Estimating New Zealand's tradable and non-tradable sectors using Input-Output Tables[1]

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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 less rapidly the non-tradable sector – both for GDP and employment.

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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 impact 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 trade agreements or multilateral rulings at the World Trade Organisation.

Of course, 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. The tradable sector also includes those firms and people who:

- Supply goods and services to exporters;
- 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 produce comprehensive estimates of tradable sector GDP, employment and labour productivity. The paper also calculates estimates of export GDP and employment. The paper finds:

- The tradable sector produces 60 percent of New Zealand GDP, and employs 50 percent of the workforce
- Almost a quarter of employed New Zealanders contribute to the production of exports
- The tradable sector is 60 percent more productive than the non-tradable sector
- The tradable sector has underperformed the non-tradable sector for at least the past decade – in terms of both output and numbers employed.

It is hoped this paper will provide a useful contribution to the analysis of New Zealand's economic performance. We find the tradable sector estimates a useful higher frequency complement to the micro data studies of the New Zealand Productivity Commission and the OECD.

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2. Methodology

Export and import intensities

The paper uses the 2013 Input Output Tables to identify which New Zealand industries are tradable. Quarterly production and employment data to March 2017 is used to estimate the contribution of the tradable sector to New Zealand GDP and employment.

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 being 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.

Combing the share of output exported, and how this output relies on inputs from other industries, 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 much higher level of industry detail than are quarterly GDP and employment figures. Estimating tradable GDP and employment necessitate aggregating the 106 industries and 201 products from the Input Output Tables to the 31 and 16 industries respectively of quarterly GDP and employment (tables 1 and 2).

Table 1: Quarterly GDP ultimate export and import intensities

	Export ratio %	Import ratio %	Share of total 2017 GDP (%)
Agriculture	78.0	3.1	4.4
Forestry and logging	77.0	2.2	0.7
Food, beverage, and tobacco manufacture	70.1	11.5	3.5
Textile, leather, clothe, footwear manufacture	66.6	56.7	0.3
Fish, aqua, agri, forest, fish support	65.8	1.9	1.0
Mining	60.5	44.8	1.5
Wood and paper products manufacture	58.7	9.1	1.0
Petroleum, chemical, poly, rubber manufacture	45.9	40.7	1.8
Transport equip, machine equip manufacture	45.7	65.4	1.9
Metal product manufacturing	44.1	24.0	1.2
Transport, postal, and warehousing	42.8	12.1	4.6
Wholesale trade	30.4	1.4	5.5
Administrative and support services	29.6	0.0	2.2
Accommodation and food services	29.4	13.0	2.3
Furniture and other manufacturing	27.3	53.2	0.3
Printing	26.0	29.5	0.3
Professional, scientific, tech services	25.8	12.6	8.9
Other services	24.4	3.0	1.9
Information media and telecommunications	24.1	3.7	3.7
Electricity, gas, water, waste services	23.3	0.2	3.1
Non-metallic mineral product manufacture	20.5	19.8	0.6
Financial and insurance services	20.0	6.3	6.4
Rental, hiring, and real estate services	17.2	2.3	7.7
Education and training	13.1	0.9	4.4
Arts and recreation services	13.0	3.1	1.4
Retail trade	10.3	0.0	5.2
Construction	5.8	0.2	6.6
Central government admin, defence, pub safety	4.0	0.0	4.1
Local government admin	2.9	0.0	0.6
Health care and social assistance	1.7	0.1	6.5
Ownership owner-occupied dwellings	0.0	0.0	6.5

Source: Statistics New Zealand.

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Table 2: Quarterly Household Labour Force Survey export intensities

	Export intensity %	Industry employment (000s)
Agriculture, Forestry and Fishing	76.2	161
Mining	60.5	4
Manufacturing	56.8	259
Transport, Postal and Warehousing	42.8	106
Wholesale Trade	30.4	114
Professional, Sci., Tech., Admin. Support Services	26.7	311
Information Media and Telecommunications	24.1	45
Electricity, Gas, Water and Waste Services	23.3	23
Financial and Insurance Services	20.0	71
Arts, Recreation and Other Services	19.5	144
Rental, Hiring and Real Estate Services	17.2	53
Retail Trade and Accommodation	17.2	378
Education and Training	13.1	222
Construction	5.8	246
Public Administration and Safety	3.9	139
Health Care and Social Assistance	1.7	254
Unallocated		18

Source: Statistics New Zealand.

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 intensities capture both the production of goods and services that are exported, and downstream domestic production that contributes to that exporting.

To illustrate, the export intensity figure for Wholesale Trade of 30.4 percent from table 1 is multiplied by the NZ$11,722m of real GDP generated by the industry in 2016 to get industry export GDP of $3,564m. Similarly, Wholesale Trade export intensity is multiplied by the 114,000 people employed in the industry to estimate export employment of 34,700 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. Using a similar approach, the Swedish National Board of Trade estimates that nearly 30 percent of the jobs in Sweden are supported by international trade.[3]

The second step of estimating the tradable sector requires adding output and employment of those industries that face notable foreign competition to export GDP and employment. New Zealand companies expose themselves to competition by exporting, or can compete in the New Zealand domestic market against imports. Firms in industries with high export or import intensities are assumed to be exposed to international competition. For them to survive they need to be as productive as the international companies they compete with, whether or not they actually export.

Threshold considerations

A crucial step in estimating the tradable sector is to decide 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 firms as tradable.

Using these guidelines we set the threshold at 20 percent. Industries under 20 percent such as rental, hiring and real estate are unlikely to be significantly influenced in the short term, at least, 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'.

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

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Robustness

Applying the Input Output Table ultimate export and import intensities to quarterly GDP and employment data has the benefit of providing a higher frequency 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 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. The export employment share is estimated at 23.7 percent in the December quarter 2015, compared to 24.4 percent using the Household Labour Force Survey.

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.[4]

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[4] 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.

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3.   Results

Tradable Gross Domestic Product

At the 20 percent threshold, 60 percent of New Zealand's March quarter 2017 GDP was produced in the tradable sector (figure 1). Within tradable GDP, export GDP accounted for more than a quarter of total GDP. Another key feature of the data as illustrated in figure 1 is the significant impact of the global financial crisis on tradable and export GDP.

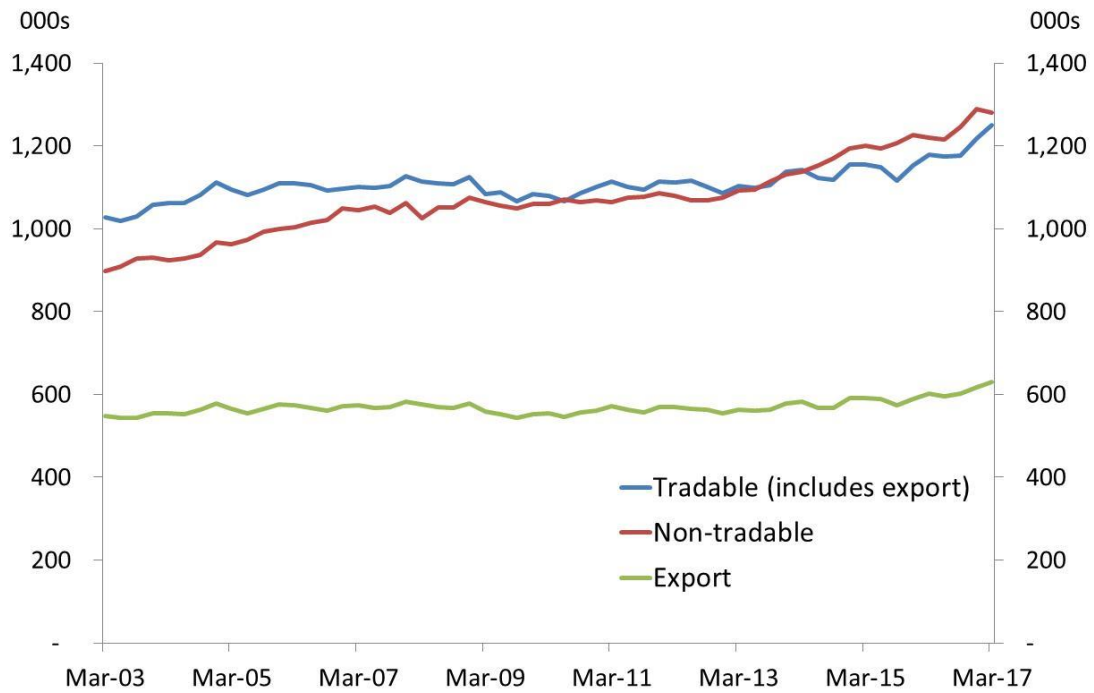**Figure 1: Tradable, Non-tradable and Export GDP, quarterly seasonally adjusted**
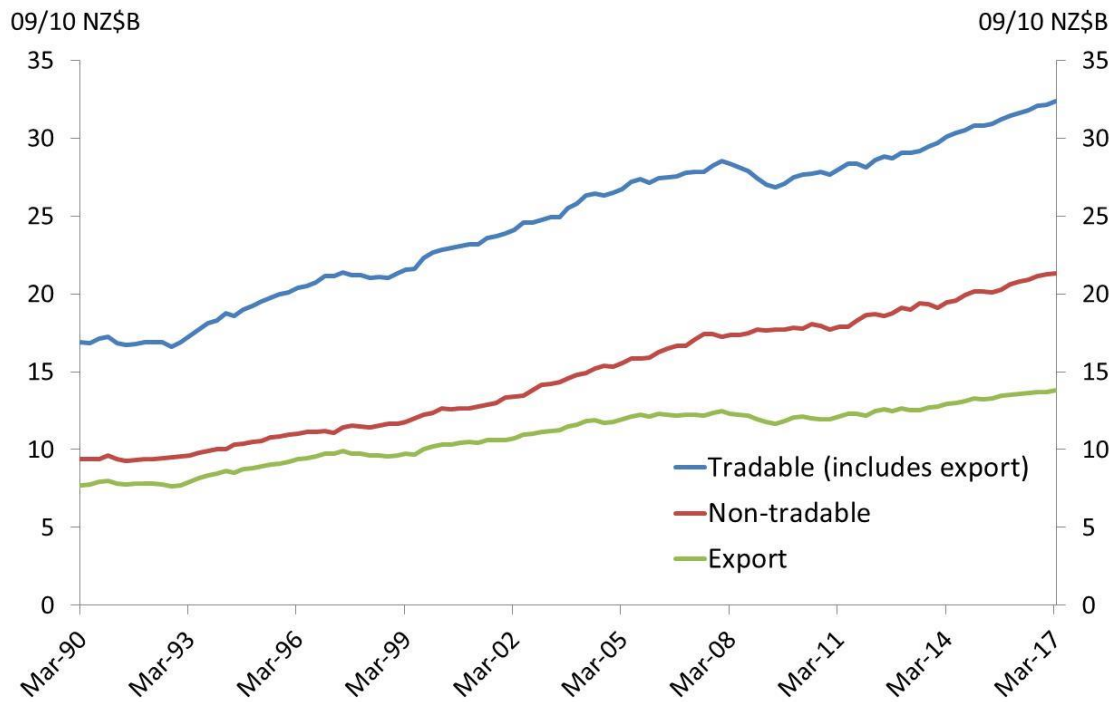
Source: Statistics New Zealand, authors' calculations.

Employment

Half of employed New Zealanders worked in the tradable sector in the March quarter of 2017 (figure 2). Within this, 621,000 New Zealanders were employed in the production of exports, almost a quarter of employed New Zealanders.

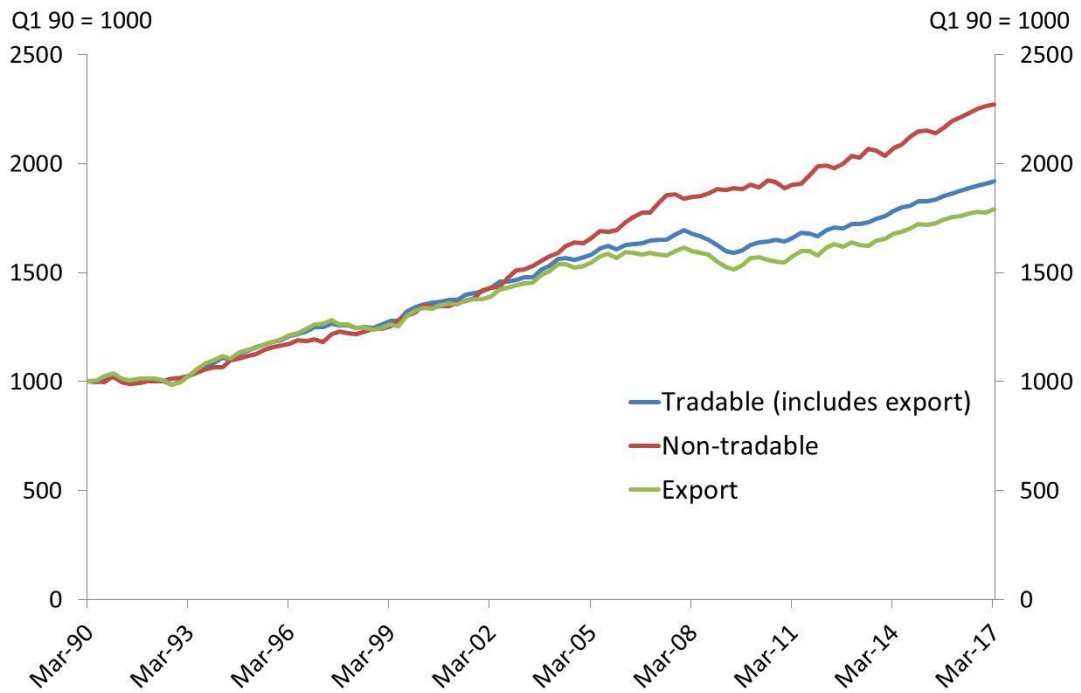**Figure 2: HLFS Employment Tradable, Non-tradable and Export sectors**

Source: Statistics New Zealand, authors' calculations.

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

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

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Figure 3: Tradable, Non-tradable and Export GDP, quarterly seasonally adjusted
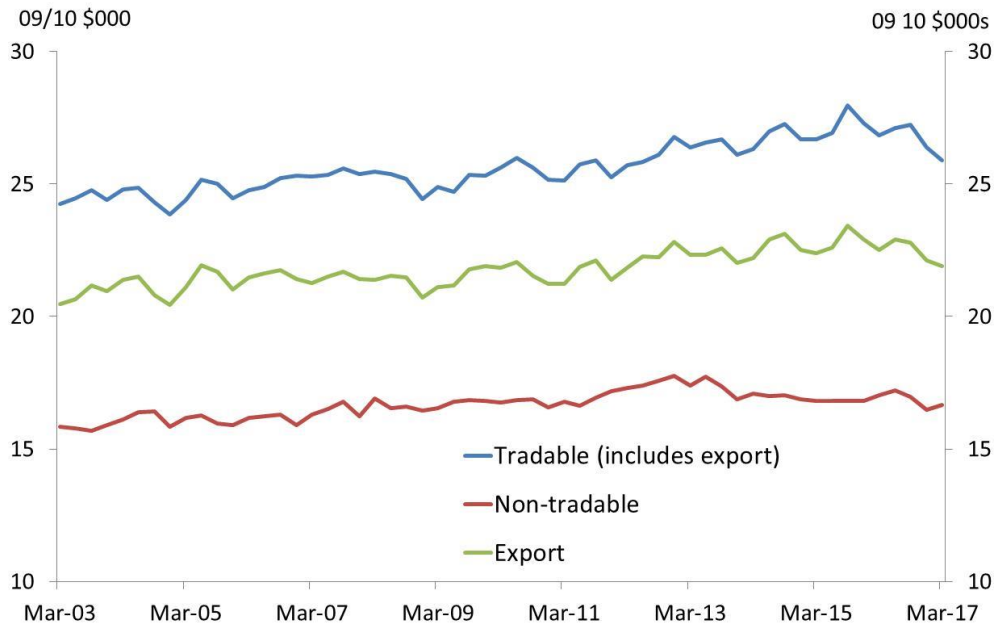

Source: Statistics New Zealand, authors' calculations.

Productivity

As would be expected, the tradable sector is substantially more productive than the non-tradable sector (figure 4). At around $26,000 per quarter, real GDP per worker is almost 60 percent higher than that in the non-tradable sector.

Figure 4: Quarterly output per worker Tradable, Non-tradable and Export sectors

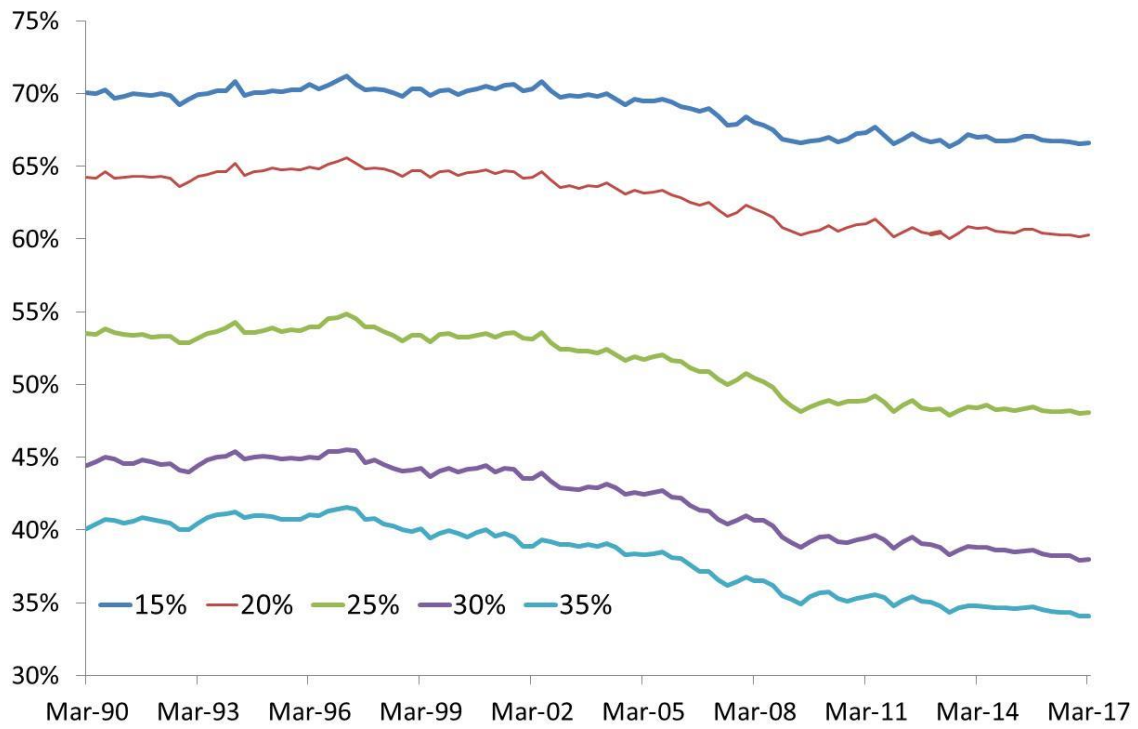Source: Statistics New Zealand, authors' calculations.

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'.

As would be expected, 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.

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).

Figure 5: Tradable sector share of GDP, quarterly seasonally adjusted

Source: Statistics New Zealand, authors' calculations.

4.   Summary and conclusions

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 firms 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$32.3 billion in the March 2017 quarter, 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 in paid employment contribute (directly or indirectly) to the production of exports.

The tradable sector is 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. As reported by Fabling and Sanderson (2013) current and past exporting firms are more productive than their non-exporting counterparts.

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 to different thresholds. This is an area where we'd like to focus research - why have resources shifted from the more productive tradable sector to the less productive non-tradable sector.

It is hoped that this paper will contribute to the analysis of New Zealand's economic performance. We find the tradable sector estimates a useful higher frequency complement to the micro data studies of the New Zealand Productivity Commission and the OECD.

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5. References

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