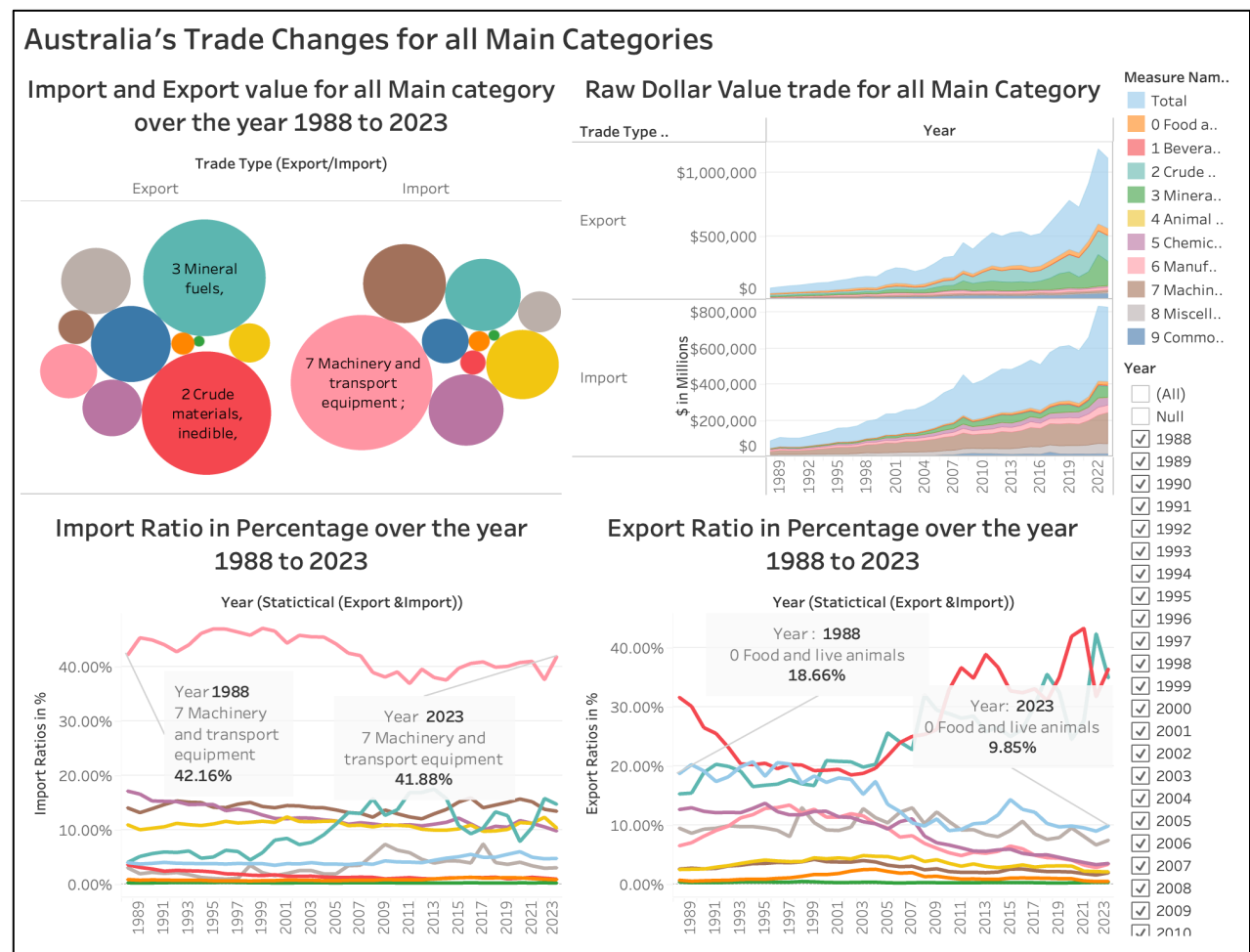


Figure 8 Dashboard 1- All Main Categories Trade

The Food industry in Australia is wide and one of the significant industries in the country, other than producing wide variety products such as meat, Fish, dairy, fruits, vegetables, essentials and live animals, Australia is also into international Trade for this category. The Export of this category plays an important role in Australia's economy and food trade globally. To explore the major trends and investigate the changes in trends for the trade (import and export). The dashboard is configuring to highlight the data for the selected main category – Food and live animals. The dashboard is interactive where the colour differentiator helps in understanding the import and export trends of all the sub-category. The Line chart highlights that export of total trade has significantly increasing over the years compared to import. The statistical analysis highlights that the category- Food and live animals export and import has increased after the pandemic.

The dashboard in figure 9, showcase the subcategory of Food and live animals distribution in export and Import. In Export trade of Meat and Meat preparation is highest and there is significant growth in Cereals and Cereals preparation in year 2022 at \$20,672 (\$ in Millions) compared to year 2020 during pandemic. In year 2023, the export value drops at \$20,643, resulting in drop at 0.14%.

In Import Line chart, sub-category 'Miscellaneous edible products and preparations' has highest import trade of \$4,066 in 2022, where in 1988 the Import value was \$177. The Import Growth of 'Miscellaneous edible products and preparations' has grown approximately 2197.74% times over the years. In year 2023, there is slight drop in value to \$4,035 which has decreased by 0.76%.

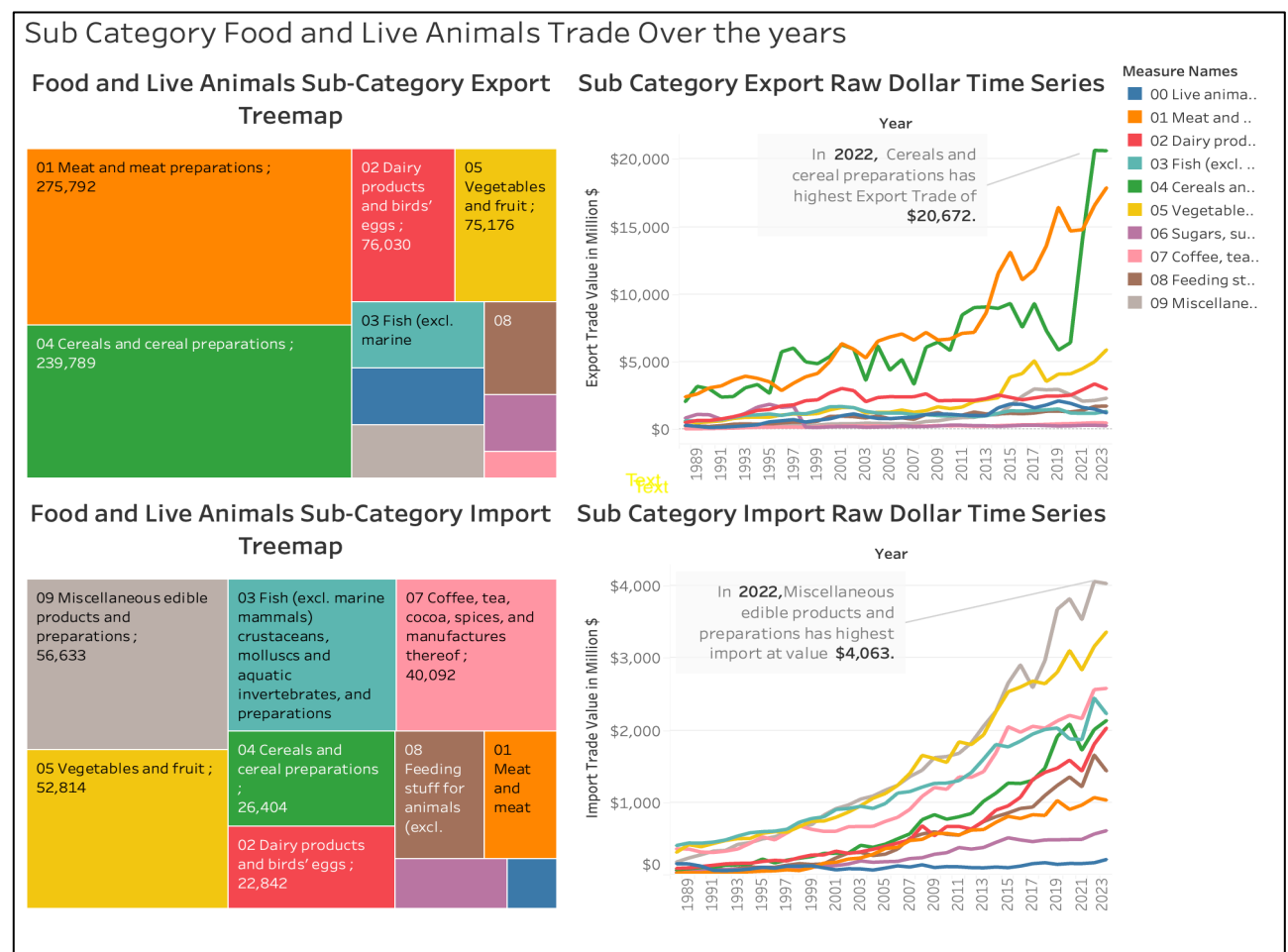


Figure 9 Dashboard 2- Sub Category Trade

Storyboard

Story Point 1

To showcase the composition of export of all the main category to analyse the Recent trend and change over the years. The Category of 'Crude materials, inedible, except fuels' has highest export contribution over the years. The category selected by me is Food and Live animals, the Export Ratio Percentage for the category has decreased of 47.21% from the year 1988 and 2023. The Area Chart highlights the Percentage composition of all the main categories. All the categories are colour coded across three different visualization maintaining the uniformity.

Story 1

Export Composition for All the Main category over the years

Import Composition for All Main Category over the years

Australia's trend for Total Trade over the years.

Trend in food and Live animal Category.

Food and Live Animal Category changes and Trends in Australia.

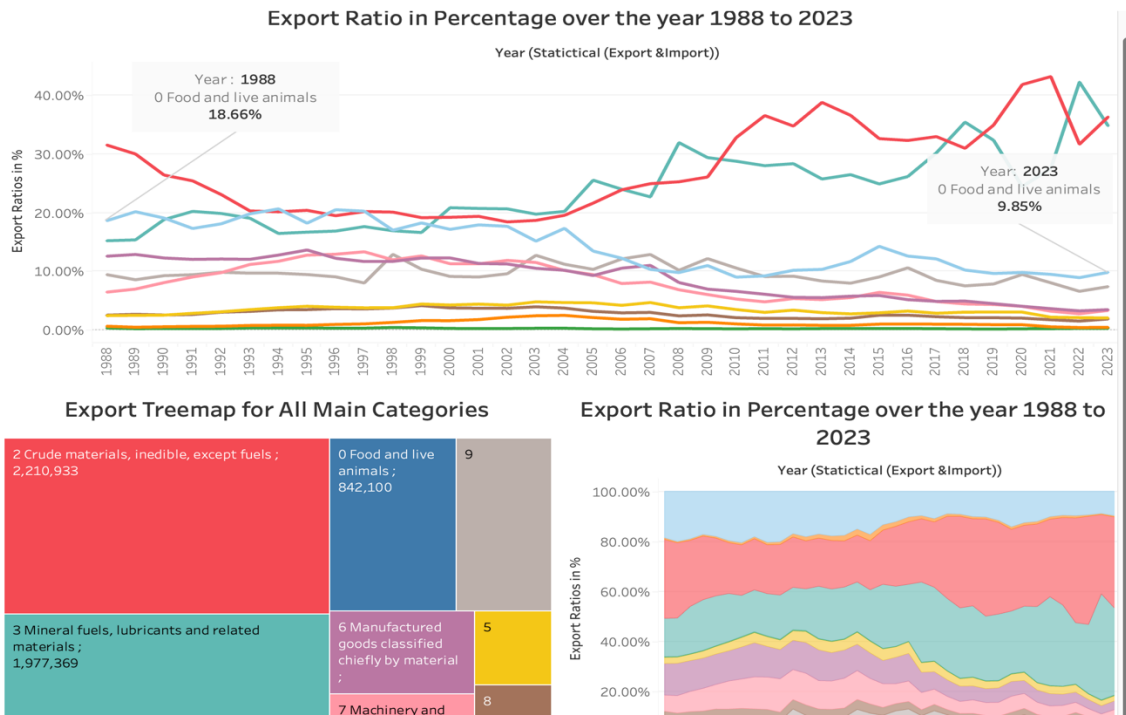


Figure 10 Storyboard: Export Composition of all Main Categories

Story Point 2

The story point 2 includes the Import Composition of all the main categories. The line chart represents the statistical Import ratio in % where Machinery and Transport equipment subcategory has the highest import contribution. This contribution I also seen in Treemap and Area chart visualization. There is steady increase in the import of this category. The category Food and Live animals selected for further analysis has Import Ratio in the range of 3.5% to 6.5% only. There is minor fluctuation in import ratio but not drastic drop or increase.

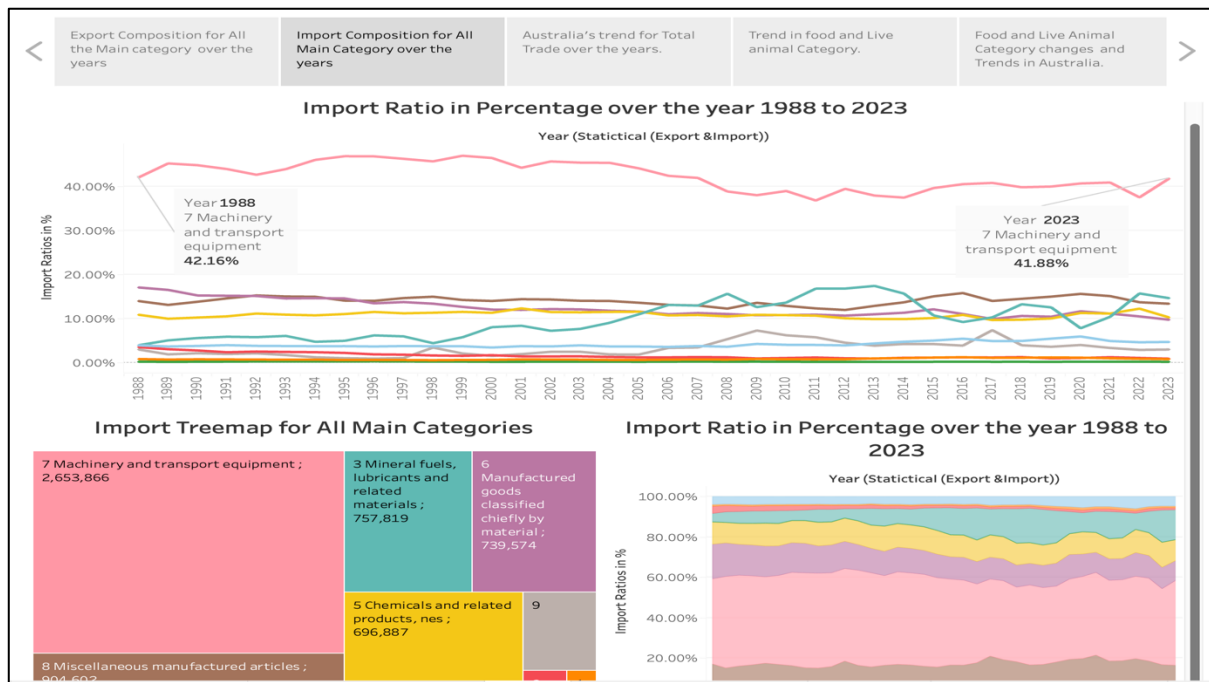


Figure 11 Storyboard: Import Composition of all Main Categories

Story Point 3

This story point highlights the trend in Australia's international trade. From the line chart, we can see the drop in year 2020 due to Covid-19 Pandemic, the export and import trade both were affected. As the drop in 2020 occurred, significant increase in trade for both export and import is seen. The export trade in 2020 was \$ 362,728 Millions, in 2021 it increased to \$458,168 Millions which is 26.31% Increase.

Similarly, In Import the drop in year 2020 occurred at \$293,603 Millions, and in year 2021 it increased to \$330,234 Millions which an increase of 12.48%.

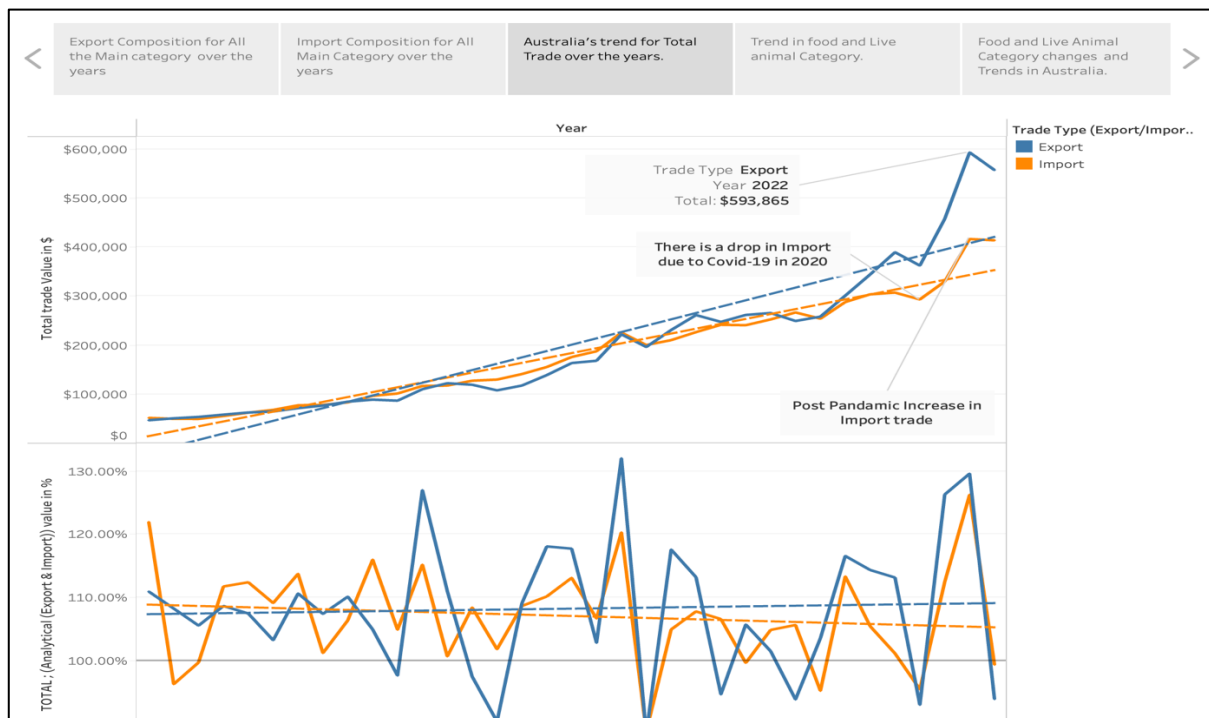


Figure 12 Storyboard: Trend of Total Trade

Story Point 4

The Category selected is Food and Live animals, so this story point mentions all the sub-category distribution in Export and import trade for the year 1988 to 2023. The growth in Cereals and Cereals preparation is \$20,672 (\$ in Millions) in year 2022 which is highest, and the export value drops with 0.14% decrease. Treemap of sub-categories helps in identifying highest trade, which are shown with the help of two separate treemaps.

The story point also includes the Raw dollar trade of these sub-categories, using colour coded theme on every visualization to ensure uniformity.

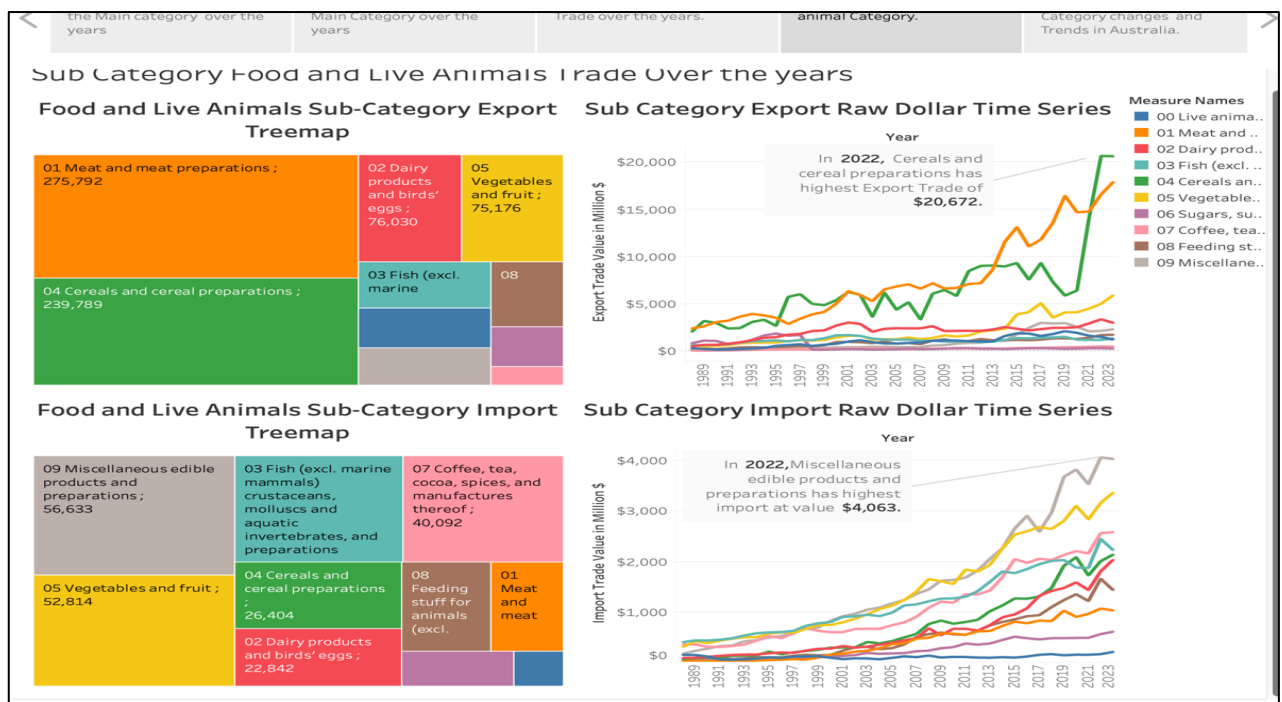


Figure 13 Storyboard Sub-category trade

Story Point 5

To Compare and analyse the Trade Total value and Category 'Food and Live animals'. These two dimensions are view through polygon graph to analyse the trend and changes over the years. In year 2003 there is drastic drop in export of Food and live animals at 77%. In year 2020, the export and import trade both are affected where the value is closer to reference line. Year 2022 is considered to have highest trade as well as highest export for the category with value of 122%.

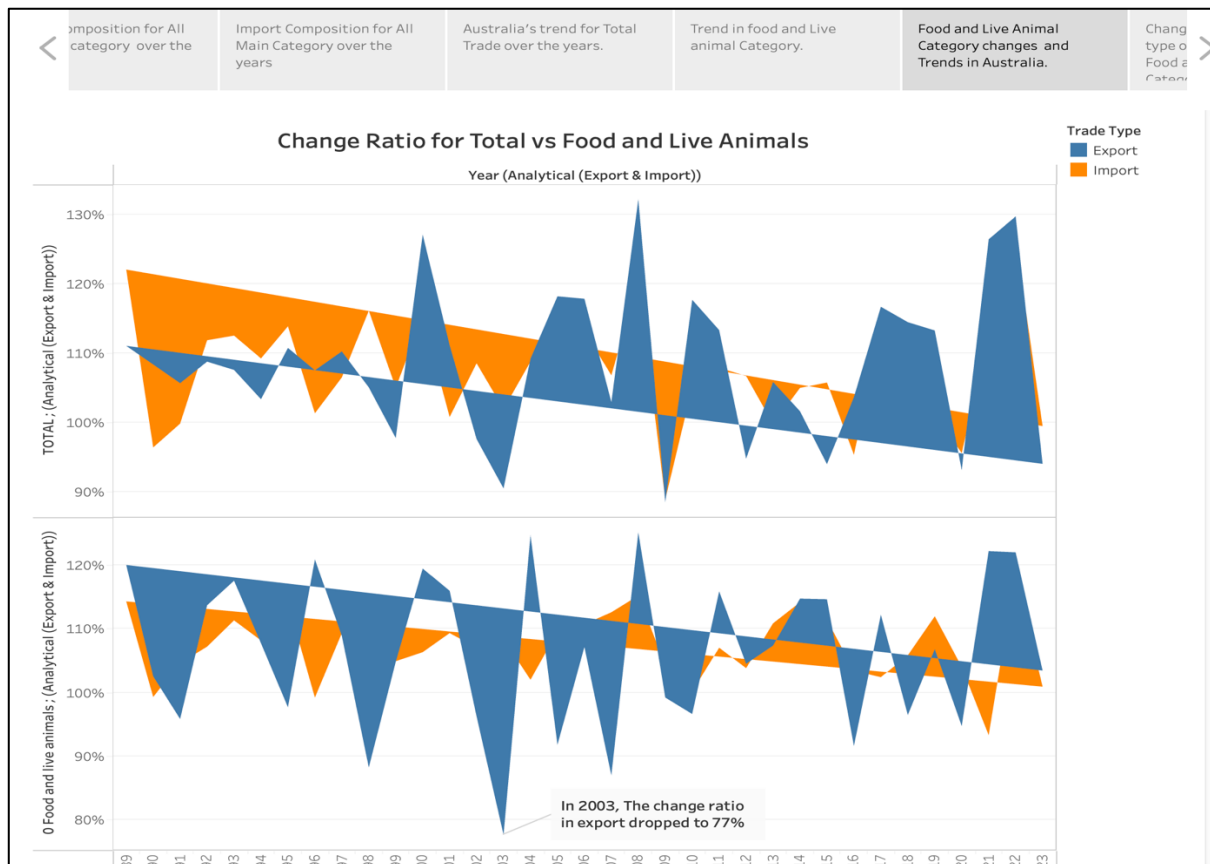


Figure 14 Storyboard: Change and trend of Food and Live animals Category.

Story Point 6

The bubble chart in story point 6 helps in quickly identifying the category that has higher composition in export and import. This story point is interactive as the user can edit the year and get data of the export and import trade of the selected year.

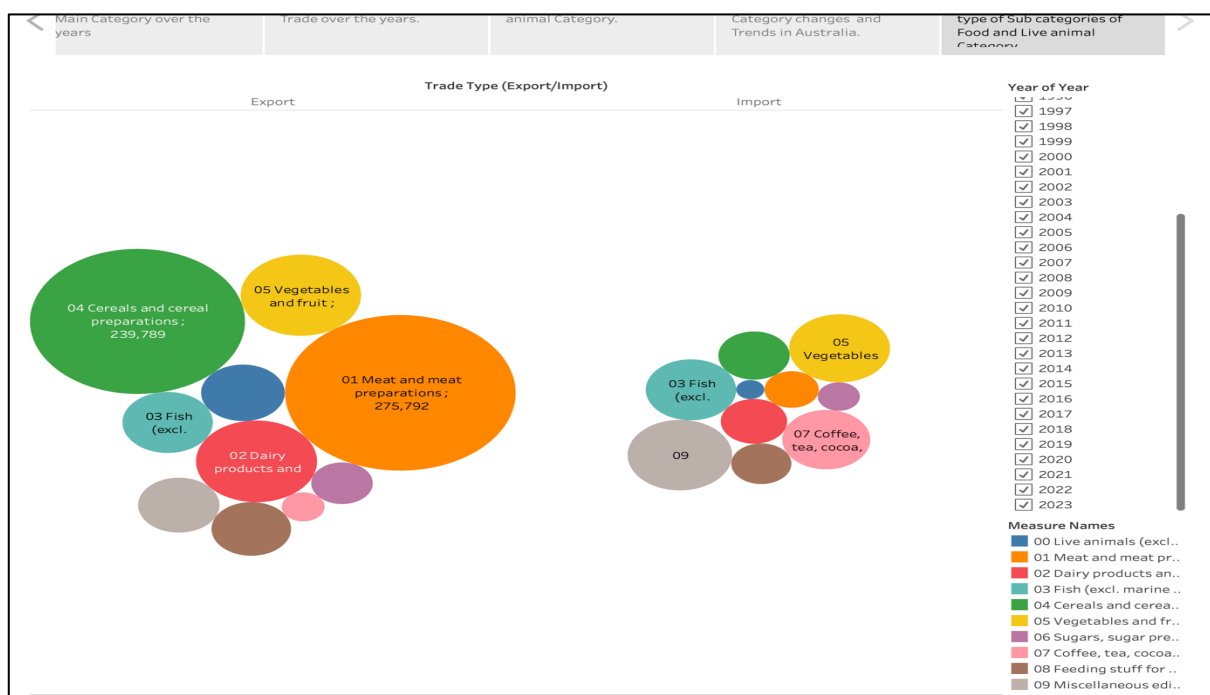


Figure 15 Storyboard: Bubble chart of sub-categories.

Summary of advantages

Dashboard

- Dashboards help to show the analysed data in one sheet, promoting error prevention and reduces the difficulty of switching worksheets by focusing on main points in one sheet.
- Live Data is connected in dashboard which helps in decision making based on data source.

Storyboard

- Storyboard helps to present the data in systematic, structural, and logical manner.
- The data points narrate a story, with the help of storyboard, data story telling becomes easier maintain the interest of the audience and conveying important message through it.
- Clear and concise message is conveyed to the audience without going through the dataset.

Conclusion

In Conclusion, based on the analysis conducted effective findings are extracted through interactive visualizations. The underlying trends, changes, and patterns in Australia's International Trade over the year 1988 to 2023 has highlighted the categories which impact the Australia's economy and international relations. The category Food and Live animals has its significant contribution in export and import trade. Australia known for its unique agricultural aspect has important role in export trade over the years. After the drop in year 2003 and 2020 there is significant growth in Food and Live animal category with an export trade of 122% contribution which is expected to grow in coming years. Since the pandemic, world has advanced in world trade to ensure the export and import is not affected much.