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New Zealand Agricultural &  
Resource Economics Society (Inc.)

## **Price, Quality, and International Agricultural Trade**

**Darian Woods**

**Paper presented at the 2012 NZARES Conference**

Tahuna Conference Centre – Nelson, New Zealand. August 30-31, 2012

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# **Price, Quality, and International Agricultural Trade**

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## **Summary**

The average value of a particular class of agricultural exports varies widely across different destinations. In the event of a supply shock, such as the implementation of the Emissions Trading Scheme, can farmers offset higher costs by raising their average prices by contracting exports to lower value destinations? If the difference in value reflects different prices because producers have market power, the answer will be “yes”. If the difference in value reflects differences in the quality of goods exported to different destinations, the answer is “no.” While not definitive, there is little support for the hypothesis that exports are curtailed.

## **Key words**

agriculture, trade, prices, quality, market power

## **Acknowledgements**

Thank you to Andrew Coleman at Motu Economic & Public Policy Research for supervising this work and giving detailed feedback.

# 1 Introduction

The agriculture sector is responsible for 47 percent of New Zealand's greenhouse gas emissions and will be included in New Zealand's Emissions Trading Scheme (ETS) in 2015 (MAF, 2009; NZ Government, 2010). As dairy, beef and sheep farming are the largest contributors of greenhouse gases within the sector, inclusion in the ETS will have a large effect on this type of farming. To these farmers, the ETS represents a negative supply shock that raises costs and lowers profits. In the most adverse scenario, if farmers or processors are required to pay the full price of emissions and the price of a carbon-equivalent tonne of emissions costs \$50 or more, MAF (2008) predicts a 123% reduction in the average dairy farm's profit. In a more likely scenario, in which the price of carbon is \$15 and in which farmers are allocated free permits equivalent to 90 percent of their 2005 emissions, MAF predicts a 12% decline in national dairy profits and a 5% decline in national sheep and beef profits.

The MAF profitability estimates were calculated under the assumption that "farmers do nothing to adapt to the new cost structure over time." This assumption is unrealistic as farmers can alter their production techniques in response to changes in input prices or pollution charges. Moreover, it is sometimes suggested that farmers and processors could adapt to the new cost structure by increasing their average prices, either by reducing the quantity exported to markets where they have market power, or by reducing exports to the countries with the lowest prices. In general, the more New Zealand exporters have market power, the more they will be able to raise average prices in response to a cost shock.

In this paper, we explore whether farmers are likely to have sufficient market power to raise their prices by examining the pattern of export shipments and receipts in different countries over the last two decades. Unfortunately, there is no single definitive technique we can use. Rather, we approach the question from a variety of different angles. Overall, we find little evidence that agricultural producers have enough market power to allow them to raise average prices significantly in response to an increase in costs. The strongest evidence comes from the way prices in overseas countries respond to changes in the New Zealand exchange rate. Nonetheless, we document that the countries with the fastest increase in dairy imports in the 1990s

were those with the lowest average values, suggesting there may be some scope for average prices in this sector to increase if the quantity of exports was reduced.

To establish whether producers can exploit market power to change prices in response to a cost shock, high quality price and quantity data are needed.

Unfortunately, such data are not typically available. Rather, quantity and “unit value” data are typically obtained, where unit values are the average price of a *class* of good sent to a country, equal to the total revenue divided by the number (or weight) of items sold. Unit values are not the same as prices, as they do not distinguish between the different quality levels of the goods within a class, all of which are sold at different prices. By using the finest classification of goods possible some of these problems are mitigated, but in general even the finest classifications (such as the chardonnay variety of wine) include goods that can vary significantly in terms of quality and price. For this reason, while the central purpose of this paper is to analyse whether prices for *identical* New Zealand goods vary by destination, providing farmers with the ability to adjust prices to mitigate the effects of the ETS, much of the focus involves ways of answering this question with *unit value* data.

The data show the unit values of New Zealand agricultural products differ widely across export destinations. The most likely reason for these different unit values is that products sold in different markets have different quality levels, although prices for the same quality goods in each country are the same. If quality differences are the cause of the different unit values across countries, it will be difficult for producers to offset the lower profitability caused by the ETS. The main alternative explanation is that the goods sold in different markets have the same quality, but because New Zealand exporters have sufficient market power to segment markets across countries, they can charge different prices. This market power could stem from the way producers market their goods, or could stem from quotas or other quantity restrictions limiting access to these markets. If market segmentation enables exporters to price differently in different markets, exporters can raise prices and shift the products to a new combination of importing countries in response to increased costs. These two arguments are explored in section 3. They represent the extreme range of implications of the extent that agricultural producers can adjust prices in response to the ETS.

In section 4, the measurement of unit values is discussed in greater detail. Different export destinations pay consistently different unit values for New Zealand agricultural products, even for ostensibly homogeneous products disaggregated at a fine ten-digit Harmonized System (HS) level. We use unit value data to create two measures of the extent that average prices vary across markets. First, we look at the relative unit values for a single product paid by the different countries that New Zealand exports to, which we call the ‘importer premium’. For example, Germany paid an average importer premium of 1.49 for frozen sheep meat exports from 1989-1998, meaning its unit values were 49 percent higher than the average unit value of all New Zealand exports of frozen sheep meat. For most export destinations, there is little variability from year to year in the importer premium paid for each product: to continue the example, Germany’s importer premium was 1.50 from 1999 to 2008. The second measure is called the ‘NZ premium’. It compares the unit value of exports from New Zealand of a particular product to a particular country with the unit values of that country’s imports from all other countries. This is an indication of whether New Zealand is sending goods that are higher or lower in value than other exporting countries to a particular importing country. As discussed in sections 5 and 6, the NZ premium in an importing country one year is also a strong predictor of its premium in subsequent years. A high “New Zealand premium” is consistent with New Zealand exports being able to compete on quality. Conversely, a low New Zealand premium is suggestive that the product is primarily competing on the basis of price.

We extend the analysis of world trade patterns in section 7. By comparing a New Zealand product’s unit value with that product’s average world unit value we can infer whether New Zealand generally competes on price or quality. The method we use is a simplification of a technique developed by Karl Aiginger (1988). The extent that a market is dominated by either price competition or quality competition is an indication of a markets’ ability to absorb price increases.

In section 8 we use exchange-rate data to test for market power. If world agricultural markets are competitive, New Zealand’s exchange rate should not affect the price that importers pay for New Zealand products. We test this hypothesis and find no

correlation between exchange rates and prices that importers pay. We believe this evidence, which is consistent with the hypothesis that the different markets are price competitive, is the strongest evidence in the paper.

In section 9 we analyse the dynamic pattern of unit values and exports. We test the hypothesis that exporters' decisions to increase or decrease quantities sent to a particular country depend on relative unit values. First we explore a variety of scenarios illustrating the ways unit values could affect the dynamic patterns of exports, starting with scenarios assuming markets can be segmented. For example, if lower-paying countries are "dumping grounds" for temporary surpluses, countries with increased imports from New Zealand should have a lower-than-average premium. Moreover, a very large expansion one year will be followed by a very large contraction the next. In this case both contracting and expanding markets should be associated with a lower-than-average premium. Other possible scenarios are discussed in the section. To examine the way that differences in unit values are related to agricultural export volumes, we estimate the mean unit value premiums in expanding and contracting markets and find that expanding markets are associated with lower unit values in some product categories.

## **2 Background issues**

The Emission Trading Scheme will raise New Zealand agricultural producers' costs. Economic logic suggests producers will want to pass on these costs if possible, or reduce production, and thus that an increase in the strictness of a country's environmental regulation relative to others should decrease its industries' output and competitiveness. Yet literature on the costs of environmental regulation is surprisingly mixed. Dean (1992) reviews empirical studies on environmental compliance costs (ECC) in Europe and notes, because estimated compliance costs are small relative to an industry's average costs, "there is little evidence of any significant impact of ECC on the pattern of trade" (Dean, 1992, pp. 11). This evidence is in contrast with the predictions of MAF (2008) and Ballingall et al. (2009), who argue there will be non-negligible reductions in New Zealand's welfare following the application of the ETS to the agricultural sector. For example,



Ballingall et al. (2009, pp. 7) argue “[P]rivate consumption (household spending) falls after an ETS is introduced, with these falls larger in the long run scenarios.”

The difference between these studies may be due to the differences between the magnitude of European environmental compliance costs and the ETS. Dean cites studies that show a marginal reduction in exports when ECC are found to be 1 to 2% of total exports’ value (pp. 6). The ETS, on the other hand, may impose higher costs on farmers. Nonetheless, the differences between many ex-post empirical studies on the effects of environmental regulation on industry and the ex-ante MAF report remain stark, partly because of the MAF assumption that “farmers do nothing to adapt to the new cost structure over time.”

It is possible that farmers could respond to the ETS by using a different combination of production techniques to raise the quality of their output. For instance, a cheese manufacturer could produce more labour-intensive high-quality cheese and reduce emissions-heavy milk inputs. The scope of quality differences between products is called a ‘quality ladder’ (Khandelwal 2008). ‘Quality’ has two important dimensions: it may refer to horizontal or vertical quality. Vertical product differentiation is a product feature that most consumers prefer, such as higher fuel efficiency in cars. It has been the focus of most of the literature on product quality, both because producers can choose different techniques or different inputs to produce at different points on a quality ladder, and because countries specialise in different quality levels (Schott 2004). Some products, such as electronics, have long vertical quality ladders. Others, such as agricultural produce, have short vertical quality ladders, although there is scope for horizontal product differentiation for a particular quality level. While agriculture goods do not have quality ladders as long as products such as electronics, quality ladders help explain differences in unit values across countries. Schott further noted that high-priced goods are generally more capital or skill intensive than low-priced goods in the same product category.

Horizontal product differentiation is a product feature that is preferred by some consumers rather than others, such as a car’s colour. Horizontal differentiation is important as even the most finely disaggregated product category has some room for horizontal differentiation, enabling producers some scope for market segmentation

through reputation, intangible marketing campaigns or inexplicable uniform differences in consumers' willingness to pay for various brands. When companies have this market power, they can set prices differently in different countries, charging premiums in some markets without losing most of their customers.

### 3 Price variation across countries: Market Segmentation vs. Quality Differences

Market segmentation occurs if New Zealand agricultural processors hold market power and can sell an identical product in each country at different monopolistic prices. Consider an example with two countries. If market segmentation occurs, the demand and marginal-revenue curves differ in slope in the two countries, but New Zealand agricultural processors have the same marginal cost curves for supplying each country. The ETS will increase the marginal cost in both markets. In response, exporters will reduce quantity and increase prices in both countries, but they will increase prices relatively more and reduce exports relatively less in the country with the steeper demand curve.

Figure 1: International Market Segmentation

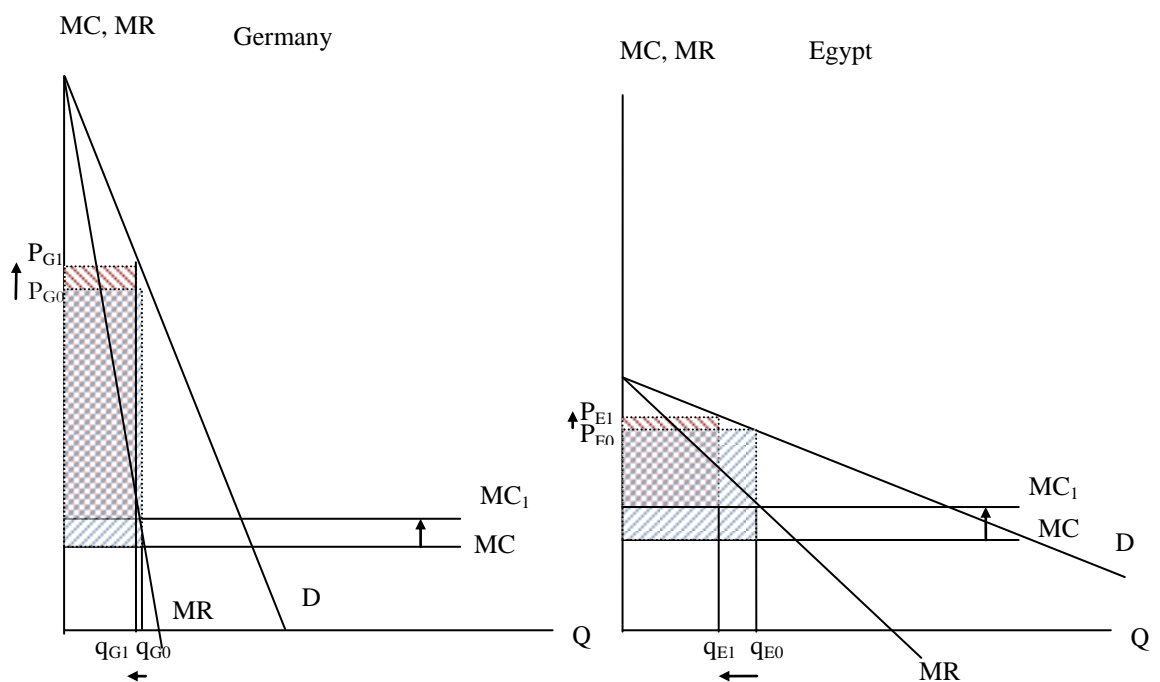
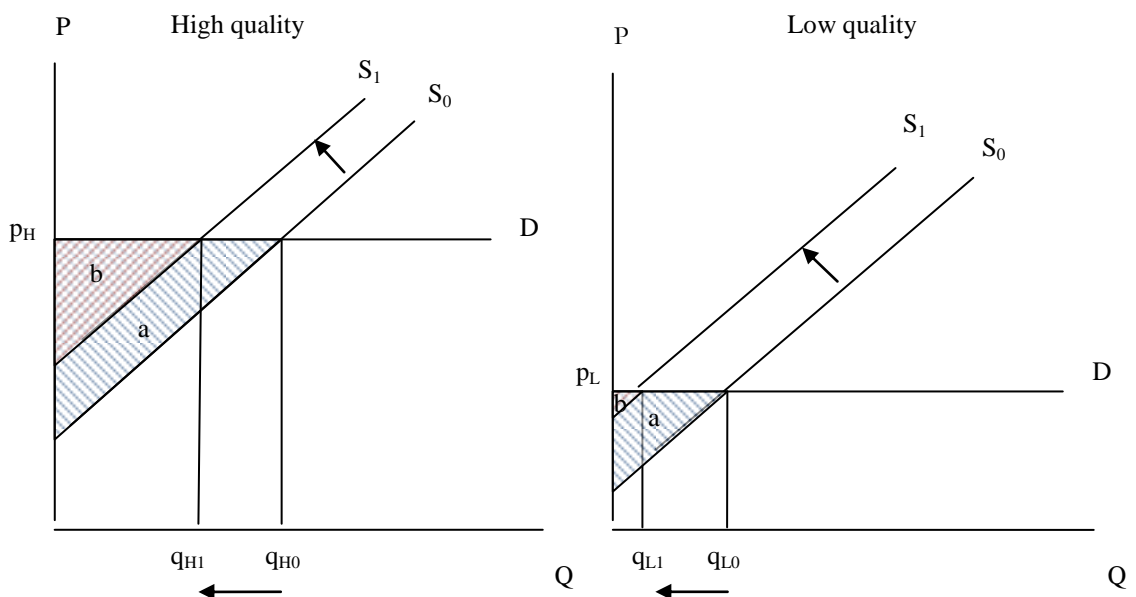


Figure 1 illustrates the possible response to an increase in marginal costs when an agricultural processor has market power, and sells an identical product to two countries that differ in the elasticity of their demand. The introduction of the ETS raises the marginal cost curve from  $MC_0$  to  $MC_1$ . To maximise revenues, exporters increase the price more in the country with the inelastic demand curve, Germany, than in the country with the more elastic demand curve, Egypt. ( $P_{G0}$  to  $P_{G1}$  is a larger increase than  $P_{E0}$  to  $P_{E1}$ .) Despite the lower price increase, Egypt's quantity decrease,  $q_{E0}$  to  $q_{E1}$ , is larger than Germany's quantity decrease,  $q_{G0}$  to  $q_{G1}$ . Unambiguously, New Zealand producers will reduce agricultural exports and lose surplus when the ETS is introduced. But market power through branding and product differentiation would allow New Zealand producers to increase prices to compensate, especially in countries with a steeper demand curve. This would offset the reduction in producer surplus.

In the second scenario that can explain different unit values, agricultural goods are commodities that are traded competitively, but different qualities are traded in different markets. This is illustrated in figure 2. In both markets the demand curve is perfectly elastic or horizontal, but the demand and supply curves are lower in the low-quality market, reflecting the lower price of the good. In both cases, the introduction of the ETS shifts the supply curves left.

Figure 2: Quality Differences



As the figure shows, when the supply curves shifts left from  $S_0$  to  $S_1$ , the price remains the same and quantity reduces from  $q_0$  to  $q_1$ . The producer surplus shrinks from area a to b. If the supply curves have different slopes, the quality with the more elastic supply curve (shallower slope) will experience a greater drop in the quantity demanded and produced. Because agricultural producers are price takers, they cannot readjust their export destination mix to increase prices.

It is likely that the situation facing New Zealand agricultural exporters is a combination of these two extreme cases. For example, the wool industry has traditionally sold much of its wool at auction, meaning it has little ability to price discriminate. Consequently, the quality differences scenario is probably most applicable. In contrast, Fonterra is by far the dominant company in the New Zealand dairy sector, and manages multiple brands in different countries, raising their market power by reducing opportunities for price arbitrage across countries (Fonterra, 2010).

## 4 Premium Measures

*Researchers often react to the absence of information about countries' product quality by constructing ad hoc proxies, the most common of which is observed export prices (unit values). This measure is unsatisfactory, however, because export prices may vary for reasons other than quality ... [i]f consumers value variety ... high-cost producers can survive ... even in the face of cost disadvantages. – Hallak, 2008*

Most trade data sets present the total value of imports and exports to and from a country in a particular product category at a point in time. Generally, the total quantity is also known, often measured in kilograms. The total value divided by quantity is the *unit value*, the value per unit of the good. It is the average price of a class of goods, measured over goods that are similar but which can differ in terms of quality. While this makes it difficult to compare across countries, because quality is not uniform, in most cases true prices are not available.

To make comparisons through time or across countries, relative unit values, the ratio of a unit value to one destination compared to another, are calculated. While relative unit values have some problems, when use to compare prices in different countries they automatically compensate for generalised price inflation, currency differences, and swings in commodity prices. They also enable data-outliers to be pinpointed.

Deaton (1988), Hallak (2005), Hallak and Schott (2008), and Khandelwal (2008) each develop methods of measuring quality using various combinations of unit values, trade balances and market share. To overcome data limitations, we use two less sophisticated techniques. First, we calculate the relative unit values of a product sold in various export destinations. Secondly, we calculate New Zealand's unit values of a product sold in a particular market compared with the unit values of the same product sold by other countries in the same market. These two measures enable us to make some inferences about the extent that market power or quality differences are behind the differences in the unit values of the same product exported to many different countries.

The first relative unit-value measure is called the 'importer premium'. It compares the unit value of a product imported by one country from New Zealand with the weighted-average unit value New Zealand producers receive for that good across all countries. An importing country that paid New Zealand's mean export unit value would have an importer premium of one. An importing country that paid a higher-than-average unit value would have an importer premium above one. By comparing unit values between countries, this measure avoids the problems of general price inflation and product-specific price changes.

The second measure is the 'NZ premium,' which examines how the unit value of a New Zealand product sent to a particular country compares with the unit values of the country's imports of that good from all other countries. A particular country and product with a NZ premium of one means that New Zealand's product sells for the mean unit value of that country's imports of that good. A NZ premium above one means that country's consumers are paying a relatively higher price for New Zealand products.

The measures are calculated as follows. First, the unit value of a product across each country that New Zealand exports to and across each time period is calculated:

$$UV_{i,t}^{NZ} = \frac{P_{i,t}^{NZ} \cdot q_{i,t}^{NZ}}{q_{i,t}^{NZ}}$$

where  $i = \text{importing country}$

$t = \text{annual time period}$

$P_{i,t}^{NZ} \cdot q_{i,t}^{NZ} = \text{value of New Zealand product in country } i \text{ at time } t$

$q_{i,t}^{NZ} = \text{quantity of New Zealand product in country } i \text{ at time } t$

To calculate the importer premium we define the weighted-average unit value of exports from New Zealand to all countries in a given time period:

$$P_t^{*NZ} = \frac{\sum_i P_{i,t}^{NZ} \cdot q_{i,t}^{NZ}}{\sum_i q_{i,t}^{NZ}}$$

The importer premium (MPr) for country  $i$  is calculated by:

$$MPr_{i,t} = \frac{UV_{i,t}^{NZ}}{P_t^{*NZ}}$$

The value  $MPr$  measures a New Zealand product's unit value to one destination relative to other countries. For example, if this product is wine,  $MPr$  is the unit value of the New Zealand wine exported to country  $m$  in time period  $t$ , divided by the weighted-average unit value of New Zealand's wine exported to all countries in that same time period.

The second relative unit-value measure is calculated from the perspective of the importing country. This measures the extent that a particular New Zealand export (eg wine) to a particular destination (eg the U.K.) is priced below or above the average price of the product in the importing country and thus indicates the level of New Zealand's prices and how they are changing over time. Let the weighted-average unit value of all exports to one country in a given time period be:

$$P_{i,t}^{*x} = \frac{\sum_x P_{i,t}^x \cdot q_{i,t}^x}{\sum_x q_{i,t}^x}$$

where  $x = \text{countries exporting to importing country}$

The NZ premium is calculated by:

$$\text{NZPr}_{i,t} = \frac{UV_{i,t}^{\text{NZ}}}{P_{i,t}^{*x}}$$

In this paper we use the ‘importer premium’ and ‘NZ premium’ to measure the extent that exports to different countries have different unit values, and to make inferences about prices in these countries. However, both measures have their limitations when used in isolation, in part because of the way they can change through time in response to changes in the pattern of exports. For this reason, the measures are best used in conjunction with other indicators of export patterns. These limitations can be illustrated by example. Imagine that New Zealand wine has two vertically differentiated quality levels, high and low, and that trade data aggregates both qualities into the same category, wine. As the following examples show, changes in the importer premium (MPr) do not always indicate an increase in quality, and vice versa.

*Case 1: Average changes in quality do not necessarily affect the average importer premium.*

Changes in the average quality of exports do not necessarily increase importer premium measures. If New Zealand exported an equal proportion of high and low quality wine to every importing country, the importer premium for all countries will equal one, and will stay equal to one even if, over time, New Zealand moves from solely producing low quality to high quality wine.

*Case 2: Increases in the average quality can reduce importer premiums*  
Worse, an increase in the quality of exports can reduce the importer premium in all countries, if a country receiving above average imports is a sufficiently large component export destination. Consider an extreme case where New Zealand sent 50 litres of low quality wine to the UK and 50 litres of high quality wine to the US in year 1. Suppose each litre of low quality wine was valued at ten dollars per litre, while each litre of high quality wine was valued at twenty dollars per litre, so  $\text{MPr}(\text{UK}) = 0.67$ , and  $\text{MPr}(\text{US}) = 1.33$ . Now suppose in year 2 New Zealand doubles its exports of high quality wine to the US, so total exports are 100 litres of high quality to the US and 50 litres of

low quality to the UK. Both importer premiums will decrease—the US's from 1.33 to 1.20 and the UK's from 0.67 to 0.60.

As this example indicates, when assessing the overall quality mix over time, other measures such as the NZ premium are complementary and sometimes necessary. If the quality of exports to all countries increased the importer premiums would remain constant, but the New Zealand premium would be expected to increase – at least if the quality of exports from other countries were unchanged. However, the NZ premium (NZPr) may also be misleading as the following examples show.

*Case 3: An importing country raises the quality of its imports from all countries.*

If a wine-importing country imported a fixed proportion of high and low quality wines from each exporting country, the New Zealand premium to that country would equal one. Even if the importing country moves up the quality ladder and starts demanding a higher proportion of high quality wine, if it imports this new mix in equal proportions of quality from each exporting country, its NZPr in wine will still equal one.

*Case 4: New Zealand is a dominant exporter to a country that increasingly imports better quality*

It is also possible that the NZ premium could fall if NZ were a sufficiently large exporter to a country. Suppose in year 1 the US imports 50 litres of high quality wine from New Zealand at \$2, and 50 litres of low quality wine from Bulgaria at \$1. New Zealand's US NZPr equals 1.33 while Bulgaria's US "NZPr" equals 0.67.<sup>1</sup> Now suppose in year 2, New Zealand increased its exports of high quality wine to 100 litres, while Bulgaria's exports were unchanged. New Zealand's US NZPr would decrease to 1.20 despite increasing its quality mix.

As these examples show, it can be difficult to make unambiguous inferences from relative unit value measures. A constant NZPr measure through time does not mean

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<sup>1</sup> This should be called the Bulgarian premium.



that quality is unchanged, because there are four ways the NZPr could stay the same even if quality changed:

1. New Zealand's export quality increases but so does the rest-of-the-world's;
2. New Zealand's export quality decreases but so does the rest-of-the-world's;
3. the countries that New Zealand exports to are importing increasingly higher quality at the same rate that New Zealand is increasing its export quality; and
4. the countries that New Zealand exports to are importing increasingly lower quality at the same rate that New Zealand is lowering its export quality.

As shown below, the data suggest that the New Zealand premium to a country changes only slowly, so that the past NZ premium is a strong predictor of future NZ premium. When interpreting these results, note that New Zealand's export quality remaining the same is only one potential explanation, albeit the most likely. The example in *Case 1* does not seem to be a major problem in our data as the NZ premiums do vary within an importing country. Although we cannot rule it out, it seems unlikely that the quality demanded by the rest of the world is growing worse as world incomes rise. For this reason, we can infer that New Zealand is either not outpacing quality growth compared to the ROW or exporting similar quality over time.

## 5 Data

The import and export data used in this paper come from two sources. We use data from Statistics New Zealand's Infoshare for the finely disaggregated import and export information specific to New Zealand that are used to calculate the importer premium measure. We use data compiled by Robert C. Feenstra et al. (2004) for world-wide import and export data to calculate the New Zealand premium measure.

The Statistics New Zealand Overseas Merchandise Trade data are originally sourced from the New Zealand Customs Service. These are annual observations of products sorted into ten-digit HS categories from 1988 to 2008. We use data from the

agricultural sectors that contribute most to New Zealand's greenhouse emissions—dairy, beef, sheep, and wool. Each export product category describes the annual export quantity (usually in kilograms) and the total Free on Board<sup>2</sup> (FOB) value, in New Zealand dollars. Each import product category describes the annual import quantity and the total Cost, Insurance, Freight<sup>3</sup> (CIF) value, also in New Zealand dollars.

An enormous quantity of data are needed to calculate the New Zealand premium: basically all trade flows between all centres for every year for a particular category of goods. Rather than obtain this data for 10-digit product categories from scratch, we have used a dataset assembled by Feenstra (2004). Feenstra's data consists of annual import and export data in four-digit SITC (Rev.2) product categories from 1988 to 2000. These data are aggregated from worldwide trade flow reports. Priority is given to importer countries' reports. We isolate 13 product categories that include dairy, beef, sheep, and wool. For each export and import category, the quantity of trade in kilograms and the value in U.S. dollars, measured in either FOB or CIF terms depending on the observation.

## **6 Trends in quality premiums over time**

This section describes the patterns of the importer premium and New Zealand premium measures for New Zealand's agricultural exports, 1988- 2008. There are two main features of the data: (1) the premiums differ widely across countries, indicating either large differences in the quality or the prices of exports; and (2) the premiums for a particular country are persistent through time.

Export unit values vary greatly. For unsalted butter, the highest unit value is 1.4 times as large as the lowest unit value, while for frozen sheepmeat the ratio is over 8. In tables 1 and 2, products are divided into three categories according to their relative variability, measured as the standard deviation over both time and country of each premium measure. Low-variance products have a premium standard deviation of 0.5 or less, medium-variance products have a premium standard deviation between 0.5

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<sup>2</sup> Free On Board (FOB) is the good's value, transport costs split between buyer and seller

<sup>3</sup> Cost, Insurance, and Freight (CIF) is the good's value plus cost, insurance and freight costs

and 1, and high-variance products have a premium standard deviation of 1 or more. (By definition, the relative premium and NZ premium both have a mean of one.) The lowest variance items are dairy items or wool.

Table 1: Importer Premium Variance

|  | Product Code  |
|--|---|
| High variance<br>(Std. dev $\geq 1$ )              | Sheepmeat (0112), Sheepskins(2116),<br>woollen fabrics(6542)  |
| Medium variance<br>( $0.5 < \text{Std. dev} < 1$ ) | Beef (0111), Fresh milk (0223), Butter<br>(0230), carded wool (2687)                                    |
| Low variance<br>(Std. dev $\leq 0.5$ )             | Concentrated milk (0224), cheese (0240),<br>greasy wool (2681), degreased wool<br>(2682), casein (5922) |

Table 2: NZ Premium Variance

|  | Product Code   |
|--|--|
| High variance<br>(Std. dev $\geq 1$ )              | Fresh milk (0223), casein(5922),<br>Sheepskins(2116)   |
| Medium variance<br>( $0.5 < \text{Std. dev} < 1$ ) | Beef (0111), Sheepmeat (0112),<br>Concentrated milk (0224), degreased<br>wool (2682), carded wool (2687) |
| Low variance<br>(Std. dev $\leq 0.5$ )             | Butter (0230), cheese (0240), greasy wool<br>(2681), woollen fabrics(6542)                               |

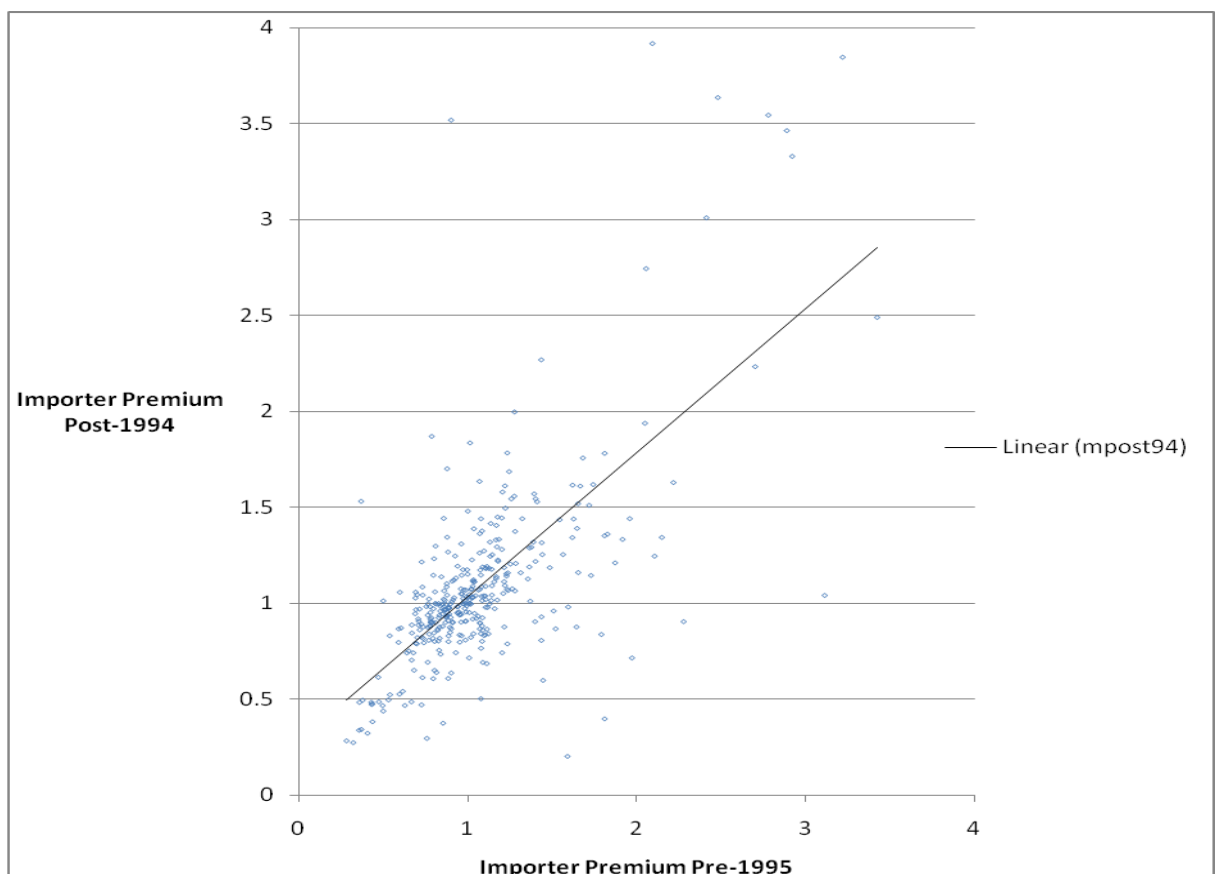
Much of this variation is explained by differences in unit value between countries rather than over time. For instance, “beef-meat” (0111) has an importer-premium standard deviation of 0.95 across all countries and all time periods, but the premium for beef exports to the United States has a standard deviation of only 0.004.

In general, the importer premium and the New Zealand premium are strongly persistent through time. For example, a country with an NZ premium higher than one in a given year is likely to have an NZ premium higher than one the next year. A

straightforward way to demonstrate this persistence is to plot the relationship between the relative unit value premium from the second part of the period against its value in the first half. If the premiums are persistent, the graph will be a straight line with a slope of one.

Graph 1 shows a plot of the importer premium for 13 4-digit product categories, across a large number of countries, using the Feenstra dataset. Each point represents the average importer premium for the product-country pair for the period 1989-1994 and 1995-2000. There are 463 observations in total.

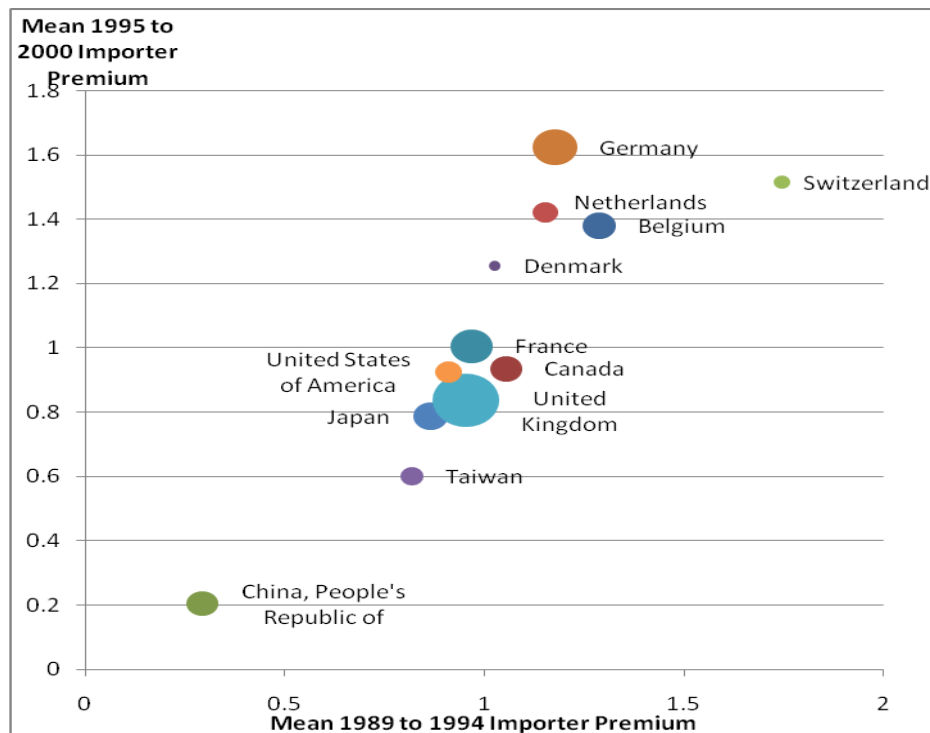
Graph 1: Importer Premium, World



The data have a slope of 0.94 (standard error of 0.017) indicating a very persistent relationship. The  $R^2$  of the regression is 0.89.

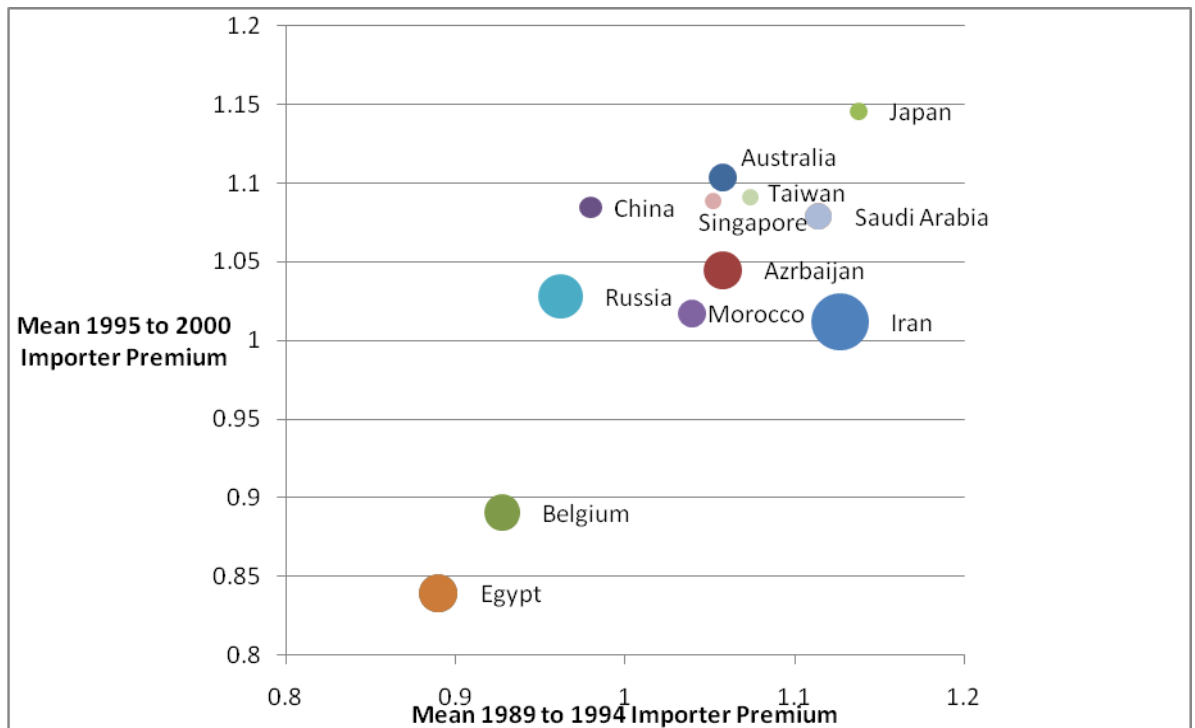
Graphs 2 and 3 provide a similar demonstration for the importer premium of two 10-digit products, frozen sheepmeat (0204430009, Meat; of sheep (excluding lamb), boneless cuts, frozen) and unsalted butter (0405100001/0405000001, Dairy produce; derived from milk, butter, unsalted). These graphs provide greater detail, showing the size of each export market. In each case, the importer premium is very persistent. The slope of the “frozen sheepmeat” graph is 1.02 (standard error of 0.06); the slope of the “butter” graph is 1.00 (standard error = 0.02).<sup>4</sup> Note that the importer premiums for butter vary much less than the importer premiums for frozen sheepmeat, most likely because the category has much less quality variation. Moreover, each product has one country which has a much lower unit value than the others; for butter, this is Egypt (importer premium = 0.85) while for sheepmeat it is China (importer premium = 0.21).

Graph 2: Frozen Sheep Meat Importer Premium



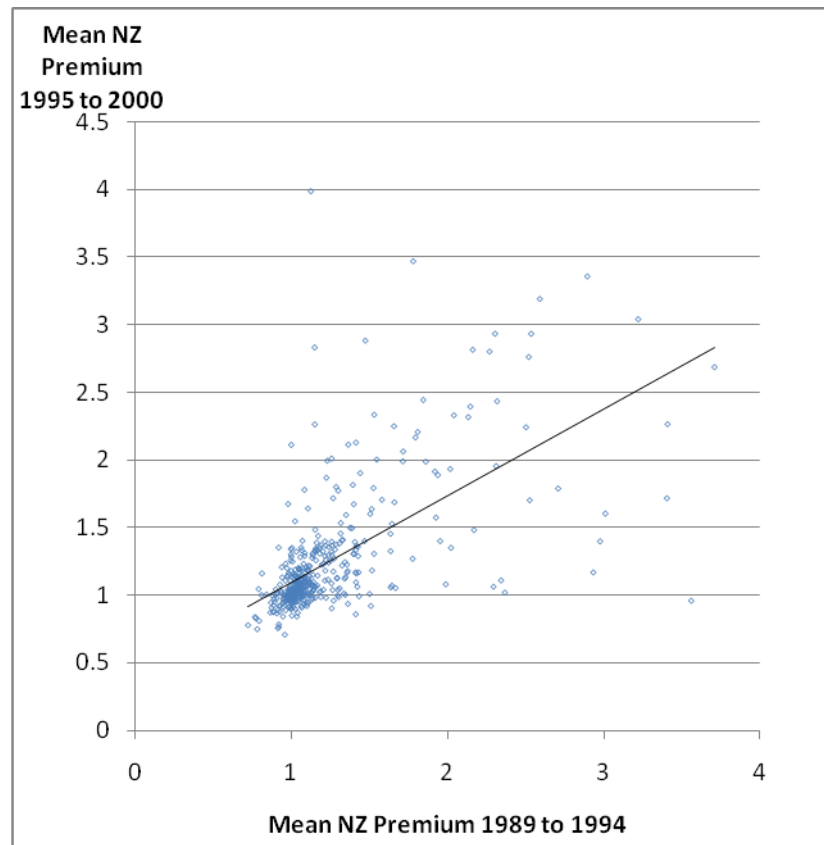
<sup>4</sup> The data for each graph are in table A1 and A2 in the Appendix.

Graph 3: Unsalted Butter Importer Premium



The New Zealand premium measures are also very persistent. Graph 4 plots the New Zealand premiums calculated for the 13 4-digit agricultural goods. Each of the 460 observations is the premium calculated over the periods 1989-1994 and 1995-2000 for a particular good and country. Extreme outliers, such as goods for which the New Zealand premium is over ten in either period, are removed as it is likely they reflect measurement error. The slope of the line is 0.85 (standard error = 0.03) with an  $R^2$  of 0.87.

Graph 4: Agricultural Exports' NZ Premium



The persistence of the New Zealand premium measures suggests importing countries persistently identify New Zealand products with particular horizontal or vertical quality characteristics. These quality characteristics enable New Zealand prices to differ from those of other countries. If the characteristics largely reflect horizontal quality differences, the scope to vary prices across countries for the same product will be larger than if they reflect vertical differences, as they indicate some market power within the markets. An approximate method to distinguish these competing explanations is discussed in the next section.

## 7 Sectors of Competition

To help clarify whether a New Zealand product is generally competing on price or on quality, we use a technique based on a method developed by Karl Aiginger (1997).

Aiginger divides a country's products into four types based on whether the country has a trade surplus or deficit in the product, and whether its mean unit value is higher or lower than its trading partners' mean unit value. The basic idea is best understood by example. Consider a product such as cheese. A country that imports a lot of low priced cheese and exports a small quantity of high priced cheese is most likely a high cost niche producer engaging in quality competition, whereas if it is a net importer and only exports low priced cheese it is an inefficient producer engaging in price competition. In contrast, if it is a net exporter of low value cheese it is most likely an efficient producer engaging in price competition, while if it is a net exporter and getting high prices, it is most likely an efficient producer engaging in quality competition.

The analysis can be conducted on a country by country basis, or a global basis. We primarily examine products for which New Zealand has had a large global trade surplus for most of the 13 years in the dataset. That is on a global basis, although in the appendix we also look at detailed 10-digit trade with Australia. Since most of the analysis concerns New Zealand exports, we can largely narrow the categories to two: efficiently produced price-competitive product categories or efficiently produced quality-competitive product categories. Price-competitive product categories are New Zealand exports that have a unit value that is lower than the mean unit value of imports in the same category. Quality-competitive categories are New Zealand exports that have a unit value that is higher than the mean unit value of international products in the same category. This categorization is not fixed, and many products switch from one category to another over the 13 annual observations.

Price unit value comparisons are done in two ways: whether by comparing New Zealand's export unit values to its import unit values, or comparing its export unit values to the New Zealand premium (ie export unit values compared to the average price of all other exporting countries' exports.) The data are sourced from Feenstra's international trade dataset from 1988 to 2000 and thus the prices reflect all international tradeflows for each product. These data divide products into four-digit SITC (Rev.2) codes. While this is less specific than the Statistics New Zealand data, it does give us 13 agricultural products with world-wide values and quantities over 13 years.



Table 1: Price or Quality Competition

| <b>Product category</b>   | <b>Price comp.,<br/>NZ imports<br/>(years)</b> | <b>Quality comp.,<br/>NZ imports<br/>(years)</b> | <b>Price comp.,<br/>world imports<br/>(years)</b> | <b>Quality comp.,<br/>world imports<br/>(years)</b> |
|---|--|--|---|---|
| Bovine meat, fresh, chilled or frozen                             | 3 observations                                 | 10 observations                                  | 12 observations                                   | 1 observation                                       |
| Meat of sheep & goats, fresh, chilled or frozen                   |  | 13 observations                                  | 7 observations                                    | 6 observations                                      |
| Milk & cream, fresh, not concentrated or sweetened                | 9 observations                                 | 4 observations                                   |   | 13 observations                                     |
| Milk & cream, concentrated or sweetened                           |  | 13 observations                                  | 1 observation                                     | 12 observations                                     |
| Butter  | 4 observations                                 | 9 observations                                   | 1 observation                                     | 12 observations                                     |
| Cheese & curd   | 13 observations                                |  | 13 observations                                   |   |
| Sheep & lamb skin with wool on                                    | 2 observations                                 | 11 observations                                  | 13 observations                                   |   |
| Wool, greasy or fleece-washed of sheep or lambs                   | 4 observations                                 | 9 observations                                   | 5 observations                                    | 8 observations                                      |
| Wool, degreased, uncombed of sheep or lambs                       | 10 observations                                | 3 observations                                   | 13 observations                                   |   |
| Sheep's or lambs' wool, or of other animal hair, carded or combed | 8 observations                                 | 5 observations                                   | 13 observations                                   |   |
| Albuminoid substances; glues [includes casein]                    |  | 13 observations                                  |   | 13 observations                                     |
| Fabrics, woven, of sheep's or lambs' wool or of fine hair         |  | 13 observations                                  | 4 observations                                    | 9 observations                                      |
| Fabrics, woven, of sheep's or lambs' wool or of                   |  | 4 observations [9                                |   | 13 observations                                     |

fine hairs n.e.s.

missing dates]



The results are shown in table 1. The first two columns in the table are based on a comparison on New Zealand import and export unit values. The last two columns are based on a comparison of New Zealand's export unit values with the price of other countries' exports (ie the New Zealand premium). By comparing the two methods' results, we can see which New Zealand exports clearly have a lower- or higher-than-average unit value. Products which both methods describe as price-competitive in at least eight of the 13 years are cheese and three categories of wool.<sup>5</sup> Products which both methods describe as quality-competitive are fresh milk, butter, and casein, and wool fabric.<sup>6</sup> Most meat products were ambiguous. Under the assumption that firms find it easier to exploit market power when they are not competing on price, these results suggest that New Zealand producers of dairy products industry (excluding cheese) have the most scope to adjust prices without losing in external markets.

A complementary picture was obtained by analysing the bilateral trade between Australia and New Zealand using 10-digit product categories covering dairy and meat products for the period 1988 to 2008. There are 22 dairy products and 5 bovine and ovine meat products with sufficient observations to use. The results, in Appendix B, suggest that New Zealand firms competed on the basis of price in 8 out of the 8 cheese subcategories, but competed in terms of quality in fresh cream and milk (butter had insufficient data to analyse). They also competed in terms of quality in some specialised lamb products.

Overall, this analysis provides a way of systematically classifying some of New Zealand's agricultural exports, according to their relative price in third markets. Since the data requirements for this comparison are very large – basically all international trade flows in a product category – we have only attempted an exploratory analysis using 4-digit trade data. Analysis by country at the ten-digit level would be more revealing about the areas where New Zealand producers are consistently able to obtain prices higher than those of competing countries in third markets. As it stands, the results show that producers of dairy products (except

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<sup>5</sup> Cheese & curd; wool, degreased, uncombed of sheep or lambs; and sheep's or lambs' wool, or of other animal hair, carded or combed.

<sup>6</sup> Milk & cream, concentrated or sweetened; butter; albuminoid substances, glue [includes casein]; wool, greasy or fleece-washed off sheep or lambs; fabrics, woven of sheep's or lambs' wool or of fine hair; and fabrics, woven, of sheep's or lambs' wool or of fine hairs n.e.s.

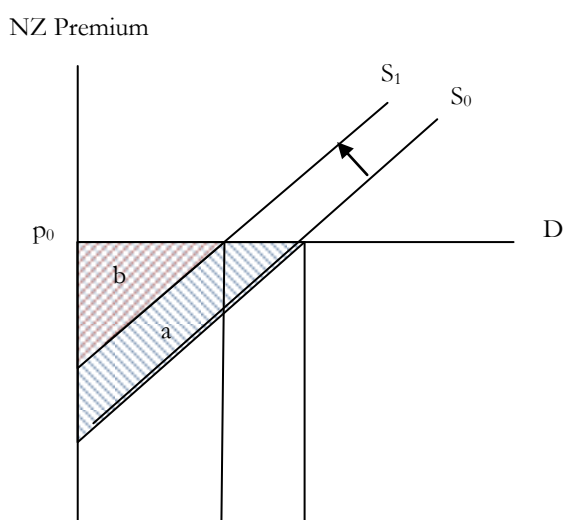
cheese) export at higher values than other countries, suggesting these products compete with a quality dimension, thus giving producers the greatest ability to raise average prices in the event of a cost shock.

## 8 Exchange Rates and NZ Premium

In this section the response of the “New Zealand premium” measure to the exchange rate is estimated. If New Zealand’s agricultural export markets are competitive, a change in New Zealand’s exchange rate should not affect the price importing countries pay for New Zealand products in their own currency. However, if New Zealand producers hold market power, an appreciating New Zealand dollar could be associated with a higher NZ premium and a depreciating New Zealand dollar should be associated with a lower NZ premium.

Figures 3 and 4 show how the prices of New Zealand products change in response to changes in the exchange rate for two different cases. Figure 3 shows the case when demand is perfectly elastic (the horizontal curve) and producers have upward sloping supply curves but little market power. Both curves are measured in the importing country’s currency. When the New Zealand dollar appreciates against the importing country’s currency, the importing country’s demand curve does not change, but from the importing country’s perspective New Zealand’s costs have risen. This leads to a contraction in the quantity exported but no change in the importing country’s unit value. Consequently, the NZ premium will not change in response to the change in the exchange rate.

Figure 3: An appreciating New Zealand dollar with quality competition



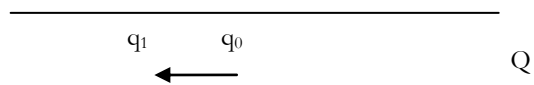


Figure 4: A depreciating New Zealand dollar with market power

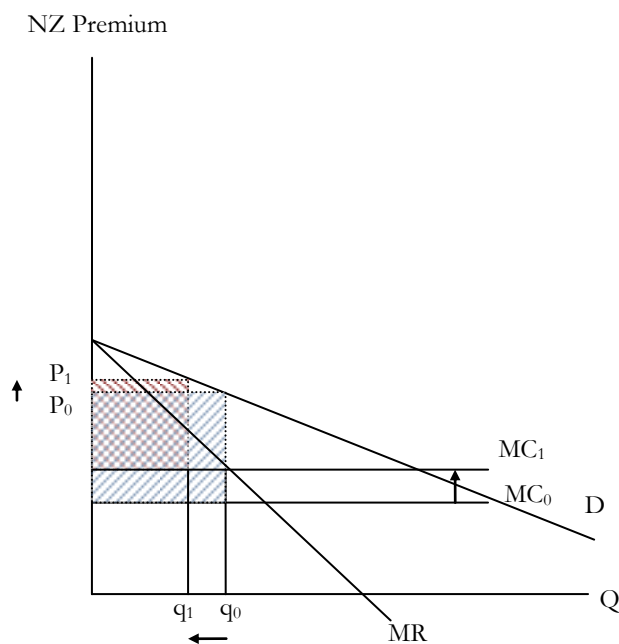


Figure 4 shows the case when the New Zealand producer has market power. In response to an exchange rate appreciation, the marginal cost curve rises but the demand curve is unchanged. To maximise profits in response to the rising costs, the producer should raise prices from  $p_0$  to  $p_1$  and the quantity should contract from  $q_0$  to  $q_1$ .

To examine how unit values respond to the exchange rate, we regress a time series of the New Zealand premium for a good-country pair against a time series for the exchange rate between New Zealand and that country, and test whether the coefficient is significantly different from zero:

$$NZ Pr_{it} = \beta_0 + \beta_1 \ln(S_{it}/\bar{S}_i) + \lambda_i + \varepsilon_{it}$$

where  $\lambda_i$  is a country –good specific fixed effect  
 $S_{it}/\bar{S}_i$  is the exchange rate at time t divided by the average exchange rate over the period (the New Zealand price of a foreign currency).

The New Zealand premium is calculated using Feenstra’s data. A positive and statistically significant coefficient  $\beta_1$  is consistent with New Zealand exporters holding market power.

Fourteen regressions were estimated: one for each of the 13 4-digit product categories, and then all 13 together. If data were not available for all 13 years’ data, or exports to that country were less than \$12,000 in 2000, the data were excluded. This narrowed the criteria to the largest 18 export destinations. The exchange rate data came from the St Louis Federal Reserve’s database, Federal Reserve Economic Data (FRED), with each US exchange rate to a third country converted to an exchange rate with New Zealand using the NZ-US exchange rate.

The evidence suggests that variation in the exchange rate was not a significant determinant of variation in the New Zealand premiums. None of the 14 coefficients  $\beta_1$  were large or statistically significant from zero. For example, the result for all products merged together is

$$NZ Pr_{it} = 0.02 + 0.05 \ln(S_{it}/\bar{S}_i) + \lambda_{it} + \varepsilon_{it} \quad n = 1292$$

(0.11)

These regressions provide no support for the market power model. Controlling for importer country fixed effects, we see exchange rates having little to no effect on the relative price that importing countries pay for New Zealand agricultural goods. Nonetheless, the results do not disprove the hypothesis that firms have market power. If the coefficient on the change in the exchange rate was positive and significant, it would indicate firms were able to and did alter their prices in response to exchange rate fluctuations. That they did not alter prices in this way shows they did not, rather than they could not: the firms may have a policy of not responding to temporary exchange rate changes, for instance, but they might alter prices in response to permanent cost shocks.

## 9 Do different unit values affect exporters' decisions?

In this section we examine whether changes in unit values in a particular market are systematically related to whether exports in that market are expanding or contracting. A variety of patterns are possible. If all markets were perfectly competitive, all prices would be the same so there would be no relationship between export volumes and the importer price premium. If producers had some market power, trade volumes and prices in an importing country are expected to increase in response to a positive demand shock, and fall in response to a negative demand shock. In this case, agricultural producers could be expected to divert exports from destinations with falling prices to those with increasing prices, inducing a positive relationship between price and quantity changes. Alternatively, New Zealand producers may reduce prices in a particular market in response to temporary surplus production, or increase prices in response to a shortfall. In this case there would be a negative relationship between prices and quantities.

We use Feenstra's international trade data on all 13 agricultural product categories over 13 years to test whether expanding markets are associated with lower-than or higher-than-usual unit values. The two relative unit value measures are compared with a measure of quantity change. For each product, the relative quantity measure is calculated as:

$$\Delta Q_i = \frac{Q_{i,t+5} - Q_{i,t}}{\sum_i Q_{i,t+5} - \sum_i Q_{i,t}}$$

For each product, each country is ranked by their level of quantity change. The average relative unit value is calculated for the 15 largest expanding markets and the 15 largest contracting markets. We then test whether the two groups have the same relative unit value measure, using a simple difference in means test.

Table 2 and 3 shows our results using the importer premium and the New Zealand premium respectively. The importer premium was higher for contracting markets than for expanding markets for nine of the thirteen 4-digit groups. In three cases the differences are sizeable and statistically significant at the 5 percent level; in one case

the difference is statistically significant but not large; and in two others the differences are large and significant at the 10 percent level. The statistically significant examples of goods with lower unit values in expanding markets than contracting markets are all dairy goods including casein, cheese, and fresh milk. It appears, therefore, that the big increases in dairy exports over the period occurred in markets where prices were at a discount to those in established markets.

The differences in the NZ premiums between expanding and contracting markets' are less marked. For six out of ten products, contracting markets have higher New Zealand premiums than expanding markets, but only one of these differences (fresh milk) is statistically significant. For two out of ten products, contracting markets have lower New Zealand premiums than expanding markets, with one result (degreased wool) statistically significant. (The other markets were either nearly identical, or had too few countries to estimate.)

The evidence that expanding dairy markets tend to have lower unit values than contracting markets does not prove that dairy producers have market power. It is possible that dairy producers sell in perfectly competitive markets and New Zealand producers increased their production of lower quality goods during this period – a story consistent with the evidence from section 7 that cheese producers tend to engage in price competition rather than quality competition. Nonetheless, this evidence is consistent with the story that dairy producers have some market power, even if this stems from the existence of dairy produce quotas in high priced markets. Since the expanding markets have typically offered lower than average prices, if New Zealand dairy producers reduce output in response to a cost increase, it is plausible they could raise average prices by contracting sales in these newly expanding, low priced markets.

## **10 Conclusion**

This paper has tried to ascertain if there is evidence that agricultural producers might be able to offset an increase in costs by obtaining higher average prices for the goods they sell. If producers have market power, they could do this by raising prices in



existing markets or by diverting goods from low priced to high priced markets. Both strategies would represent a profit-maximising approach to a cost increase such as that which will occur when the Emissions Trading Scheme is introduced. The evidence that the average value of agricultural products varies widely by export destination means the idea has initial plausibility.

A fundamental difficulty inherent in tackling this problem concerns data – either the analysis is restricted to a particular, extremely detailed, product category (such as 18-month aged cheddar), in which case it is difficult to generalise, or it is done at a level at which each product category includes goods that differ by quality. We have adopted the latter approach, and concentrated on 13 different agricultural products for which global trade data were available, supplementing these data with more detailed product categories where appropriate. This choice meant it was possible to collect sufficient data to calculate the New Zealand premium, the measure of the premium New Zealand producers get for their product in each overseas market compared to all other exporters in the world. However, it also means that any comparison of average prices (unit values) is bedevilled with the difficulty of knowing whether quality differences or market power are the primary cause of average price differences.

Overall, we found little evidence that New Zealand agricultural producers have much market power. Possibly the most telling evidence is the unresponsiveness of unit values to exchange rate movements: when the New Zealand dollar changes value, producers do not appear to reposition their prices relative to those of similar products sold in overseas markets by producers from other countries. This does not rule out the possibility that they would not reposition their prices in response to a permanent cost shock, because they may believe exchange rate movements are temporary and respond differently to permanent and temporary cost changes. Nonetheless, the absence of evidence of a response to temporary cost changes does not provide evidence that producers can or will raise prices in response to a permanent cost increase.

The most interesting evidence concerns dairy prices. New Zealand is one of the world's largest exporters of dairy produce, but it does not get a premium price on

world markets, except for fresh milk and cream. This would suggest it mainly competes on price in world markets. At the same time, dairy prices in the fastest expanding markets are lower than those in the fastest contracting markets, suggesting some market power. These two pieces of evidence are consistent with the argument that access to quantity restricted markets provides producers with some market power, enabling them to charge higher prices in established rather than new markets. If this is the case, there is some scope for dairy producers to alter their mix of exports if costs increase, reducing exports to low priced countries. However, it appears unlikely that this is significant enough to offset a substantial increase in costs, as the price differences by destination are relatively modest for dairy products such as butter, cheese or casein.

Table 2: Importer Premium t-tests

| Product category                                      | Expanding Importer<br>Premium | Contracting Importer<br>Premium | Pr(MPr expanding < Mpr<br>contracting) |
|---|-------------------------------|---------------------------------|--|
| Bovine meat, fresh, chilled or frozen                 | 1.1523<br>(0.0688)            | 1.2382<br>(0.0818)              | 0.7884                                 |
| Meat of sheep & goats, fresh, chilled or<br>frozen    | 0.8923<br>(0.0498)            | 0.9974<br>(0.0570)              | 0.9170                                 |
| Milk & cream, fresh, not concentrated or<br>sweetened | 0.9367<br>(0.0371)            | 1.3370<br>(0.0844)              | 1.0000                                 |
| Milk & cream, concentrated or sweetened               | 0.9912<br>(0.0172)            | 1.1319<br>(0.0629)              | 0.9837                                 |
| Butter  | 0.9654<br>(0.0251)            | 0.9336<br>(0.0185)              | 0.1543                                 |
| Cheese & curd   | 1.052<br>(0.0233)             | 1.1244<br>(0.0292)              | 0.9726                                 |
| Sheep & lamb skin with wool on                        | 1.4729<br>(0.1688)            | 2.0916<br>(0.3873)              | 0.9211                                 |
| Wool, greasy or fleece-washed of sheep or<br>lambs    | 1.0172<br>(0.0392)            | 1.0705<br>(0.0599)              | 0.7707                                 |
| Wool, degreased, uncombed of sheep or<br>lambs        | 1.0514<br>(0.0126)            | 1.0554<br>(0.0140)              | 0.5841                                 |

|   |                    |                    |        |
|---|--------------------|--------------------|--------|
| Sheep's or lambs' wool, or of other animal hair, carded or combed | 1.5289<br>(0.1506) | 1.4897<br>(0.2898) | 0.4535 |
| Albuminoid substances; glues [includes casein]                    | 1.0051<br>(0.0185) | 1.0587<br>(0.0215) | 0.9695 |
| Fabrics, woven, of sheep's or lambs' wool or of fine hair         | n/a                | n/a                | n/a    |
| Fabrics, woven, of sheep's or lambs' wool or of fine hairs n.e.s. | n/a                | n/a                | n/a    |

Table 3: NZ Premium t-tests

| <b>Product category</b>                            | <b>Expanding Importer Premium</b> | <b>Contracting Importer Premium</b> | <b>Pr(MPr expanding &lt; Mpr contracting)</b> |
|--|-----------------------------------|-------------------------------------|---|
| Bovine meat, fresh, chilled or frozen              | 1.1766<br>(0.0680)                | 1.2669<br>(0.0621)                  | 0.8357  |
| Meat of sheep & goats, fresh, chilled or frozen    | 1.0085<br>(0.0147)                | 1.0128<br>(0.0122)                  | 0.5890  |
| Milk & cream, fresh, not concentrated or sweetened | 1.2533<br>(0.0683)                | 1.8641<br>(0.3198)                  | 0.9641  |
| Milk & cream, concentrated or sweetened            | 1.1450                            | 1.3278                              | 0.9264  |

|   |          |          |        |
|---|----------|----------|--------|
|   | (0.0375) | (0.1196) |        |
| Butter  | 0.9676   | 0.9531   | 0.2485 |
|   | (0.0108) | (0.0108) |        |
| Cheese & curd   | 0.8254   | 0.8623   | 0.8031 |
|   | (0.0160) | (0.0400) |        |
| Sheep & lamb skin with wool on                                    | 3.3671   | 3.2678   | 0.4475 |
|   | (0.4662) | (0.5837) |        |
| Wool, greasy or fleece-washed of sheep or lambs                   | 0.9811   | 1.0719   | 0.8415 |
|   | (0.0212) | (0.0879) |        |
| Wool, degreased, uncombed of sheep or lambs                       | 0.9574   | 0.7144   | 0.0272 |
|   | (0.0877) | (0.0819) |        |
| Sheep's or lambs' wool, or of other animal hair, carded or combed | 2.9272   | 3.3736   | 0.7035 |
|   | (0.5901) | (0.5884) |        |
| Albuminoid substances; glues [includes casein]                    |          |          |        |
| Fabrics, woven, of sheep's or lambs' wool or of fine hair         | N/a      | n/a      | n/a    |
| Fabrics, woven, of sheep's or lambs' wool or of fine hairs n.e.s. | N/a      | n/a      | n/a    |

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## **Appendix A: 4 Digit product codes and the importer premium for frozen Sheepmeat and Butter**

### ***SITC (Rev.2) key:***

*0111: Bovine meat, fresh, chilled or frozen*

*0112: Meat of sheep or goats, fresh chilled or frozen*

*0223: Milk & cream, fresh, not concentrated or sweetened*

*0224: Milk & cream, concentrated or sweetened*

*0230: Butter*

*0240: Cheese & curd*

*2116: Sheep & lambskin with wool on*

*2681: Wool, greasy or fleece-washed of sheep or lambs*

*2682: Wool, degreased, uncombed of sheep or lambs*

*2687: Sheep's or lambs' wool, or of other animal hair, carded or combed*

*5922: Albuminoid substances; glues [includes casein]*

*6542: Fabrics, woven, 85%+ of sheep's or lambs' wool of fine hair*

*6543: Fabrics, woven, of sheep's or lambs' wool or of fine hairs n.e.s.*

Table A1: Frozen Sheep Meat Importer Premium

| <b>Country</b>                | <b>Mean Importer<br/>Premium 89 - 98</b> | <b>Mean Importer<br/>Premium 99-08</b> |
|-------------------------------|--|--|
| Belgium                       | 1.29                                     | 1.38                                   |
| Canada                        | 1.05                                     | 0.94                                   |
| China, Peoples Republic<br>of | 0.29                                     | 0.21                                   |
| Denmark                       | 1.03                                     | 1.25                                   |
| France                        | 0.96                                     | 1.01                                   |
| Germany                       | 1.20                                     | 1.62                                   |
| Japan                         | 0.87                                     | 0.79                                   |
| Netherlands                   | 1.15                                     | 1.42                                   |
| Switzerland                   | 1.75                                     | 1.52                                   |
| Taiwan                        | 0.82                                     | 0.60                                   |
| United Kingdom                | 0.95                                     | 0.83                                   |
| United States of America      | 0.91                                     | 0.92                                   |

Table A2: Unsalted Butter Importer Premium OLS

| <b>Country</b>                 | <b>Mean Importer<br/>Premium 89 - 98</b> | <b>Mean Importer<br/>Premium 99 – 08</b> |
|--------------------------------|--|--|
| Australia                      | 1.06                                     | 1.10                                     |
| Azrbaijan                      | 1.06                                     | 1.04                                     |
| Belgium                        | 0.93                                     | 0.89                                     |
| China, People’s Republic<br>of | 0.98                                     | 1.08                                     |
| Egypt                          | 0.89                                     | 0.84                                     |
| Iran                           | 1.13                                     | 1.01                                     |
| Japan                          | 1.14                                     | 1.04                                     |
| Morocco                        | 1.04                                     | 1.01                                     |
| Russia                         | 0.96                                     | 1.03                                     |
| Saudi Arabia                   | 1.11                                     | 1.08                                     |
| Singapore                      | 1.05                                     | 1.09                                     |

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## Appendix B: 10-digit product codes, and agricultural trade between Australia and New Zealand

### 10-Digit Harmonised System key

*0201300001: Meat of bovine animals, beef cuts according to NZ Meat Producers' Board definition, of*

*cow, steer and heifer, boneless, fresh or chilled*

*0202300009: Meat; of bovine animals, beef cuts other than according to the NZ Meat Producers' Board*

*definition, of cows, steer and heifer, boneless, frozen*

*0204420001: Meat; of sheep, lamb cuts with bone in, frozen (excluding carcasses and half-carcasses)*

*0204430001: Meat; of sheep, boneless cuts of lamb, frozen*

*0204430009: Meat; of sheep (excluding lamb), boneless cuts, frozen*

*0406200001: Dairy produce; cheese, cheddar, grated or powdered*

*0402290001: Dairy produce; whole milk powder containing added sugar*

*0406200029: Dairy produce; cheese, grated or powdered, n.e.c. in item no. 0406.20*

*0402290019: Dairy produce; milk & cream, in powder, granules or other solid forms, containing added*

*sugar or other sweetening matter, of a fat content exceeding 1.5% (by weight), n.e.c. in item no. 0402.29*

*0401200100: Dairy produce; milk & cream, fresh, not concentrated, not containing added sugar or other*

*sweetening matter, of a fat content exceeding 1% but not exceeding 6% (by weight)*

*0401200900: Dairy produce; milk & cream, other than fresh, not concentrated, not containing added*

*sugar or other sweetening matter, of a fat content exceeding 1% but not exceeding 6% (by weight)*

0402100009: Dairy produce; milk & cream, concentrated or containing added sugar or other sweetening

*matter, skimmed milk powder, not spray process, fat content not over 1.5%*

0402100018: Dairy produce; milk & cream, concentrated or containing added sugar or other sweetening

*matter, in powder, granules or other solid forms, fat content not over 1.5%, other than skimmed*

*milk powder*

0402210019: Dairy produce; whole milk powder, concentrated, not containing added sugar or other

*sweetening matter, of a fat content exceeding 1.5% (by weight), n.e.c. in item no. 0402.21*

04029010000: Dairy produce; milk & cream, concentrated, not containing added sugar or other

*sweetening matter, other than in powder, granules or other solid forms*

0404990001: Dairy produce; milk & cream condensed

040229009: Dairy produce; milk & cream, evaporated

0403100000: Dairy produce; yoghurt, whether or not concentrated or containing added sugar or other

*sweetening matter or flavoured or containing added fruit or cocoa*

04039001100: Dairy produce; buttermilk, curdled milk & cream, kephir and other fermented or acidified

*milk & cream, concentrated or sweetened, with or without flavouring, fruit, cocoa, liquid or semi-solid (excluding yoghurt)*

0404100000: Dairy produce; whey, whether or not concentrated or containing added sugar or other

*sweetening matter*

0404901900: Dairy produce; natural milk constituents (excluding whey), concentrated or sweetened,

*other than liquid or semi-solid, n.e.c. in chapter 4*

0406100001: Dairy produce; fresh cheese (including whey cheese), not fermented

**Price versus quality competition, trade in beef and sheepmeat  
between Australia and New Zealand, 1988 to 2008**

| <b>Product</b> | <b>No. Obs<br/>Price</b> | <b>No. Obs<br/>Quality</b> | <b>N/A</b> |
|----------------|--------------------------|----------------------------|------------|
| 201300001      | 11                       | 7                          | 3          |
| 202300009      | 4                        | 10                         | 7          |
| 204420001      | 6                        | 8                          | 7          |
| 204430009      | 7                        | 10                         | 4          |
| 204430001      | 1                        | 19                         | 1          |

N/A observations are due to missing values where New Zealand or Australia or neither country traded to the other.

**Price versus quality competition, trade in dairy products between Australia and New Zealand, 1988 to 2008**

| <b>Product</b> | <b>No. Obs Price</b> | <b>No. Obs Quality</b> | <b>N/A</b> |
|----------------|----------------------|------------------------|------------|
| 0406200001     | 12                   | 2                      | 7          |
| 0402290001     | 6                    | 4                      | 11         |
| 0406200029     | 19                   | 2                      | 0          |
| 0402290019     | 7                    | 5                      | 9          |
| 0402290029     | 8                    | 4                      | 9          |
| 0401200100     | 5                    | 6                      | 10         |
| 0401200900     | 3                    | 6                      | 12         |
| 0402100009     | 5                    | 9                      | 7          |
| 0402100018     | 3                    | 5                      | 13         |
| 0402910000     | 0                    | 13                     | 8          |
| 0402990001     | 4                    | 12                     | 5          |
| 0402990009     | 1                    | 16                     | 4          |
| 0403100000     | 10                   | 10                     | 1          |
| 0403901100     | 10                   | 8                      | 3          |
| 0404100000     | 5                    | 12                     | 4          |
| 0404901900     | 7                    | 8                      | 6          |
| 0406100001     | 17                   | 4                      | 0          |
| 0406200029     | 19                   | 2                      | 0          |
| 0406300000     | 21                   | 0                      | 0          |
| 0406400000     | 16                   | 5                      | 0          |
| 0406900011     | 19                   | 1                      | 1          |
| 0406900039     | 21                   | 0                      | 0          |