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Introduction

Australia's import and export data from 1988 to 2021 will be included in this report. The collection includes 67 subcategories and 10 main categories of import and export statistics. Multiple industries' productivity and resource use are evaluated in each subcategory. In 2020, Australia's economy ranked 13 globally in terms of GDP (current US dollars), 22 globally in terms of total exports, 24 globally in terms of total imports, 14 globally in terms of GDP per capita (current US dollars), and 74 globally in terms of economic complexity (ECI) (OEC, 2022). With few trade restrictions on its import and export of products and services to other nations, Australia is a free and open market. Asia is home to some of Australia's largest economic partners, with a few notable outliers including the United States and the United Kingdom. China is one of its biggest import and export trading partners, nevertheless. Nearly AUD 215 billion worth of goods were traded between China and Australia in 2018, with the majority coming from industries like tourism and education and natural resources like coal, gas, and iron ore (Asialink Business, 2021).

As a result, this study will use visualisation tools like Tableau to create visual graphs, charts, dashboards, and stories to portray Australia trade statistics in order to grasp the country's complicated import and export figures. The report may do smart visual analysis using the dataset's visual representation to discover intriguing information about Australia's ten import and export categories. The dataset from ABS must first be prepared in Microsoft Excel in order to further emphasise key numbers and reveal the complex link between Australian trade features.

Data Preparation

Data preparation is a crucial first step since it makes the data more understandable for later analysis and visualisation. Since there are significant variances in the dataset's data magnitudes among categories and subcategories, ranging from a few million to thousands of millions, the data is difficult to visualise. To address this issue, two patterns—statistical (Ratio sheet) and analytical (Change sheet) — will be developed to assist additional investigation.

The formula used in the report were taken from UTS Data Visualisation and Visual Analytics Week 9, 4.1.3 Unpacking the patterns.

Statistical Formula

For **category** i=1 to 10, the percentage of each category can be denoted as

$$Percentage_{(i\text{-}import)} = sub\text{-}total_{(i\text{-}import)} / total_{(import)}$$

$$Percentage_{(i\text{-}export)} = sub\text{-}total_{(i\text{-}export)} / total_{(export)}$$

where total $Percentage_{(i\text{-}import)}$ and $Percentage_{(i\text{-}export)}$ should be 100%

For **sub-category** j=1 to 10, the ratio of each sub-category be denoted as

$$Percentage\text{-}Sub_{(j\text{-}import)} = d_{(j\text{-}import)} / sub\text{-}total_{(j\text{-}import)}$$

$$Percentage\text{-}Sub_{(j\text{-}export)} = d_{(j\text{-}export)} / sub\text{-}total_{(j\text{-}export)}$$

where $d_{(j)}$ is data at sub-category *j*, and total $Percentage\text{-}Sub_{(j\text{-}import)}$ and $Percentage\text{-}Sub_{(j\text{-}export)}$ should be 100%

Analytical Formula

For **time series** t = 1988, 1989,…, 2021; ratio of change for category (i) or sub-category (j) between *t* and *t-1* can be denoted as

$$Ratio\ Change_{(t)} = d_{(t)} / d_{(t-1)}$$

where $d_{(t)}$ is data for category (i) or sub-category (j).

Figure 1 Formatted Excel Sheets

Visualisation Technique 1. Time Series Charts

Figure 3 Total Export and Import

Figure 2 Export and Import Changes over the years

We can see from the graphs above that Australia's trade operations did fairly well, with just two major outliers in 2004 and 2015. We may also observe that trade with Australia normally grows year over year, with trade declines rarely occurring after years of trade growth. However, the graph above highlights some of the most intriguing trends, such the sharp rise in imports in 2003 and the sharp rise in exports in 2014. We must further examine all the major categories that contribute significantly to the import total in the relevant year in order to determine the underlying causes of the 2003 import spike. To display the change in percentage, we must first make the time series chart below, which includes all of the major categories.

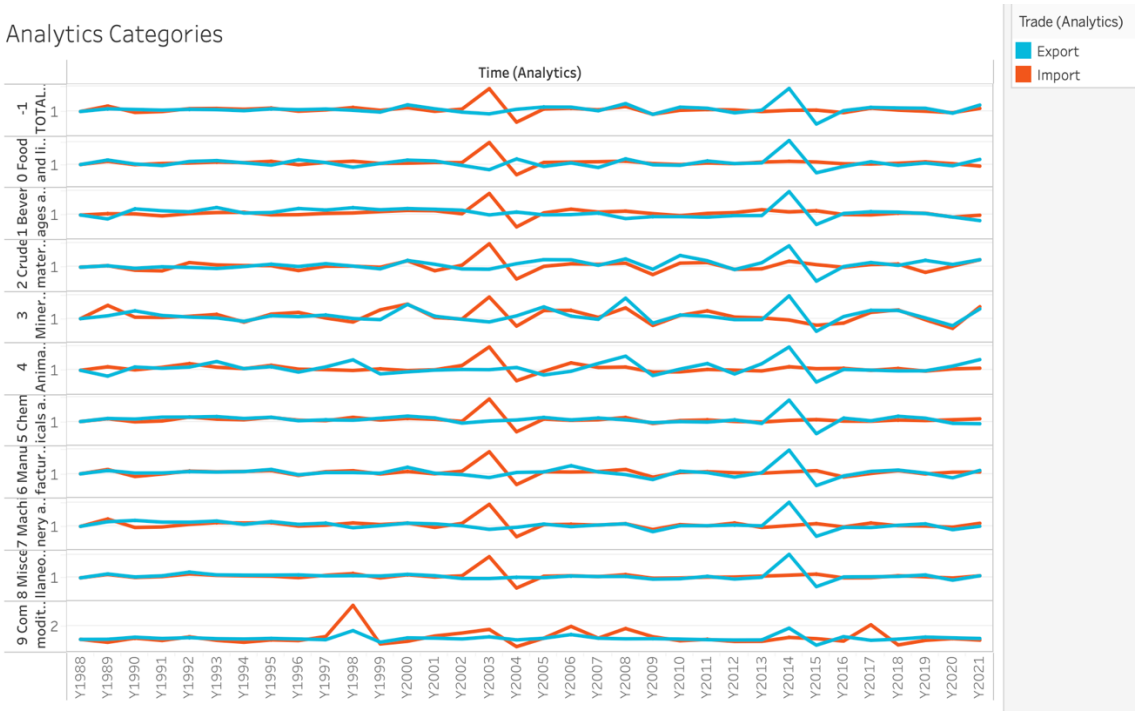


Figure 4 Changes in major categories

As can be seen from the line graphs above, Australia's imports increased nearly double in 2003 compared to the year before, with the overall number of imports increasing by 92.2%. With just a 78.5% growth from the prior year, category 9 (Commodities and transactions not classified elsewhere in the SITC) has one of the lowest statistics of all of Australia's import categories, while all other categories have had increases of more than 90%. Contrarily, most of its export categories had a decline in the same year compared to the prior year, with the exception of categories 4, 5, and 9, which saw marginal increases of 0.25%, 0.24%, and 20%, respectively.

At first, it can appear strange why Australia developed a trade deficit in 2003. However, if we compare the exchange rate of the Australian dollar to that of the majority of its trade partners, we may begin to see why. The global economy expanded substantially in 2003-04, with many of Australia's key trading partners seeing a rebound. Although Japan and the rest of East Asia also shown unexpected strength, the United States and China were the main drivers of global economic activity.

The global recovery has been aided by extremely expansionary monetary and fiscal policy settings in many regions of the world, as well as a reduction in certain near-term negative threats. Nonetheless, substantial current account and budget deficits continued throughout 2003-04 (Australia Government, 2004). While other economies across the world experienced a downturn, the Australian economy escaped the global financial crisis largely unscathed.

As a result, the Australian dollar was trading at a greater value in relation to its trade partners, implying that AUD 1 now has a larger purchasing worth than before, allowing Australian businesses and individuals to import more products and services for the same money. In contrast, because the Australian dollar is now more costly, its trading partner will have to spend more money in order to purchase Australian dollars as well as its goods and services. As a result of the trade imbalance, Australia's economy performed well in relation to most of its trading partners.

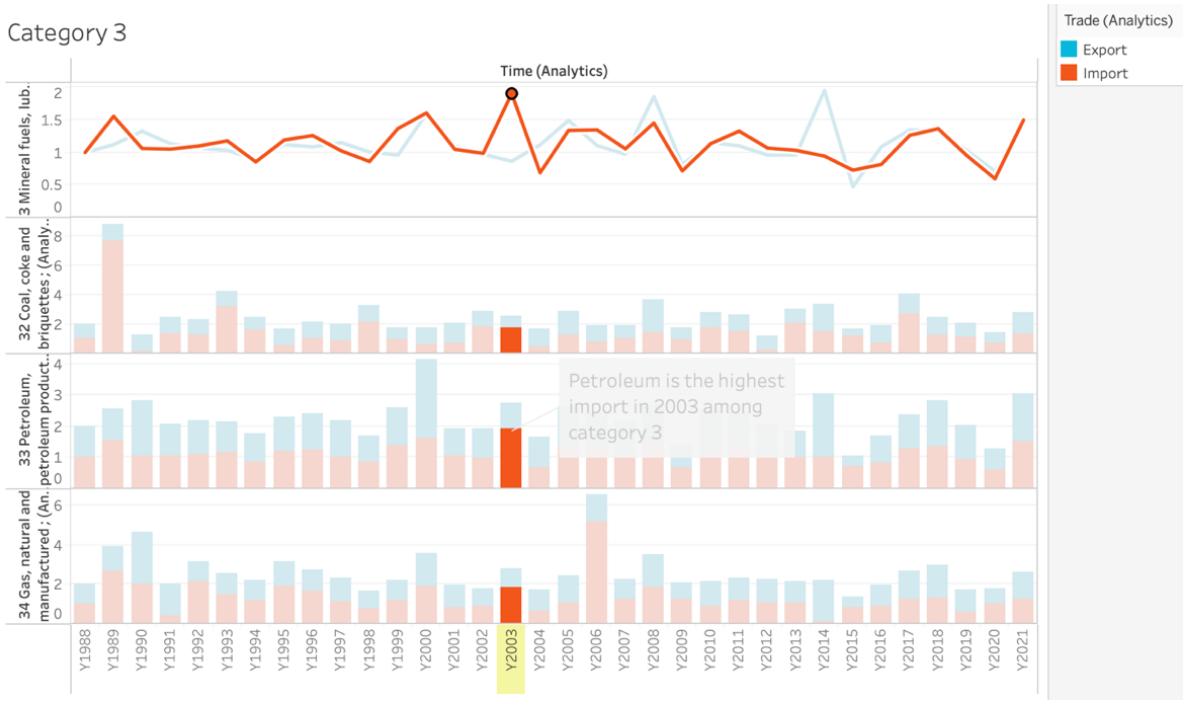


Figure 5 Category 3

Household consumption was at a 30-year high in 2003-04, with higher gasoline costs and two interest rate rises helping to temper growth in the first half of 2004 (Australia Government, 2004). Strong global demand, a limited oil supply, and worries about potential supply disruptions all contributed to increased oil prices, which in turn fuelled this rise in imports. The number of speculators investing in the oil market has increased, which has also raised prices as can be seen in figure 5. Suddenly, Australian businesses are forced to import more machinery, supplies, and labour from abroad, which accelerates development even faster.

In order to conduct an examination comparable to what occurred to Australia's export in 2014, a time series chart that is similar to figure 4 was created. However instead of lines the chart uses bar charts to better represent the trade movement of Australia throughout the years.

As can be seen on figure 6, there are some categories that are noticeably different and contribute more than other categories in export. Those categories are category-1 (food and live animals) with 11.03%, category-2 (beverage and tobacco with 8.13%, category-3 (crude material, inedible except fuels) with 37.67%, category-4 (mineral fuels, lubricants and related materials) with 26.07%, and category-9 (commodities and transactions not classified elsewhere in the SITC) with 8.17%. With the majority of these exports coming from main categories 3 and 4, these five main categories accounted for 91.07% of all Australian exports in 2014, a staggering quantity to say the least.

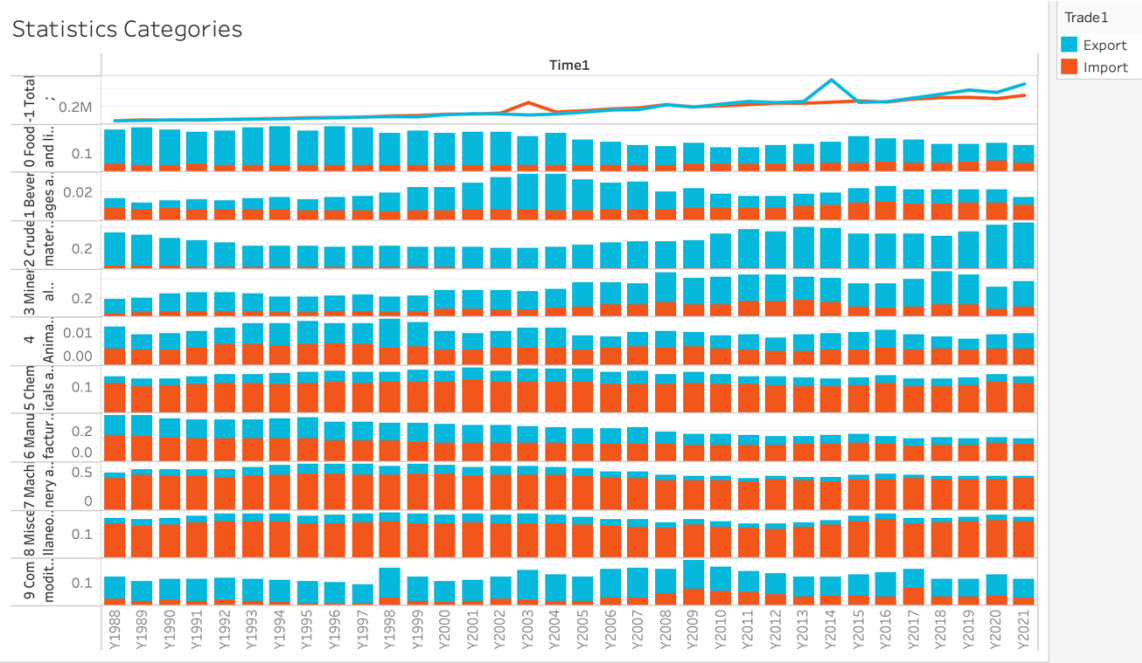


Figure 6 Statistics Categories

We can state with confidence that Australia's economy is significantly dependent on the sale of its natural resources, including coal, natural gas, and oil, since these products accounted for 63.74% of the country's total exports in 2014. We may presume that whatever the reason for the increase in export in 2014 seen in the chart below, it was most likely driven by these two sizable categories as most of its export data are consistent year over year.

However, the reason for the increase in the export percentage in 2014 is still a mystery given how little the percentages of primary categories 3 and 4 have changed over the last few years. By ruling out the possibility that there is increased demand for primary categories 3 and 4, which would raise the export percentage as well because these two numbers are directly related to one another, we can begin to identify the underlying source of this trend. On the other hand, it would be more likely to occur in a scenario where the price for primary categories 3 and 4 is higher. We may start by examining the relative price of natural resources like coal, oil, and natural gas. Since these commodities are mostly used to power cities and businesses, their prices are strikingly stable since people will always require them. 2014 saw a sharp increase in the price of coal and iron ore, forcing nations like China, which largely rely on coal power plants to pay more for the two commodities. As a result, Australia's overall exports grew although only slightly more mining was required than in previous years.

Visualisation Technique 2. Interactive Chart

To notice the differences between each subcategory, two additional pie charts, import in 2021 and export in 2021, were created. The import pie chart shows that 40% of Australian imports are in the category of machinery and transport equipment. At 15%, Miscellaneous Manufactured Articles are the second-largest import. Products connected to chemicals and manufactured goods both maintain their third-place ranking with 11%.

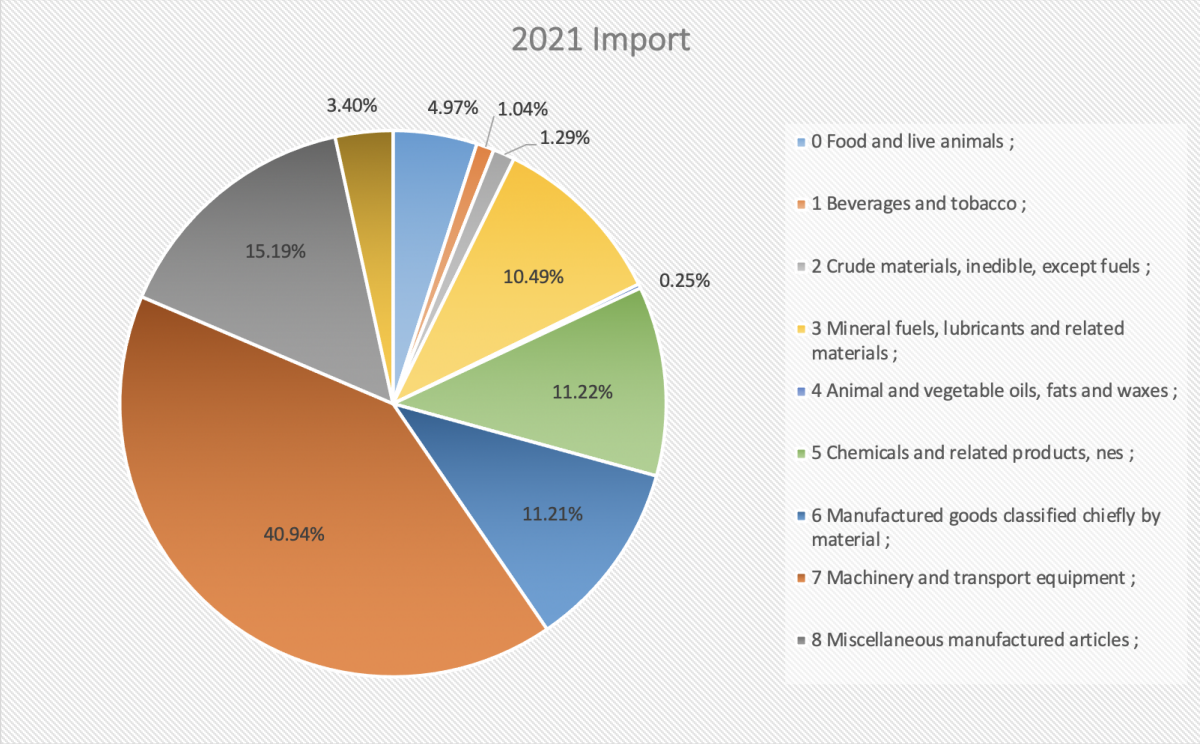


Figure 7 2021 Import pie chart

Furthermore, the top three export categories are crude materials, inedible, excluding fuels, at 43%, mineral fuels, lubricants associated materials, at 27%, and food, live animals, at 9%, as can be seen by glancing at the export pie chart. The majority of the exports are only made up of crude materials and material fuels. There is a tremendous quantity of export in each of these two areas. About 20% of the overall commerce is in the subcategory 28 (Metalliferous Ores and Metal Scrap), whereas 13% is in the subcategory 32 (Coal Coke and Briquettes).

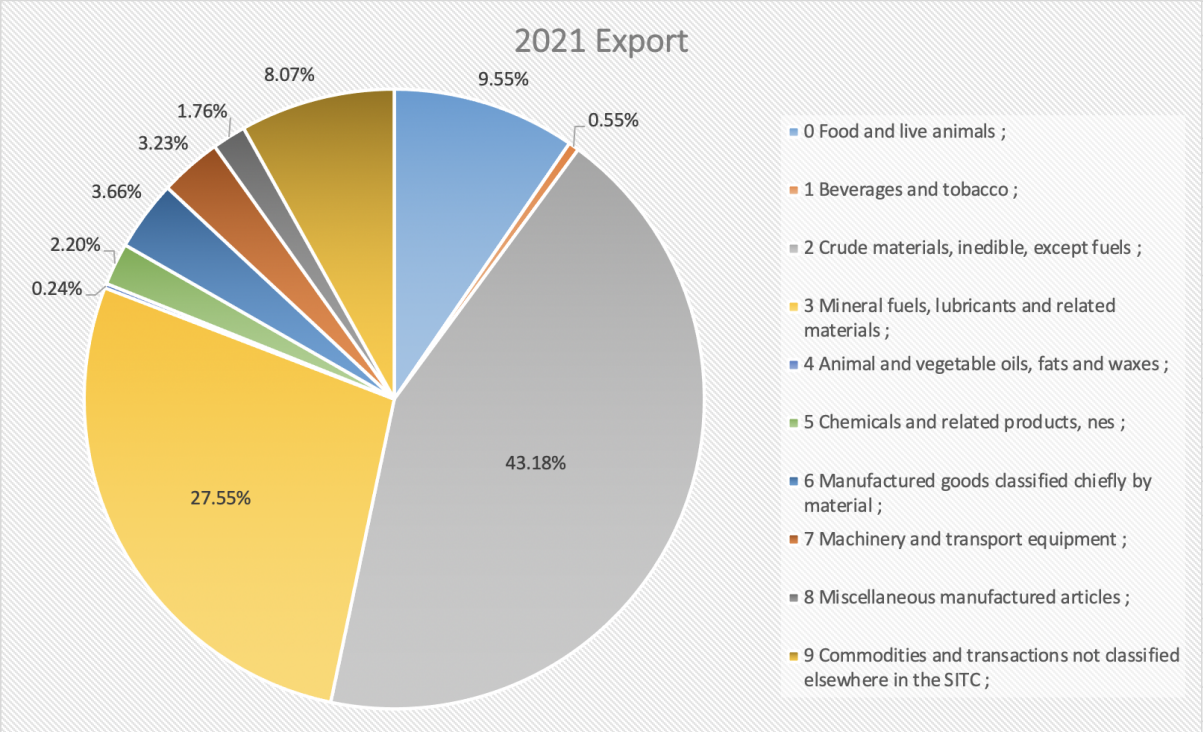
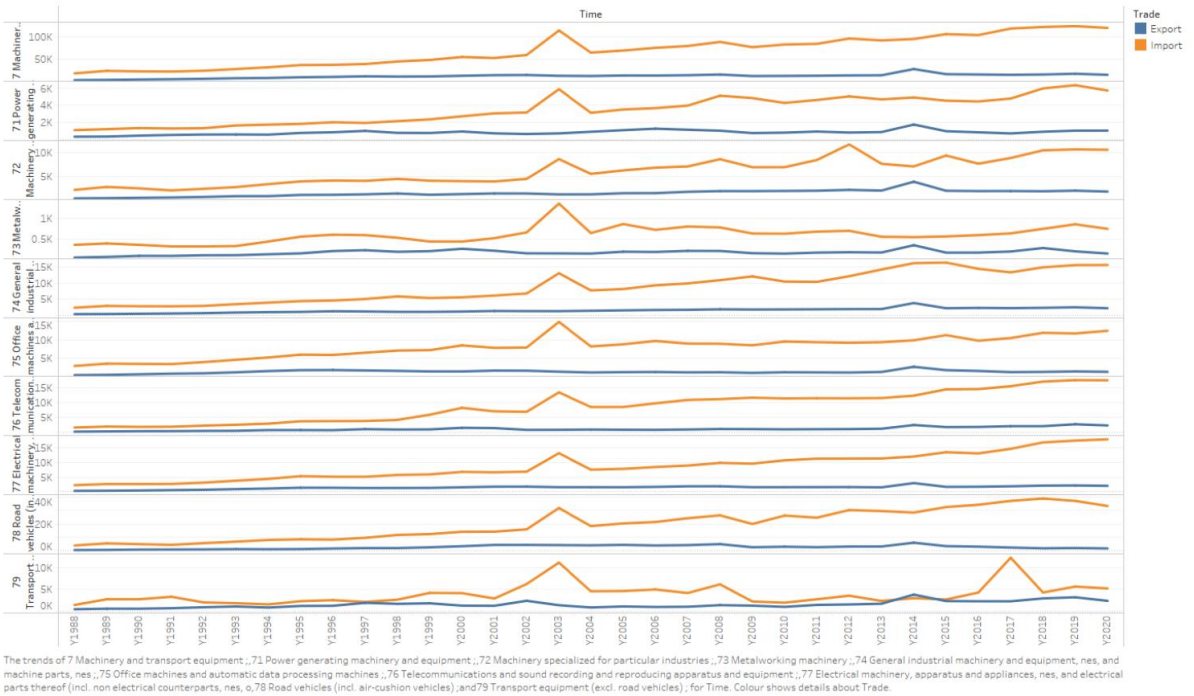
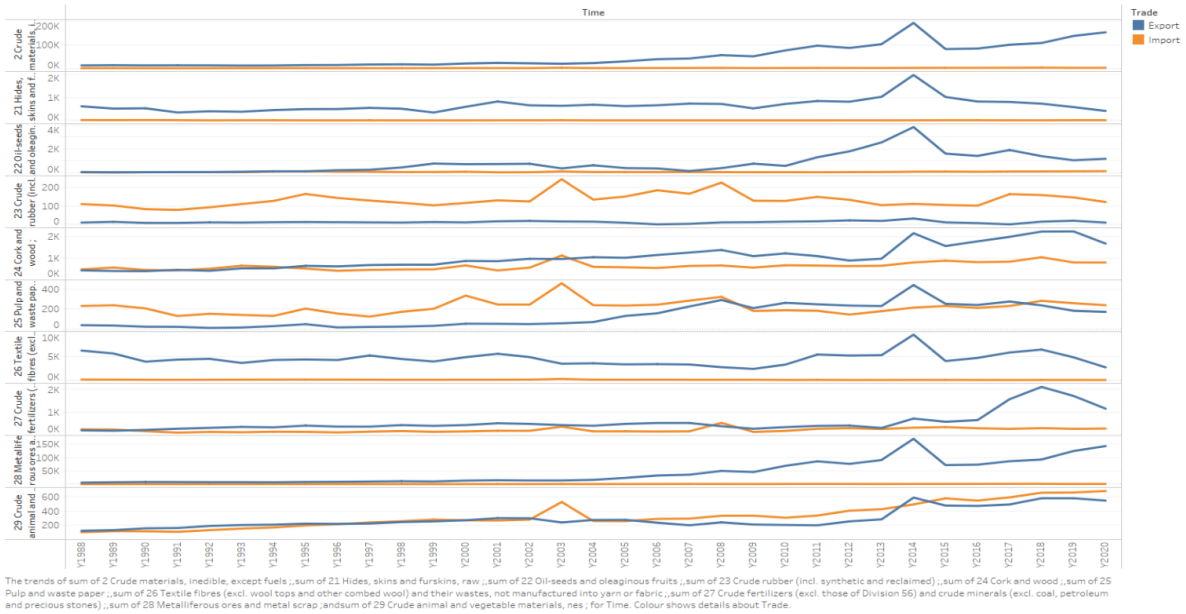


Figure 8 2021 Export pie chart

More in-depth graphics were made to help comprehend the greatest export and import category. The import of machinery and transport equipment is shown in the chart below as a million-dollar total over the course of each year. Since each sub-import category's line increases almost exactly in line with its major category, it is difficult to identify any trends. However, the import quantity for 79 transport equipment is not significantly more than the export amount.

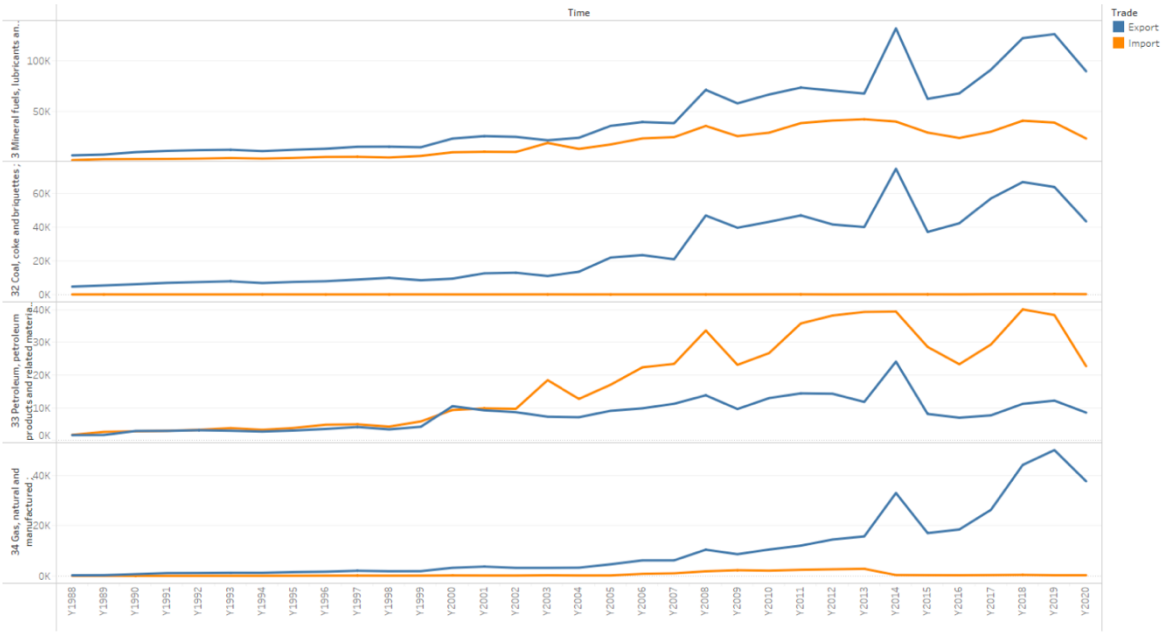


Observing the graph of two groups below (Crude materials inedible except fuel). Most of the subcategories were dominated by export, however 27 and 29 had remarkably similar import spending and export revenue. However, there are 23 kinds of crude rubber since it is created from chemicals derived from petroleum as a basic material.

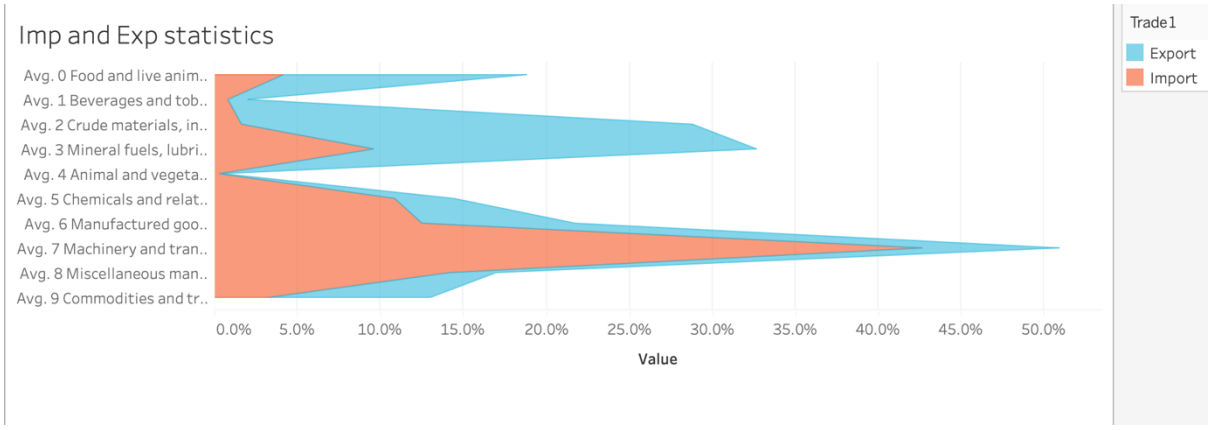


The trends of sum of 2 Crude materials, inedible, except fuels ;,sum of 21 Hides, skins and furskins, raw ;,sum of 22 Oil-seeds and oleaginous fruits ;,sum of 23 Crude rubber (incl. synthetic and reclaimed) ;,sum of 24 Cork and wood ;,sum of 25 Pulp and waste paper ;,sum of 26 Textile fibres (excl. wool tops and other combed wool) and their wastes, not manufactured into yarn or fabric ;,sum of 27 Crude fertilizers (excl. those of Division 56) and crude minerals (excl. coal, petroleum and precious stones) ;,sum of 28 Metalliferous ores and metal scrap ;andsum of 29 Crude animal and vegetable materials, nes ; for Time. Colour shows details about Trade.

The graph below shows trade data for category 3 products. Australia has surprisingly imported a lot more gasoline than it can sell. It is surprising on a continent surrounded by water. On the other hand, this supports the earlier conclusion that Australia must import plastic goods made from fuel-extracted raw materials.

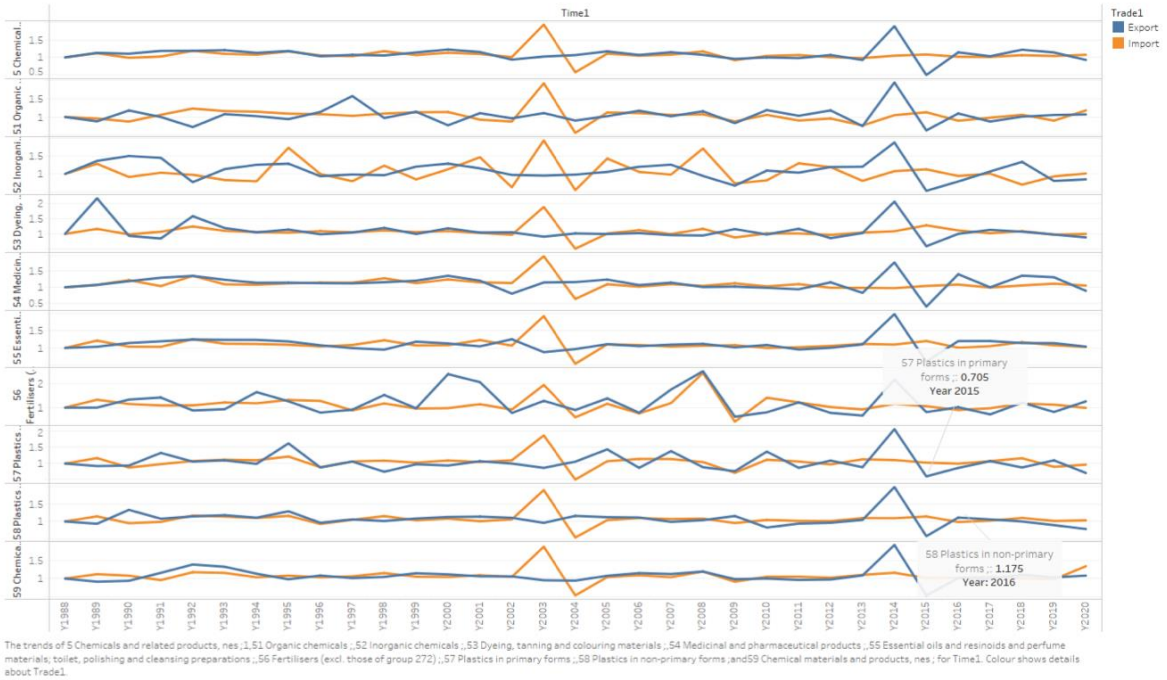


The trends of 3 Mineral fuels, lubricants and related materials ;,32 Coal, coke and briquettes ;,33 Petroleum, petroleum products and related materials ;and34 Gas, natural and manufactured ; for Time. Colour shows details about Trade.

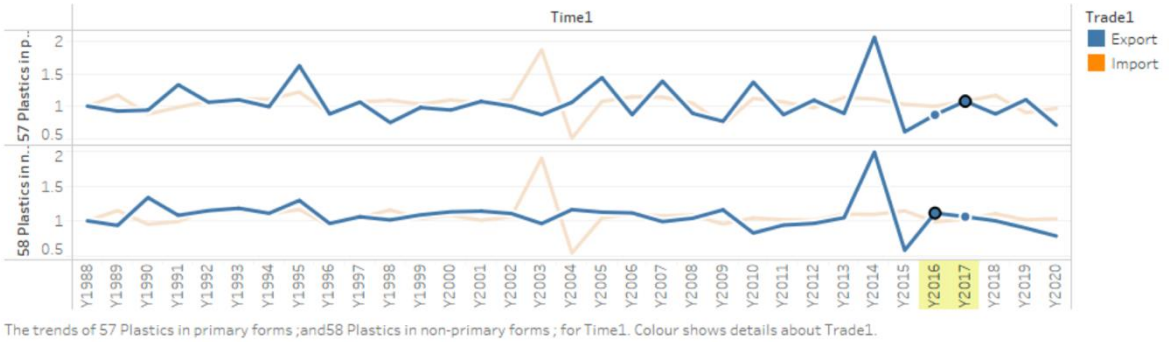


Category 5 (Chemical and Related Product)

The graph below shows trade data for category 3 products. Australia has surprisingly imported a lot more gasoline than it can sell. It is surprising on a continent surrounded by water. On the other hand, this supports the earlier conclusion that Australia must import plastic goods made from fuel-extracted raw materials.



Despite plastics in none-primary form exports down in 2016, plastic in primary form exports is rising. This indicates that Australia's extraction of plastic from petroleum is not reducing. Therefore, if the manufacturer reduces its output of plastic goods, the remainder will need to be shipped in primary form.



The trends of 57 Plastics in primary forms ;and58 Plastics in non-primary forms ; for Time1. Colour shows details about Trade1.

Visualisation Technique 3. Visual Dashboard

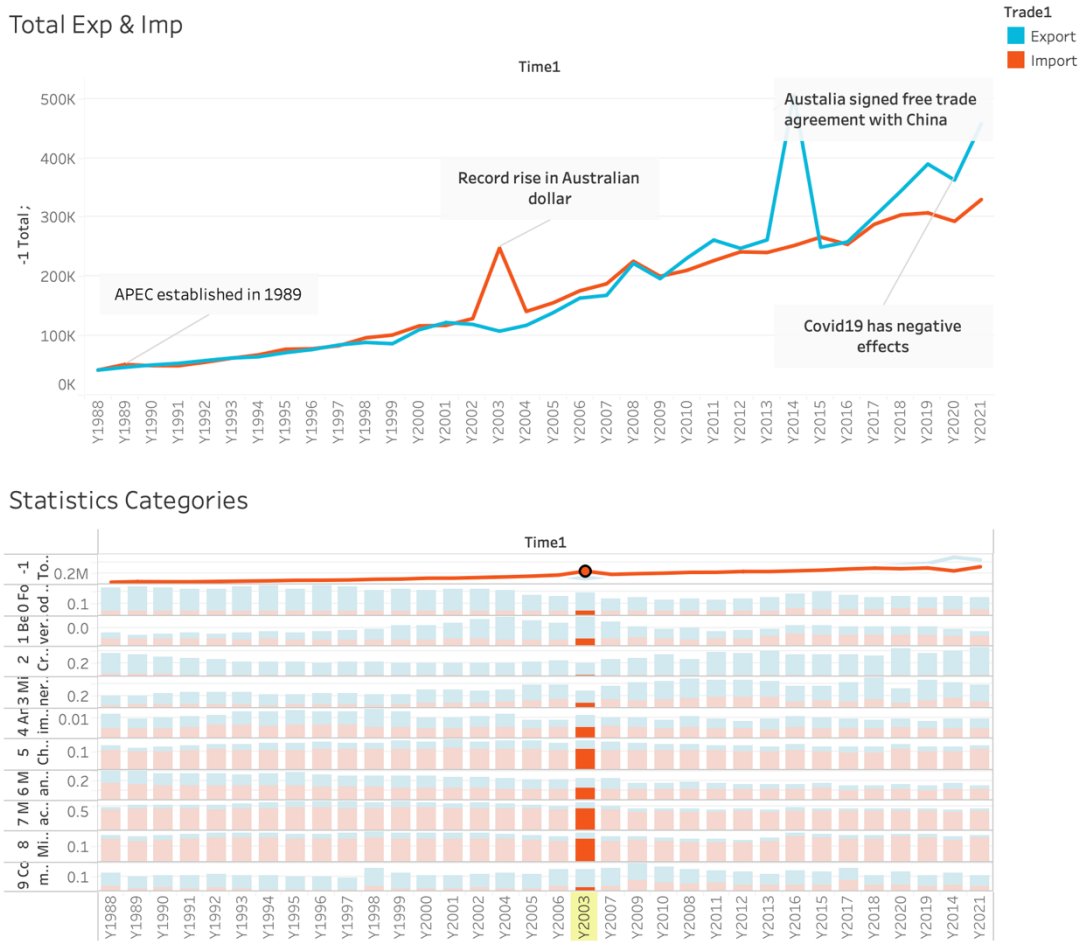


Figure 9 Dashboard 1

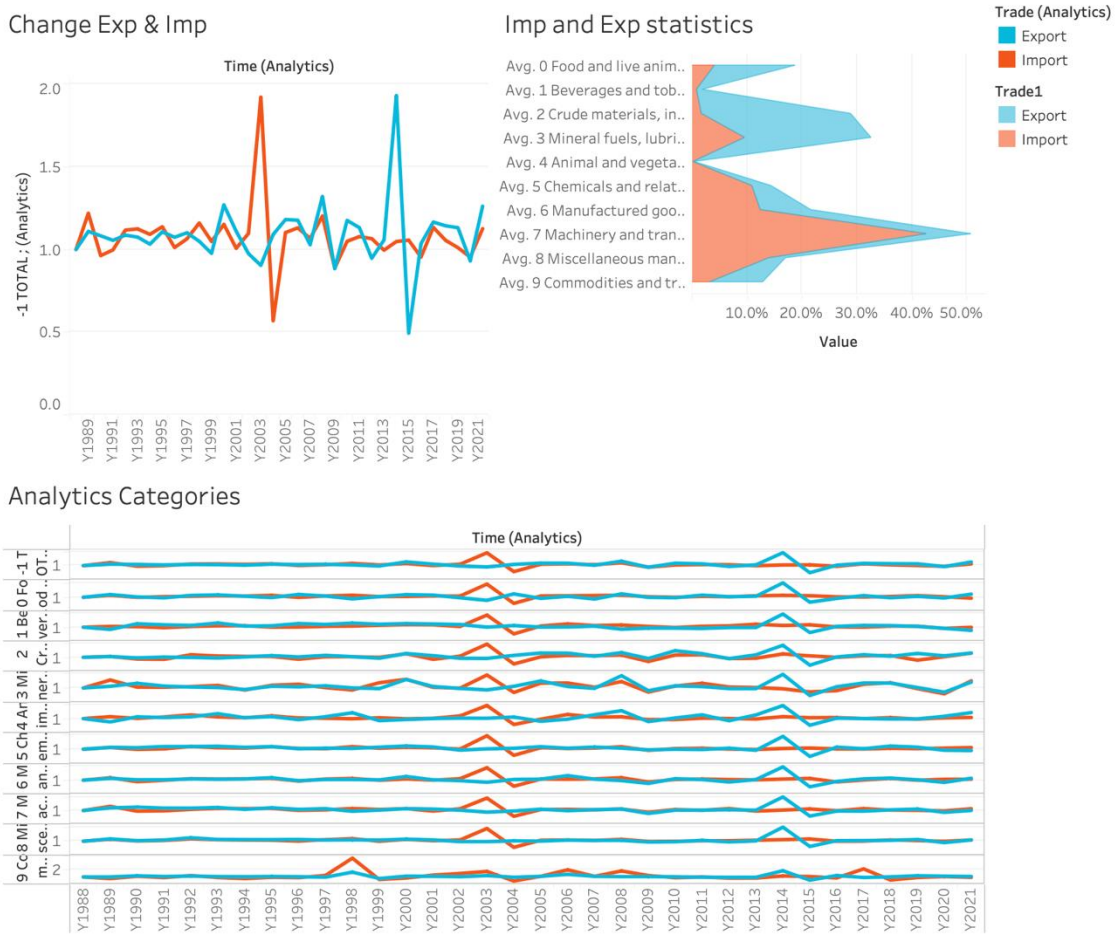


Figure 10 Dashboard 2

The dashboard, as seen in the above picture, is a potent visualisation approach that brings together several spreadsheets in one location so that the audience can compare and monitor a large quantity of data while also getting a rapid overview. Here, we can see that the initial dashboard is composed of two charts. The top figure is a line graph that displays the overall yearly change in imports and exports, while the lower chart displays changes across all categories.

Higher fuel prices and two interest rate increases helped to limit GDP in the first half of 2004 despite household spending reaching a 30-year high in 2003–04. (Australia Government, 2004). The factors that led to higher oil prices—strong global demand, constrained oil supply, and concerns about future supply disruptions—also contributed to this jump in imports. As can be seen in the dashboard 3, there are more speculators speculating in the oil market, which has led to higher prices. The sudden need for additional foreign labour, materials, and machinery by Australian enterprises speeds up expansion even further.

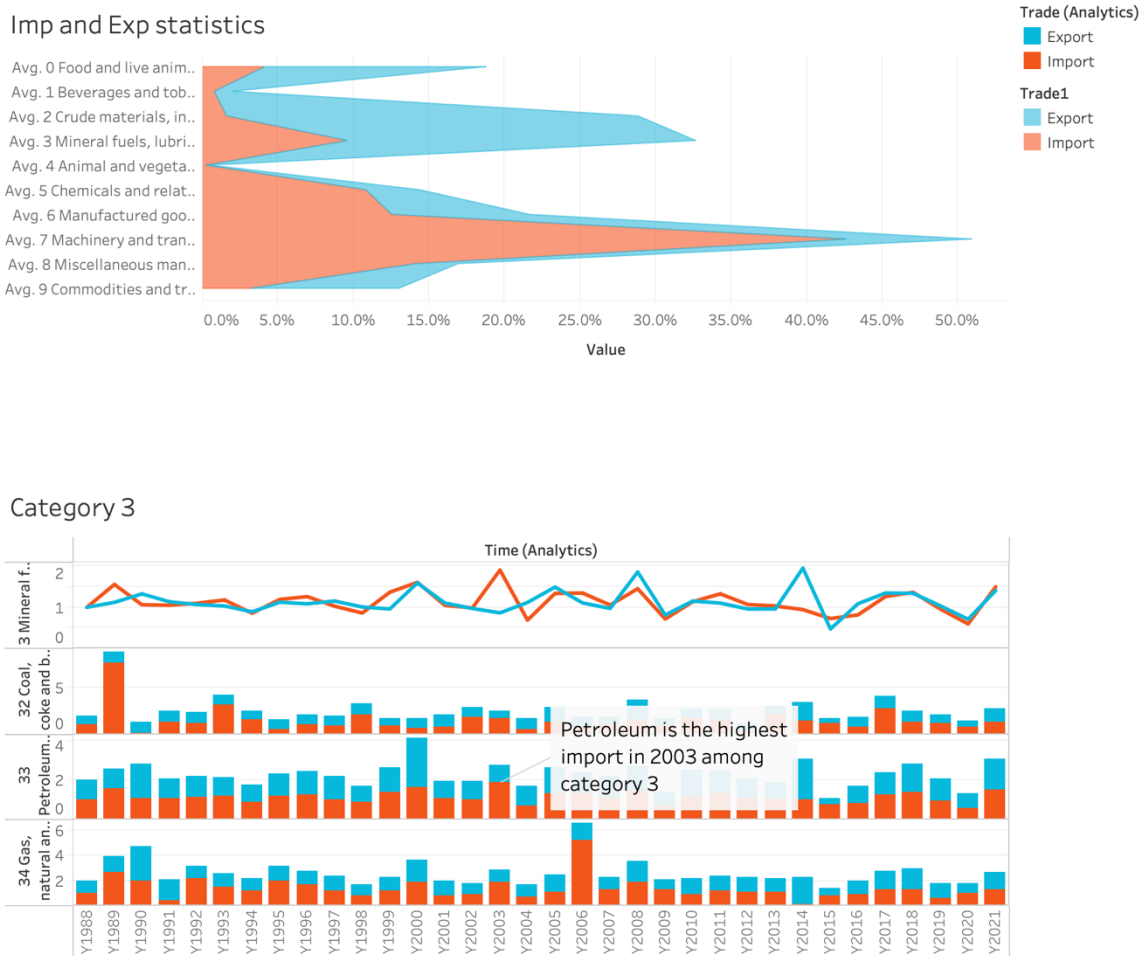
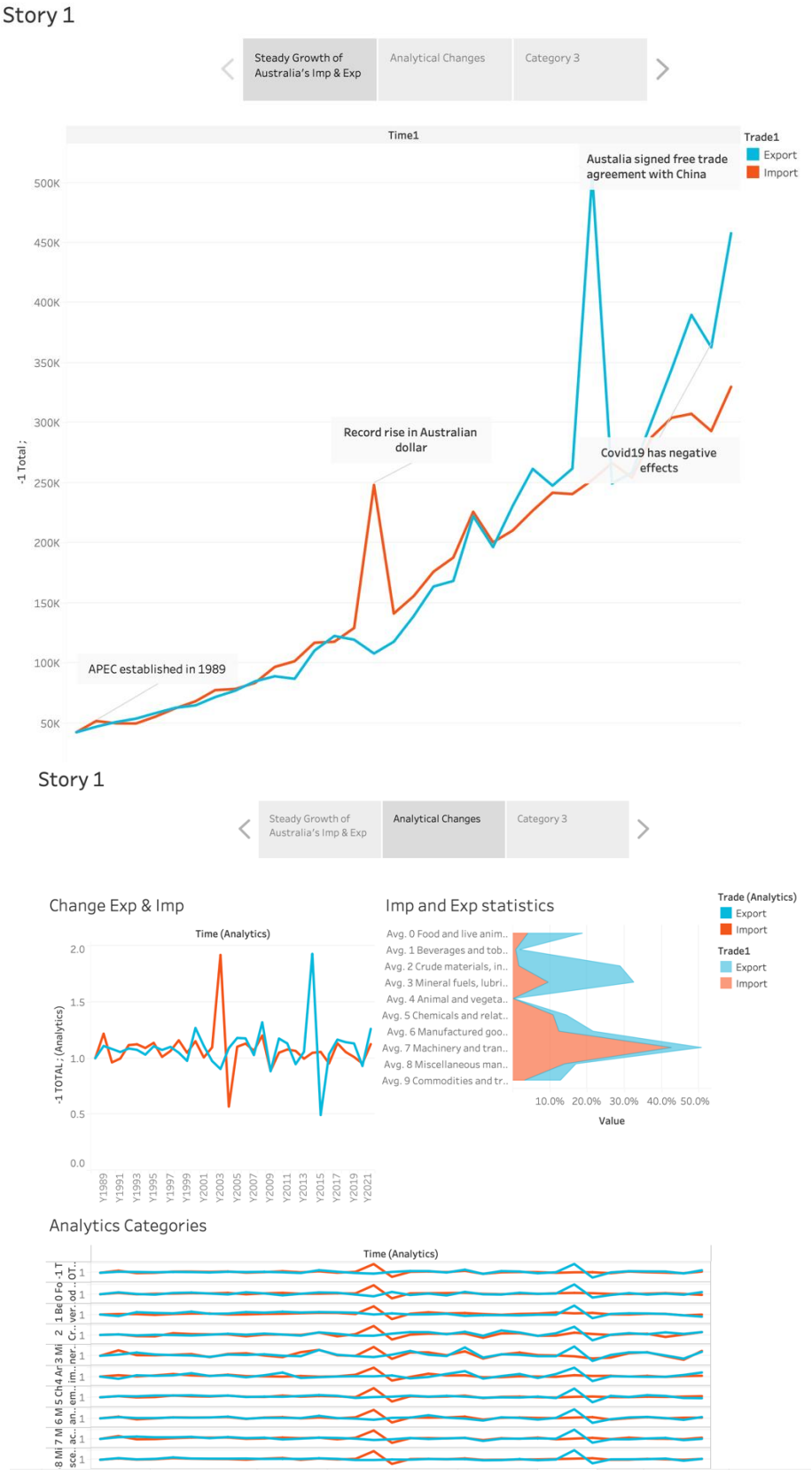
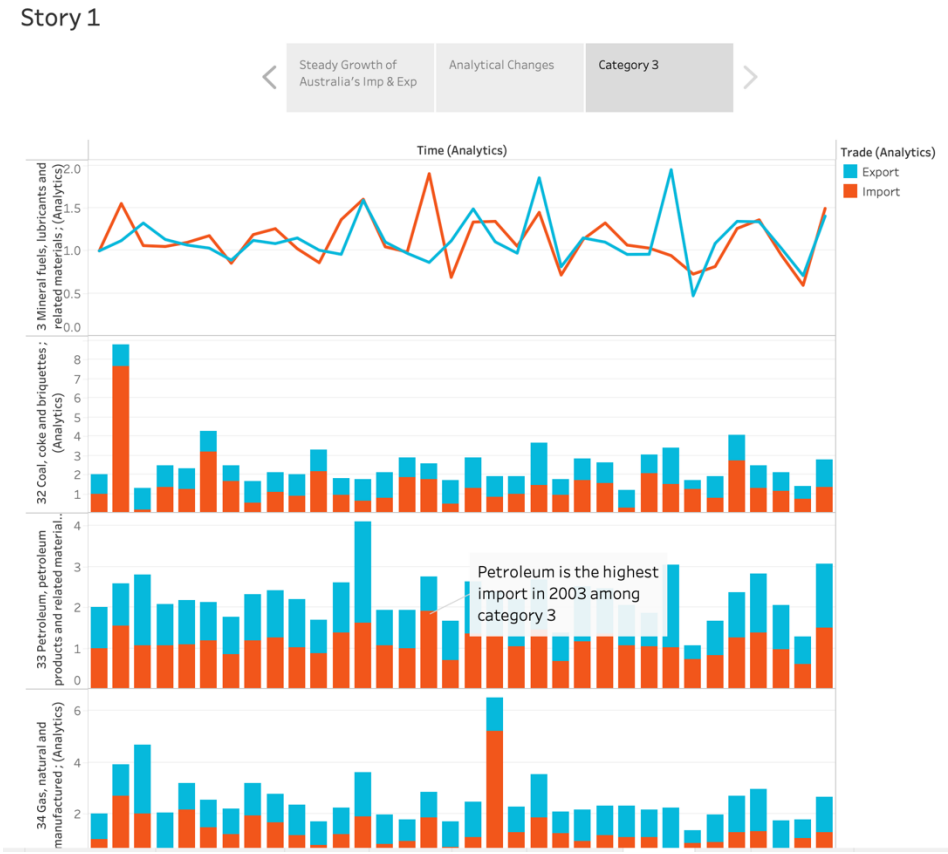


Figure 11 Dashboard 3

Ye Min Oo

Data Storytelling: Visual Storyboard





Summary: Visual Dashboard & Visual Storyboard

Advantage of Dashboard and Storyboard

Storyboard and dashboard's benefit are their capacity to combine extensive data with straightforward visual charts and graphs, making even the most sophisticated statistical conclusions understandable to anybody. In contrast to printed reports, an analytics dashboard enables non-technical users to understand the data within minutes of reading. The use of Dashboard and Storyboard has many benefits. Instead of writing conclusions in words, let the audience view the report's conclusion on a single page in the form of a graph. It enables the authors to direct the audience's attention to the information they want them to see on the graph.

A storyboard elevates data visualisation by showcasing information to the audience in a unique and captivating manner. Effective data visualisation is only one aspect of it. It is the discipline of conveying information through an engaging narrative that is based on significant data findings. As we can see from the storyboard, the record rise in the Australian dollar exchange rate and the reduction in tariff led the import spike in 2003, and the export spike in 2014 was brought

on by the signing of free trade agreements with China, Japan, and Korea. Moreover, the audience may be more interested and better able to retain the knowledge if insights are conveyed through engaging and fascinating stories.

Additionally, the audience may switch between the narrative points by using the navigation arrow. Each story point or slide has its own distinct, concise tale caption in the navigator at the top of the story board. The audience can rapidly understand the primary ideas being delivered since the story captions highlight the most important facts. It's also important to point out that the motion charts let viewers to see the whole history of how the composition of Australian imports and exports has evolved over time.

Findings and Recommendation

Australia is a nation that depends heavily on its supplies of fossil fuels and other natural resources. Even though it is a developed nation, due of its sale of natural resources, its economic exports are strikingly comparable to those of those poor nations, whereas most developed nations would shift their attention to products and services that required a highly skilled workforce. As a result, the Australian economy is extremely durable to financial crises throughout the world. It has not only not had any significant recessions, but it has also occasionally benefited from them because to its robust economy and currency, as was the case in 2003 and 2014. But if we didn't include the vital cues it offers to quickly comprehend complex data with various variables, visual analytics wouldn't be done credit.

- Since 1988, Australia's overall import value has climbed by 591%.
- Since 1988, Australia's overall export value has climbed by 757%.
- The free trade agreements with China gave the Australian export industry several advantages and caused a surge in exports in 2014. In comparison to other categories, imports and exports of animal and vegetable oils, fats, and waxes continue to be quite low.
- In 2003, domestic demand for imported products was spurred by the strengthening of the Australian dollar and the decrease in tariffs, which resulted in a surge in imports.
- Despite plastics in none-primary form exports down in 2016, plastic in primary form exports is rising. This indicates that Australia's extraction of plastic from petroleum is not reducing.

- Australia's top exports were raw minerals and mineral fuels. With 41.73% of the overall export in 2020, crude materials achieved their highest level.
- Exports of coal and metalliferous ores were important to Australia's economy.
- Due to the increase in foreign residents in Australia, particularly foreign students, the demand for imported food goods grew.
- Surprisingly, from 1997 to 1998, the export of sugar and honey decreased from 10% to 1%. The considerable consolidation of the Australian sugar sector is to blame for this.
- Due to developments in global commerce, Australia's overall export has seen a decrease in the percentage of food and live animals.

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