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**The Composition of New Zealand Exports
1989-2018**

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Abstract

It has been over 30 years since New Zealand initiated a trade liberalisation strategy as part of its radical economic reforms. Specifically, trade policies were changed in the early 1980's and this liberalisation was brought to a halt around 2002. This paper uses revealed comparative advantage indices of 4-digit export categories to explore the changing composition of exports from 1989 to 2018.

Keywords

trade liberalisation
New Zealand exports
revealed comparative advantage

JEL Classifications

D22, E61, E65, F13, F14

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1. Introduction

In 1984, New Zealand (NZ) began a major economic reform programme, although trade policy change had been in the political spotlight for a few years. The trade liberalisation component of the programme began slightly before 1984 and continued to around 2001. In that year the government stopped the tariff reduction plan pending future trade negotiations with our partners offshore to create so-called ‘policy space’. This action kept New Zealand tariffs at about the same level as in other developed economies (Anderson *et al.* 2009).

These developments are documented in Bollard and Buckle (1987), Silverstone *et al.* (1996), Evans *et al.* (1996) and Lattimore (2003). Tariffs had been very high and the accompanying import licenses very tight in New Zealand (by developed country standards) from 1938 until 1983. Export subsidies were a late innovation in the 1970’s to compensate exporters for the implicit tax represented by import protection (sometimes referred to as tariff compensation). These policies were radically changed over the trade reform period.

By 1982, NZ trade policy had developed three broad strands – import licenses, tariffs, compensating tariffs and compensating subsidies for industries affected by the import control – so-called tariff compensation. Import licenses and agricultural subsidies were removed first and that was generally followed by small annual tariff reductions on a pre-announced schedule. There were a few surprises in this process. One memorable surprise occurred in 1997 when the 25 percent most favoured nation (MFN) tariff on car imports was removed overnight in the government’s Budget speech presented by the Hon. Winston Peters.

This paper reviews the composition of NZs exports in 1989 when the more detailed harmonized classification system (HS) was introduced. This is early enough to give a reasonable picture of the composition of exports pre-liberalisation because resources take some years to move between sectors of the economy. The export product composition in 1989 is then compared with the composition in 2017 and at the 4-digit level, 2018. This latter year is roughly 35 years after the trade liberalisation programme began and 20 years after it finished.

The time interval being used here is more than long enough to see major market changes at home and abroad including technological changes in NZ industries relative to those overseas. Scrub cutters in the 1960’s would never have predicted that we would be planting Manuka seedlings in 2019 for bees to do their work. The point is, that ‘forecasting is difficult, especially about the future’ as a wag once put it. Accordingly, this paper will take a wide view of NZ export products, no matter how uncompetitive they might appear to be globally, at present.

The review uses an index of comparative advantage at the 4-digit HS product level to gauge the international competitiveness of tradable industries in the economy. The measure used, Revealed Comparative Advantage (RCA), is the ratio of New Zealand’s trade share in a particular line of products with the world’s trade share in the same product line. An RCA value

of 1.0 and above indicates that New Zealand has a comparative advantage in that product line. However, even changes in a product's RCA index less than 1.0, over the period from 1989 to 2018, are taken as an indicator of changes in NZ's export competitiveness in world markets for the product. After all, the suppliers of an export product have already jumped a major hurdle in finding a potential overseas market – this is a costly exercise. The North Otago farmers who sent a trial shipment of frozen meat to London in 1882 on an experimental refrigerated sailing cum steam ship incurred a high market research cost.

It needs to be borne in mind that RCA values are not adjusted for trade policy distortions either in NZ or abroad; they are being calculated only from existing trade flows. Accordingly, if a country subsidises an export product, its RCA will tend to fall if the policy is removed and if it taxes an export product, the RCA will tend to rise if the policy is removed. The RCA measure is reflecting competitiveness in the current situation given the global policy interventions in place at the time.

2. Literature Review

Ballingall and Briggs (2002) made an earlier study of the composition of New Zealand exports focusing on those product lines which exhibited a revealed comparative advantage in 1984 and 1999 using SITC (Rev 1) data. They show the short-term effects of NZ trade liberalisation. By 1999, the major meat and dairy product lines had reinforced their position in the export mix while the newer Kiwifruit and wine industries (among others) were growing rapidly. The results in this paper are referred to here though continuity is limited somewhat because SITC data is somewhat less detailed than the HS data used in the present paper. This restricts the formal comparisons one could have made 20 years on.

A taster for the rapid changes that can be experienced in export markets is exemplified by the NZ wine industry. Ballingall and Briggs (2002) reported that NZ wine had a revealed comparative advantage less than 2.0 in 1999 but this had risen to over 14.0 by 2016 (Anderson et al, 2017) as a result of large capital inflows to finance firm expansion.

Nesbitt (2013) followed up on the Ballingall and Briggs paper comparing the change in export composition from 1999 to 2007. She used HS data in her assessments and these 2007 results together with the earlier results for 1999 will be incorporated into the results here for 2018.

Blakeley *et al.* (2009) provide a general analysis on New Zealand's place in the globalized world. They point to a weakness in New Zealand's outward direct investment and to the effect of the 'tyranny of distance' on the export sector. Bano and Scrimageour (2011) provide an in-depth assessment of the changing RCA of the NZ Kiwifruit industry as it matured from its early NZ beginnings in the 1950's.

3. New Zealand's Historic Economic Performance

Trade was liberalized in the 1980's because living standards in NZ were falling relative to countries we emulate, for quite a long time. In other words, NZ has struggled to maintain a high level of real income per capita throughout its modern history as illustrated in Table 1. NZ began its modern economic history in the middle of a globalisation phase in world history in the mid-nineteenth century and quickly joined the highest income countries in real income per capita terms, Table 1. This is discussed in detail by Hawke *et al.* (1984 and 1999). New Zealand was able to quickly 'manufacture' strong comparative advantages in selected high-priced primary products and accordingly matched income levels in the United States, Australia and the United Kingdom right up to the 1920's. Exploitables (as Hawke called them) were the first export industries – native timber, Kauri gum, flax, gold and coal. These were followed by wool, meat and dairy products. These export industries gave a very large boost to real incomes given high market prices overseas, the volume of export output and the high level of labour productivity in NZ at the time.

Table 1: Maddison's Real Income Per Capita
Relative to the United States = 1.0

Year	New Zealand	Australia	UK	Singapore
1870	1.27	1.34	1.30	NA
1880	1.18	1.35	1.09	NA
1890	1.11	1.31	1.18	NA
1900	1.05	0.98	1.10	0.33
1910	1.07	1.05	0.93	0.32
1920	1.02	0.86	0.82	0.26
1930	0.80	0.76	0.88	0.31
1940	0.90	0.88	0.98	0.32
1950	0.88	0.78	0.73	0.23
1960	0.84	0.78	0.76	0.20
1970	0.74	0.80	0.73	0.30
1980	0.66	0.78	0.70	0.49
1990	0.59	0.74	0.71	0.61
2000	0.58	0.74	0.73	0.74
2010	0.62	0.84	0.78	0.95
2016	0.63	0.86	0.78	1.05

Source: Maddison Project Database 2

On Maddison's measure, the Great Depression and Second World War period saw a halt in New Zealand's prosperity relative to the United States, but after the 1940's NZ went into a major relative decline until the 1990's. This decline may be attributed, in part, to the import substitution policies adopted at the time. The decline was halted in the decades after 1990 and there have been some small gains in relative per capita real income to 2016.

The sectoral composition of the economy has changed considerably since the beginning of the import substitution era. In particular, the relative size of the primary sector shrank from 26 percent of GDP in 1953 to 11 percent in 1982, at the end of the import substitution era. Since then, the primary sector has declined very slowly to 8 percent of GDP in 2013 while manufacturing has continued to shrink.

High import tariffs and import licensing were reflected over this period in a large implicit export tax on exportable production. As the trade policy reform programme began to bite from the early 1980's, the relative size of the primary sector stabilized as Professor Fisher (Otago University) would have predicted a century ago (Hawke and Lattimore 2005). Fisher was well aware that Kuznets' industrialization recipe for sectoral development would be wrong where the primary sector had a very high level of labour productivity, as in New Zealand. The sectoral shift between manufacturing and services in New Zealand after 1982 is consistent with Engel's Law (that as income rises, the proportion of income spent on staple products falls) aided by the major increases in manufacturing competitiveness, especially in the 'Star' economies of Asia (Japan, South Korea, Taiwan, Malaysia, Thailand, China and Vietnam).

The following sections review the composition of NZ's gross exports (including re-exports) since the trade policy reforms began, at three levels of aggregation. Harmonised System (HS) export data are used throughout this paper. A highly aggregated grouping of four categories (raw materials, intermediate, consumer and capital goods) is introduced first. The concordance for this grouping and the data is available on the World Integrated Trade Solution (WITS) website to 2017. The second approach is to use 16 categories of exports; animal products (HS 00 to 05) to miscellaneous goods (HS 90's). The data for this aggregation is also available from the WITS website to 2017. The third grouping used in the review is HS 4-digit data available from United Nations (UN) Comtrade to 2018. New Zealand exports around 1200 groupings of products at the 4-digit level. This data is available from the author on request. The RCA index is used to assess the competitiveness of each item of New Zealand exports at all three levels of aggregation.

4. Changing Export Composition

4.1 Highest Aggregation Level

The change in New Zealand's export performance from 1989 to 2017, at the highest aggregation level is shown in Table 2 compared to a selection of other mid-sized, major agricultural producers. At the start of the trade policy reform period, New Zealand had a comparative advantage in raw materials and intermediate products and a comparative disadvantage in consumer products and capital goods. This was still the pattern in 2017. However, there were important changes. New Zealand's comparative advantages in raw materials and intermediate goods were reduced over the period and the export competitiveness in consumer goods (especially) and capital good exports increased. In 2017, New Zealand almost had a comparative advantage in exports of consumer goods.

Table 2: New Zealand's Export Competitiveness
RCA Indices

Product Group	New Zealand		Australia		Brazil		Chile		Denmark	
	1989	2017	1989	2017	1989	2017	1990	2017	1989	2017
Raw Materials	4.86	3.68	5.43	6.55	2.20	4.89	2.89	5.22	1.95	1.42
Intermediate Goods	1.44	1.18	1.50	0.67	1.91	1.11	3.00	1.62	0.73	0.59
Consumer Goods	0.47	0.93	0.25	0.56	0.61	0.45	0.21	0.36	1.07	1.17
Capital Goods	0.18	0.22	0.20	0.14	0.47	0.42	0.03	0.07	0.79	0.80

Source: WITS database.

New Zealand's (and Australia's) growth in competitiveness in consumer goods differs from the other countries shown in Table 2. Brazil and Chile had a reduction in competitiveness in consumer goods while Denmark, with its locational advantages in Europe, increased only slightly. The increase in competitiveness in New Zealand's capital goods exports is also notable. Australia and Brazil had reduced competitiveness over the period while Denmark was virtually static.

The increased competitiveness (higher RCA) of New Zealand exports of consumer goods combined with a reduced competitiveness in raw materials and intermediate goods, indicates that the country's exports have moved up supply chains. As we will see later, many of the consumer goods exported now are based of agricultural and horticultural products produced at the farm level in New Zealand.

Over this 30-year period there has been a struggle for control of world food supply chains emanating from the expansion and concentration of food retailers overseas and the increasingly strict quality regulations of foreign governments based on health, safety and environmental concerns. It indicates that while New Zealand still exports very large quantities of agricultural and horticultural products as raw materials or intermediate goods, it appears to have increased value added in various product supply chains. Furthermore, in many areas of manufacture New Zealand does not have economies of size and it suffers from the 'tyranny of distance' to overseas markets. Accordingly, we should expect to see some emerging export products in the 'niche' category produced by small and medium sized firms.

4.2 Two Digit Export Products

Table 3 provides a measure of the change in competitiveness (that is, changes in the RCA index) for product lines in each of sixteen groups which correspond roughly to 2-digit HS categories. There have been major changes in competitiveness in these 16 product groups over the thirty-year period. New Zealand's comparative advantage in animal, food and wood products have all increased – especially food and wood products. New Zealand has gained competitiveness in the miscellaneous products group. The competitiveness index for mechanical and electrical machinery remains constant.

**Table 3: Change in Revealed Comparative Advantage (RCA) Indices
1989 to 2017**

Products	New Zealand		Australia		Brazil		Chile		Denmark	
	1989	2017	1989	2017	1989	2017	1990	2017	1989	2017
Animal	14.32	20.91	3.52	2.81	0.72	3.43	1.77	4.33	6.58	5.18
Vegetable	2.22	2.08	2.83	1.80	3.36	5.43	3.61	2.87	1.48	0.90
Food	0.99	3.44	1.64	0.76	5.94	3.33	3.25	1.81	3.16	1.95
Minerals	0.21	0.15	7.00	20.12	5.88	8.09	8.06	21.67	0.30	0.22
Fuels	0.45	0.19	3.55	3.54	0.56	1.14	0.11	0.10	0.68	0.54
Chemicals	0.69	0.44	1.21	0.49	0.67	0.48	0.54	0.43	1.08	1.90
Plastic & Rubber	0.30	0.24	0.20	0.11	0.65	0.58	0.12	0.27	0.94	0.66
Hides & Skins	5.22	1.17	1.50	0.51	0.83	1.31	0.11	0.14	1.95	2.10
Wood	1.67	4.58	0.31	0.51	0.96	2.10	1.93	3.18	0.70	0.86
Text. & Clothing	2.03	0.47	2.04	0.52	0.64	0.27	0.18	0.21	0.69	1.33
Footwear	0.18	0.13	0.07	0.05	4.21	0.70	0.48	0.24	0.46	0.71
Stone & Glass	0.37	0.32	2.51	1.42	0.49	0.52	1.49	0.32	0.55	0.28
Metals	0.98	0.55	1.38	0.66	2.08	1.10	4.78	3.97	0.61	0.88
Mach & Electric	0.19	0.19	0.18	0.13	0.40	0.30	0.01	0.06	0.74	0.86
Transportation	1.10	0.10	0.16	0.13	0.57	0.73	0.05	0.11	0.31	0.32
Miscellaneous	0.36	0.63	0.26	0.47	0.27	0.14	0.22	0.04	1.85	1.07

Source: WITS Database

New Zealand has had a very high degree of comparative advantage in animal products for over a century and this is well documented in economic history. Over the last 30 years the RCA index has increased by 40 percent. However, a few countries have been catching up. For example, Brazil has very large dairy and beef cattle populations and its RCA index increased five-fold over this thirty-year period even though it has a large and rapidly growing human population. This is partly because Brazil has been able to deal with earlier strong global regulations against countries with foot and mouth disease. Uruguay, and especially Chile, also experienced large increases in their comparative advantage indices in animal products. The RCA's in Australia and Denmark, traditionally large meat exporters, fell over the period. In Australia, the booming iron ore exports have tended to crowd out a number of traditional export products.

New Zealand's comparative advantage in vegetable products is still above 1.0 but has declined slightly. The RCA's in Australian, Chilean and Danish vegetable products also fell while Brazil gained comparative advantage in vegetable products as a result of the continuing expansion in soybean and maize production vis-a-vis the United States.

NZ exports of food products have grown rapidly in recent years and so the RCA index for this group has risen three-fold. Many food product exports are based on further processing of animal and vegetable products but imported ingredients are also very important including

cereals, flours, sugar and spices. The rising competitiveness of NZ wine has been important here. Another important influence in the food export expansion has likely been the ideas and technology arising in what some would refer to as the 'Foodie Revolution'. New Zealand has played its part here too. There has been a marked improvement in the quality of New Zealand cafes and restaurants over the last thirty years in response to changing consumer preferences. The quality of the products they provide has improved significantly. The increase in in-bound tourism may have also been a stimulus for domestic supply. Brazil lost some RCA in its traditionally innovative food sector but it has had to compete with very large increases in its exports of vegetable and mineral products.

Wood exports have also grown rapidly over the period being considered here. Tree planting increased rapidly in New Zealand after World War 2 and continued into the 1990's. Pinus Radiata plantings predominated and drove exports because their short 25 to 30-year rotation length and the latitude position of New Zealand (and Chile) that provides the ideal ratio of daylight to night for Radiata to grow all year round (which the species does not do in its native environment, California). This supply growth coincided with demand growth in Asian house construction and packaging materials for their burgeoning exports.

New Zealand competitiveness has remained the same in the two groups, machinery and electrical equipment and transportation equipment, though the RCA index is quite low. Competitiveness in the remaining ten categories competitiveness has been reduced.

The RCA indices for many other groups were less than 1 (comparative advantage) in 1989 and declined to some extent over the 30-year period in both New Zealand and Australia. This included chemicals, plastics and rubber products, textiles and clothing, footwear, stone and glass and metals. The biggest fall was in metals where aluminum and iron products are prominent. The RCA index for this group fell from 0.98 to 0.55 in New Zealand. In the minerals group, New Zealand's RCA fell slightly while Australia's mineral index rose dramatically on the back of Western Australian iron ore mine developments (to 20) crowding out comparative advantage in other areas. Chile had a similar rise in mineral RCA based on copper mining.

In 1989, New Zealand had a revealed comparative advantage in textiles and clothing and it now has a comparative disadvantage. This will be due to two factors – the reduction in trade protection for the sector producing these goods and the fast rise in competitiveness of other textile and clothing producers, especially in East and South Asia. Australia and Brazil had the same reductions in competitiveness in these products. It is worth remembering that Brazil was a leading fashion designer and exporter in this area for some decades. Interestingly, Denmark, a high wage economy, developed a comparative advantage in textiles and clothing over the period, perhaps as a result of its locational advantage in Western Europe.

The hides and skins group is related partially to the textiles and clothing and footwear supply chains and here New Zealand's comparative advantage was significantly reduced over the period as it was in Australia. This will be due to declining sheep populations and the expansion of domestic clothing and footwear production. The comparative advantage in hides and skins increased in both Brazil and Denmark (both with large relative animal populations).

5. Highlights of 4-Digit Export Product Changes

Table 4 reports the incidence of major changes in competitiveness (up and down) amongst the 1200 4-digit product lines. The incidence is reported as positive or negative percent changes in the RCA indices, relative to the 2018 value.

Table 4: Incidence of Changes in Revealed Comparative Advantage (RCA) Indices
4-Digit Product Lines, RCA Index, 1989 Relative to 2018

Products	+ 50%	+20-50%	0-20%	-100%	-50to-100%	0 to-50%
Animal	15	2	0	18	1	0
Vegetables	28	5	5	16	5	7
Food	31	6	4	17	2	5
Minerals	16	3	0	3	0	1
Fuel	3	1	1	6	0	0
Chemicals	51	12	8	60	10	6
Plastic & Rubber	14	5	0	20	0	3
Hides & Skins	5	0	0	6	3	2
Wood	18	5	5	24	5	4
Textiles & Clothing	50	14	9	45	10	11
Footwear	0	1	1	2	0	2
Stone & Glass	13	9	3	23	7	4
Metals	17	11	7	49	6	9
Mech & Elect. Equip.	44	32	9	48	10	15
Transport Equipment	13	2	1	7	2	4
Miscellaneous	39	13	6	22	5	6

The first thing to notice about Table 4 is the volatile nature of RCA indices over this 30-year period. Most of the changes in RCA indices occur in Column 3 (+50% of the 2018 value) and Column 6 (-100% of the 2018 value). These are very large changes denoting changes in types of products (for example, meat products switching from frozen to chilled form) and/or changes in the firm structure of industries. Over this long period such changes will be the result of the trade liberalisation policies from the 1980's, innovations, changes in investment patterns in the tradable sector and technology changes in New Zealand relative to changes introduced by overseas competitors. This evidence supports the view that evaluations of export competitiveness over long periods ought not be restricted to arbitrary cutoff points like an RCA of 1.0.

The volatility of RCA index changes at the 4-digit level means that most of the 1200 product lines at the 4-digit level will be of interest to readers. The best that can be done here is to describe any patterns that appear to the author at the 4-digit level and make the full table available on request. A summary of the 4-digit level results is given in Table 5. The product lines are classified in this table accord to their NZ competitiveness vis-a-vis world export growth over the period 1989 to 2018.

Eighteen percent of NZ exports in 2018 were in the STAR category and comprised 3.1 percent of total NZ exports. The STAR category is defined as NZ product lines whose growth exceeded world trade growth in that product line. STAR products, in product number terms, were concentrated in vegetable and food products, minerals, chemicals, textiles and clothing, metal and machinery and electrical products. In export value terms, the STAR products were concentrated in food products, livestock products, stone and glass, metal and machinery and electrical products.

A further 12.6 percent of exports in 2018 were in the UNDERACHIEVER group (fast world growth but NZ trade growth slower than for the world). More than half the exports in this year were in this, and the STAR group. This reflects the ability of the NZ export sector to keep up with the growth in world trade patterns. In export value terms, the leading sectors in the UNDERACHIEVER group were in animal, vegetable, food, chemicals, hides and leather, machinery and electrical equipment and miscellaneous products. There were a number of product lines that lost a high percentage of world market share in this grouping including live horses (101), buttermilk (403), frozen vegetables (710), apples (808), chocolate (1806), kaolin (2507), fertilisers (3101), albumins (3502), fuel wood (4401), asbestos (6811), aluminium containers (7613) and yachts (8903).

The TRADITIONAL grouping comprised 263 product lines (out of around 1200) and represented fourteen percent of exports. In export value terms they were concentrated in forestry and metal products (including logs, steel and aluminium). The product lines that gained the most world market share in this category included some animal fats and oils (1506), meat extracts (16.3), titanium oxide (2823), carboxylic acid (2918), wood in the rough (4403), semi-chemical wood pulp (4705) and textile wall coverings (5905).

The SNAIL grouping is heavily concentrated in the animal products area and comprises nearly thirty two percent of total exports. The product lines losing the most world market share in this category included (frozen beef (202), chilled sheepmeat (204), fish fillets (304), butter (405), casein (3501), raw sheepskins (4102), wool, not carded (5101), yarn of carded wool (5106), drawn glass (7004) and nickel tubes (7507).

Table 5: Relative New Zealand Trade Growth 1989-2018

Number of 4-Digit Product Lines

Product Group	Stars Fast World Growth Faster NZ Growth		Under Achievers Fast World Growth Slower NZ Growth		Traditional Slow World Growth Faster NZ Growth		Snails Slow World Growth Slower NZ Growth		
	HS	No.	Percent of Exports	No.	Percent of Exports	No.	Percent of Exports	No.	Percent of Exports
Livestock	01-05	8	3.1	13	12.6	4	0.0	17	21.8
Vegetables	06-15	27	0.2	39	6.8	28	0.1	15	0.3
Food	16-24	20	9.0	20	1.7	5	0.6	9	0.7
Minerals	25-27	12	1.0	11	1.0	16	0	5	0
Chemicals	28-38	34	0.4	63	1.5	43	0.3	31	1.4
Plastics	39-40	9	0.3	24	0.7	8	0	5	0
Hides & Leather	41-43	1	0	4	1.3	1	0	9	0.7
Forestry	44-49	6	0.2	14	0.7	14	8.8	35	2
Textiles & Clothing	50-53	10	0.1	20	0.1	49	0.4	60	1.3
Footwear	64-67	2	0	6	0	4	0	5	0.1
Stone & Glass	68-71	7	1.1	24	0.2	12	0	19	0
Metal	72-83	27	0.9	41	0.5	21	1.9	50	0.6
Machinery & Electrical	84-85	12	0.9	43	2.5	21	0.9	60	1.3
Transport Equipment	86-89	7	0.3	14	0.7	8	0.2	4	0.1
Miscellaneous	90-97	8	0.2	37	5.1	29	0.1	24	0.1
Total Exports			18		36.5		14		31.5
Total Product Lines		190		373		263		348	

Note: Columns may not add to 100 due to rounding.

Source: See text.

We return now to the comparative advantage dimension of the export composition story.

5.1 Animal Products

Unsurprisingly, New Zealand had in 1989 (or has in 2018), a comparative advantage in nearly all the 4-digit animal product export lines. Furthermore, they have changed a great deal over thirty years. There are a number of reasons for these large changes. First, the livestock composition on New Zealand farms changed in accord with relative profitability. Sheep numbers decreased and dairy cattle numbers increased. Secondly, New Zealand has some of the highest trade shares in dairy products and meat in the world. Accordingly, New Zealand's RCA indices are strongly affected by what other large exporters do in terms of the animal composition on farms. They are also affected by the export policies of other large exporters like the European Community and the import demand of large importers like China. Thirdly, New Zealand export policy has influenced exports in some items. For example, the formerly large trade in live sheep to the Middle East has been curtailed.

Other market influences have also had their effects. For example, New Zealand had a very small world trade share in honey (409) in 1989 but this has grown rapidly in recent years particularly due to the increased attention to the manuka honey variety. Accordingly, the RCA index for honey has grown from 4 to 51 over the period. Honey is THE STAR product in the Animal products group with an increase in world trade share of eleven percent. The world trade shares of liquid milk (401) and whey and other milk (404) each grew by nearly five percentage points.

New Zealand's comparative advantages have increased, or developed, in the following product lines: live poultry (105), chilled beef (201), chilled sheepmeat (204), other meat and offal (208), crustaceans (306), fresh milk and cream (401), milk and cream concentrates (402), whey products (404), butter and other fats (405), cheese and curd (406), bird's eggs in shell (407), honey (409), pigs bristles (502), guts and bladders (505) and bird's feathers (505), animal bones (506), ivory, whalebone (507), mollusc shells (508) and ambergris (510).

The index of comparative advantage decreased over the period for live horses, cattle, sheep and other animals (101/6), frozen beef (202), pig meat (203), edible beef offal (206), live, fresh, frozen and salted fish (301/5), buttermilk (403). Outside the comparative advantage domain, New Zealand's export competitiveness increased for poultry offal (207) and shelled bird's eggs (408). Competitiveness decreased over the period in live pigs (103).

5.2. Vegetables

The vegetable products which gained comparative advantage over the period were: dried vegetables (712), dates, figs etc. (804), apricots, cherries and peaches (809), cereal flours (excl. wheat, 1102), seeds, spores and fruit (1209) and hop cones (1210). Products losing at least some degree of comparative advantage were: cut flowers (603), onions and garlic (703), frozen vegetables (710), apples and pears (808), frozen fruit and nuts (811) and dried fruit nes (813).

In the competitiveness domain (below comparative advantage) the following product lines gained position: fresh tomatoes (702), cucumbers (707), coconuts and brazil nuts (801), bananas (803), citrus fruit (805), coffee and tea (901/2), ginger and saffron (910), oats (1004), rice (1006), wheat flour (1101), cereal groats (1103), starches (1108), linseed (1204), rapeseed (1205), seaweeds (1212) and swedes (1214). Product lines losing competitiveness over the period included: lettuce (705), table grapes (806), melons (807), nutmeg (908), wheat (1001), barley (1003) and malt (1107).

5.3 Food Products

As previously mentioned there has been a lot of movement in food markets recently in New Zealand and this is mirrored in the export markets for food. New Zealand has developed or increased its degree of comparative advantage in twenty product lines including beef fats (1502), fats and oils (1504), other animal fats (1506), other fixed vegetable fats (1515), preserved meat (1602), meat and fish extracts (1603), crustaceans (1605), sugar confectionary (1704), malt extracts (1901), prepared foods (1904), other vegetable products (2004/5), jams, jellies and spreads (2007), fruit juice (2009), sauces (2103), soups (2104), food preserves nes (2106), water (2201/2), wine (2204), vinegar (2209) and flours (2301).

The above list is also remarkable for the size of the rise in RCA over the period 1989-2018. For example, the RCA index for meat extracts has risen from 1.3 to 62, malt extracts from 0.3 to 19 and wine from 0.8 to 13. The RCA increase for wine is noteworthy because New Zealand is a relatively new entrant. New Zealand's wine industry was very small until the 1970's. It achieved a comparative advantage in the late 1990's. Since that time its comparative advantage has grown at a very fast rate relative to other economies. Product lines which have had a reduced level of comparative advantage or lost it completely include wool grease (1505), margarine (1517), vegetable waxes (1521), other sugars (1702), chocolate (1806), prepared tomatoes (2002), beer (2203), other fermented beverages (2206) and ethyl alcohol (2207/8).

In the competitiveness domain, the following product lines have gained in competitiveness: peanut and olive oil (1508/9), coconut, rape and mustard oil (1513/14), cane sugar (1701), pasta (1902), preserved fruit and vegetables (2001), coffee extracts (2101), brans (2302), vegetable waste (2308), cigarettes (2402) and other tobacco products (2403). Only a few food products have lost competitiveness in this domain. They are vermouth (2205), lard (1501), soyabean oil (1507), tapioca (1903) and yeasts (2102).

5.4 Minerals

New Zealand developed a comparative advantage in salt (2501) based on production at Lake Grassmere and increased its comparative advantage in other ores (2617) and slag (2619) over the period. Comparative advantages in kaolin (2507) and limestone flux (2521) were reduced. The domestic demand for clays (including kaolin) has probably been increasing with the expansion in the pottery industry and this may have eroded what was a very large (>5.0) RCA index in kaolin over thirty years.

Export competitiveness has increased in a number of mineral products: graphite (2504), sands (2505), other clays (2508), pebbles (2517), dolomite (2518), gypsum (2520), quicklime (2522), and ash and residues (2620). The only area where New Zealand lost competitive advantage in minerals was in marble (2515) and this may be the result of the recent domestic demand shift to marble benches in houses.

5.5 Fuel

New Zealand is not well endowed with minerals (with a few exceptions) so it has relied heavily on hydro-electric power sources and imported fuel over the last century. By 2018 New Zealand had developed a comparative advantage in coal gas (2705) and bitumen (2713) but had lost its comparative advantage in bituminous mixtures (2715). Petroleum gas (2711) had gained competitiveness while coal (2701), peat (2703) and petroleum oil (2709/10) had lower RCA indices. These trends reflect closures of underground coal mines over time and the net import position of New Zealand in oil and petroleum products.

5.6 Chemicals

This group of tradable products provides a snapshot of the complex processes that underpin modern production activities. We are dealing here with the 4-digit categories of products but the real-world activities of firms and government negotiations are dealing with much more disaggregated statistics (up to 10-digits).

There are over 150 product lines in the chemicals grouping presented here and to save space, only the products with the largest changes in export value are discussed here. The disassembly/assembly processes used in manufacturing have increasingly been used with natural products including milk, animals and plants and many of the extracts produced in New Zealand (outside the food groups) are itemized here.

Being a very small economy in many ways, New Zealand role in global supply chains is varied from a primary producer of industrial chemicals based on raw materials produced here to the role of distributor of chemicals manufactured overseas to other markets – particularly in the Pacific. Technological change has also had a major influence on trade patterns as new products replace old. One example in the chemical area is the digital camera revolution which has replaced chemical photographic processes in many applications.

Over the last 30 years New Zealand's comparative advantage has increased in titanium oxide (2823), carboxylic acid (2918), provitamins (2936), vegetable alkaloids (2939), other paints and vanishes (3210), casein (3501), gelatin (3503) and peptones (3504). New Zealand's comparative advantage has decreased over the period in acyclic alcohols (2905), dried glands (3001), human and animal blood (3002), animal or vegetable fertilizer (3101), mineral or chemical fertilizer (3102), beauty makeup (3304), hair preparations (3305), oral or dental preparations (3306), albumins (3502), enzymes (3507), explosives (3602), safety fuses (3603), wood gum (3805) and rosin (3806).

At the lower end of the spectrum, New Zealand has gained competitiveness in sulphur (2802), hydrogen (2804), boron oxides (2810), sulphides (2813), iron oxides (2821), phosphinates (2835), silicates (2839), acyclic hydrocarbons (2901), cyclic alcohols (2906), amine function compounds (2921), hormones (2937), antibiotics (2941), medicaments (3003), colouring matter (3203), prepared pigments (3207), paints and vanishes (3208/9), essential oils (3301), chemical preparations for photographs (3707) and composite diagnostic preparations (3822).

Competitiveness has been reduced over the period in a large number of chemicals, the largest of which are: alkali metals (2805), sulphuric acid (2807), chromium oxide (2819), sulphates (2833), oxometallic salts (2841), saturated acyclic monocarboxylic acid (2915), prepared driers (3211), artist's paint (3213), putty (3214), perfumes and toilet waters (3303), shaving preparations (3307), soap (3401), polishes and creams (3405), modelling pastes (3407), glues and adhesives (3506), photographic plates (3704), dye carriers (3809) and anti-knock preparations (3811).

5.7 Plastics and Rubber Products

Comparative advantage increased in plastic table and kitchenware products (3924) and rubber pharmaceutical articles (4014). The RCA index for baths and showers (3922) fell dramatically from 3.7 in 1989 to 0.2 in 2018 perhaps as a result of an increase in the demand for product variety in the export housing market that New Zealand manufacturers were unable to meet. Competitiveness rose over the period for acyclic polymers (3906), amino-resins (3909, ion-exchanges (3914), waste plastic (3915), plastic wall and floor coverings (3918), natural rubber (4001), waste rubber (4004) and retreaded pneumatic tyres and tubes (4112/3).

Competitiveness fell for the following product lines: polymers of ethylene, propylene and vinyl chloride (3901, 3902 and 3904), polyesters (3907), silicones (3910), monofilament rods (3916), self-adhesive plates and foil (3919), compounded rubber (4005), vulcanized rubber thread (4007), new pneumatic tyres (4011), rubber articles of apparel (4015) and hard rubber (4017). Waste looms large in this export category as it did in previous groups.

5.8 Hides and Skins

New Zealand has a relatively large exportable surplus of hides and skins of bovine and sheep origin and over the period from 1989 the composition of these products changed considerably. Sheep numbers declined while cattle numbers increased. Deer, goat and ostrich numbers on farms fluctuated over the period along with the wild animal exploitation of deer, goats, thar and chamois. On the other hand, domestic skin and hide use increased in the clothing and footwear industries. Nevertheless, there was some volatility in the export competitiveness of product lines in this category. The domestic market and inbound tourism also played a role in these changes. The local manufacture of sheepskin products (slippers, boots and rugs) and leather apparel were increasingly popular over the period with concomitant effects on export supply.

The degree of comparative advantage in other hides [other than bovine and sheep hides] (4103) rose significantly from 1.8 in 1989 to 3.8 in 2018. Similarly, the RCA of leather from other animals (4107) rose from 0.3 to 2.1 over the period. The RCA for chamois leather (4108) increased from 0.01 to 2.0 and tanned furskins rose from 1.5 to 9.2. The comparative advantage index fell for raw bovine hides (4101), raw sheep skins (4102), bovine leather (4104), sheep leather (4105), saddlery (4201), articles of apparel (4303) and artificial fur (4304).

5.9 Wood

There was a large increase in harvestable trees over the decades to 2018 following peak planting of *Pinus radiata* in the 1980's and 1990's. This coincided with an increase in the Asian demand for saw logs. New Zealand sawmills had difficulty matching export prices for logs and there was some consolidation of New Zealand sawmilling firms and the upgrading of mills. Asian demand was concentrated in smaller saw logs for milling into timber suitable for pellets and boxes for their mushrooming exports. There was also a growing demand for house framing timber in Asia, and particularly in China.

At the other end of the wood supply chain, international tourism was growing rapidly over the 30-year period as a result of rising incomes and cheaper airfares. New Zealand benefitted greatly in this growth both in terms of inbound tourists and the increased attention New Zealand was receiving globally. In other words, the 'tyranny of distance' was probably weakened slightly in terms of global cognition and this affected the demand for information about New Zealand. Over the period being considered here, the RCA for New Zealand calendars rose from 2.6 to 6.5 in 2018. The RCA for New Zealand newspapers and periodicals rose from 0.05 in 1989 to 0.12 in 2018.

New Zealand gained comparative advantage in wood in the rough, sawn wood, sheets of veneer and shaped wood categories (4403/7/8/9). It also gained in plywood (4412), wood pulp (4701), coated paper (4810) and calendars (4910). There was no change in comparative advantage in waste paper (4707). The degree of comparative advantage was reduced for fuelwood (4401), piles (4404), fibreboard (4411), broom handles (4417), tableware (4419), cork articles (4504), newsprint (4801), toilet paper (4803), kraft paper (4804), , corrugated paper (4808), wall paper (4814), cartons and boxes (4819), paper labels (4821), children's picture books (4903), new stamps (4907) and postcards (4909).

Outside the comparative advantage category, New Zealand improved competitiveness in a wide range of categories: charcoal (4402), cork articles (4503), wickerwork (4602), uncoated paper (4805), grease proof paper (4806), filter blocks (4812), paper bed sheets (4818), newspapers and periodicals (4902) and transfers (4908). Competitiveness was reduced in only three areas: wood wool (4405), wooden frames for paintings (4414) and music, maps and plans (4904/5/6).

5.10 Textiles and Clothing

The textiles and clothing sector was, like footwear, one of the most highly protected areas prior to 1984. It has undergone major structural change since then. The change has rejuvenated New Zealand's competitiveness in the area over the last thirty years. Many product lines have been dropped and many product lines have expanded – in both women's and men's clothing. Comparative advantages have not appeared in these two clothing lines, but niche roles have appeared. This is likely driven by the large number of small and medium sized clothing fashion firms that have developed over the years. Some of these firms commission manufacturing overseas but significant manufacturing is occurring in New Zealand.

Comparative advantages have been created or expanded in non-carded wool (5101), woven flax (5309), metallized yarn (5605), textile wall coverings (5905), blankets and rugs (6301), tarpaulins (6306) and other headgear (6506). Comparative advantage has shrunk or disappeared for animal hair products (5102), waste wool (5103), wool yarn (5106/9), twine and ropes (5607), carpets (5703), textile labels (5807) and hats (6504).

At RCA levels less than 1.0, competitiveness has improved over the last thirty years for product lines of woven silk and cotton (5007, 5208), jute yarn (5307), synthetic filaments (5402/3), woven fabrics (5512/16), felt (5602), embroidery and quilted products (5810/1), coated textile fabrics (5903) and textile wall coverings (5905). These are followed by a large number of categories of clothing. Increased competitiveness in women's clothing includes suits (6104), blouses (6106), underwear (6108), pantyhose (6115), women's coats (6202) and plaited hats (6502). Men's items include shirts (6105), jerseys (6110), coats (6201) and ties (6215). Unisex items include track suits (6211), umbrellas (6601), trimmings (6603) and wigs and false beards (6704).

There have also been a large number of product lines where New Zealand's competitiveness has gone down over 30 years including carded cotton (5203), flax yarn (5306), synthetic yarn (5509), wadding (5601), terry toweling (5802), conveyor belts (5910), men's suits (6103), curtains (6303), rags (6310) and walking sticks (6602). The reduced export competitiveness in rags contrasts with the increased export competitiveness of other waste products. It appears there is increased use of rags by domestic industry. In the recent past, New Zealand used to export used textile products and clothing to Australia for cleaning and sorting. Some would be re-exported back to New Zealand firms (like charitable organisations) for sale.

5.11 Footwear

New Zealand had a high RCA index in waterproof footwear in 1989 (0.8) but this has been reduced to 0.2 in 2018. This is probably the result of the increased offshoring of manufacture by New Zealand brands like Skellerup. However, New Zealand's competitiveness in other footwear (0.25) and shoe insoles (0.4) has remained at roughly the same level over the period in spite of the removal of high import protection instruments earlier.

5.12 Stone and Glass

New Zealand has gained comparative advantage in stone articles (6815), cullet and waste (7001), gold articles (7114) and coins (7118), and has a reduced level of comparative advantage in panels, boards and tiles (6808), asbestos articles (6811), drawn glass (7004), safety glass (7007) and base materials (7109).

Below the comparative advantage threshold, New Zealand has gained competitiveness in monumental stone (6802/3), rock wool (6806), kitchenware (6911), statuettes (6913), glass balls (7002) and glass beads (7018). New Zealand's competitiveness has been reduced in abrasives (6805), bricks and tiles (6901), roofing tiles (6905), laboratory ceramics (6909), cast glass (7003), signaling glassware (7014), worked diamonds (7102), precious metal waste (7112), jewels (7113), pearl articles (7116) and imitation jewellery (7117). It appears that global economies of size have increased in glass and ceramic production so New Zealand has narrowed its stone and glass exports to specialty products.

5.13 Metals

As in other groupings, there were many changes in competitiveness in the metals category. Of particular note was the loss of comparative advantage in some aluminium products and the gain in RCA in some metal waste products. The New Zealand economy appears to be too small at present to recycle some valuable waste products.

New Zealand gained comparative advantage over the 30-year period in ferrous waste (7204), barbed/twisted wire (7313), anchors (7316), other copper articles (7419), aluminium reservoirs (7612), lead waste (7802) and tin waste (8002). Comparative advantage was lost or reduced for flat rolled iron (7210), non-electric domestic appliances (7321), sanitary ware (7324), copper bars and tubes (7407 and 7411/12), aluminium bars, foil, tubes and containers (7604 – 7613), zinc waste (7902) and tin plate (8004).

New Zealand's competitiveness was increased below the comparative advantage threshold in ferro alloys (7202), iron bars and rods (7213), alloy steel (7224), tubes and pipes (7303), sewing needles (7319), other cast iron articles (7325), copper waste (7404), unwrought lead (7801), other tin articles (8000) and titanium articles (8108). New Zealand's competitiveness was reduced for semi-finished iron products (7207), stainless steel in ingots (7216), sheet piling (7301), stranded wire (7312), screws and bolts (7318), table and kitchen articles (7323), nickel waste (7503), nickel articles (7505/8), lead plate (7804) and zinc bars (7904).

5.14 Mechanical and Electrical Equipment

New Zealand gained comparative advantage in weighing machinery (8423), harvesting equipment (8433), milking machines (8434), other agricultural equipment (8436), machine tools for metal (8462/3), electromagnets (8505), traffic control equipment (8530) and electrical insulators (8535). Comparative advantage was reduced over the period in handsaws (8202), filing cabinets (8304), wire, rods and tubing (8311) and gas generators (8405).

Below the comparative advantage threshold, export competitiveness was increased in hand tools (8204/7), bells (8306), central heating equipment (8403), Hydraulic turbines (8410), rolling machines (8420), other agricultural machinery (8432), metal rolling mills (8455), transformers (8504), hair shavers (8510), record/cassette players (8519), tape recorders (8520), radar/radio navigational aids (8526), television receivers (8528), electrical resistors (8533) and diodes/semi-conductor devices (8541).

Export competitiveness was reduced in the sub-RCA (1.0) category for locks and safes (8303), buckles (8308), turbo jets (8411), furnace burners (8416), refrigerators (8418), mobile lifting equipment (8426), extruding equipment (8444), machine tools for stone (8464), soldering machinery (8468), batteries (8506/7) and insulated wire (8544).

5.15 Transport Equipment

New Zealand now has a comparative advantage in exports of railway containers (8609), gliders (8801) and parachutes (8804) though its comparative advantage in yachts and pleasure craft (8903) has halved since 1989. It nearly had a comparative advantage in fishing vessels (8902) in 2018 from a low base in 1989. By contrast, there has been a major decrease in New Zealand's competitiveness in invalid carriages (8713) from 0.95 in 1989 to 0.64 in 2018. New Zealand's competitiveness has increased over the period for a number of product lines, while not attaining comparative advantage status yet (RCA 1.0). This list includes cars (8703 – 8706), trucks (8709), motorcycles (8711), vehicle parts (8714) and aircraft launching gear (8805).

Replica car production and classic car restoration are popular activities in New Zealand but its world export market share is below the global average. This interest used to be attributed to the inordinately large number of car brands available in the New Zealand market and the import licensing restrictions on car imports which encouraged car maintenance. However, a very high proportion of Formula 1 racecar mechanics working in the cluster of plants just South of London are former New Zealanders and they are two generations away from mechanics trained in the import substitution era (Lattimore and Khaled 2008).

5.16 Miscellaneous Products HS 9

By 2018 New Zealand had developed a comparative advantage in this group in a diverse set of products: cinematographic cameras and projectors (code 9007), breathing apparatus (9020), funfair equipment (9508), travel sets (9605) and scientific collections (9705). Comparative advantage increased in mechano-therapy appliances (9019) and postage stamps (9704).

The RCA index increased for more than half the 4-digit product lines in this group. Some other products (not listed above) had 50 percent increases in the RCA index but did not reach the 1.0 comparative advantage level. They include photographic apparatus (9006), image projectors (9008), surveying equipment (9015), time of day recording apparatus (9106), other firearms (9303), fishing rods (9507) and vacuum flasks (9617).

A distinguishing feature of this miscellaneous group is the size of the change in their RCA indices. The changes are often ten times between the two years (1989 and 2018) whether the index is increasing or decreasing. This points to opportunistic behaviour in a small economy like New Zealand targeting niches in world trade. Mechano-therapy devices had a strong CA in 1989 (5.8) and that has more than doubled in 2018 (13.6). Breathing appliances have developed a comparative advantage in 2018 from a low base in the earlier year (0.08). Some of these products are probably associated with Fisher and Paykel Healthcare.

Product lines that have fallen in competitive terms over the period include spectacles (9004) and toys (9503). In 1989 New Zealand had a comparative advantage in spectacles but now has a very low RCA index.

6. Conclusions

It has been over 30 years since New Zealand initiated a trade liberalisation strategy as part of its radical economic reforms. Trade policies were changed in the early 1980's and liberalisation was brought to a halt around 2002. This paper uses revealed comparative advantage indices of 4-digit export categories to explore the changing composition of exports from 1989 to 2018.

The composition of New Zealand exports has changed since the 1980's in predictable and unpredictable ways. Exports are still concentrated in natural resource-based products but world market changes have affected the product composition to some extent in traditional export areas. The dairy industry has grown at the expense of the sheep industry and crop farming and the increased output of the exotic forestry industry has flowed into exports.

The export competitiveness of the animal, vegetable and food industries has grown in a wide variety of product areas (not just in wine) associated with the current food and health foci. Some ingredients of food exports are sourced from the farm sector but they are complemented by many imported ingredients. The removal of most import protection has unveiled export competitive manufactures in textiles and clothing, machinery, transport equipment and other categories.

There are potential comparative advantage areas right across the product areas. The key ingredient to success in our traditional agricultural and horticultural industries is the human capital embedded in the workforce and it has proved very effective for a long time in experimenting with new products. Manuka honey is but the latest successful venture. However, the primary sector doesn't have a monopoly on human capital – the location and culture of our peoples breed this asset. The upside of the distance factor encourages innovation and over time breeds a culture happy to deal with trial and error.

Exports have also been driven by many market changes in terms of both New Zealand export supply and global excess demand. The reduction in implicit export taxes under the trade liberalisation programme has reinforced the place of traditional export products, as is to be expected. The programme has also freed up resources for more productive activities including in the exportable sector.

A time series analysis of the interval between the early 1980's and the present would help to uncover the development paths of rising export competitiveness in export industries. Some of this work is already underway. This analysis could make use of the work of Ballingall and Briggs (2002) and Nesbitt (2013) who have 'done the numbers' for 1999 and 2007.

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