

Trade Data Analysis 1.1

**Working paper for Resilience
Inquiry**

February 2023

NEW ZEALAND
PRODUCTIVITY COMMISSION
Te Kōmihana Whai Hua o Aotearoa



The New Zealand Productivity Commission

Te Kōmihana Whai Hua o Aotearoa¹

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Introduction

This note sets out the Productivity Commission’s approach to analysing trade data for its Economic Resilience Inquiry. Version 1.1 of this paper updates (and slightly varies) the preliminary findings from version 1.0 used to inform the Issues paper for the Inquiry. Further versions with more developed analysis will be available as the Inquiry progresses. The following files are available on the Commission’s website to reproduce the analysis:

	Imports	Exports
R script	R script for imports txt version	R script for exports txt version
Data inputs (to be used with R script)	2019_Imports_HS10_by_Country_Rformat.csv BEC convergence.csv	2019_Exports_HS10_by_Country_Rformat.csv
	BACI_HS17_Y2019_V202201.csv BACI_full_country_names.csv BACI_product_codes_HS17_V202201.csv HS2_codes.csv ISO2_BACI_CREATED.csv ISO2_SNZ_HS10_CREATED.csv	
Data outputs	ProdCom Import Analysis version 1.1.xlsx NZimports_SNZ.csv NZimports_BACI.csv NZimports_BACI_SNZ.csv NZimports_filtered.csv	ProdCom Export Analysis version 1.1.xlsx NZexports_SNZ.csv NZexports_BACI.csv NZexports_BACI_SNZ.csv NZexports_filtered.csv

The analysis is based on the approach undertaken by the Australian Productivity Commission (Australian Productivity Commission, 2021) to determine supply chain vulnerabilities. The APC developed a series of filters to apply to its data to identify imported and exported products that are vulnerable to supply chain disruption. These filters have been modified as required to reflect New Zealand’s trade situation and data constraints.

At this stage, the Commission’s analysis has been limited to exploration of merchandise trade data. The APC also explores trade services data and the Commission intends to do this as part of its Resilience Inquiry.

1 Purpose

The aim of the trade data analysis is to help the Commission focus its inquiry into the resilience of the New Zealand economy to supply chain disruptions ('the Inquiry').² Ideally the Commission would like to identify specific industries and communities that are exposed to disruption and investigate whether government policy settings and interventions can improve their resilience to future shocks.

Looking at imported and exported products will hopefully inform the Commission's understanding of New Zealand's vulnerability to international supply chain disruptions. This analysis of vulnerability is based on different measures of market concentration. It will need to be augmented with further work to examine how substitutable the products are and how diversifiable the input and output markets are. For example, products that are used as intermediate inputs to production are likely to be more critical to maintaining output compared with those used for capital formation and final consumption. Exports are also important for exploring vulnerability to supply chain disruption, as they can form essential parts of other countries' supply chains. The income earned from exports obviously also contributes a significant part of New Zealand's GDP and its ability to deliver on society's wellbeing aspirations.

2 Trade data

Products (and services) that are imported from or exported to only a few countries or concentrated markets are likely to be more vulnerable to supply chain disruptions. Linking these products and services to firms or industries may indicate which New Zealand industries and communities are most exposed to such future disruption.

Stats NZ's (SNZ's) merchandise trade data³ provides detailed monthly information on the value and volume of physical goods that are imported into and exported from New Zealand. The physical goods are recorded using a 10-digit international Harmonised System Code (HSC). However, there is no publicly available information on who imports and exports the products, making industry and supply chain identification challenging.

Linkage with firm data can be done with administrative data in SNZ's Integrated Data Infrastructure (IDI) environment (which is time consuming) or at an industry level via concordance between the product (HSC) and industry (ANZSIC) codes. SNZ does not currently produce concordance tables, although some industry-product information does exist in the Input-Output (I-O) tables produced by SNZ using the National Accounts. Concordance tables have been produced by government and private research agencies for the purposes of specific research projects, and their suitability for use for this analysis requires further investigation. Despite this, there is value in undertaking this analysis without concordance. The Commission is using a range of information gathering techniques as part of the Inquiry, and the trade data will be useful for validating qualitative information and anecdotal experiences from its engagement with industries and communities over the coming months.

International trade data is required to gauge the share of the global trade that New Zealand trade makes up. International trade data is also required to calculate how *concentrated* New Zealand's trade is. The Commission has sourced this data from the BACI dataset developed by CEPII, a French centre for research on the world economy.⁴

² <https://www.productivity.govt.nz/inquiries/resilience/>

³ <https://www.stats.govt.nz/large-datasets/csv-files-for-download/overseas-merchandise-trade-datasets>

⁴ http://www.cepii.fr/CEPII/en/bdd_modele/bdd_modele_item.asp?id=37

There are several dimensions and alternative ways to measure concentration, which the Commission will investigate further.⁵ However, there are two main types for the purposes of this analysis:

- Economy-specific concentration, where a nation sources almost all of its imports from or sends most of its exports of a specific product to a small number of markets (this is captured in the APC's first filter)
- Global concentration, arising from relatively small number of economies exporting a given product (this is captured in the APC's second filter).

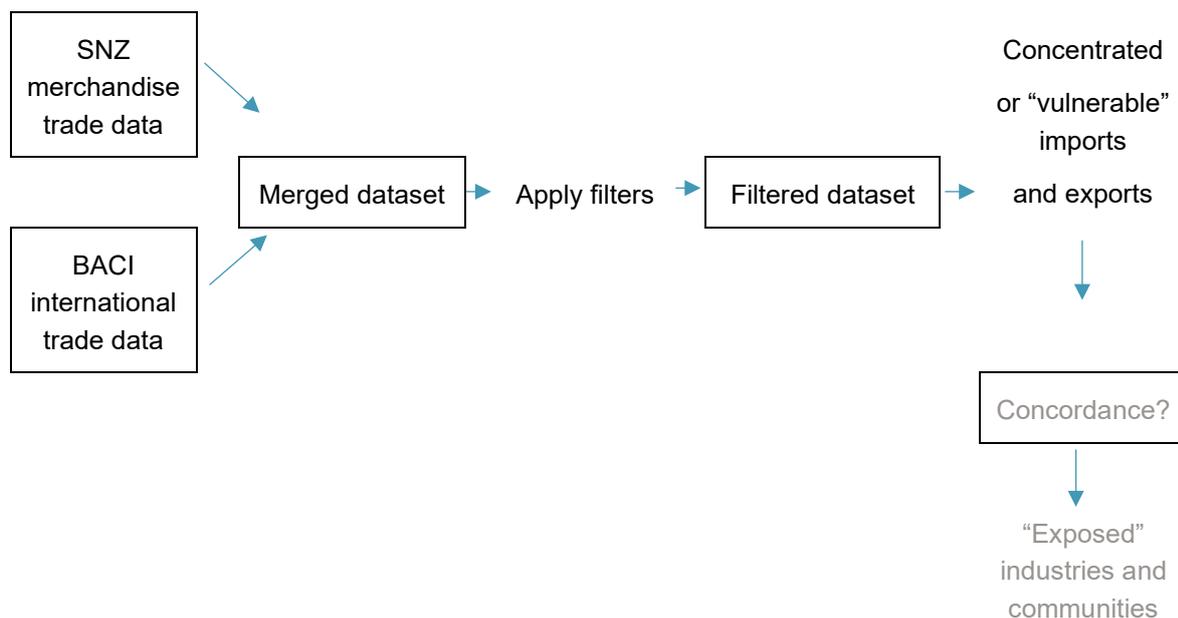
Aside from using market concentration as an indicator of vulnerability, the Commission will also look at New Zealand's previous experience. The Covid pandemic and the Global Financial Crisis are recent examples of supply chain disruptions that can be explored, data permitting.

At this stage, analysis has concentrated on data from 2019, the year before the pandemic. This provides a useful benchmark to compare trade flows before and after a substantial supply shock to the New Zealand economy. Future analysis could undertake time-series analysis with SNZ merchandise trade data that is readily available from 2017-2021, and from at least 2010 allowing for concordance with earlier Harmonised System codes.

3 Outline

The following diagram (Figure 1) conceptually outlines the steps undertaken with the data analysis.

Figure 1: Trade data filtering process



Separate import and export datasets were created by merging detailed HSC-10 level SNZ merchandise trade data for 2019 with the less detailed HSC-6 level international trade dataset BACI for 2019. The APC filters were then applied to the merged datasets.

Analysis and findings for imports and exports is presented separately in this report.

⁵ Recent examples include analysis by Jiang (2021) and McKinsey Global Institute (2023)

4 Import analysis

4.1 Import dataset

The original SNZ dataset had a total import CIF (“cost, insurance, freight”) value of \$64 billion NZD. The merged dataset with BACI has a total value of \$60.8 billion NZD. There are 132,048 matched observations (country:HSC-10 product pairings) and 1,268 unmatched SNZ observations, meaning more than \$3 billion NZD of trade could not be matched. Unmatched observations consist of oils, lubricants, and confidential trade items.

Table 1: Ten most concentrated markets for all imports in 2019

	Country of origin	Share of total value of imported HSC10 products (%)	HSC10 categories imported	Trade value of imported HSC10 products (NZD)
1	China	21.2%	8177	\$12.9B
2	Australia	11.8%	7314	\$7.2B
3	USA	10.5%	7180	\$6.4B
4	Japan	6.2%	4176	\$3.8B
5	Germany	5.9%	5467	\$3.6B
6	United Arab Emirates	4.4%	881	\$2.7B
7	Thailand	4.4%	3128	\$2.6B
8	Malaysia	3.2%	2568	\$1.9B
9	United Kingdom	2.9%	5691	\$1.8B
10	Italy	2.2%	4793	\$1.4B
	Rest of World (203 countries)	27.2%	9011	\$16.5B
<i>Total value of import trade</i>			<i>\$60.8B</i>	
<i>Total countries with import trade</i>			<i>213</i>	
<i>Total imported HSC10 categories</i>			<i>11040</i>	

The main changes to create the import dataset were:

- 2349 observations were removed where New Zealand is recorded as the country of origin, representing a value of \$187 million or 0.29% of the total value of imports. These are likely to be re-imports (where the same imported goods comes back into New Zealand either due to New Zealand adding some small amount of added value or shipping logistics) or returned exports.
- Country names were changed to BACI spellings, which includes Taiwan as “Other Asia, Not Elsewhere Specified”.

The results in this section have been generated from the merged SNZ-BACI import dataset to provide a picture of New Zealand's total import trade and a basis for comparison with the filtered dataset, discussed in the next section.

Table 1 shows that China is New Zealand's main country of origin for total imports, followed by Australia, the USA and Japan. Imports from China make up 21% of New Zealand's total imports. New Zealand also imports more HSC-10 products from China than any other country.

Figure 2 shows the top ten (out of 96) HSC-2 level products New Zealand imported in 2019. Machinery and Vehicles made up approximately 15% each, Electrical 9% and Mineral Fuels 7%. The next six categories (Plastics, Optical and Medical, Pharmaceutical, Furniture, Iron and Steel, and Aircraft) made up less than 5% each; while the remaining 86 HSC-2 level products New Zealand imported each make up 2% or less of New Zealand's total import value of \$61 billion.

Figure 2: Top ten HSC-2 categories for all imports in 2019

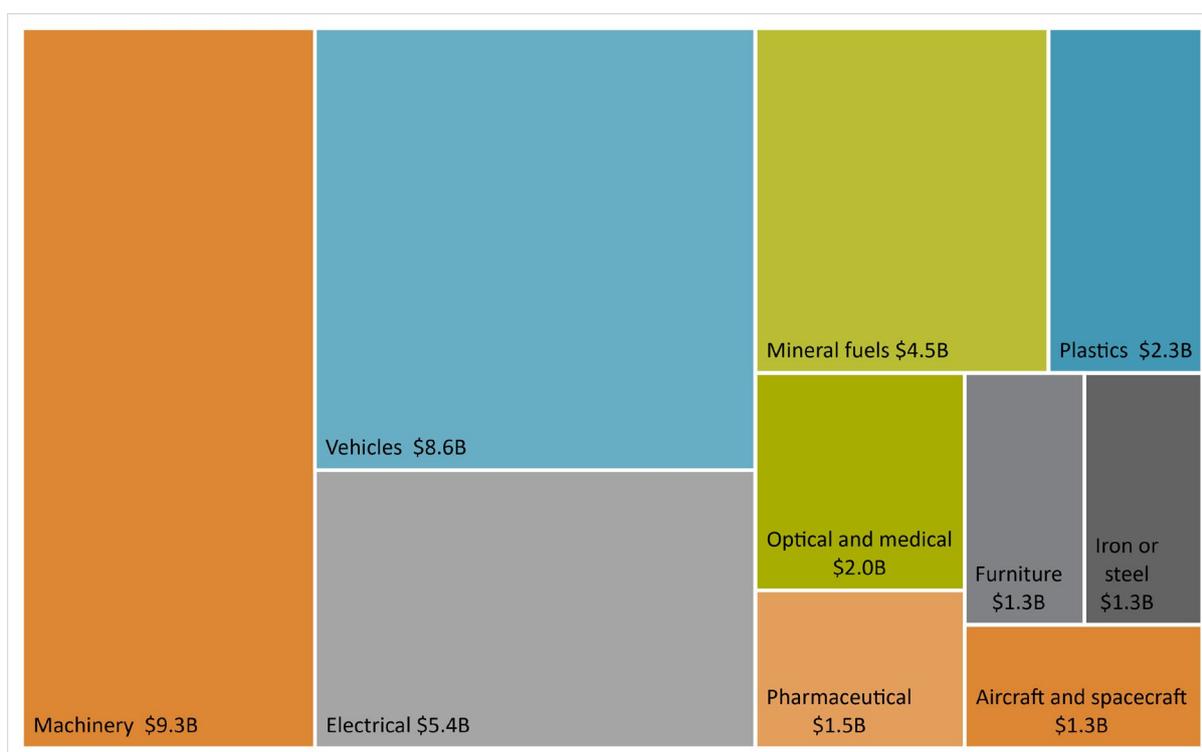
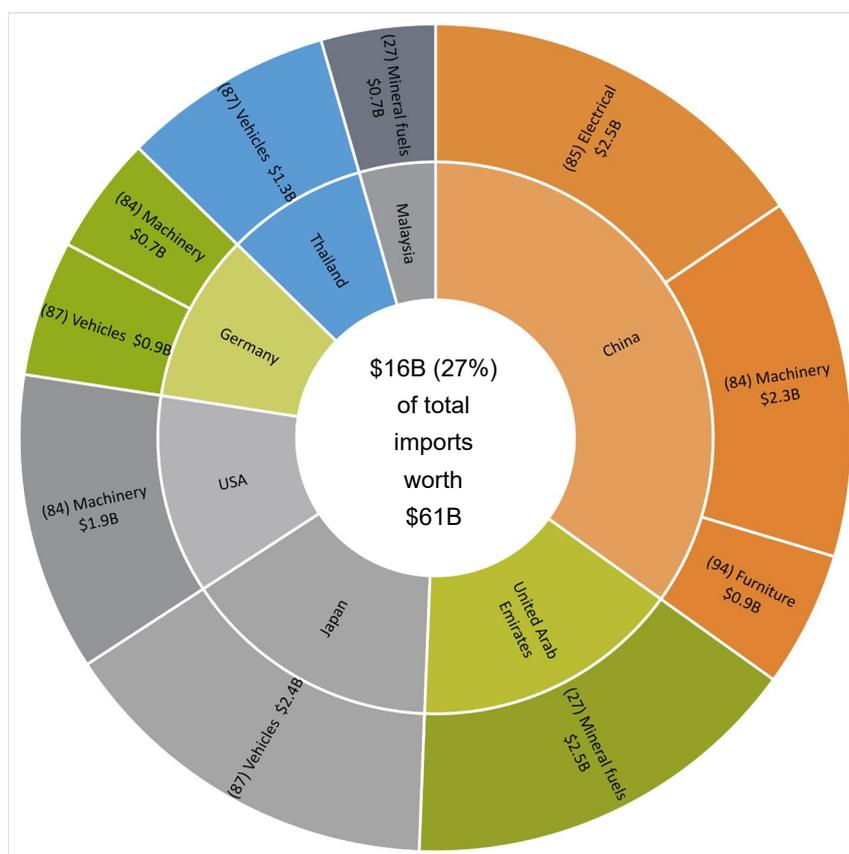


Figure 3 shows New Zealand's top ten total imports by *HSC-2 category and country* in 2019, worth \$16 billion, or 27% of New Zealand's total import value of \$61 billion. Imports from China accounted for \$5.6 billion (35%) of that \$16 billion, or 9% of the total \$61 billion matched imports.

Figure 3: Top ten HSC-2 categories for all imports by country in 2019



4.2 Import filters

The following filters were applied to the import dataset:

- Filter One (concentrated import sources). This filter aims to identify products that have a limited number of existing import sources, or specifically where the main supplier provides more than 80% of the HSC-10 product category that New Zealand imports. The rationale for this filter is that imports sourced from only a few countries are more likely to be more exposed to individual supply constraints, transportation disruptions, production bottlenecks and/or unforeseen policy changes (border closures, export restrictions, natural disasters etc.).
- Filter Two (concentrated global markets): This filter determines whether there are limited alternative global suppliers that New Zealand could access in the event of a disruption. Following the APC method, this is assumed to be when the Herfindahl–Hirschman Index (HHI) is greater than 3100, or when the main global supplier of a product to New Zealand also accounts for at least 50 per cent of global exports of that product.⁶
- Filter Three (main global supply): This filter determines if New Zealand sources its concentrated imports from the *main* global supplier in a concentrated market. The rationale for this filter is that these imports may be more challenging to source from alternative global suppliers in the case of disruption.

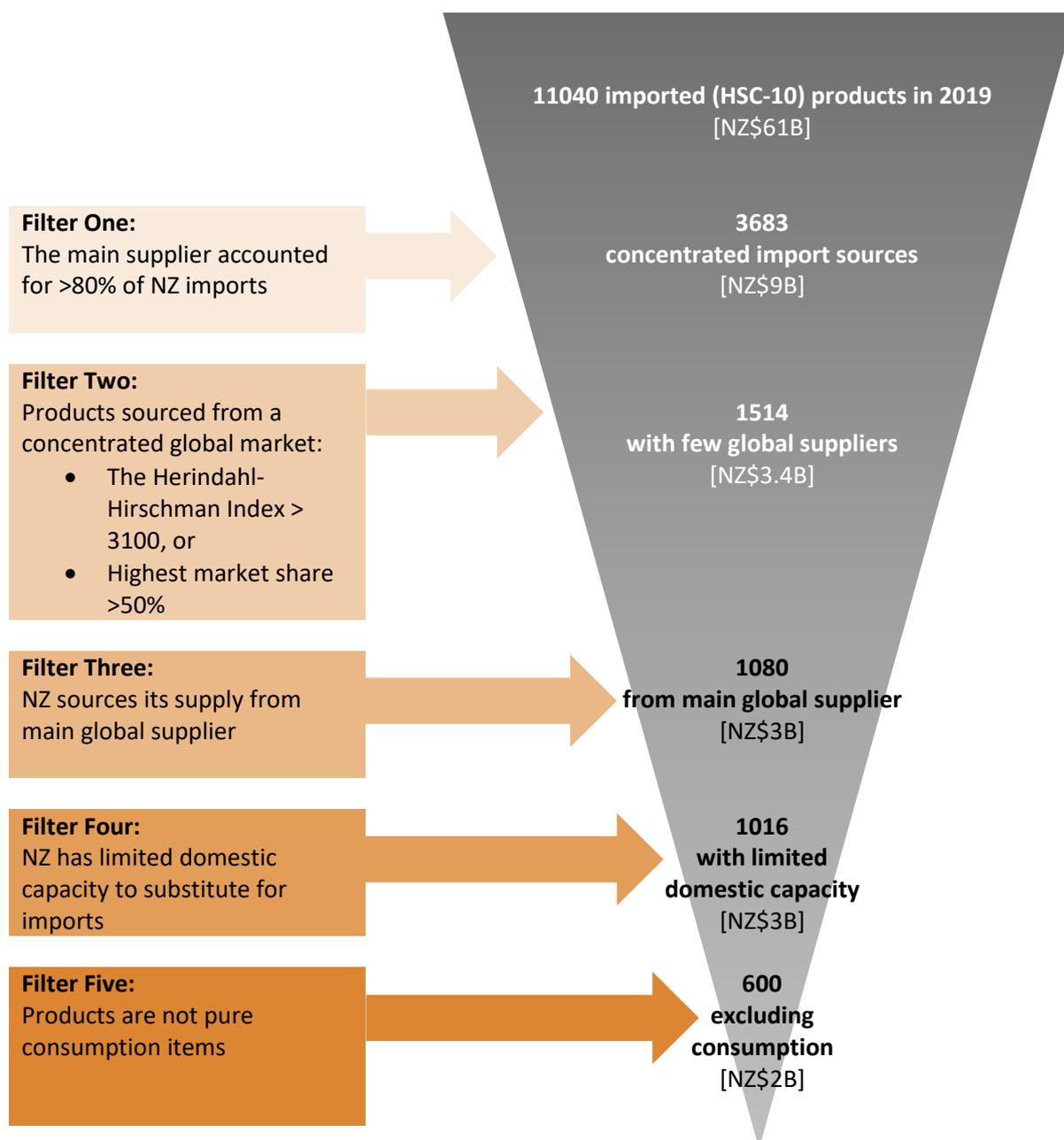
⁶ The HHI is a measure of market concentration using the square of the sum of county shares of individual HSC-10 product imports. Values range between 0 and 10000 – values above 2500 signal high market concentration.

- **Filter Four (limited domestic capacity):** This filter is intended to remove products that New Zealand could produce domestically. The capability to produce a product is assumed to occur where the export value is higher than the import value for the same HSC-10 product.⁷

A fifth filter was applied to remove products that are pure consumption items, based on the UN's Broad Economic Categories (BEC).⁸ These items are less likely to be essential to the functioning of the economy, but their loss may still have important wellbeing implications.

Figure 4 summarises the filtering process as applied to the merged SNZ-BACI dataset for imports, as outlined in section 3 above.

Figure 4: Concentrated imports in 2019



⁷ This proxy measure is based on the measure used by Global Affairs Canada in their study of vulnerable imports. See Jiang (2021)

⁸ <https://unstats.un.org/unsd/classifications/Econ#Correspondences>

Figure 4 shows that from the original 11040 HSC-10 level products New Zealand imported in 2019, 3683 (33%) were from concentrated import sources, 1514 (14%) were from concentrated global markets, 1080 (10%) were all sourced from the main global supplier, 1016 (9%) have limited domestic capacity to be substituted, and 600 (5%) exclude pure consumption items.

In terms of value, from the total \$61 billion matched imports that New Zealand imported in 2019, \$9 billion (15%) were from concentrated import sources, \$3.4 billion (6%) were from concentrated global markets, \$3 billion (5%) were sourced from the main supplier and have limited capacity to be substituted, and \$2.2 billion (4%) exclude pure consumption items.

4.3 Findings from filtered import dataset

This section sets out the specific findings from the filtered dataset.

The filtering process identified \$2.2 billion worth of imported products out of the \$61 billion imports in 2019 that could be matched with international trade data.⁹ In other words, 4% of the value of New Zealand’s imported products could be considered “vulnerable” to persistent supply chain shocks according to this methodology.

Table 2: Ten most concentrated markets for vulnerable imports in 2019

	Country of origin	Share of total value of vulnerable HSC10 products (%)	Vulnerable HSC10 categories	Total value of vulnerable products (NZD)
1	China	66.7%	372	\$1447M
2	USA	9.5%	55	\$206M
3	Japan	6.6%	22	\$144M
4	Australia	3.9%	20	\$84M
5	Singapore	3.2%	1	\$68M
6	Canada	2.8%	6	\$61M
7	Indonesia	1.6%	7	\$35M
8	Malaysia	1.4%	3	\$30M
9	Germany	1.3%	29	\$29M
10	France	0.9%	5	\$19M
	Rest of World (21 countries)	2.2%	80	\$47M
<i>Total value of vulnerable import trade</i>			\$2.2B / \$60.8B	
<i>Total countries with vulnerable import trade</i>			31/ 213	
<i>Total vulnerable imported HSC10 categories</i>			600/ 11040	

⁹ More information is available in the excel file “ProdCom Import Analysis version 1.1” referenced in the Introduction section.

Table 2 shows that China alone accounted for 66.7% of these vulnerable imports' sources in 2019, by value, although it makes up only 21% of New Zealand's total goods imports in 2019 (see Table 1). There are 31 countries New Zealand imports vulnerable products from, out of a total of 213. The top 10 countries accounted for 98% of the total value of vulnerable products. In addition to China, these countries were the USA (9.5%), Japan (6.6%), Australia (3.9%), Singapore (3.2%), Canada (2.8%), Indonesia (1.6%), Malaysia (1.4%), Germany (1.3%) and France (0.9%).

In terms of products, Table 2 also shows that of the total 600 vulnerable HSC-10 level products identified, China supplied 372 of them (or 62%). Table 3 shows that that China supplied four of New Zealand's ten most vulnerable imports.

Table 3: Ten most vulnerable HSC-10 imports in 2019

	HSC2	HSC10 category	Origin	Value of vulnerable HSC10 category	Value of total HSC10 category	% of total HSC10 category	% of total vuln. trade
1	84	Data processing machines	China	\$741M	\$795M	93	34
2	23	Brewing or distilling dregs and waste	USA	\$98M	\$108M	91	5
3	85	Monitors for data processing machines	China	\$68M	\$78M	88	3
4	48	Paper and paperboard	Singapore	\$68M	\$69M	98	3
5	44	Sawn coniferous (red cedar) wood (>6mm)	Canada	\$50M	\$50M	100	2
6	87	Vehicles	USA	\$47M	\$49M	94	2
7	94	Seats	China	\$45M	\$56M	82	2
8	70	Glass containers	China	\$42M	\$51M	82	2
9	17	Sugars	Australia	\$40M	\$40M	100	2
10	87	Vehicles	Japan	\$36M	\$37M	97	2
<i>Total vulnerable trade</i>							<i>\$2171M</i>

The 600 vulnerable products represent 5% of the 11040 HSC-10 level products New Zealand imports. At a more aggregated level, however, 66% or 63 of the 96 HSC-2 categories New Zealand imports have vulnerable products in them. Machinery and mechanical Appliances (HSC-2:84) accounted for 40% of New Zealand's vulnerable imports, while Electrical Machinery and Equipment (HSC-2:85) and Vehicles (HSC-2:87) both accounted for approximately 10% each. These were followed by Furniture (HSC-2:94, 7%), Wood (HSC-2:44, 6%), Paper (HSC-2:48, 5%), Food Residues and Waste (HSC-2:23, 5%), Glass (HSC-2:70, 3%), Articles of Iron or Steel (HSC-2:73, 3%), and Fats and Oils (HSC-2:15, 2%).

Table 4 also shows the breakdown of New Zealand's vulnerable HSC-2 category imports by their value compared with the total value of this category New Zealand imports. While Machinery and

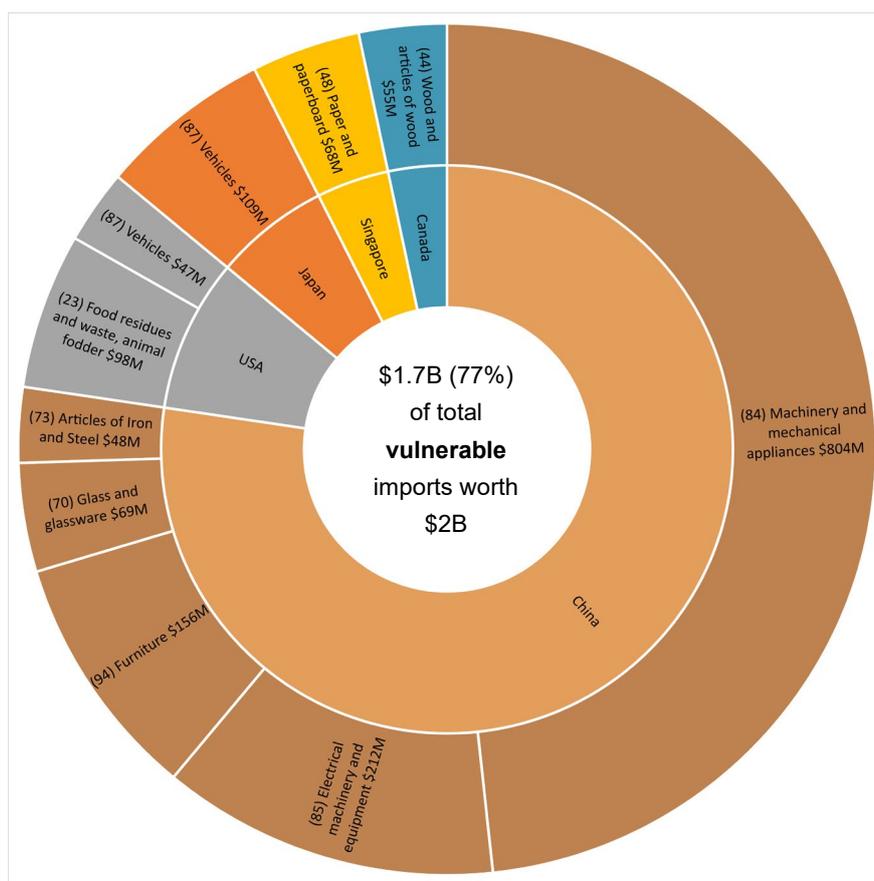
Electrical Machinery are most vulnerable in terms of value, Wood followed by Glass and Furniture are arguably more vulnerable in terms of the proportion of the value of the HSC-2 category made up of vulnerable products.

Finally, Figure 5 below, shows New Zealand's top 10 vulnerable imports *by country and HSC-2 category*, which are worth \$1.7B or 77% of New Zealand's vulnerable imports. China's share of this remains significant at \$1.3B or 77% of the top ten.

Table 4: Ten most *vulnerable* HSC-2 imports in 2019

	HSC2	HSC2 category	Value of vulnerable HSC2 category	Value of total HSC2 category	% of total HSC2 category	% of total vuln. trade
1	84	Machinery and mechanical appliances	\$858M	\$9279M	9	40
2	85	Electrical machinery and equipment	\$226M	\$5384M	4	10
3	87	Vehicles	\$204M	\$8566M	2	9
4	94	Furniture	\$156M	\$1327M	12	7
5	44	Wood and articles of wood	\$127M	\$424M	30	6
6	48	Paper and paperboard	\$100M	\$1118M	9	5
7	23	Food residues, waste, fodder	\$98M	\$1054M	9	5
8	70	Glass and glassware	\$69M	\$408M	17	3
9	73	Articles of iron or steel	\$56M	\$1304M	4	3
10	15	Animal or vegetable fats and oils	\$43M	\$393M	11	2
<i>Total vulnerable trade</i>						\$2171M

Figure 5: Top ten HSC-2 vulnerable imports by country in 2019



5 Export analysis

5.1 Export dataset

The original SNZ dataset had a total export 'FOB' ("free on board") value of \$59.9b (*including re-exports*). The merged dataset has 78,505 observations (country:HSC-10 product pairings, but only for 53,641 unique country:hsc-6 product pairings), with a value of \$58.2b NZD. There was a total of 702 unmatched observations, meaning almost \$2 billion of trade could not be matched.

No substantial changes were made to the original SNZ dataset, except for changing Taiwan to 'Other Asia Not Elsewhere Specified', as discussed for imports in section 4.1.

The following results have been generated from the merged export dataset to provide an overview of New Zealand's total export trade and as basis for comparison with the filtered dataset, discussed in the next section.

Table 5 shows that New Zealand is sourced most of its total export trade in 2019 from China, followed by Australia, the USA and Germany.

Table 5: Ten most concentrated markets for all exports in 2019

	Destination country	Share of total value of HSC10 products exported (%)	HSC10 categories exported	Total value of HSC10 products exported (NZD)
1	China	28.7%	1908	\$16.7B
2	Australia	14.7%	6443	\$8.6B
3	USA	9.6%	3471	\$5.6B
4	Japan	6.0%	1739	\$3.5B
5	Republic of Korea	2.9%	1088	\$1.7B
6	United Kingdom	2.5%	2053	\$1.5B
7	China (Hong Kong)	2.1%	1821	\$1.2B
8	Other Asia	2.0%	1036	\$1.2B
9	Malaysia	1.8%	1226	\$1.1B
10	Indonesia	1.8%	597	\$1.1B
	Rest of World (196 countries)	27.7%	8344	\$16.1B
<i>Total value of export trade</i>			\$58.2B	
<i>Total countries with export trade</i>			206	
<i>Total HSC10 categories exported</i>			9541	

Figure 6 shows New Zealand's top ten HSC-2 categories of total exports in 2019. Dairy and Honey made up 28%, followed by Meat at 14% and Wood at 9%. All the other categories made up less than 5% each.

Figure 6: Top ten HSC-2 categories for all exports 2019

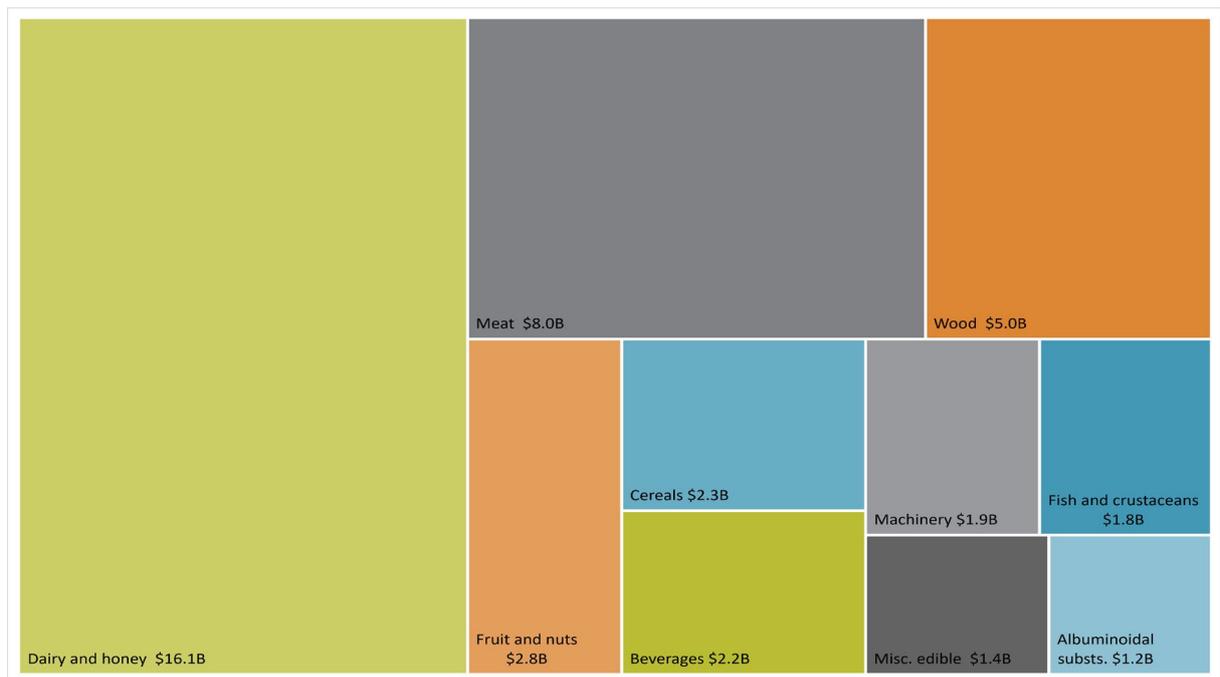


Figure 7: Top ten HSC-2 categories for all exports by country in 2019

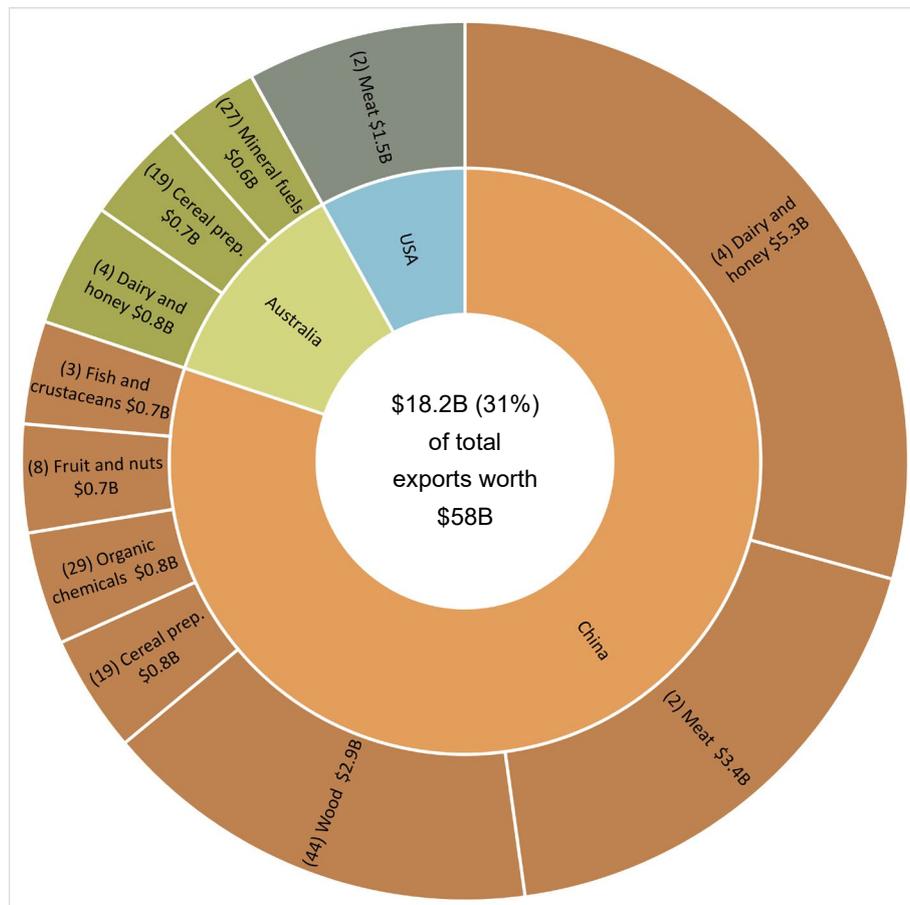
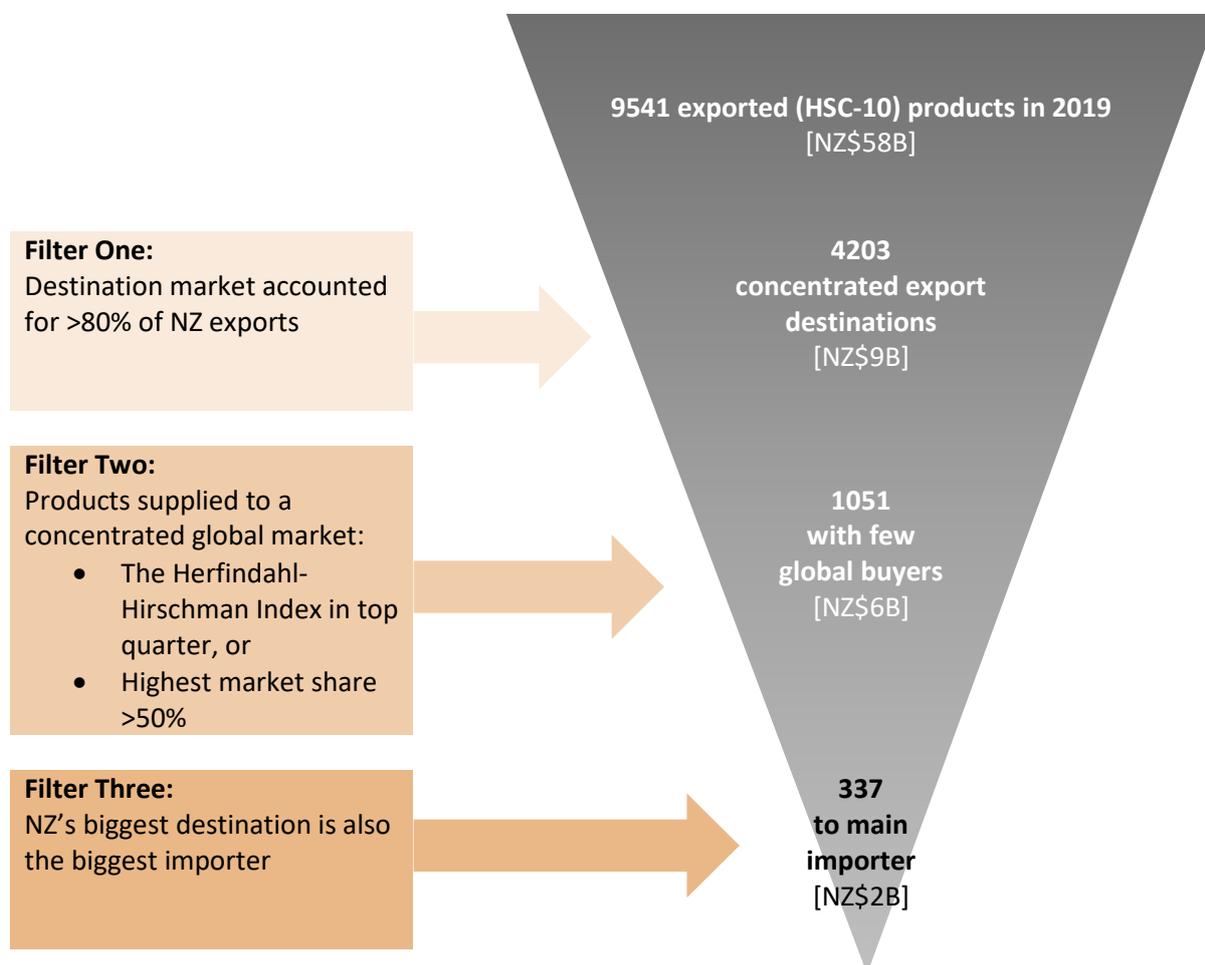


Figure 7, shows New Zealand's top ten total exports by *HSC-2 category and country* in 2019. They are worth \$18.2 billion, or 31% of New Zealand's total export value of \$58 billion. China accounted for \$14.6 billion (80%) of this.

Figure 8: Concentrated exports in 2019



5.2 Export filters

The following filters were applied to the export dataset:

- Filter One (concentrated exports). This filter identifies which New Zealand exports are concentrated, by assessing whether a single destination accounts for more than 80% of New Zealand's exports for a product. The rationale is that concentrated exports are more exposed to supply chain disruptions caused by transportation issues, export restrictions or natural disasters etc.
- Filter Two (concentrated global markets). This filter identifies which exports have few alternative destination markets to redirect exports. The Commission has assessed whether the HHI is in the top quartile **or** the biggest importer accounted for more than 50% of global imports.
- Filter Three (main global demand). This filter identifies which exports are to destinations that are also the largest importer. Exports that are destined for concentrated markets may be vulnerable because it can be difficult to easily switch to alternative markets (eg. without experiencing significant price changes).

Figure 8 summarises the filtering process as applied to export dataset. It shows that of the 9541 products New Zealand exported in 2019, 4203 (44%) of those products were to concentrated individual markets, 1051 (11%) of those were to concentrated global markets, and 337 (4%) of those were to the largest global market.

5.3 Findings from filtered export dataset

This section sets out the specific findings from the filtered export dataset.

The filtering process identified \$2 billion worth of exported products from New Zealand's \$58 billion exports in 2019 (note, that products individually worth less than \$100,000 were *not* excluded in the export analysis). This means that 3% of the *value* of New Zealand exported products could be considered 'vulnerable' to persistent supply chain shocks using the APC methodology. This compares with 3.5% of the *number* of HSC-10 products (or 337 out of 9541) that could be considered vulnerable.

Table 6: Ten most concentrated markets for *vulnerable* exports in 2019

	Destination country	Share of total value of vulnerable HSC10 products (%)	Vulnerable HSC10 categories	Total value of vulnerable products (NZD)
1	Australia	55.9%	165	\$899M
2	China	25.1%	31	\$403M
3	USA	7.6%	37	\$122M
4	Japan	4.7%	11	\$75M
5	India	2.2%	6	\$35M
6	Republic of Korea	1.6%	7	\$26M
7	United Arab Emirates	1.3%	5	\$21M
8	Indonesia	0.8%	1	\$12M
9	China (Hong Kong)	0.4%	6	\$6M
10	Singapore	0.2%	6	\$3M
	Rest of World (22 countries)	0.4%	62	\$7M
<i>Total vulnerable trade</i>			\$1.6B / \$58.2B	
<i>Total countries with vulnerable export trade</i>			32 / 206	
<i>Total HSC10 vulnerable categories exported</i>			337 / 9541	

Table 6 shows that New Zealand is most dependent on Australia as an export market for vulnerable products. They receive more than half the value of New Zealand's vulnerable export products (a total value of \$899 million out of \$1.6 billion), and almost half of the products (or 165 out of 337). (The proportion of re-exports in these figures requires further investigation.)

While China is New Zealand's main export market, New Zealand is less dependent on China for vulnerable exports, with them receiving a quarter of New Zealand's vulnerable products (\$403 million) compared to 29% of all (unfiltered) New Zealand's exports (\$16.7 billion out of \$58.2 billion).

The top ten countries New Zealand exported vulnerable products to accounted for almost 100% of the total value of vulnerable products. In addition to Australia and China, these countries were USA, Japan, India, Republic of Korea, United Arab Emirates, Indonesia, China (Hong Kong) and Singapore.

Table 7 shows that Australia received four of New Zealand's ten most vulnerable exports, while China received two.

Unlike with imports, there are vulnerable products in all 96 of the HSC-2 categories New Zealand exports. Precious stones and metals (HSC-2:71) accounted for 34% of New Zealand's vulnerable exports, followed by Meat and Offal (HSC-2:2) at 17%, Wood and Wood Articles (HSC-2:44) at 11%, and Beverages (HSC-2:22) at 6%. All other HSC-2 categories accounted for less than 5% each.

Table 7: Ten most vulnerable HSC-10 exports in 2019

	HSC2	HSC10 category	Destination	Value of vulnerable HSC10 category	Value of total HSC10 category	% of total HSC10 category	% of total vuln. trade
1	71	Gold	Australia	\$539M	\$540M	100	33
2	2	Frozen sheep meat cuts (excluding lamb)	China	\$258M	\$317M	82	16
3	22	Waters (mineral, sweetened), metal containers)	Australia	\$98M	\$100M	98	6
4	44	Coniferous wood logs	China	\$50M	\$50M	100	3
5	85	Electromagnets	USA	\$42M	\$45M	94	3
6	44	Non-coniferous wood for fuel	Japan	\$37M	\$37M	100	2
7	44	Non-coniferous wood in the rough, saw logs and veneer logs	India	\$34M	\$34M	100	2
8	39	Plastics for conveyance or packing	Australia	\$28M	\$29M	95	2
9	20	Vegetable (beetroot) preparations	Australia	\$26M	\$27M	98	2
10	44	Pinus radiata wood for fuel	Japan	\$24M	\$29M	83	1
<i>Total vulnerable trade</i>							<i>\$1609M</i>

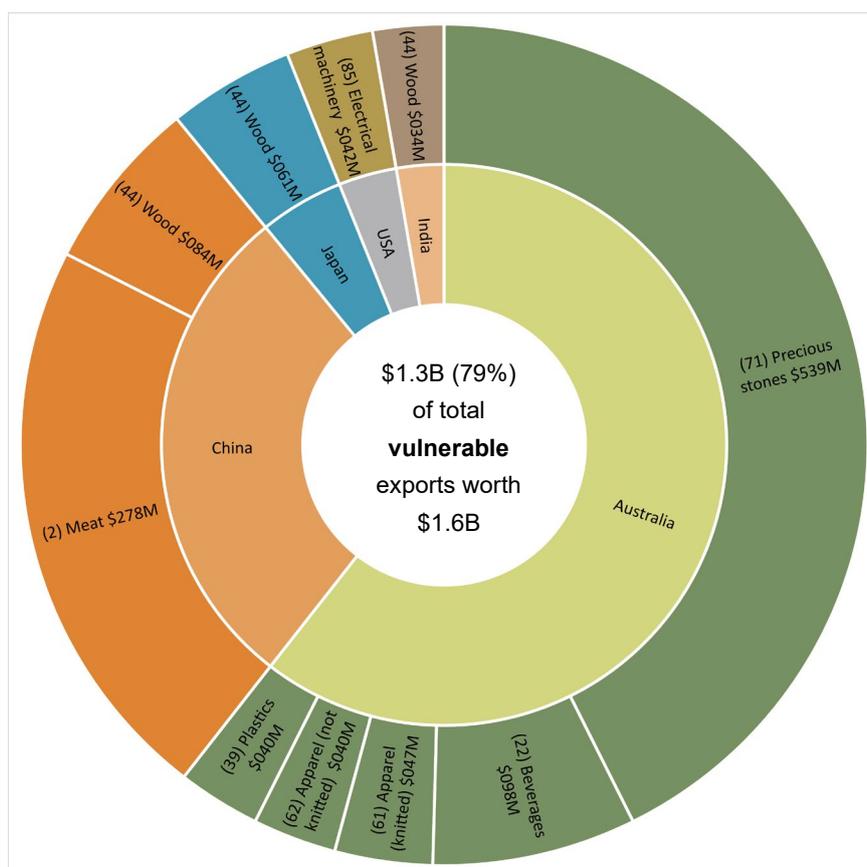
Table 8 shows the breakdown of New Zealand's ten top vulnerable HSC-2 category imports by their value compared with the total value of this category that New Zealand exports. Whiles Precious Stones, Meat and Wood are most vulnerable in terms of value, Precious Stones and Apparel are more vulnerable in terms of the proportion of New Zealand's total imports in their respective categories. (Further analysis should explore the proportion of these that are re-exports.)

Finally, Figure 9 shows New Zealand's ten most vulnerable exports *by country and HSC-2 category*, which are worth \$1.3B or 78.5% of New Zealand's vulnerable imports. Australia's share of this was \$765M or 60.5% and China's was \$361M or 28.6%.

Table 8: Ten most *vulnerable* HSC-2 exports in 2019

	HSC2	HSC2 category	Value of vulnerable HSC2 category	Value of total HSC2 category	% of total HSC2 category	% of total vuln. trade
1	71	Precious stones, metals; imitation jewellery; coin	\$554M	\$690M	80	34
2	2	Meat and edible meat offal	\$278M	\$8028M	3	17
3	44	Wood and articles of wood; wood charcoal	\$180M	\$5011M	4	11
4	22	Beverages, spirits and vinegar	\$99M	\$2175M	5	6
5	85	Electrical machinery and equipment	\$74M	\$1058M	7	5
6	84	Machinery and mechanical appliances	\$69M	\$1862M	4	4
7	61	Apparel, knitted or crocheted	\$47M	\$99M	48	3
8	62	Apparel, not knitted or crocheted	\$40M	\$118M	34	3
9	39	Plastics and articles thereof	\$40M	\$517M	8	3
10	20	Preparations of vegetables, fruit, nuts	\$32M	\$334M	10	2
Total vulnerable trade						\$1609M

Figure 9: Top ten HSC-2 vulnerable exports by country in 2019



6 Conclusion

This study has explored vulnerability by identifying which products are sourced from (or sold to) a small number of countries, and those countries are the main global sellers (or buyers) of those products.

What this analysis reveals...

This trade data analysis shows that in 2019, 600 (5%) of the 11040 HSC-10 products New Zealand imported were vulnerable to supply chain disruption. These products were worth \$2.2 billion (4%) of New Zealand's \$60.8 billion in total imports.

New Zealand sources 67% of the value of its vulnerable products from China (despite China only accounting for 21% of New Zealand's total import value). New Zealand's next most concentrated import source was the USA (9.5%), followed by Japan (6.6%). New Zealand's three most vulnerable imported products were data processing machines, brewing or distilling dregs and waste and monitors for data processing machines.

In terms of exports, 337 (4%) of the 9541 HSC-10 products New Zealand exported in 2019 were vulnerable to supply chain disruption. These products were worth almost \$2 billion of New Zealand's \$58 billion in total exports. They are vulnerable because they were exported to a single or limited number of countries and those countries were the main global consumers of these products.

Interestingly, Australia was New Zealand's largest destination for vulnerable products, both in terms of value and number of products. They accounted for 56% of the total value of vulnerable products

from 165 exported products, compared to China, which accounted for 25% of the value from 31 products. This effectively reverses their relative positions with total exports, where China accounts for 29% and Australia 15% of the traded value. However, even with total trade, New Zealand exports a much greater number of HSC-10 products to Australia (6443) than China (1908).

New Zealand's three most vulnerable exported products were gold, frozen sheep meat cuts (excluding lamb), and canned water (mineral, aerated, sweetened).

What this analysis doesn't reveal...

This trade data analysis has not looked at trade patterns over time to observe whether concentration persisted. It has also not explored the importance of these products and supply chains to particular industries and communities. The former requires time-series analysis and the latter requires linking the data with industries and their production processes with merchandise trade and employment information.

Even looking across multiple years and tracing products to industries and regions will not shed light on the *dynamic* nature of supply chain disruptions. For instance, the ability of Industries to substitute inputs or outputs for different products (and services), or innovate technologies to produce goods or services using alternative methods. Identifying vulnerable products (and services) is also only part of the picture as supply-chain disruptions are likely to impact different parts of the economy differently.

This initial analysis has been valuable for testing the approach taken by other studies to identify vulnerable trade. Constructing the dataset and applying the different filters enables a closer look to be taken at which parts of the economy the Inquiry should on and where price shocks or other disruptions may be estimated with modelling. The Commission will use existing input-output relationships, CGE and distributional modelling to explore these dynamics.

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