

# Exploring Tradable and Non-Tradable Inflation in Consumer Prices

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## Abstract

Statistics New Zealand will shortly introduce tradable and non-tradable inflation component series of the Consumer Price Index. These series are indicative of goods and services whose prices are primarily determined on world markets, and those whose prices are primarily determined on the domestic market.

This paper will outline the intended approach by Statistics New Zealand. The practical aspects, methodology and problems of categorising items as tradable and non-tradable are also addressed.

JEL Classification: C43 & E31 (Index Numbers and Aggregation, and Price Level; Inflation and Deflation)

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## 1. Introduction

Statistics New Zealand will shortly introduce a tradable and non-tradable inflation series of the Consumers Price Index (CPI). These will provide users with a series that is indicative of goods and services whose prices are primarily influenced by world prices and international supply and demand, and whose prices are primarily determined by factors such as domestic demand and supply. Goods and services which enter international trade and satisfy the law of one price, or at an appropriate relative price that could satisfy the law of one price, can be defined as tradable. All other goods and services will be defined as non-tradable.

Statistics New Zealand has decided to produce this series to satisfy its desire to develop ways for the CPI to measure inflation, as well as key clients have expressed interest in a tradable and non-tradable split of the CPI and what such a series could show about the composition of inflation in New Zealand. This is because it has been noted, primarily by the Reserve Bank of New Zealand, that the tradables and non-tradables sectors have had historically differing levels of price change that affect how the level of inflation changes. Previous methods used to measure how the different sectors change have always been considered crude and subjective.

This paper explores tradable and non-tradable inflation in the CPI, starting with the Australian tradable and non-tradable series and the methodology used to create its series. This is followed by Statistics New Zealand's preferred methodology which incorporates possible approaches Statistics New Zealand can take in creating the series, and which of them will be used. The effect of the dual economy on New Zealand and the dichotomy in the economy created by tradables and non-tradables are also covered. The practical aspects of creating a tradable and non-tradable series covers the steps that are, or will be, used to convert the chosen methodology into a working reality. The sensitivity analysis examines the robustness of the proposed methodology.

## 2. Review of the Tradable and Non-tradable Literature

This section outlines the work of various authors regarding the distinction and use of tradables and non-tradables.

Before considering the work of others, it is important to differentiate between the purpose for which previous authors have made their distinction, and why Statistics New Zealand is now seeking to do so. In much of the literature on tradables and non-tradables, the distinction is drawn along sectoral lines. The purpose of this distinction has been to specify and measure tradable and non-tradable sectors, and to further disaggregate tradables into import and export sectors, for analysis and comparison. This differs from Statistics New Zealand's purpose to devise a methodology for the classification of items within the CPI into tradable and non-tradable groups.

The most notable work done on a classification system for the distinction between tradables and non-tradables was undertaken by Dwyer (1989, 1991 and 1992). This work was elaborated on by Knight and Johnson (1997). Other work that contributed to or used some classification system for tradables and non-tradables will be discussed in turn.

As a starting point, traded goods are defined as 'goods which enter into international trade (that is exports and imports) and satisfy the law of one price', or, 'at an appropriate relative price

could do so'. This approach follows from Goldstein and Officer's (1979) 'spectrum' of goods (as quoted in Dwyer, 1992, and Knight and Johnson, 1997).

Dwyer uses a classification system to determine the relative size of tradable and non-tradable sectors, the size and composition of export and import sectors (as subsets of the tradable sector) and the 'internal competitiveness' of each sector. The theoretical foundation for this study is the 'Australian model', comprising a small open economy with traded and non-traded goods sectors, where the relative prices of traded and non-traded goods determine resource allocation (Dwyer, 1992, p443). Overall, the review of the size and competitiveness of Australia's traded goods sector was undertaken in an attempt to explain Australia's external (im)balance.

The work of Dwyer (1989, 1991 and 1992) was pivotal in the development of a systematic approach to classifying tradable and non-tradable industries. Dwyer's work identified that the lack of an existing methodology hindered efforts by previous authors to classify and study differences between tradable and non-tradable components of the Australian economy. Without any existing methodology, the identification of tradable and non-tradable sectors has been subjective and static (see comments Dwyer, 1992; Goldstein, Khan & Officer, 1980; and Knight and Johnson, 1997, p8). Dwyer criticises the use of a priori reasoning in producing a subjective classification and points out that this could be both a source of weakness for existing research and the reason for lack of such research.

Noting that "although simple in principle, the distinction between traded and non-traded goods faces many practical issues in application", Dwyer outlines a methodology that attempts to remove the subjectivity of previous classifications of tradables and non-tradables and provide a dynamic approach that will allow industries to move between classifications over time, as the industry determines.

Dwyer's methodology is outlined below:

"The following procedure is proposed:

- (1) measure the output of each industry within the economy;
- (2) identify the degree to which domestic production of each industry is exported, and nominate a degree above which this production can be defined as export orientated;
- (3) identify the degree to which domestic production of each industry is substitutable with imports, and nominate a degree above which this production can be defined as import competing;
- (4) sum the output of those industries which are defined as export orientated and import competing to form a measure of the traded goods sector;
- (5) sum the output of the remaining industries to form a measure of the non-traded goods sector."

Dwyer defines export orientation as the extent to which total supply from a given industry is exported, and scope for import substitution as the extent to which total usage of goods within a given industry are competing imports.

Even though an objective methodology is given, Dwyer still notes the use of subjective judgement in choosing the threshold value, although she maintains that consistent application of the rule permits a largely objective assessment. Robustness of the threshold value can also be achieved by analysing changes in the size and composition of each sector for different threshold values.

Dwyer's analysis of the 108 Australian industries notes that "inspection [of the threshold value] revealed that at a value of less than 10 percent, the profile of industries comprising the traded and non-traded goods sectors was unstable with major industries moving into and out of the sectors". Similarly, "at threshold values above ten per cent, only a narrow class of industries were eligible for inclusion in the traded sector" (Dwyer, 1992, p449). Even though the threshold value is nominated arbitrarily, we can still be assured that we are using a value that can be tested and analysed.

Knight and Johnson (1997) have also significantly contributed to the literature on tradables and non-tradables. They define a tradable item as "a domestically produced good or service if it is actually traded internationally (as are exports) or if it could be traded internationally at some plausible variation in relative prices". This leads to the important conclusion that the difference between a commodity being *tradable* and a commodity being *traded* is the result of the profitability of trade. This definition follows the definition of Dwyer (1992). Knight and Johnson further note that the tradables category will include domestically produced goods and services that replace imports.

Following Dwyer (1992), Knight and Johnson used a commodity approach to defining tradable and non-tradable, although others have used an industry approach (most notably Goldstein et al, 1980). This enables the use of data at a more disaggregated level. They note, as did Dwyer, that what is being represented is a measure of traded output, not tradable output which could be traded internationally at some plausible range of variation in relative prices, as would be preferable.

Most literature on industry classifications further disaggregates the tradables sector into importing or exporting sectors. The classification of an industry as either solely exporting, import competing or domestic production is not necessary in terms of the distinction between tradables and non-tradables. Given "appropriate relative prices it is optimal for an industry which is mainly export orientated or import competing to export all of its output or to only compete with imports on the domestic market" (Knight and Johnson, 1997, p10). As a result, all output from tradable industries is nominated as tradable output for the purposes of Dwyer (1992) and Knight and Johnson (1997).

Noting Dwyer's comments on the sensitivity of the threshold level, Knight and Johnson outline two further criteria for judging the desired threshold level. They point out that "the threshold should be chosen to reflect the orientation of domestic production for an industry". The threshold should reflect the share of imports or exports at which "international markets will exert a discernible influence on the behaviour of the industry" (Knight and Johnson, 1997). The other factor is the ability of the classification to maintain stability, while also maintaining representivity of the tradables sector, throughout the business cycle. Instability is defined as when an industry repeatedly moves between classifications over time. "The threshold should be such that the resulting classification does not mask any movements in the tradables sector generated by the business cycle, or result in an unstable industry composition" (Knight and Johnson, 1997).

The conclusion of Dwyer and Knight and Johnson is that a 10 percent threshold is reasonable for Australia.

Goldstein et al (1980) identified the determinants of import demand. Such a study required the analysis of relative prices. The relative price here is the price of imports to import competing goods, which can be defined as those that are traded (or tradable). Notably, Goldstein et al tried to determine the interaction between import demand and the price of imports, the price of tradable goods and the price of non-tradable goods. This allows the measurement of

coefficients of substitution between import prices, the price of tradables and the price of non-tradables.

Goldstein et al are among other earlier authors who note the pragmatic problem of a lack of price indexes for tradable and non-tradable goods. In constructing their own price indexes, the authors note that “the construction of price indices for tradable and non-tradable goods is based on a division of the economy along sectoral lines” (Goldstein et al, 1980). If an industry exports a significant amount of its production or competes to a significant degree with imports, then that industry can be classified as “exportable” or “importable”, respectively. The combined output is then labelled tradable output and the remainder, non-tradable. However, at no stage do Goldstein et al expand on what they consider or define as significant. Interestingly, using traded output to proxy the nature of an industry should not be solely attributed to Dwyer (1989, 1991 and 1992).

Notably, Goldstein et al define a non-tradable good as one that is not traded internationally for any relevant range of variation in relative prices. The definition used by Dwyer, and subsequently by Knight and Johnson, is that tradables are “goods which enter into international trade (that is, exports and imports) and satisfy the law of one price”, or “at an appropriate relative price could do so”. Note the subtleties in the difference of definition. Goldstein et al narrowly define non-tradables, whereas Dwyer (and Knight and Johnson, 1997) narrowly define tradables. The difference in outcomes resulting from this are not known, although one would imagine that with a narrow definition of tradables, some tradable output could be included in non-tradables, while a narrow definition of non-tradables would result in some non-tradable output ending up in tradables, providing the methodology supported the definition used.

Their study finds that “the price of nontradable goods does not appear to be a significant determinant of the demand for imports in most industrial countries [seven of the 10 countries considered]”.

The distinction between tradable and non-tradable goods has long hindered research and analysis of the size and composition of Australian sectors. Recent work by Dwyer (1992) and Knight and Johnson (1997) has made significant progress towards finalising a methodology for the classification of output to tradable and non-tradable sectors, and further identifying exportable and importable output. Dwyer’s work would appear to have a precedent from Goldstein et al in the use of sectoral output relative to exports and imports to identify the degree of import substitution or export orientation and assign output to respective sectors.

### **3. Developing a Preferred Methodology**

#### **Definition of tradable and non-tradable commodities**

Defining commodities in an open economy into a tradable and non-tradable split is simple in theory, but difficult to support with empirical evidence. From research done by Goldstein et al; Knight and Johnson and Dwyer (1992), it is evident that there are different approaches in defining proxies for measuring tradable and non-tradable output. These proxies measure output at different levels of aggregation.

Goldstein et al offer an approach based on the sectoral lines of an economy with industries measured according to significance of trade. In the analysis of price movements, Goldstein et al point to the weakness of this approach because there is no base-weighted price index that can be defined: “Price change is measured as a ratio of output at constant prices which are current-weighted prices” (Goldstein et al). The second limitation is the level of aggregation within each

industry, which causes some tradable output to be included in the non-tradable sector and vice versa (Goldstein et al). Furthermore, the definition of this approach is based on prices, but a quantity based approach is used with no price consideration. To address this issue, an analysis of the economy at a disaggregated level is preferred.

Knight and Johnson (1997) define two general approaches in defining tradables. The 'first' approach considers goods and services which are actually traded internationally, and commodities absorbed domestically as non-traded goods and services. This commodity classification is reliant on international trade statistics. The possibility arises of goods and services which could become traded at a variation in price, calling for a more refined approach of commodities to include a broader scope than just simply being traded or not traded.

The 'second' classification by Knight and Johnson includes commodities that are internationally traded and those which could be traded at a plausible variation in relative prices. This includes goods and services that earn or save foreign exchange via export and import replacements or at a certain price level could do so (Dwyer, 1992). The difference between a commodity being tradable and being traded arises as a result of the profitability of trade, which is not only affected by the price but also indirectly by factors of production. To achieve a balanced definition, Knight and Johnson (1997) suggest the use of both trade flows and market behaviour in identifying tradable and non-tradable commodities. This follows Goldstein et al, who argue that the second approach is not independent of the first because commodities may lie on a spectrum between tradable and non-tradable, and may switch between categories over time in response to changes in international comparative advantage or relative price (Knight and Johnson).

### **Relevance of developing a tradable and non-tradable index**

Why is there a need to develop this distinction in the output of an economy? Historically, there has been a notable divergence in inflationary behaviour between tradable and non-tradable sectors. Previous methods of classification are generally considered crude and subjective (Knight and Johnson, 1997). A clear definition and classification is needed to produce indexes that show the true behaviour of tradable and non-tradable inflation derived from a disaggregated level.

Given the existence of a tradable and non-tradable dichotomy in an economy, there are distinct differences in the factors that drive the inflation in the tradable and non-tradable sectors. The non-tradable sector is affected by such factors as local demand and supply and indirectly via the tradable sector. Goods, although not traded, can become so at a change in the relative prices or internal competitiveness in the economy. The tradable sector is influenced by world prices and international supply and demand. This shows a clear possibility for behavioural differences in the tradable and non-tradable sectors.

In essence, there is a dual economy, with interplay between the tradable and non-tradable sectors, but the tradable sector exhibits greater interplay with the rest of the world. Therefore, the non-tradable sector is indirectly affected by the tradable sector as prices change, but it is independent of direct world influences. This is the inherent difficulty with the indexes developed thus far, because the switching of commodities between sectors as conditions change to suit the profitability of trade causes the aggregated index not to truly represent the underlying level of aggregation.

The distinction in the output of the economy along tradable lines is considered to be especially relevant for effects of currency devaluation, the purchasing power parity (PPP) theory of exchange rates, the determination of inflation in open economies and the specification and estimation of international trade flows (Knight and Johnson). The PPP rate is a useful measure

of comparative prices between the ratio of PPPs and exchange rates. If PPP rates and exchange rates are equal, one unit of a currency purchases the same amount in the country under consideration as it does in the reference country. When the PPP rate is greater than the exchange rate, it can be concluded that one unit of the currency under consideration purchases less domestically than on other markets abroad (Schreyer and Koechlin, 2002). The importance of non-traded commodities in low-income countries reveals substantive margins of exchange rates exceeding PPP rates (ibid).

The relative price of traded and non-traded commodities determines the allocation of resources between the sectors. A change in the relative price of traded goods will indicate an enhanced or diminished ability of the traded goods sector to attract resources from elsewhere in the economy. Therefore it is a representation of that sector's internal competitiveness (Knight and Johnson). Tradable and non-tradable indexes that are accurate measures of the inflationary behaviour can properly represent all the underlying commodities to assist in the analysis of international trade, exchange rate, resource allocation and as a tool in policy decision making. Deriving a proper methodology is paramount to the accuracy of the indexes.

### **A testable proposition for the New Zealand model**

In developing a testable proposition for the New Zealand model, it is assumed, on the basis of size and output characteristics, that the economy operates as an open market price taker. All the commodities in the economy are defined as being traded at a world price (denominated in local currency) and that the non-tradable goods in the economy can become tradable at a plausible change in relative prices, or change in the profitability of trade.

The price of a commodity in the tradable sector is a function of the international price of that commodity and the domestic demand and supply conditions in the economy. This can be defined as:

$$P_i^T = f(P_w^T, D_{id}^T, S_{id}^T) \quad (\text{Equation 1})$$

where  $P_i^T$  = domestic price of a traded commodity i  
 $P_w^T$  = world price of commodity i expressed in local currency  
 $D_{id}^T$  = domestic demand of traded commodity i  
 $S_{id}^T$  = domestic supply of traded commodity i

The world price  $P_w^T$  will be derived by international demand and supply conditions. Considering the 'spectrum' of commodities, the coefficient ( $\beta_1$ ) of the  $P_w^T$  term for non-tradables should tend to zero. As  $\beta_1$  approaches one, a threshold level of discernible international influence can be established. The tradable commodity should have a  $\beta_1$  value close or equal to one, a similar or equal price to the world market price.



The price of a commodity in the non-tradable sector is simply a function of local demand and supply conditions and can be defined as:

$$P_i^{NT} = f(D_{id}^{NT}, S_{id}^{NT}) \quad (\text{Equation 2})$$

where  $P_i^{NT}$  = domestic price of a non-traded commodity i  
 $D_{id}^{NT}$  = domestic demand of non-traded commodity i  
 $S_{id}^{NT}$  = domestic supply non-traded commodity i

It can be seen that equation two is a special case of equation one; where the coefficient on the international price is equal to zero. Here, changes in the domestic demand and supply conditions cause changes in resource allocation which may cause the price of the good to become traded. Most goods in open economies face some competition at a global level. Therefore, there is inherently a price at which all commodities may become traded. This is the interaction of the dual economy.

## 4. Practical aspects of creating a Tradable and non-tradable Index

Recapping on the two main approaches that were recommended by Knight and Johnson (1997), the 'first' approach makes use of a classification that includes commodities which are internationally traded and commodities which could be traded at a plausible variation in relative price. The 'second' approach considers the economy as consisting of a broad spectrum of commodities, with those at one end which are identified as traded, these are goods and services actually traded internationally. At the other end of the spectrum are commodities that are absorbed domestically and are identified as non-traded.

With the methodology to create New Zealand tradable and non-tradable inflation series in hand, the practical steps to move this from theory to practice can be looked at.

As the tradable and non-tradable index series is created, Dwyer's (1992) classification method will be used. There are four steps to this method, which involves using GDP data from Input-Output tables to obtain an estimate of 'industry export orientation', which is the ratio of exports to total supply, and an estimate of the 'scope of import substitution' in each industry, which is the ratio of competing imports to total usage for each industry. This method will use commodities instead of industries, because commodities are more disaggregated than industries. Disaggregated data allows a more accurate classification of the tradable and non-tradable split.

In order to incorporate the two approaches in classifying the tradable and non-tradable commodities, further econometric testing will be done on commodities close to the predetermined threshold level and commodities that seem to defy current market and client expectations. Econometric testing will calculate the significance of correlation between international and domestic pricing.

### Practical steps

The first step in using the methodology is to obtain the background data, to work out which commodities are tradable or non-tradable. To do this, the Input-Output tables from National Accounts at Statistics New Zealand will be used. The Input-Output tables contain large amounts of data on supply and use in New Zealand, recorded in value terms of millions of New Zealand

dollars. For the tradable and non-tradable series Statistics New Zealand is only interested in the data on the import and export values per commodity and the total supply and use values for each commodity. We are using the commodity class because this is the lowest possible disaggregation of the data available, as it includes each individual good and service. By using this we will be able to more accurately split the economy into tradables and non-tradables.

The second step follows Dwyer's classification method, using the data in the Input-Output tables to calculate whether commodities are export orientated or import substitute. Dwyer defines export orientation as the extent to which total supply from a given industry is exported, and import substitution as the extent to which total usage of goods within a given industry are competing imports. The calculation is done by taking the value of imports or exports as a percentage of total supply or total use.

The third step is to use the percentage tradable calculated for each commodity. The commodities will be split on the predetermined threshold level for tradables. Those commodities with a tradable percentage higher than the threshold will be classed as tradable, and those with a lower percentage will be classed as non-tradable. According to Knight and Johnson it is important that the threshold chosen should retain the advantages of the Dwyer classification system. An analysis is done in section 5. The most important of these is the ability to reflect changes in the size of the tradable sector due to the impact of the business cycle on production. This requires that the threshold not be set too low or too high, as the stability of the sector induced by the level of the threshold would then mask any movements in the tradables generated by the business cycle. However, the threshold should also be at a level that ensures the industry composition of the sectors is not too unstable.

The fourth step is to match CPI items to the Input-Output commodities, so that all CPI items can be sorted into an appropriate Input-Output commodity. Commodities can then be classified as tradable or non-tradable. This work will be done by the Inflation Measures Division, National Accounts and Classifications and Standards sections of Statistics New Zealand.

When the match is completed, the fifth step will be to create the CPI tradable and non-tradable inflation series. The index series will be created by taking the weighted price movements of the CPI items and using the concordance created in step four to assign these weighted price movements to either tradable or non-tradable inflation. These can then be summed to get an overall movement for tradable and non-tradable inflation.

## **5. Sensitivity Analysis of the Tradable and Non-tradable Split**

It has been noted that for Australia the appropriate threshold level is 10 percent (Dwyer, 1992; Knight and Johnson, 1997). The 10 percent threshold value was used by these authors in assigning output to tradable and non-tradable sectors. This threshold was subsequently adopted in the Australian Bureau of Statistics methodology for assigning CPI items to tradable and non-tradable component series of the 14<sup>th</sup> series CPI.

Although 10 percent has been used for Australian purposes, it should not be assumed that such a level is appropriate for use in assigning New Zealand's CPI items to tradable and non-tradable component series. This section outlines the method for selecting an appropriate threshold level for New Zealand. It does not represent an extensive study of the optimal threshold value, rather an indication of whether a threshold of 10 percent is appropriate, or whether other threshold values, designated by multiples of 5 percent, might be more appropriate. To finish, the future research direction for obtaining the optimal threshold value is outlined.

This analysis starts by examining how changes in the threshold value affect the composition of tradable and non-tradable sectors. The reasons for this are: firstly, the analysis in previous literature on the subject has been undertaken on a sectoral basis, and therefore the need for comparison between the previous methods used is needed; secondly, the ABS CPI methodology used a threshold value that was determined by sectoral analysis, and comparability with the ABS is highly desirable.

As noted in previous sections, an axiomatic approach is preferred where there are several criteria that the optimal threshold value would fulfil. As outlined by Knight and Johnson and Dwyer, these criteria are:

- the threshold value represents the share of domestic production where it is likely that international markets exert a discernable influence on the domestic market.
- Stability of the sector is not compromised by small changes in the threshold value
- Goods and services are allowed to move between tradable and non-tradable classifications as goods move through the business cycle

Also, to properly judge the threshold value, analysis should be undertaken of the goods and services that change classification when the threshold value is altered. This would involve determining whether the composition of industries' goods and services is representative of the tradable and non-tradable sectors, and whether the resulting split would fit with market expectations, in order to maintain the credibility of the component series.

### **Analysis of the threshold value**

In analysing the threshold value, Knight and Johnson define stability as constancy of industry classification over time. Stability can also be established by minimising the number of industries that change classification due to small movements in the threshold value within a given time period (Knight and Johnson include this as part of their analysis). That is, the optimal threshold value is given by the value that results in the smallest number of industries changing classification as we move away from a given threshold<sup>1</sup>.

### **Stability**

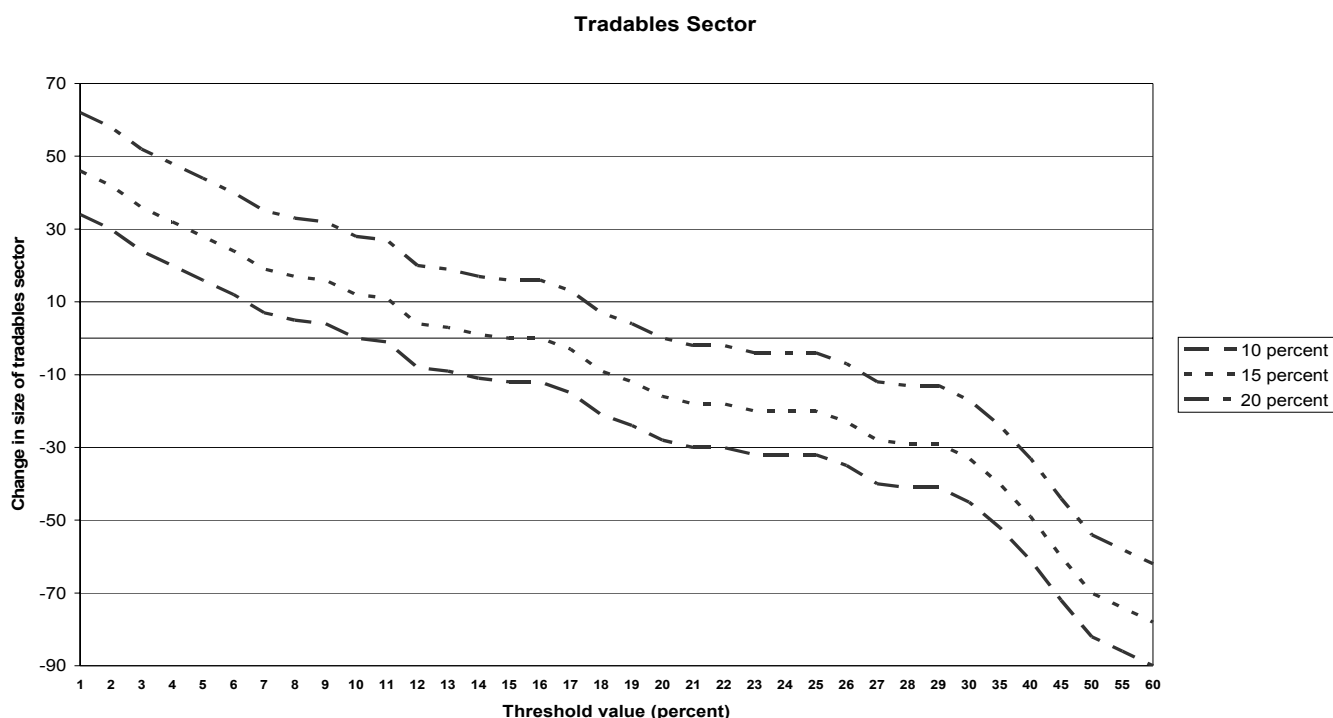
The present analysis is concerned with stability within a time period. Although future research to determine the optimal threshold value would benefit from an analysis over time, only marginal value would be added to this study. Graph 5.1 compares different threshold values and the changes in the size of the tradables sector as the threshold value deviates from those values. The impact of changing the threshold value is given as the number of industries changing classification as a result of either a 1 percent increase or decrease in the threshold value.

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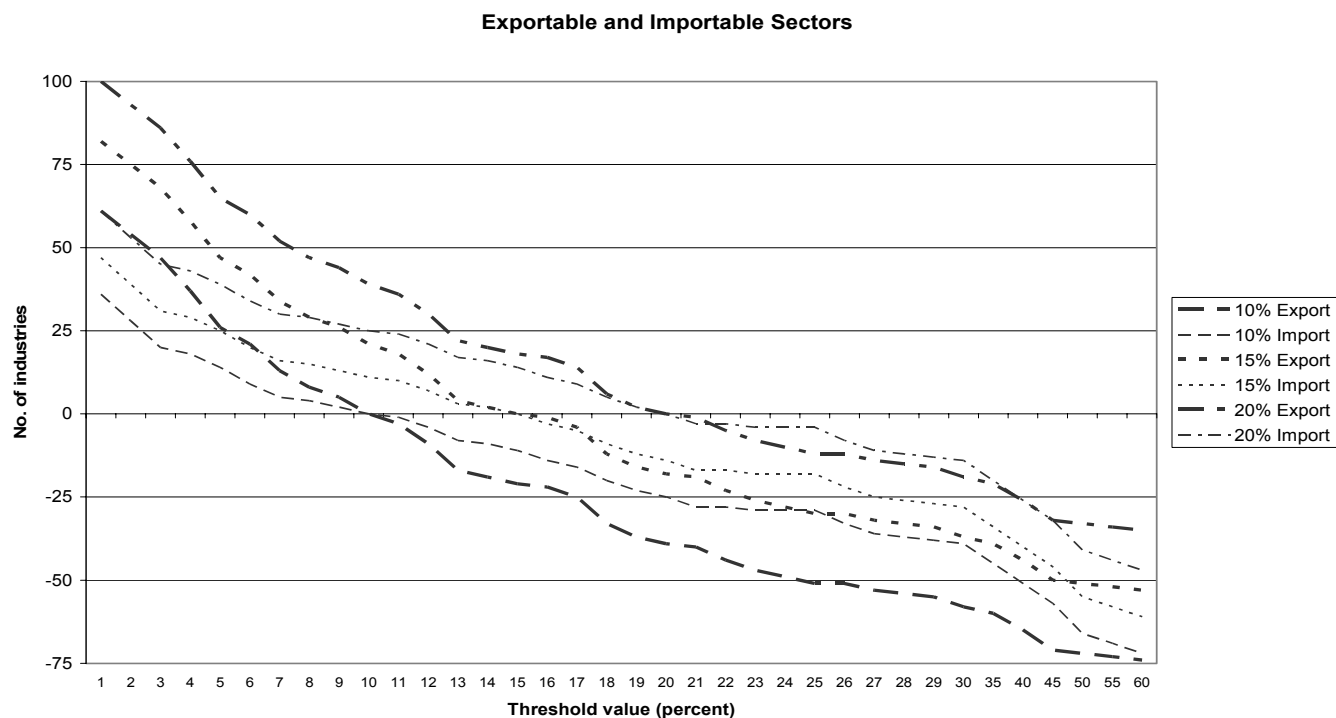
<sup>1</sup> This should be noted as 'strict' stability. It should be noted that strict adherence to such a definition without concern for the industries that are subsequently classified as tradable or non-tradable is not advocated. The composition of the tradables sector is as important as the stability (this is reinforced by Knight and Johnson).

For comparison of the different threshold values, it can be seen that small deviations from the threshold value result in smaller changes in the size of the tradables sector at a threshold value of 15 percent, than for either 10 percent or 20 percent. As we move 1 percent either side of the threshold 15 percent, the tradable sector gains one industry, or remains unchanged. Whereas, repeating the exercise for 10 percent and 20 percent, the tradable sector gains four industries in either case, or loses one industry and two industries respectively.

**Graph 5.1**



When analysing the stability of the tradable sector, Knight and Johnson decompose the tradables sector into exportable and importable sectors, and examine changes in the size and composition of these sectors. Decomposing tradables into exportables and importables allows for greater understanding of the movements into or out of the tradables sector due to movements in the threshold value. Graph 5.2 shows how the composition of exportable and importable sectors changes when small deviations are made from a given threshold value.

**Graph 5.2**

When we examine changes in the composition of exportable and importable sectors at different threshold values, we see again that a threshold value of 15 percent produces a more stable result than the 10 percent or 20 percent threshold. When examining the exportable and importable sectors, we need to consider the stability, size and composition of both sectors. At a 15 percent threshold we can see that the number of industries changing classification is very similar. The number of industries moving between exportable and importable industries is very similar at a 15 percent threshold. That is, the number of industries that change as we move 1 percent away from that 15 percent threshold value is fairly consistent between both importable and exportable sectors.

### Moving industries

We turn now to an analysis of the composition of tradable and non-tradable sectors. To avoid confusion, it should be noted that this paper refers to industries that change classification as a result of changing threshold values as 'moving industries'. This differs from Knight and Johnson, who refer to moving industries as industries that change classification (as tradable or non-tradable) over time. With this in mind, we examine the composition of the tradable and non-tradable sectors for different threshold values. For this analysis it would be useful to note the individual industries that change classification as a result of increases in the threshold value. The industries that change classification are outlined in table 5.1.

**Table 5.1**

<b>Threshold Value (percent)</b>	<b>Industries changing classification from tradable to non-tradable</b>
<b>10</b>	Poultry; deer; other animal products; sand, pebbles, gravel, clay; bacon, ham and smallgood products; processed milk and cream; bakery products; builders joinery; wood containers; newspapers and journals; communication services; management consultancy; other business services; higher education; other education services; motion picture, radio, television services.
<b>15</b>	Plants, flowers, seeds; raw vegetable materials; fish; fruit juices; grain products; animal feedings; spirits, wines, beer, tobacco; furniture; wholesale trade; road passenger transport; computer software and services; libraries, museums, art.
<b>20</b>	Metal ores; building stone; salt; yarn and thread; carpets; twine, rope, netting; books and stationery; petroleum products; paints; pleasure and sporting boats; prefabricated buildings, beverage services; general insurance; equipment hire; advertising and marketing; sport and recreation services.

In analysis, it should be noted that at a threshold value of 10 percent, the industries moving out of the tradables sector to the non-tradables sector include industries that are service based, such as management consultancy, other business services, communication services and higher education, which would fit with the definition of tradable commodities. Also within this group are items that might have 'expected' to be included in the tradables sector, such as poultry, deer, other animal products, bacon, ham, and smallgood products, and processed milk and cream. Some items such as poultry might be attributed to international regulations and health standards restricting international trade of poultry products. Others such as processed milk and cream might warrant further inspection due to the nature of the industry structure (such as the role of Fonterra in milk purchase agreements and the interaction of domestic prices facing Fonterra and the domestic price of milk and cream products).

Moving from a threshold value of 10 percent to 15 percent, it is interesting to note that items that disappear from the tradables sector include spirits, wines, beer and tobacco, wholesale trade, road passenger transport, computer software and services, and raw vegetable materials. It should be noted that the tobacco here is processed tobacco and does not include unmanufactured tobacco. If New Zealand processes tobacco for domestic consumption, prices are most likely to be determined by domestic cost conditions of supply, and therefore the exclusion of tobacco as an item from the tradables sector would be sensible. Alcohol can also be defined as importable and exportable, and so further disaggregation of alcohol and tobacco would be needed to determine the places of each. Computer software and services include many 're-exports' in the form of returns and replacement items. Road passenger services are of concern, as this is probably due to the level of 'exports' to foreign visitors<sup>2</sup>. Exclusion would be sensible from the tradables sector.

At a threshold value of 20 percent, some items that change classification are of concern. The changing status of petroleum products should be a warning sign that such a high threshold value might be inappropriate. An interesting item to change status is general insurance. It

<sup>2</sup> Domestic consumption of services by foreign residents is classified as an export for the purpose of the Input-Output tables.

should be noted that general insurance is classified as an importable industry, due to high flows of insurance to overseas residents in New Zealand and the availability of international insurance through multinational companies.

In terms of industries moving classification, it is evident that a threshold value of 20 percent is inappropriate. However, the choice between 10 percent and 15 percent is more difficult. Based on prior expectations as to the composition of the tradables sector, one might expect to include milk and cream products (but this is excluded from the composition under both values), raw vegetable materials, fish and spirits, wine and tobacco, and to exclude passenger transport and the domestic labour-intensive service-based industries. On balance, the analysis would suggest that a threshold value of 15 percent is marginally preferred to 10 percent due to its stricter classifications of services, such as passenger transport. It would also be expected that an analysis of further disaggregated commodity data that alcohol and tobacco would have a clearer classification.

### **Recommended threshold value**

Overall, we can see that the appropriate threshold value for New Zealand is 15 percent. This threshold value satisfies the first two criteria set by Knight and Johnson (1997) for a robust threshold value. We can see that a 15 percent threshold is most robust to small changes in the threshold value. In addition, the composition of the tradable sector is robust in that the industries within this sector have a discernible international influence on domestic behaviour. However, it is acknowledged that more research into the optimal threshold value is needed.

## **6. Conclusion**

The tradable and non-tradable distinction is a difficult one. Much work has been undertaken, particularly in Australian research, to provide a clear methodology to designate industries as tradable or non-tradable. Such work sets out the criticism of the use of a priori classification. As outlined in section 1, Dwyer's work is at the forefront in using traded output to proxy tradable output of the Australian economy and to distinguish between tradable and non-tradable industries. Importantly, this research presents two critical definitions, not independent of each other, for tradable and non-tradable industries. This research has also led the way for the Australian Bureau of Statistics to publish a component series of tradable and non-tradable consumer prices.

This paper has outlined the methodology and definitions of tradables and non-tradables used in the Australian approach. Further, a proposed methodology and definitions for use in a commodity approach have been given. For comparability between Knight and Johnson's Australian methodology in determining the threshold value, an analysis of industries has been undertaken using the 1996 Input-Output tables. Such an analysis has shown that using the Australian threshold value for a New Zealand approach would produce an unstable tradables composition.

Dwyer and subsequently Knight and Johnson outlined two definitions of tradable and non-tradable industries. There exists a need to incorporate both such definitions in the chosen methodology. As discussed in section 3, the first approach considers only commodities that are actually traded. The second approach considers any good that either is internationally traded or could be at some plausible range of variation in relative prices (Knight and Johnson). The proposed methodology incorporates these two definitions by using not only traded goods and

services as a proxy for tradables, but also identifies goods and services for which a traded proxy would be inappropriate, and suggests econometric testing.



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