

Data Visualisation and Analytics

ASSESSMENT TASK 3

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Executive Summary

This report primarily focuses on exploring the Australia International Trade dataset provided by Australian Bureau of Statistics (ABS). Australia is deeply integrated in global trade, and imports and exports a wide variety of commodities every year. This dataset holds import and export data from 1988 to 2020. It contains 10 main categories and 67 sub-categories in total. The unit of measurement for all data in this dataset is million Australian dollars (A\$ Millions). 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*

Note: Category 0 – Food and live animals is chosen as the main category to be further analysed by our group.

Through in-depth elaboration and analysis of the trends and change points identified by the visual analytical tools in Tableau, the following major findings and insights are drawn:

Data Preparation

Data preparation is a very important initial step as it prepares the data in a more meaningful way for the subsequent visualisation and analysis. It is obvious to find that there are large differences in the magnitudes of the data across the dataset, from a few million to thousands of millions between categories and sub-categories. This makes it difficult to visualise the data. To solve this problem, two patterns will be created to facilitate further analysis: statistical (Ratio sheet) and analytical (Change sheet).

The Statistical Pattern (Ratios)

The statistical pattern helps find the proportion or percentage of each category's import or export to the total import or export every year. The percent proportion formula for each category $i = 0$ to 9 is,

$$\text{Percentage_Ratio}_{(i-\text{import/export})} = \frac{\text{sub_total}_{(i-\text{import/export})}}{\text{total}_{(\text{import/export})}} \times 100\%$$

Similarly, this part/whole formula can be used to find the percent proportion for each sub-category's import or export to its parent category's import or export. Now all the data are in percentage format and on the same scale.

The Analytical Pattern (Changes)

The analytical pattern, on the other hand, is used to measure the year-over-year change for a specific category or sub-category. To calculate the yearly change, we simply divide the data for a specific category or sub-category in the current year by the previous year,

$$\text{Yearly_Change} = \frac{d_t}{d_{t-1}} \times 100\%$$

where d stands for data and $t = 1988, 1989, \dots, 2020$.

Note: There is a special case. No previous year data can be found before 1988, hence all data in 1998 will be 100%.

Table Transformation Using VBA From 2D to 1D

All Main Categories

The first visualisation used to analyse the analytical pattern in the import and export for all the main categories of the dataset between 1988 and 2020 is shown below in Figure 1.

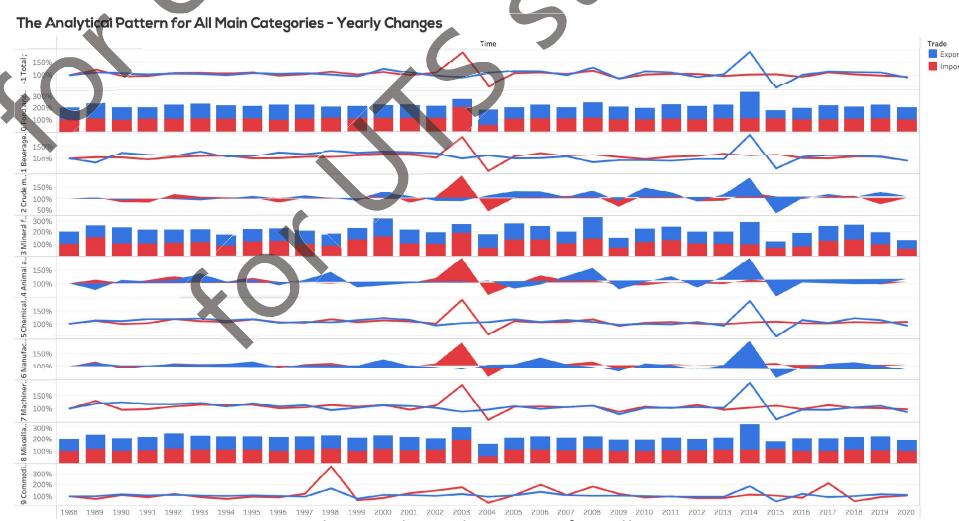


Figure 1: The Analytical Pattern for All Main Categories

In Figure 1, the analytical patterns for the import and export of all the main categories are compared and visualised through a time series.

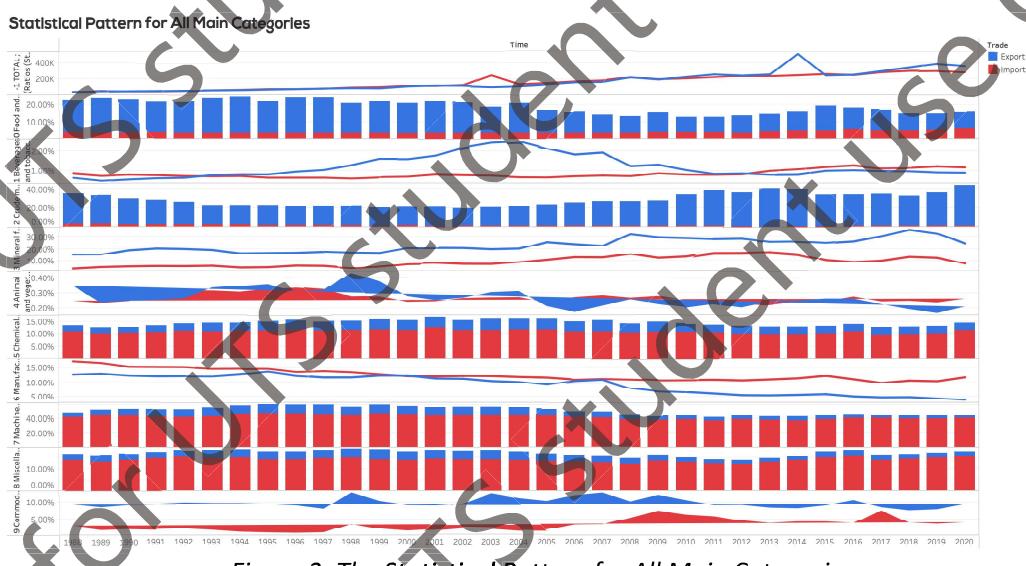


Figure 2: The Statistical Pattern for All Main Categories

The second visualisation is used to analyse the statistical pattern in all main categories' import and export through the years.

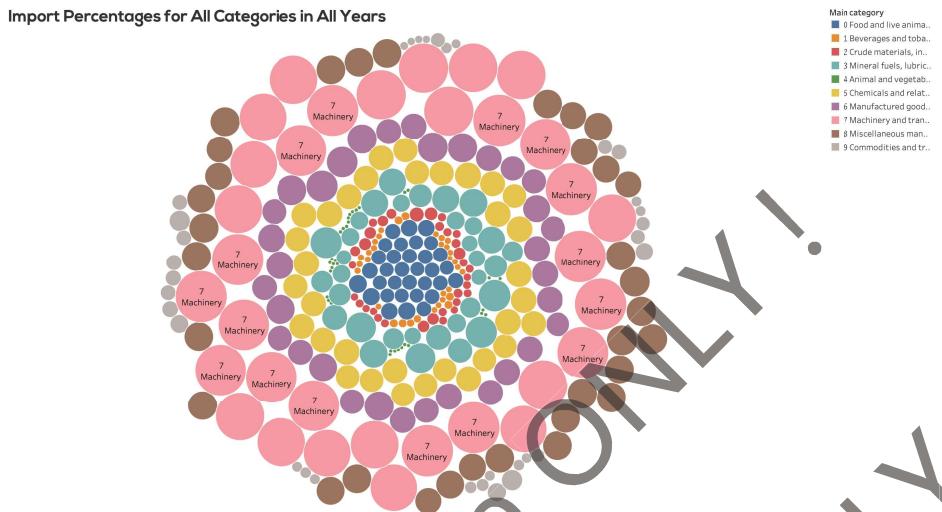


Figure 3: Bubble chart for Import Percentages of All Categories in All Years

As Figure 3 illustrates, the bubble chart was also utilised as another visualisation technique to better portray what the largest source of Australian import was over the years between 1988 and 2020.

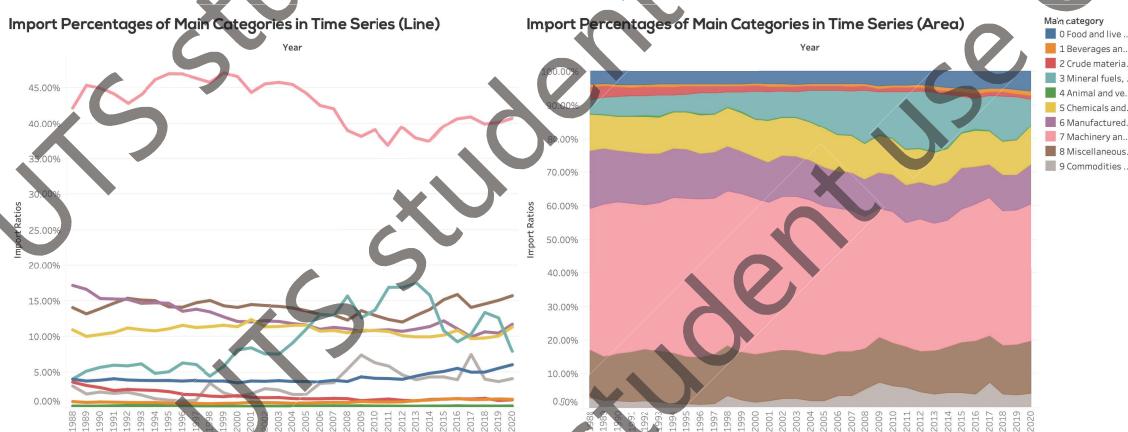


Figure 4: Line (Left) and Area (Right) chart for Import Percentages from 1988 to 2020

According to these charts, it is obvious

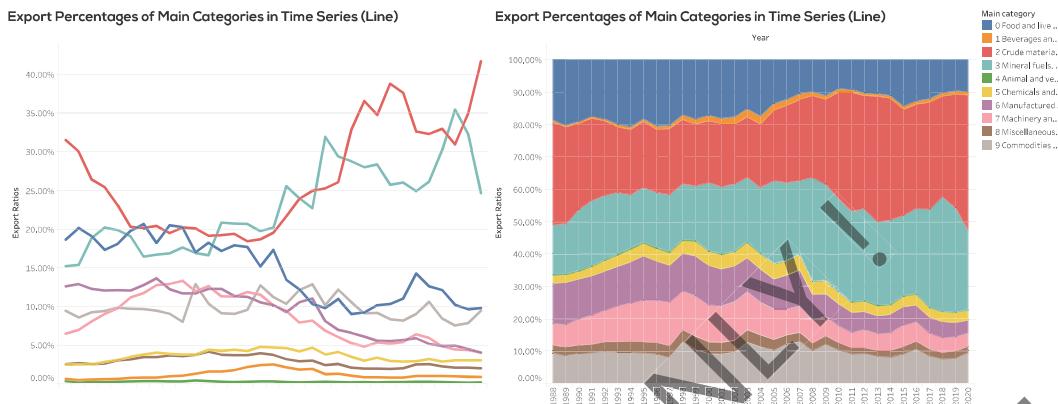


Figure 5: Line (Left) and Area (Right) chart for Export Percentages from 1988 to 2020

On the other side, many interesting trends and changes in the composition of Australia's exports can be found by looking at the line chart and area chart above.

Dashboard

Agriculture in Australia has historically been one of the most significant industries in the country. Although Australia is mostly arid, it has a diverse agricultural sector with approximately 85,681 farm businesses in total (National Farmers' Federation, 2018), producing a wide range of primary products such as wheat, fruit, vegetables, meat, and live animals. The nation plays a very important role in the global agriculture and food trade. However, agriculture has undergone much change over the last few decades. To further investigate and explore the major trends and changes in terms of both import and export, the dashboard will be configured to display data for the main category 0 – ‘Food and live animals’, together with its 10 sub-categories as listed below:

- 00. *Live animals*
- 01. *Meat and meat preparations*
- 02. *Dairy products and birds' eggs*
- 03. *Fish, crustaceans, molluscs and aquatic invertebrates and preparations*
- 04. *Cereals and cereal preparations*
- 05. *Vegetables and fruit*
- 06. *Sugars, sugar preparations and honey*
- 07. *Coffee, tea, cocoa, spices, and manufactures thereof*
- 08. *Feeding stuff for animals*
- 09. *Miscellaneous edible products and preparation*

Dashboard 1: Changes and Trends in Australia's Trade of Food and Live Animals

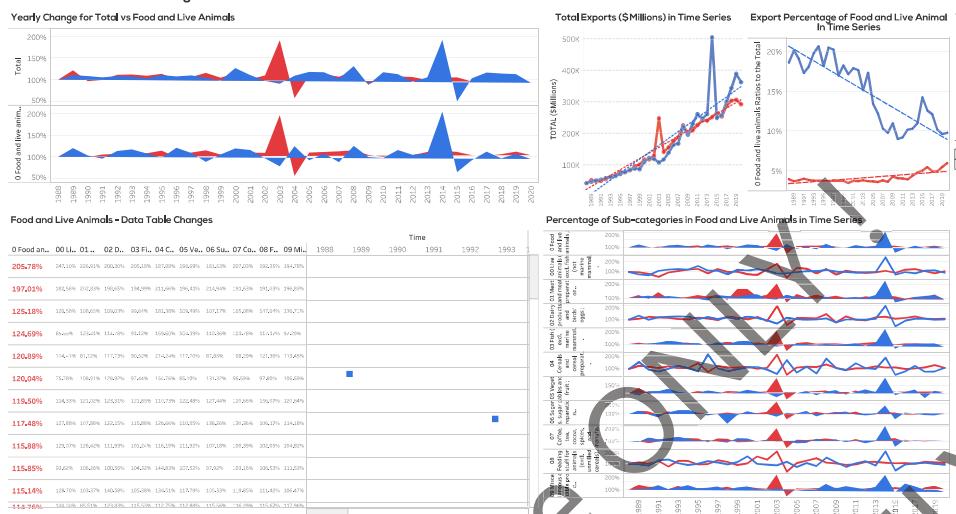


Figure 6: Dashboard 1 – Changes and Trends in Australia's Trade of Food and Live Animals

The dashboard as shown in Figure 6 above is a powerful visualisation technique that combines multiple worksheets into a single place so that the audience can not only have a quick overview, but also compare and monitor a vast amount of data simultaneously. Here we can see the first dashboard being made up of 5 charts. The chart on the top left consists of two polygon charts that show the import and export totals' yearly change and the import and export yearly change for the main category – ‘Food and live animals’.

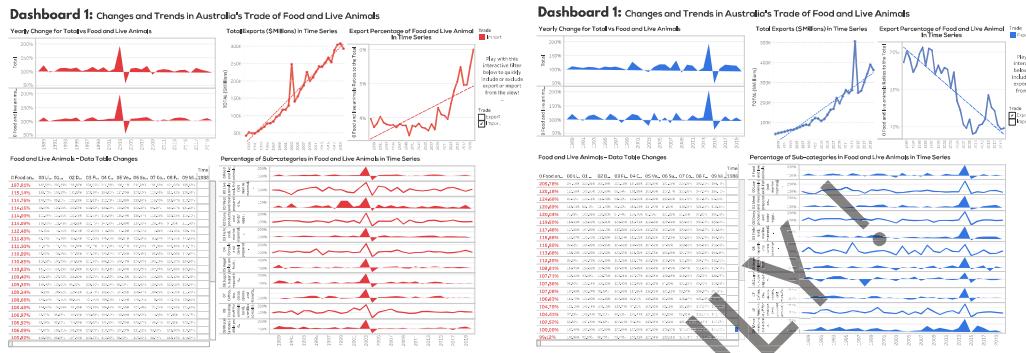


Figure 7: Demonstration for the Interactive Filter in Dashboard

To better uncover the trends in sub-categories, a second dashboard as seen in figure 9 was configured by 4 charts, 2 tree maps for visualising the part-to-whole relationships for each sub-category import and export ratios, and 2 line charts for visualising the trends in time series.

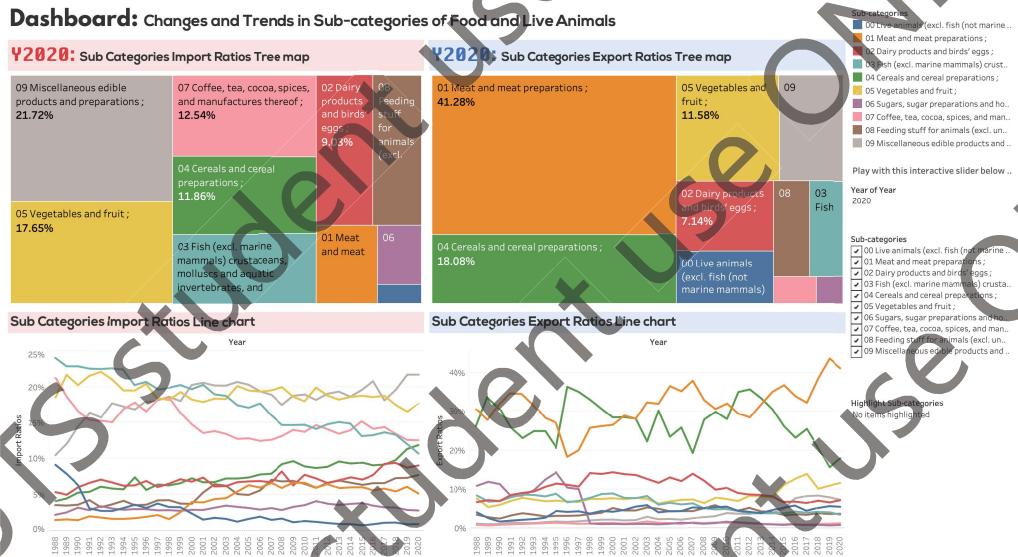


Figure 8: Dashboard 2 – Changes and Trends in Sub-categories of Food and Live Animals

Compared to the first dashboard, this dashboard is even more interactive.

Storyboard

In Tableau, a storyboard is a sequence of worksheets or dashboards that work together to convey information, messages or rather a story to the audience. Each worksheet or dashboard in a storyboard is called a story point. The storyboard created by our group consists of 5 story points in total, each story point will be thoroughly elaborated.

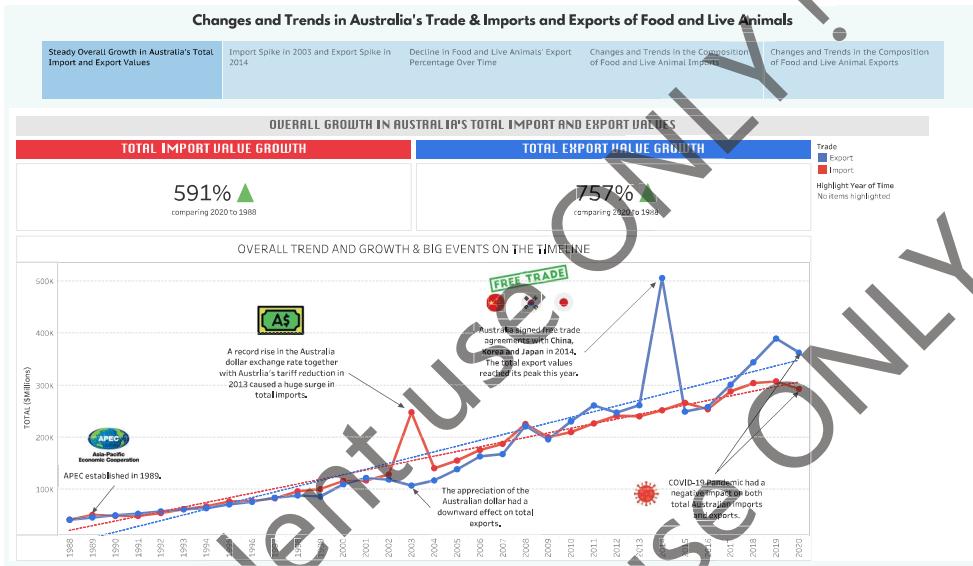


Figure 9: Story point 1 in Storyboard

As Figure 9 illustrates, the first story point is a dashboard formed by two text boxes and a line chart.

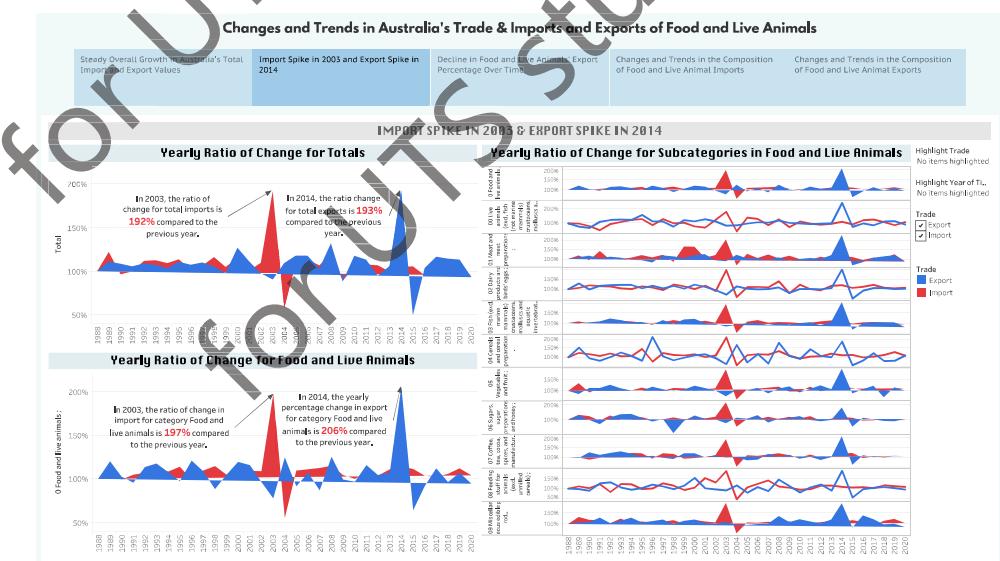


Figure 10: Story point 2 in Storyboard

The polygon charts in the second story point made these two spikes even more evident as Figure 10 depicts.

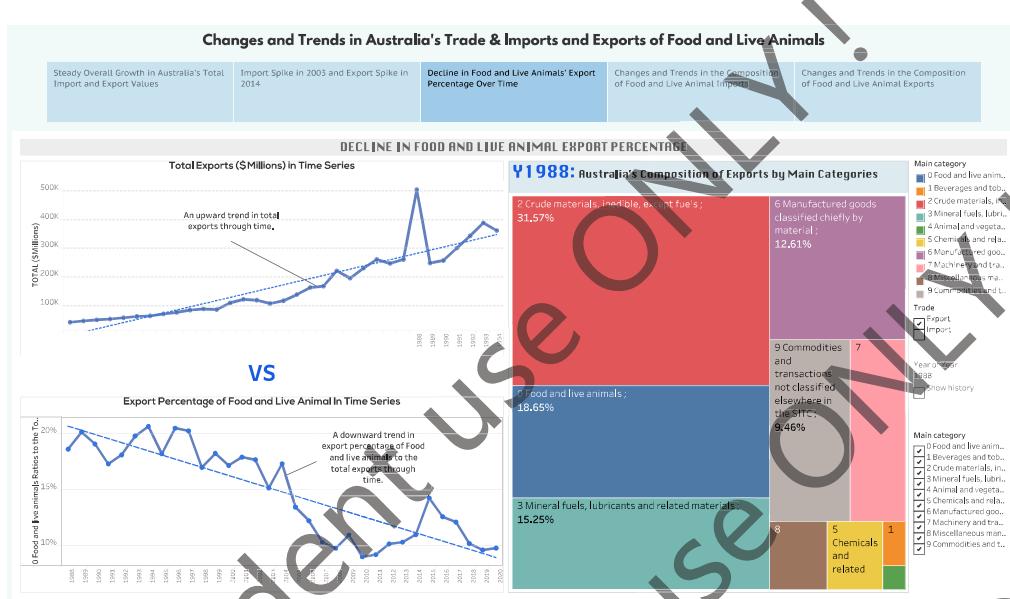


Figure 11: Story point 3 in Storyboard

In the third story point, the overall upward trend in total exports is in clear contrast to the overall downward trend in export percentage of food and live animals.

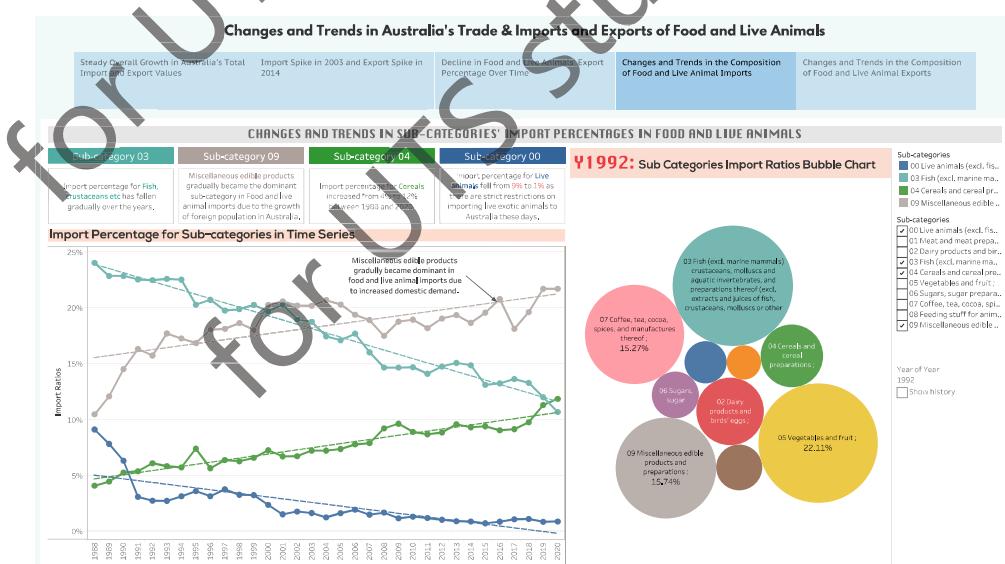


Figure 12: Story point 4 in Storyboard

The fourth story point focuses on the trends and changes in sub-categories' import percentages.



Figure 12: Story point 5 in Storyboard

The last story point moves the focus to the trends and stories in sub-categories' export percentages.

Summary of Advantages

Dashboard

Storyboard

for UTS student use ONLY!

Conclusion

In conclusion, the interactive charts, dashboards, and storyboard have effectively revealed the change points, underlying trends, and patterns in the Australia International Trade dataset. After the insightful and thorough analysis of all the visualisations, the following valuable insights and conclusions are found:

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