

**CLASSIFYING NEW ZEALAND'S EXPORT MARKETS:  
A BEHAVIOURAL APPROACH**

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## *Preface*

Analysis of export markets and trade flows involves (amongst other things) an examination of market characteristics, competitor behaviour, transport arrangements, supply responses and trade policies administered by importing countries. Often, this examination takes place for individual markets. However, where the topic of interest is the disposition of the products resulting from a particular form of production, then a wide range of markets can be involved. In order to allow efficient research to be carried out, markets are often grouped geographically. However, this can lead to misleading results as market characteristics in neighbouring areas can often be quite different.

This Discussion Paper suggests that a better way of grouping markets may be to use behavioural segmentation to classify countries into markets using cluster analysis based on a number of key market characteristics. This proposition is then used to group New Zealand's export markets into 14 clusters.

The work reported in this Discussion Paper provides a further tool for consideration in the range of techniques used to analyse New Zealand's trade and export market opportunities.

**R L Sheppard  
ASSISTANT DIRECTOR**



## **1. INTRODUCTION**

Over the past twenty years the structure of New Zealand's export trade has changed dramatically. Traditional markets, especially the UK, have declined in importance while other markets in Asia and the Middle East have become more prominent. While exports are still dominated by agricultural products the focus of exporting activities is shifting from production to more market oriented approaches. Within New Zealand the regulatory environment has changed significantly. Tariffs and quotas have been removed or reduced substantially, while subsidies and export incentives have been all but abolished.

This paper is a part of a study which aims to examine how the structure of New Zealand's export markets has changed with the deregulation of the New Zealand economy. A structural model of New Zealand's export markets is to be constructed to assist with this analysis.

In order to simplify the estimation of the model the number of countries and commodities being examined must be reduced to a manageable level in a systematic fashion. This paper describes the method used to classify countries into markets by answering three questions (Hair, 1987, pg 197).

1. How should inter-country similarity be measured?
2. What procedure should be used to place countries into groups?
3. How many groups should be formed?

These questions are discussed in Sections 2, 3, and 4.

Behavioural segmentation was used to classify countries into markets, using cluster analysis. The resulting market segments are then described and their implications discussed.

## **2. INTER-COUNTRY SIMILARITY**

Aggregation by country to reduce the number of equations to be estimated is common practice in trade modelling. However in aggregating countries in to groups care must be taken to avoid the problem of aggregation bias. When data which respond to stimulus in different ways are added together parameter estimates based on the aggregate data will be biased to the extent that the original series differed. That is, the countries comprising a market must be similar with respect to their tastes, preferences, and purchasing behaviour if parameter estimates are to be unbiased.

In this section two approaches to determining inter-country similarity are examined; regional aggregation which uses geographic location as a proxy for market characteristics, and the segmentation approach, which allocates countries to groups based on market behaviour. Data used to calculate measures of similarity are then discussed.

In most trade models geographic location has been used as a similarity measure, the assumption being that countries which are close neighbours will be similar in terms of culture, income etc. While this approach is very simple it has a number of drawbacks. Firstly, the close neighbour assumption is not always valid, for example Papua New Guinea and Australia

are very close geographically, but have very different cultures and exhibit quite different purchasing behaviour. Secondly, the definition of market boundaries is essentially an arbitrary process. If countries which are dissimilar in purchasing behaviour are aggregated, because of the close neighbour assumption, or because of arbitrary allocation then parameter estimates based upon the aggregate data will be biased (Abbott, pg 53).

An alternative to use data on purchasing behaviour to calculate a similarity measure directly using a behavioural segmentation. The approach is similar to that used to segment consumers within a market, the difference being that the cases are countries rather than individuals.

The segmentation approach was used to determine market membership for two reasons: firstly, it has the potential to reduce aggregation bias, secondly, as an exploratory analysis technique it can provide additional insights into the structure of the market.

Use of the segmentation approach requires selection of a set of variables to be used a basis for the segmentation. The variables used were selected to reflect the purchasing behaviour of each country and to reflect the determinants of that behaviour, such as income, tastes and preferences, and cultural influences. The nineteen variables calculated for each country were:

#### Behavioural Variables

1. The level of real imports per capita.
2. The growth rate of real imports.
3. The level of real imports from New Zealand per capita.
4. The growth rate of real imports from New Zealand.
5. The variation in the level of real imports (Total Imports).
6. The variation in the level of real imports from New Zealand (Total Imports).
- 7-15. The variation in the level of real imports from New Zealand by product category (1 digit SITC).

#### Determinants

16. The level of Real GDP per capita.
17. The growth rate of Real GDP per capita.
18. Northerly location (degrees north of the equator).
19. Easterly location (degrees east of Greenwich).

All currency variables are expressed in \$US.

The data were obtained from several sources. Data on the value of trade was obtained from the United Nations. This provided much of the data on the level and variation of imports. This was used in conjunction with data from the 1991 Summers and Heston (S&H) database to calculate per capita values, and the growth rate in real GDP<sup>1</sup>.

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<sup>1</sup> Refer to Appendix 1 for further detail.

Import and GDP growth rates fill a second important function. Data for eighteen years are being used to construct market segments. Clearly substantial changes may take place in a country's economy in that time period. Such changes may result in a country switching from one market segment to another over time. Growth rates are expected to capture some of these inter-temporal effects, and allow the identification of separate market segments for countries where change has been rapid.

The level of imports per capita and New Zealand imports per capita jointly capture the market share for New Zealand products. Comparison of the import growth rates indicates whether the New Zealand share of a country's imports has been growing over time. Variation in the level of imports at the total level may indicate that the country faces foreign exchange constraints.

Variation in demand for New Zealand imports is measured using nine separate variables which relate to the total variation in New Zealand imports for a given country, and variation in demand for specific product categories.

Product categories were defined using 1 digit SITC codes. Product categories used were for codes 0 through 8. A high variance in demand can be the result of two types of behaviour. Demand may be volatile, as with imports of sheep from Iran have been in the recent past, due to political or financial constraints, or because purchasers in the market switch from one supplier to another for whatever reason. Alternatively a high variance can result when a country has a high level of imports with small variations in demand in percentage terms. These alternatives can be distinguished by using the variance figures in conjunction with data on the level of imports.

Real GDP per capita was used as a proxy for the level of economic development, which is seen as a major determinant of demand for many goods. Day et al indicate that use of other factors, particularly trading and pricing factors, can capture variation in the level of economic development more accurately than using income factors only. Trade factors have already been examined as behavioural variables, while price factors may not be crucial in this study, as the data used is real, and expressed in a single currency.

Location was used as a proxy for variations in tastes and preferences, and cultural factors. These variables were calculated using the location of the country's capital in degrees latitude and longitude, to the nearest degree. Locations south and west were expressed as negatives.

Clearly the scales of the variables outlined above differ substantially. Growth rates range from 0 to 5 while the variance figures are extremely large numbers. In order to calculate similarity measures between cases these variables must have a comparable scale. This was achieved by using standardised values, with a mean of zero and a standard deviation of 1.

The transformed values are used to calculate a similarity, or distance measure. Cluster analysis provides a convenient method for calculating a variety of distance measures, and for combining the countries in a systematic way.



### **3. PLACING COUNTRIES INTO GROUPS**

Choice of a clustering procedure is based upon the types of properties desired for the resulting clusters. The discussion in this section examines the types of properties that the clusters must have in order to reduce aggregation bias, and the method used to perform this analysis.

In this study clusters (or markets) were required to be discrete, with all countries belonging to only one cluster. This ensures that the composition of each market is constant over time, simplifying aggregation and avoiding the introduction of econometric problems such as structural breaks.

It was also desirable for the markets to be of roughly similar size. Some clustering methods tend to place all but the most dissimilar cases very quickly into one cluster. This meant that the largest trading partners would be placed in separate clusters, and the smaller trading partners would be placed together in one cluster. While such a result is easy to interpret it is not interesting, or useful. This expectation was confirmed by exploratory analysis using seven alternative clustering methods. Only one produced a set of results which was not entirely dominated by the size factor.

Finally, as the principle objective of using cluster analysis was to limit aggregation bias the method used had to ensure that the differences between countries in a cluster were minimised.

Ward's method of clustering uses an agglomerative approach, where the clusters that merge at each step are those which result in the smallest decrease in squared, within cluster distances (Anderberg, pp 42,43; Norusis (2), pg B167). This has two effects: firstly, differences between countries in a market are minimised, limiting aggregation bias, secondly, Ward's method tends to produce clusters which have a similar number of countries. Clearly the Ward method produces clusters with the desirable properties laid out in the previous paragraphs.

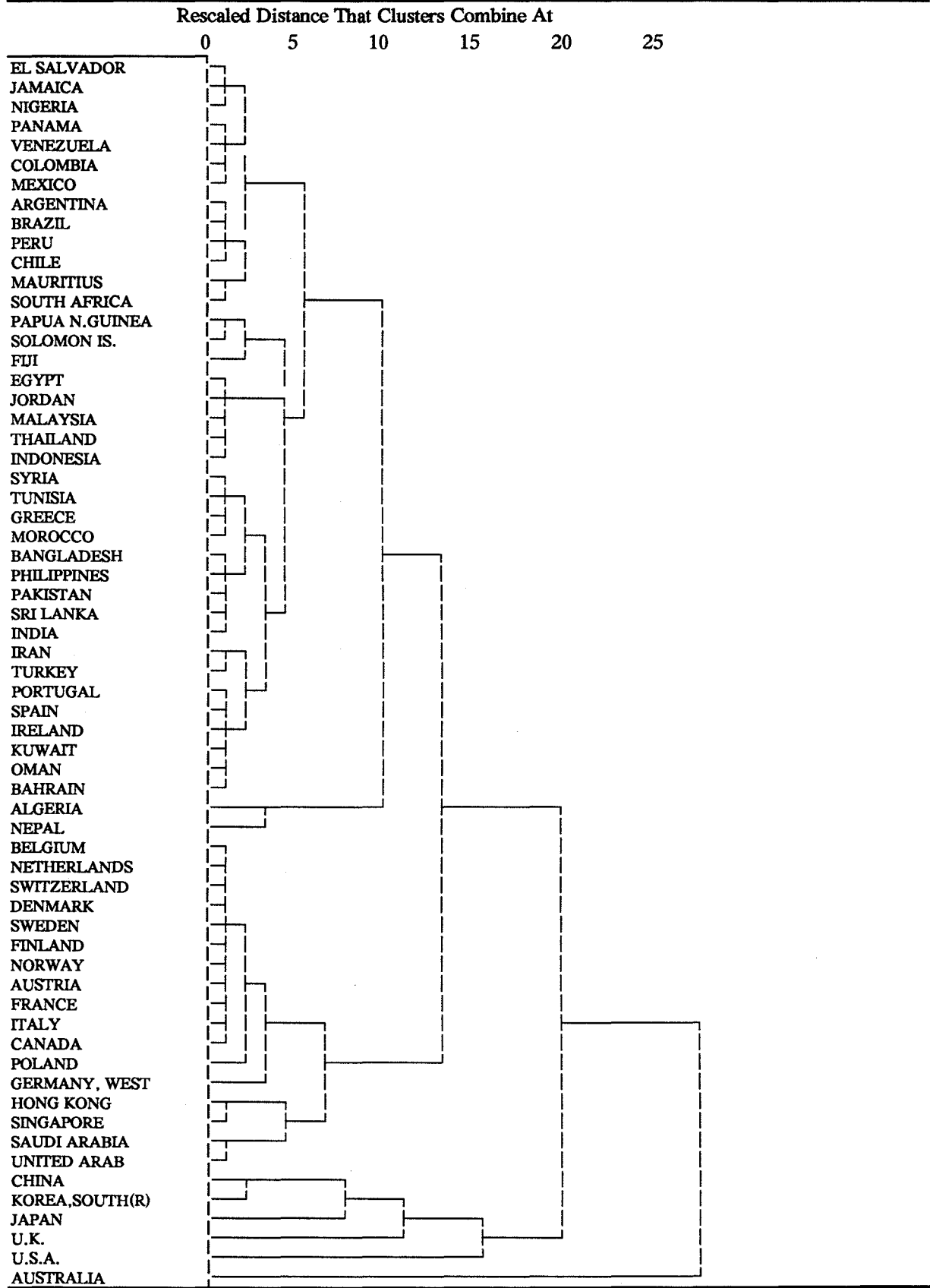
The standardised variables described in Section 2 were calculated for a set of 67 countries. Ward's method was then used to obtain a set of possible solutions. Figure 1 contains a dendrogram, which shows the order and distance at which countries were combined into clusters, beginning with all countries as separate clusters at the left hand side, and combining them until all the countries are members of one cluster.

From the dendrogram a number of the markets are obvious. The UK, the United States, Japan, French Polynesia and Australia are combined only at very large distances and so are very dissimilar. These countries should each form a separate market segment.

### **4. DETERMINING THE NUMBER OF MARKETS**

The dendrogram in Figure 1 illustrates one weakness of cluster analysis very clearly. The number of clusters used in the analysis directly affects the composition of some of the clusters, and there is no accepted statistical method for determining the correct number of clusters to use. However there are tests which can be used to ensure that the clusters used are significantly different from each other, and these, in conjunction with practical considerations, can act as a guide in determining the number of markets to define.

Figure 1: Dendrogram using Ward's Method



Practical considerations include the interpretability of the clusters, the reasonableness of the groupings, and the relative distance between combined groups. Of particular importance is the order in which the markets combine, for example combining developed countries with less developed countries at one level of aggregation would indicate that a larger number of markets should be used. It was decided to use a solution where the relative distance between clusters was reasonably low. This allowed for between eight and fourteen clusters.

With more than fourteen markets Algeria and Nepal were separate markets. However export volumes to both of these countries were too insignificant for them to be treated separately in the estimation of the demand model. As a result fourteen was deemed to be the maximum number of markets to be used. French Polynesia was also too small to be treated separately, but it only merged with another cluster when the distances being considered were very large. Instead French Polynesia was merged with a group of Pacific islands (see Section 5).

Use of thirteen markets would have resulted in the merging of two markets that clearly represented the Middle East and Southern Asia, placing a group of higher per capita GDP countries with a group of Low GDP per capita countries. This would create some difficulties in interpretation and would clearly bias estimates of income effects for that market.

The final step in determining the number of markets to use involved verifying that the differences between the markets were statistically significant for the variables being considered.

Analysis of variance was used to determine if the within market means were significantly different from the mean for the full set of 67 countries. Differences were significant at the 5% level for all 19 variables (refer to Appendix 1). This indicates that the fourteen groups differ enough from the overall population to be considered as separate markets.

## 5. DESCRIPTION OF MARKETS

The fourteen markets defined in Section 4, can be delimited primarily on location, income, and the volume of imports. The composition of each market is described in Table 1.

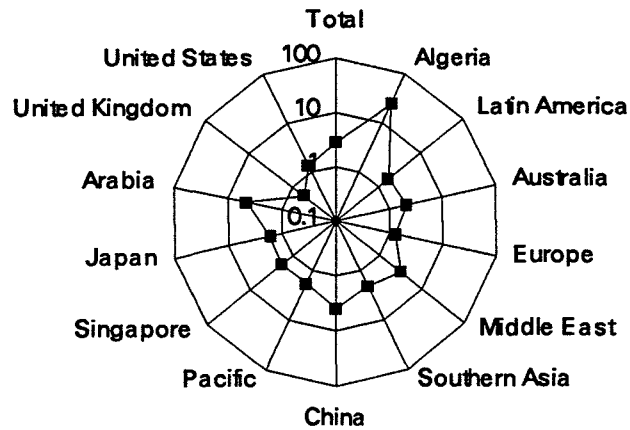
**Table 1: Market Composition**

Market	Constituent Countries
Algeria	Algeria, Nepal.
Latin America	Argentina, Brazil, Chile, Colombia, El Salvador, Jamaica, Mauritius, Mexico, Nigeria, Panama, Peru, South Africa, Venezuela.
Australia	Australia.
Europe	Austria, Belgium, Canada, Denmark, Finland, France, Germany (West), Italy, Netherlands, Norway, Poland, Sweden, Switzerland.
Middle East	Bahrain, Greece, Iran, Ireland, Kuwait, Libya, Morocco, Oman, Portugal, Qatar, Spain, Syria, Tunisia, Turkey
Southern Asia	Bangladesh, Egypt, India, Indonesia, Jordan, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand.
China	China, South Korea.
Pacific	Fiji, Papua New Guinea, Solomon Islands, Vanuatu.
Singapore	Hong Kong, Singapore.
Japan	Japan.
Arabia	Saudi Arabia, United Arab Emirates.
United Kingdom	United Kingdom.
United States	USA.
French Polynesia	French Polynesia.

Each of these markets has a distinctive set of characteristics. For most markets imports from New Zealand were primarily from SITC Group 0, while the larger trading partners appeared to be differentiated on import volumes and the range of products which they purchased.

The Algeria group has a lower level of imports per capita than any other market, probably because this market the lowest average GDP per capita. The Algeria group does have a high level of import growth, from New Zealand, and from the rest of the world which may be related to its relatively high growth in GDP (Figure 2).

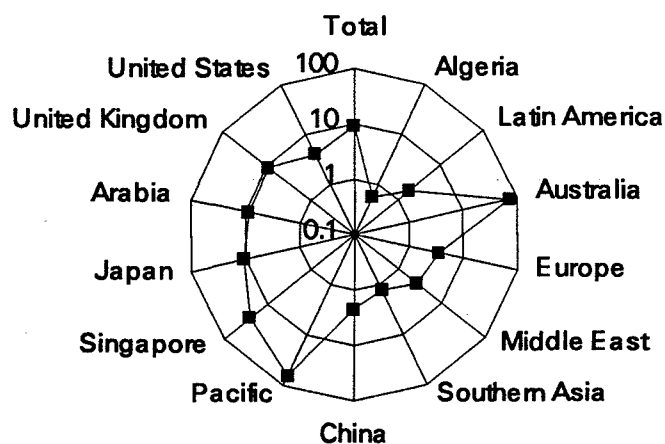
**Figure 2: Relative Growth in Imports from New Zealand**



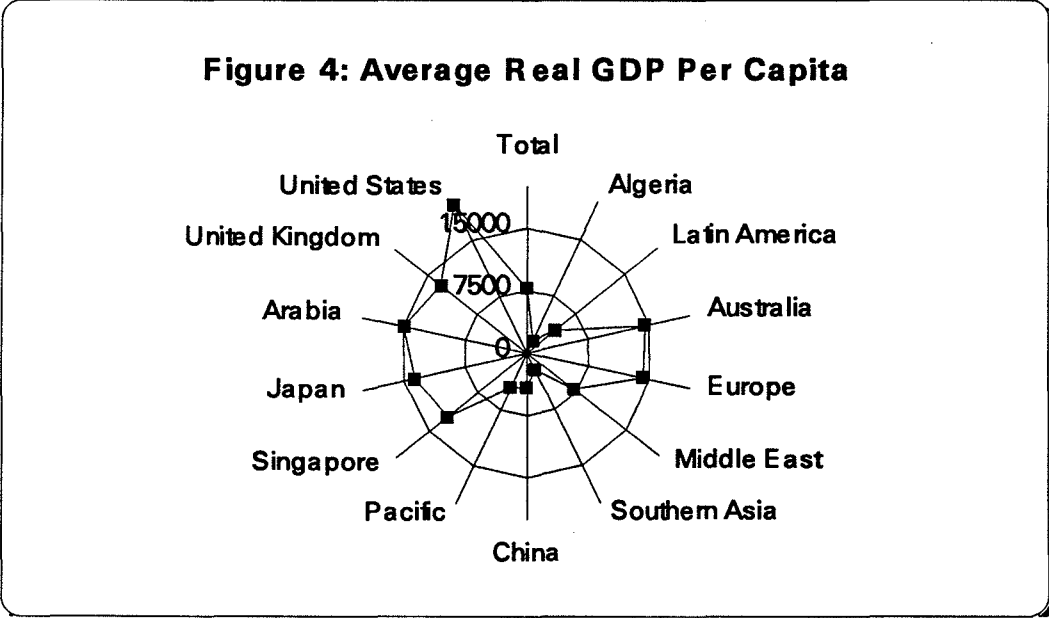
The Latin American market has a low level of imports per capita, both from New Zealand and the rest of the world perhaps because GDP per capita is also relatively low.

Australia has the highest level of New Zealand imports per capita of any group (\$US 72), and imports a wide variety of New Zealand's exports in relatively large volumes (Figure 3). In addition to location the level of imports per capita may be due to the CER agreement and Australian import substitution policies, as Australia's level of imports per capita for 1971 to 1988 was \$US 1690 substantially lower than that of most other developed countries (compared with average for Europe of \$US 4131).

**Figure 3: Imports from New Zealand Per Capita**



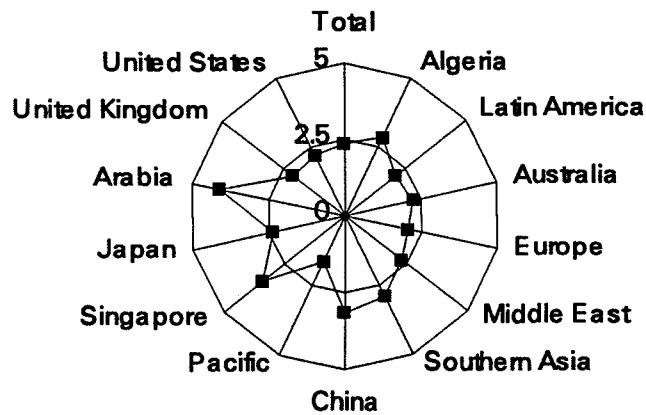
The European group is made up of high GDP per capita countries from the northern hemisphere (Figure 4). Countries in this group have the second highest level of imports per capita (after the Singapore group) but a lower than average level of New Zealand imports per capita, and growth of imports from New Zealand is relatively low. This is expected, because of barriers to entry, trade switching with the EC, and because many of these countries compete directly with New Zealand in markets for New Zealand's primary produce.



Countries in the Middle East group have a moderate level of GDP per capita, and a low level of New Zealand imports per capita. However the level of imports from New Zealand is growing at a faster rate than average.

Southern Asia has a low level of GDP per capita, but the growth rate in GDP is high (Figure 4). Total imports per capita are relatively high, but per capita imports from New Zealand are well below average.

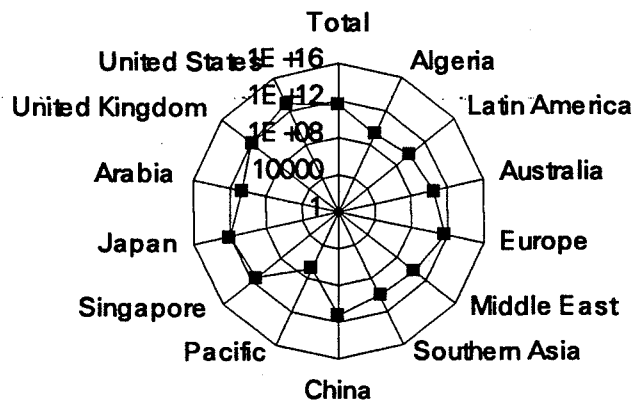
**Figure 5: Relative Growth in GDP Per Capita**



The China group has a high rate of GDP growth. Per capita imports from New Zealand are low, but the actual level of imports is relatively high. Imports are principally raw materials, most notably wool.

The Pacific group has the second highest level of NZ imports per capita. The average GDP per capita for this market is low, and growth in GDP is also low. This confirms the status of these countries as client states, in that they are all dependent on trade with New Zealand. The Pacific has a very low average variance of imports firstly because the countries involved are small, and secondly because purchases do not vary much in size or timing (Figure 6).

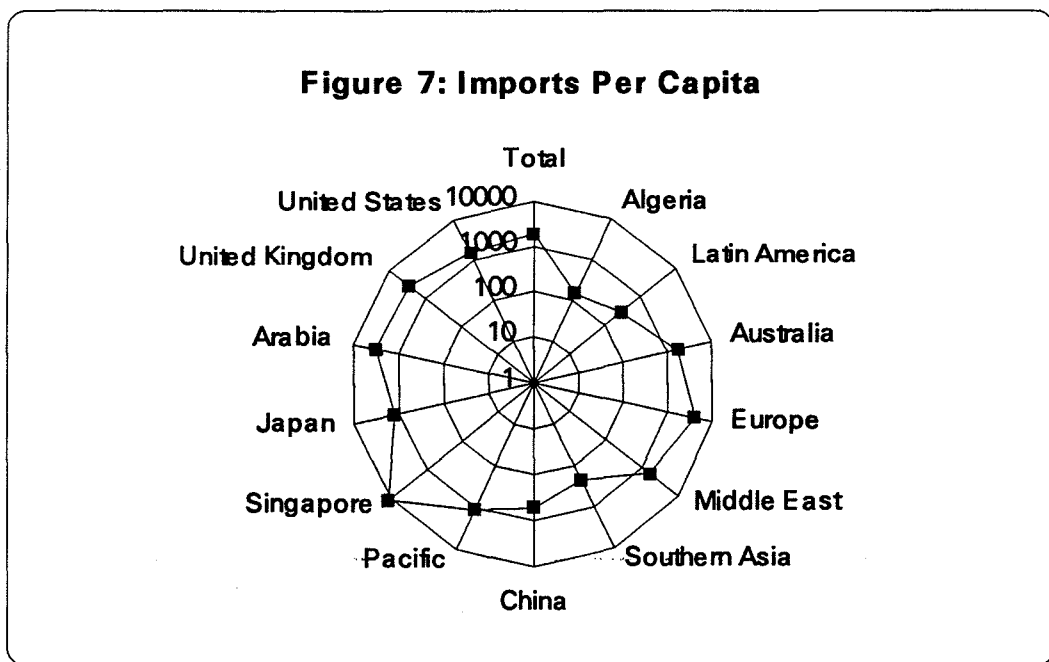
**Figure 6: Variation in Food & Live Animal Imports**



French Polynesia (Cluster 14) was included in the Pacific group. This was done for two reasons. Firstly, French Polynesia is too small to be left on its own. The other single country clusters have New Zealand's biggest trading partners in them. Secondly, it appears that the French Pacific may be separated from the rest of the Pacific because of the way the location variables were calculated (Tahiti is 165 degrees longitude east, while Fiji etc are around 150 degrees longitude west, very close on the map - close in actual distance but opposite ends of the location scale).

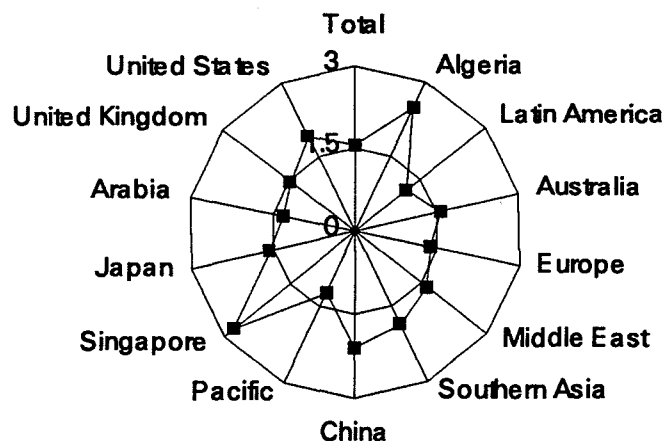
Combining the Pacific and French Polynesia is not without problems, as French Polynesia has a much higher GDP than the rest of the Pacific group, and does not have the same traditional ties to New Zealand.

The Singapore group could be referred to as the newly developed nations. Both countries have a high level of GDP per capita, and a high GDP growth rate. The group has the highest growth rate of imports of all the groups, and the highest level of imports per capita (Figure 7,8). Imports from New Zealand per capita are high, but the population of this group is small, so this is a relatively small market. Imports from New Zealand are primarily food stuffs.





**Figure 8: Relative Growth in Imports**



Japan imports a wide range of products from New Zealand, and has a high level of New Zealand imports per capita. Compared with other markets imports of food, crude materials, chemicals, and basic manufactures from New Zealand are relatively high.

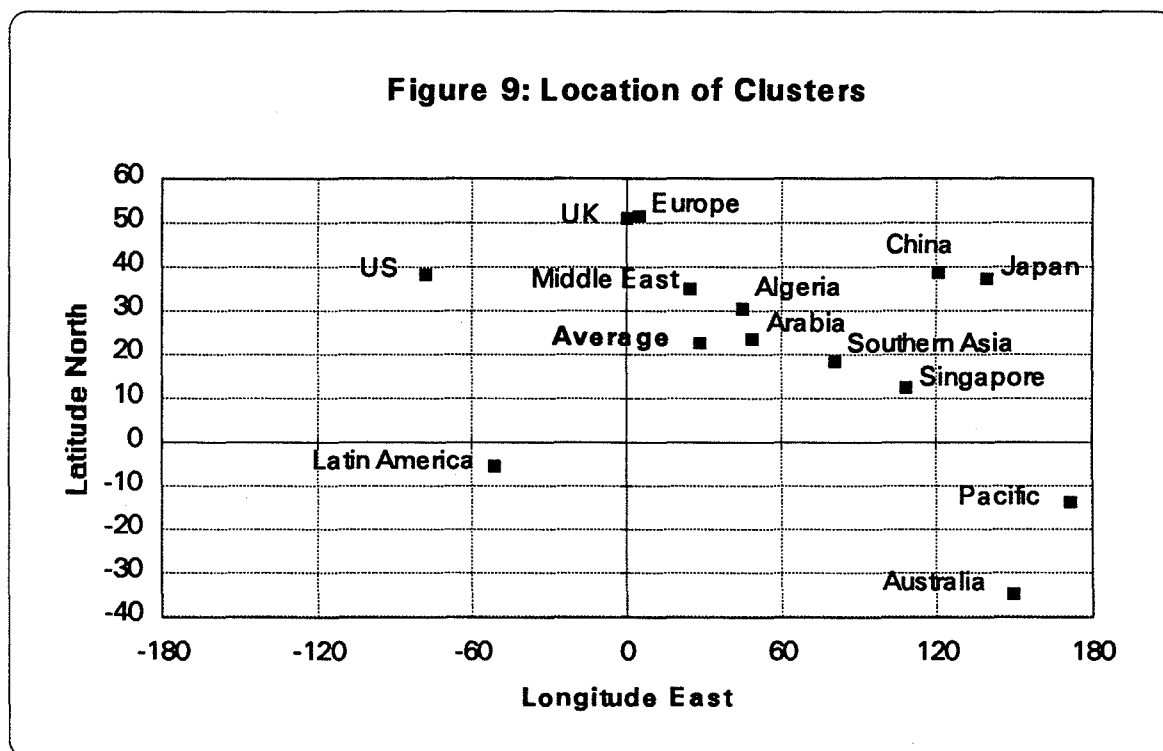
The Arabia group has the second highest average GDP per capita and the highest GDP growth rate. Imports from New Zealand are primarily from SITC Group 0, food and live animals, and imports from New Zealand are growing at a fast rate.

The United Kingdom imports primarily food, beverages, and raw materials. The level of imports per capita is high, as is the level of imports from New Zealand, but this the only market where the level of imports from New Zealand is falling (i.e. the growth rate is less than one). This is likely the result of increasingly restricted access stemming from the UK's membership of the EU. Falling demand for New Zealand's traditional exports, fat lamb carcasses and butter would also be contributing to this trend.

The United States has the highest level of GDP per capita. Imports per capita are below average. Imports from New Zealand are low on a per capita basis, even though the actual level of imports is high.

## 6. CONCLUSIONS

Figure 9 shows the location of each market. Where a market has more than one member the average of the latitude and longitude figures were used. Included in Figure 9 is a point labelled "Average". This is the population mean for the set of countries classified.



The thirteen markets described above can be classified, with the exception of New Zealand's major trading partners, almost entirely on the basis of location and income characteristics. Though the markets appear to be geographically dispersed the distances between markets are only statistically significant when they are very large, such as Australia and Southern Asia in latitude and Japan and the Middle East in longitude. In addition some markets are dispersed over a wide area, such as the Middle East which includes Spain, Portugal and Ireland. This indicates that classification based on geographic location alone may not be sufficient to limit aggregation bias in later estimates.

The analysis has also highlighted a number of the key features of New Zealand's international trading relationships, such as the protected nature of many of New Zealand's key markets in the UK and Continental Europe, and the impact of declining demand for products traditionally exported to the UK. Other interesting features include the identification of markets which engage in further processing, particularly the Japan, China, and Singapore markets, the identification of the Pacific Islands as client states, and the increasing importance of the Middle East and Arabia as markets for New Zealand's primary produce.

Finally it should be re-emphasised that international markets are not static. The analysis above has tried to capture some dynamic effects by incorporating market trends in the form of growth rates, but cannot allow for substantial changes in purchasing behaviour over time. The composition of the market segments described in this paper is likely to change over time.



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## ***Appendix 1: Calculation of Variables***

### **Per capita Values**

Real GDP per capita was available for most countries from the Summers and Heston (S&H) 1991 database. Where possible the figure for the latest available year (1988) was used. For other per capita variables the numerator was taken from deflated UN trade data for 1988, and the population in 1988 was taken from the S&H database.

### **Calculation of Growth Rates**

The growth rate of a variable was calculated as the movement in the average value of the variable between the two periods 1971 to 1979 and 1980 to 1988, i.e.

$$G(x) = \frac{\sum_{i=1980}^{1988} x_i}{9} \bigg/ \frac{\sum_{j=1971}^{1979} x_j}{9} \quad (1)$$

### **Calculation of Location**

Each country's location was defined as being at the capital city. The location in longitude and latitude were obtained from an atlas. Longitude west and latitude south were then converted into negatives to create two continuous variables for northerly and easterly location.

### **Missing Values**

For several countries data was not available for the entire period of interest. As a result growth rates and per capita values had to be estimated. For per capita values figures from the nearest available year were used. This provided acceptable results, as the year on year changes for the countries concerned did not appear to be large.

For growth rates the available time period was divided in half and the divisors modified appropriately. This poses some problems from a theoretical standpoint as the growth rates should be based on the same time period in order to allow comparison.



## *Appendix 2: ANOVA Statistics*

The following tables show the F and other associated statistics from performing one way analysis of variance. For all of the variables the group means are significantly different from the population mean at the 5% level. ANOVA was performed using the transformed data as it reduced the size of the reported sums of squares and mean squares without affecting the calculated F statistics. Note that the use of ANOVA assumes that error terms are normally distributed. The size of the F statistic in some of these tables is suspiciously large, indicating that this assumption may not be appropriate.

**Table 2: ANOVA Statistics**

<b>Growth Rate of Real GDP</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	47.8445	12	3.9870	11.8587	0.0000
<b>Within Groups</b>	18.1555	54	0.3362		
<b>Growth Rate of Total Country Imports</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	31.8953	12	2.6579	4.2085	0.0001
<b>Within Groups</b>	34.1047	54	0.6316		
<b>Growth Rate of Imports From New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	54.7299	12	4.5608	30.3268	0.0000
<b>Within Groups</b>	12.1163	54	0.2244		
<b>Growth Rate of Real GDP per capita</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	51.7827	12	4.3152	16.3901	0.0000
<b>Within Groups</b>	14.2173	54	0.2633		
<b>Level of Imports per capita</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	50.3521	12	4.1960	14.4802	0.0000
<b>Within Groups</b>	15.6479	54	0.2898		
<b>Level of Imports from New Zealand per capita</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	33.4271	12	2.7856	4.4937	0.0001
<b>Within Groups</b>	33.4739	54	.6199		



**Table 2: ANOVA Statistics ctd.**

<b>Variance of Total Imports</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	56.7802	12	4.7317	27.7131	0.0000
<b>Within Groups</b>	9.2198	54	0.1707		
<b>Variance of SITC Group 0 Imports from New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.7653	12	5.5638	1360.8438	0.0000
<b>Within Groups</b>	0.2208	54	0.0041		
<b>Variance of SITC Group 1 Imports from New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.9692	12	5.5808	174933.998	0.0000
<b>Within Groups</b>	0.0017	54	0.0000		
<b>Variance of SITC Group 2 Imports from New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	63.2679	12	5.2723	78.0766	0.0000
<b>Within Groups</b>	3.6465	54	0.0675		
<b>Variance of SITC Group 3 Imports from New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.9421	12	5.5785	8032.4949	0.0000
<b>Within Groups</b>	0.0375	54	0.0007		
<b>Variance of SITC Group 4 Imports from New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	65.7556	12	5.4796	241.1048	0.0000
<b>Within Groups</b>	1.2273	54	0.0227		
<b>Variance of SITC Group 5 Imports from New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.3265	12	5.5272	476.2226	0.0000
<b>Within Groups</b>	0.6267	54	0.0116		
<b>Variance of SITC Group 6 Imports from New Zealand</b>					
	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.9531	12	5.5794	24007.96	0.0000
<b>Within Groups</b>	0.0125	54	0.0002		

**Table 2: ANOVA Statistics etc.**

**Variance of SITC Group 7 Imports from New Zealand**

	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.9786	12	5.5816	141447.268	0.0000
<b>Within Groups</b>	0.0021	54	0.0000		

**Variance of SITC Group 8 Imports from New Zealand**

	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.9705	12	5.5809	35468.3782	0.0000
<b>Within Groups</b>	0.0085	54	0.0002		

**Variance of Total Imports from New Zealand**

	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	66.9144	12	5.5762	3886.731	0.0000
<b>Within Groups</b>	0.0775	54	0.0014		

**Location Longitude East**

	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	41.2349	12	3.4362	7.2040	0.0000
<b>Within Groups</b>	25.7576	54	0.4770		

**Location Latitude North**

	<b>SS</b>	<b>df</b>	<b>MS</b>	<b>F</b>	<b>Sig</b>
<b>Between Groups</b>	52.568	12	4.3807	20.3357	0.0000
<b>Within Groups</b>	11.6325	54	0.2154		