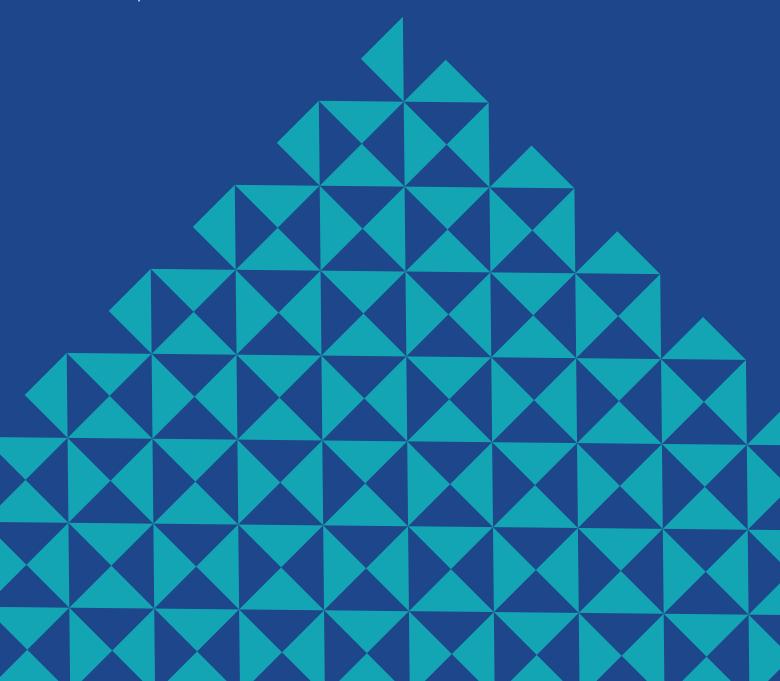**NEW ZEALAND
FOREIGN AFFAIRS & TRADE**

MFAT Working Paper: Estimating New Zealand's tradable and non-tradable sectors using Input-Output Tables

– Peter Bailey and Dean Ford[1]

Abstract

This paper uses the 2013 Input Output Tables to estimate the contribution of the tradable sector to New Zealand's GDP and employment. Assuming that a tradable industry is one that either: exports more than 20 percent of its output; or, imports more than 20 percent of its inputs, we find that the tradable sector accounts for 60 percent of GDP and half of employment. Since 2005 the tradable sector has been growing at a slower pace than the non-tradable sector – in terms of both GDP and employment.

1 Introduction

The Ministry of Foreign Affairs and Trade acts in the world to make New Zealanders safer and more prosperous. As such, we are deeply interested in how global developments impact New Zealanders. This includes understanding the implications of economic events – such as the evolution of global GDP growth, movements in commodity prices, or swings in the New Zealand dollar; and policy developments, such as the negotiation of bilateral and regional trade agreements, or multilateral rulings and other activities at the World Trade Organisation.

Many other individuals and organisations are similarly interested in how New Zealand is affected by the world. Economists, political commentators, and financial journalists spend a great deal of energy seeking to understand whether New Zealanders are getting ahead or slipping behind the rest of the world.

Much of this analysis is focused on the performance of New Zealand's exports – how much did we sell overseas, at what price, and to whom?

However, the tradable sector – that part of the economy directly impacted by global conditions, the exchange rate, and trade policy — is much broader than just exporters.[2] The tradable sector also includes those firms and people who:

• supply goods and services that are inputs to exports;

• produce exportables (goods and services that are sold domestically, but could be exported); or,

• face import competition.

This paper uses the 2013 Input Output Tables to calculate a comprehensive estimate of New Zealand's tradable sector. It builds on the work of Attewell and Crossan (2013) to estimate tradable sector GDP, employment and labour productivity. The paper also estimates export GDP and employment. The paper finds that:

• The tradable sector produces 60 percent of New Zealand GDP, and employs 49 percent of the workforce

• The tradable sector is 59 percent more productive than the non-tradable sector on average

• Almost a quarter of employed New Zealanders contribute to the production of exports

• The tradable sector has been growing at a slower pace than the non-tradable sector for at least the past decade – in terms of GDP and numbers employed

A related research paper extends the export employment analysis by investigating export employment in New Zealand's regions.[3]

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2 **Methodology**

EXPORT AND IMPORT INTENSITIES

The paper uses the 2013 Input Output Tables to identify which industries are tradable and which are not.

Input Output Tables show which industries produce and consume various goods and services. These industry interdependencies can show how various industries contribute to the production of each industry's final output. Input Output Tables, for example, show the degree to which dairy production relies on inputs of electricity, transport, agricultural support, and financial intermediation services.

Input Output Tables also show the extent to which various products are sent offshore. For example, (and unsurprisingly), the tables affirm that the majority, of New Zealand's dairy produce is exported rather than consumed domestically.

Input Output Tables also show the extent to which various products are imported rather than produced domestically. Some imports are used by New Zealand firms as inputs into their own production while some imports compete directly with domestic production. But regardless of where these imports enter the value chain, their existence exposes domestic firms to a degree of foreign competition.

Capturing the share of output exported, including inputs from other industries feeding into this output, allows industry ultimate export intensities to be calculated. Export intensities capture how much an industry exports directly, and how much of its output is used by other industries for exporting. Examining where New Zealand production competes with imports allows industry import intensities to be estimated.

Input Output Tables are produced to a higher level of industry detail than are quarterly GDP and employment figures. Estimating tradable GDP and employment necessitates aggregating the 106 industries and 201 products from the Input Output Tables to the 31 and 16 industry catagories respectively in quarterly GDP and employment (tables 1 and 2).

TABLE 1: QUARTERLY GDP ULTIMATE EXPORT AND IMPORT INTENSITIES

	Export intensity % (Mar 2013)	Import intensity % (March 2013)	Share of annual GDP (% March 2018)
Agriculture	78.0	3.1	3.9
Forestry and logging	77.0	2.2	0.6
Food, beverage, and tobacco manufacture	70.1	11.5	3.1
Textile, leather, clothing and footwear manufacturing	66.6	56.7	0.3
Fishing, aquaculture and agriculture, forestry and fishing support services	65.8	1.9	0.7
Mining	60.5	44.8	1.2
Wood and paper products manufacture	58.7	9.1	0.9
Petroleum, chemical, poly, rubber manufacture	45.9	40.7	1.6
Transport equipment, machinery and equipment manufacturing	45.7	65.4	1.8
Metal product manufacturing	44.1	24.0	1.1
Transport, postal, and warehousing	42.8	12.1	4.6
Wholesale trade	30.4	1.4	5.1
Administrative and support services	29.6	0.0	2.1
Accommodation and food services	29.4	13.0	2.2
Furniture and other manufacturing	27.3	53.2	0.3
Printing	26.0	29.5	0.2
Professional, Scientific, Technical, Administrative and Support Services	25.8	12.6	8.3
Other services	24.4	3.0	1.8
Information media and telecommunications	24.1	3.7	3.7
Electricity, gas, water, waste services	23.3	0.2	2.8
Non-metallic mineral product manufacturing	20.5	19.8	0.5
Financial and insurance services	20.0	6.3	5.6
Rental, hiring, and real estate services	17.2	2.3	6.9
Education and training	13.1	0.9	3.9
Arts and recreation services	13.0	3.1	1.4
Retail trade	10.3	0.0	5.0
Construction	5.8	0.2	6.2
Central government administration, defence, and public safety	4.0	0.0	3.8
Local government administration services	2.9	0.0	0.5
Health care and social assistance	1.7	0.1	6.1
Owner-occupied property operation	0.0	0.0	5.9

2   Methodology

TABLE 2: QUARTERLY HOUSEHOLD LABOUR FORCE SURVEY EXPORT INTENSITIES

	Export intensity % (March 2013)	Import intensity % (March 2013)	Industry employment (000s June 2018)
Agriculture, Forestry and Fishing	76.2	2.8	153
Mining	60.5	44.8	5
Manufacturing	56.8	16.2	257
Transport, Postal and Warehousing	42.8	12.1	110
Wholesale Trade	30.4	1.4	109
Professional, Scientific, Technical, Administrative and Support Services	26.7	12.3	340
Information Media and Telecommunications	24.1	3.7	47
Electricity, Gas, Water and Waste Services	23.3	0.2	22
Financial and Insurance Services	20.0	6.3	76
Arts, Recreation and Other Services	19.5	4.2	147
Rental, Hiring and Real Estate Services	17.2	2.3	52
Retail Trade and Accommodation	17.2	5.1	382
Education and Training	13.1	0.9	235
Construction	5.8	0.2	242
Public Administration and Safety	5.6	0.3	150
Health Care and Social Assistance	1.7	0.1	273
Not specified			20

Source: Statistics New Zealand.

The GDP and employment export ratios show that much of New Zealand agriculture, forestry and fishing output is produced for international markets and hence exposed to international competition. Manufacturing industry export ratios are also relatively high. In contrast, rental, hiring, and real estate services, and construction, do not face much international competition.

TRADABLE SECTOR ESTIMATES

The tradable sector is estimated in two steps using export and import intensities.

First, the ultimate export intensities are multiplied by industry output and employment to calculate export GDP and employment for each industry. Ultimate export intensities capture both the production of goods and services that are exported, and production of goods and services that are used as inputs to exports.

To illustrate, the export intensity figure for Wholesale Trade of 30.4 percent from table 1 is multiplied by the NZ$12,243m of real GDP generated by the industry in the year ending March 2018 to get industry export GDP of $3,722m. Similarly, Wholesale Trade export intensity is multiplied by the 109,000 people employed in the industry to estimate export employment of 33,136 persons (table 2).

Other countries have taken a similar approach in estimating export employment. Tschetter (2008) and Rasmussen (2016) use input-output analysis to estimate the number of jobs directly and indirectly supported by exports in the United States. The Swedish National Board of Trade uses a similar approach, and estimates that nearly 30 percent of the jobs in Sweden are supported by exporting .[4]

Second, the non-exported output of those industries that face notable foreign competition is added to the export estimates from step one to calculate tradable sector GDP and employment. Firms

[4]   Swedish National Board of Trade (2015) Trade is essential for Jobs – a Value Chain Perspective for Sweden.

that sell solely to domestic markets can still be impacted by global events if other firms in their industry export or import to a high enough degree. The domestic price of cheese for example is heavily influenced by the price paid for exported cheese.

THRESHOLD CONSIDERATIONS

Crucial to estimating the tradable sector is deciding the export and import intensities thresholds at which the degree of foreign competition is deemed 'notable'.

Attewell and Crossan (2013), Dwyer (1992), and Knight and Johnson (1997) all provide guidance on the appropriate threshold. Attewell and Crossan (2013) set their threshold at 25 percent, although used a lower definition of 'notable' for their direct method. Dwyer (1992) argues that the tradable sector should be relatively stable. The threshold should be set so as to minimise the sensitivity of the tradable sector estimates to small movements in the threshold level. Knight and Johnson (1997) weigh in with a practical suggestion of setting the threshold so as to include industries where international markets have a discernible influence on behaviour of the tradable sector. Along these lines Conway and Zheng (2014) note that the most productive firms tend to be open to international engagement, suggesting that an appropriate threshold captures the most productive industries as tradable.

Using these guidelines we set the threshold at 20 percent. Industries under this 20 percent threshold such as rental, hiring and real estate are unlikely to be significantly influenced in the short term by international markets. Furthermore, the 20 percent threshold generates a relatively stable tradable definition. At a 20 percent threshold a one percent increase or decrease in the threshold would see two industries shift between the tradable and non-tradable sectors. Four industries would shift between tradable and non-tradable at both 25 percent and at 30 percent thresholds. Section 3 briefly tests the sensitivity of our key results to our definition of 'notable'.

ROBUSTNESS

Applying the Input Output Table ultimate export and import intensities to quarterly GDP and employment data has the benefit of providing quarterly time series estimates of New Zealand's tradable sector. However, this process requires aggregating the Input Output Table data into a relatively small number of industries, 31 for quarterly GDP and 16 for quarterly employment. At these aggregations firms are not homogeneous yet our broad brush approach treats them as such.

This aggregation risks generating misleading results. For example it is possible that most of the employment in one of the 16 HLFS industries is due to a specific sub-industry, whereas most of the exports are generated in a different sub-industry. Aggregating the two together could generate a flawed estimate of export employment.

Furthermore, when calculating export employment we assume that an industry's export share of its output is equal to the export share of its employment. It is possible that this assumption overstates export employment. Exporters tend to be more productive than non-exporters, so they are likely to get more output from each worker than do non-exporters.

The best way to combat this overstatement risk is to drill down into the industry classifications as much as possible. While we cannot isolate exporters from non-exporters within each industry, we can isolate export intensity across industries.

The more comprehensive, but less contemporaneous Linked Employer Employee Database suggests this overstatement is quite small in aggregate. The export employment share is estimated at 23.0 percent in the March quarter 2017 (latest data available), compared to 24.1 percent using the Household Labour Force Survey. We also tested the relationship using Statistics New Zealand Business Demographics employee count data. In this dataset the 2016 export employment share was 24.6 percent.

It is also worth noting that our ultimate export and import intensities are generated using the 2013 Input Output Tables, and applied to 30 years of GDP and employment data. The 2013 intensities are unlikely to hold perfectly for the entire period. We tested the appropriateness of 2013 export intensity estimates for earlier periods by comparing them with export intensities estimated using the 2007 Input Output Tables. Some of the 109 Input Output Table industries shifted between tradable and non-tradable sectors when we used 2007 intensities rather than 2013 intensities at the threshold of 20 percent. However, none of the 31 GDP sectors shifted markedly or between tradable and non-tradable sector.[5]
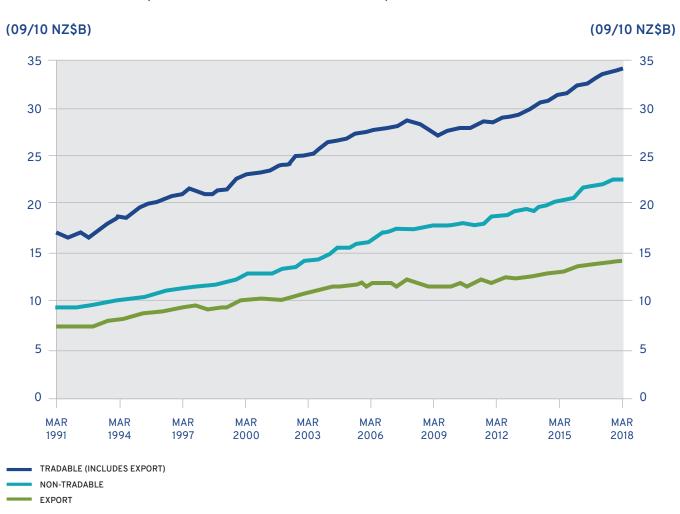
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[5] One of the more interesting sub-industries with a change in export intensity was motion picture and sound recording, shifting from an export intensity of 26.4 percent in 2007 to 58.7 percent in 2013.

3 Results

TRADABLE GROSS DOMESTIC PRODUCT

At the 20 percent threshold, 60 percent of New Zealand's March quarter 2018 GDP was produced in the tradable sector (figure 1). In the year ending March 2018 tradable GDP reached nearly NZ$135 billion. Export GDP alone accounted for more than a quarter of total GDP and almost NZ$56 billion. Another key feature of the data as illustrated in figure 1 is the significant impact of the global financial crisis on tradable GDP.

FIGURE 1: TRADABLE, NON-TRADABLE AND EXPORT GDP, QUARTERLY SEASONALLY ADJUSTED

(09/10 NZ$B)   (09/10 NZ$B)

TRADABLE (INCLUDES EXPORT)
NON-TRADABLE
EXPORT
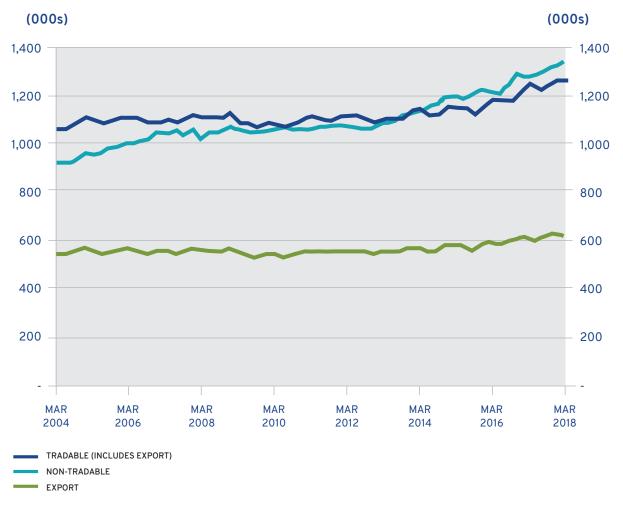
Source: Statistics New Zealand, MFAT calculations.

EMPLOYMENT

Almost half of employed New Zealanders, 1.27 million people, worked in the tradable sector in the March quarter of 2018 (figure 2). Within this, 628,000 New Zealanders were employed in the production of exports, almost a quarter of employed New Zealanders.

FIGURE 2: HLFS EMPLOYMENT TRADABLE, NON-TRADABLE AND EXPORT SECTORS

TRADABLE (INCLUDES EXPORT)
NON-TRADABLE
EXPORT

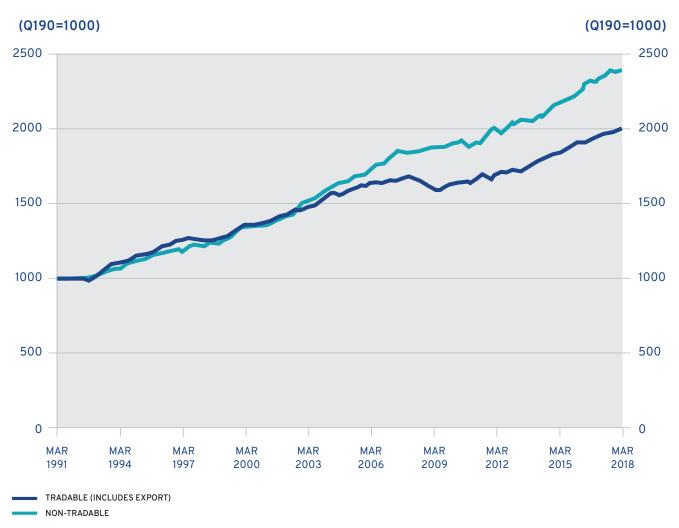Source: Statistics New Zealand, MFAT calculations.

In our estimates the tradable sector has been losing ground to the non-tradable sector for at least the past decade, both in terms of GDP and employment.

The export share of employment at 528,000 workers in the March quarter of 2003 accounted for 27.9% of the working population. In the March quarter of 2018 this had increased in levels terms to 628,000, but declined to 24.1% of the working population.

GDP growth was quite uniform across tradable and non-tradable sectors of the economy from 1990 until 2005. Beyond this, the non-tradable sector has outperformed the tradable sector (figure 3). A focus for subsequent analysis will be on establishing what's behind this.

3 Results

FIGURE 3: TRADABLE AND NON-TRADABLE GDP, QUARTERLY SEASONALLY ADJUSTED

(Q190=1000)   (Q190=1000)
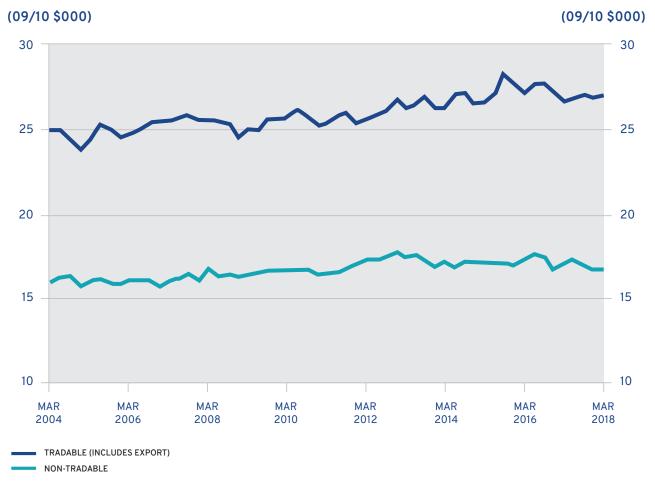

■ TRADABLE (INCLUDES EXPORT)
■ NON-TRADABLE

Source: Statistics New Zealand, MFAT calculations.

PRODUCTIVITY

As expected, the tradable sector is substantially more productive than the non-tradable sector (figure 4). At around $27,000 per quarter, real GDP per worker is around 60 percent higher than that in the non-tradable sector.

FIGURE 4: QUARTERLY OUTPUT PER WORKER TRADABLE AND NON-TRADABLE SECTORS

(09/10 $000)   (09/10 $000)

TRADABLE (INCLUDES EXPORT)
NON-TRADABLE

Source: Statistics New Zealand, MFAT calculations.

THRESHOLD SENSITIVITY

As discussed above, a crucial step in estimating the tradable sector is to decide at which threshold the degree of foreign competition is deemed 'notable'.
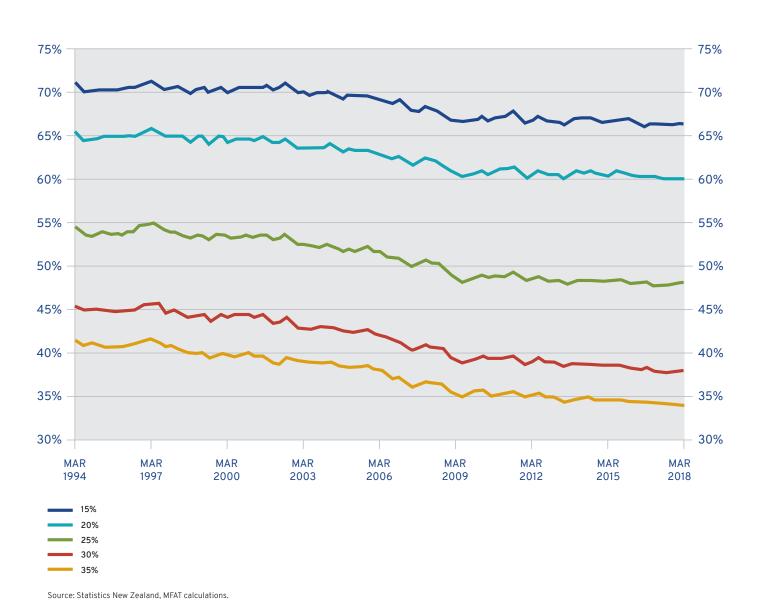
Different threshold selections give different tradable sector shares of GDP. At a 15 percent threshold the tradable sector share is just below 70 percent of the economy, while at 35 percent the tradable share is only 35 percent.[6]

Invariably, threshold selection is somewhat arbitrary. However, the paper's key result – that the tradable sector has underperformed the non-tradable sector for at least the past decade – appears quite robust to different threshold selections (figure 5).

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[6] Five industries drop out of the tradable sector when we shift the ratio from 20% to 25%, and another five when it shifts to 30%, including professional, scientific and tech services responsible for almost 9% of GDP.

3 Results

FIGURE 5: TRADABLE SECTOR SHARE OF GDP FOR VARIOUS COMPETITION THRESHOLDS, QUARTERLY SEASONALLY ADJUSTED

Source: Statistics New Zealand, MFAT calculations.

4 Summary & conclusions

EXPORT AND IMPORT INTENSITIES

This paper reports on estimates of New Zealand's tradable GDP and employment, using export and import intensities calculated from 2013 Input Output Tables. As well as New Zealand's direct exporters, the tradable sector includes industries that supply goods and services to exporters, produce goods and services that could be exported, and are exposed to import competition.

Using this comprehensive approach to estimating the tradable part of the economy highlights the importance of New Zealand's international connections. The tradable sector, at NZ$135 billion in the year ending March 2018, was one and a half times larger than the non-tradable sector. Half of the New Zealanders in paid employment are employed in the tradable sector. Almost a quarter of the New Zealanders, 628,000, in paid employment contribute (directly or indirectly) to the production of exports.

The tradable sector is on average 60% more productive than the non-tradable sector. This finding is in agreement with New Zealand and international research highlighting the importance of international connections and competition for productivity.

A key finding of the paper is that the tradable sector has underperformed the non-tradable sector for at least the past decade. This is apparent in our estimates of both GDP and employment. This finding is robust at different thresholds. It is unclear why resources have shifted from the more productive tradable sector to the less productive non-tradable sector.

5   **References**

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