MEASUREMENT OF INTERNATIONAL COMPETITIVENESS: THE CASE OF NEW ZEALAND AGRICULTURAL PRODUCTS*

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I. Introduction

New Zealand is well known as a country achieved successful economic reform. One of the major goals of the reform is to improve international competitiveness. New Zealand's internal market is pretty small, with 3.5 million population. Thus New Zealand has been pursued export-oriented or outward looking economic policy. Agricultural products account for lion's share of total export. Changes in efficiency and competitiveness of the agricultural sector give rise to a great impact on the whole economy in New Zealand.

New Zealand's reform experience can become lessons to the other countries which are on the way of policy reform trigered by the Uruguay Round and/or changes in domestic economic environment. We can expect the result of the reform on interantional competitiveness positive in the long run. In a neoclassical world, distortions lead misallocation of resources and hurt economic efficiency. Thus removal of distortions can increase efficiency as a whole economy. However, in order to promote some strategic sectors, most countries carry out some economic policies which often distort

the economy. In this case, competitiveness can be dampened in a certain sector by the removal of supports i.e., reform because of the increased adjustment cost and removal of internal support and/or border protection. However, the effects of the reform after the period of adjustment can be expected to be positive specially for a successful reform as the case of New Zealand.

Major objective of this paper is to analyze the change of interantional competitiveness of New Zealand's major agricultural products after economic reform. In this paper, we also discuss the definition of interantional competitiveness. Some methodology of measurement of competitiveness which is highly dependent on the purpose of measurement, and empirical test will be made at a firm level, a very specific example.

II. Measurement of Competitiveness

Why can some countries sell products and others cannot in international market? For this question, many people answer that because some countries have international competitiveness and others have not. Then what is the definition of international competitiveness and what is the meaning and implications? Following the definition, how to measure and compare international competitiveness?

The first question relates to defining international competitiveness. No simple definition of competitiveness would suffice. It is in fact a multi-dimensional concept that embraces the ability to export, efficient use of factors of production and natural resources, and increasing productivity. It depends on basically three sets of factors all taken together; the macro economic environment, the ability to absorb, use, and develop technology, and marketing strategy. At a firm level, international competitiveness can be defined as ability of producing or selling goods and services at lower costs or lower prices compared to competitors in a domestic and international market. At a country level, competitiveness implies that ability of expanding or retaining nation's wealth by producing goods and services which are demanded in international market under the competitive market condition.

Therefore, characteristics of international competitiveness include

as follows. First, critical determinant of international competitiveness, both at industry and national level, is efficiency in distribution of factors of production or resources. Second, increase in a nation's wealth is a major goal of international competitiveness. Third, international competitiveness is a dynamic and relative concept of explaining changes of relative positions in international market in a time horizon.

Competitiveness is difficult to define, mainly because its two basic determinants, price and quality of products, are not easily compared. Price comparisons are not much useful without regard to quality, and furthermore quality differences are difficult to specify. Measurement of competitiveness is as complicate as the concept. Competitiveness can be classified by the subject of competitors, i.e., enterprise, industry and nation, by arena of competition, i.e., import and export, and by object of competition, i.e., products, capital and technology. Of course, there can be more categories of competitiveness. Diversified categories of competitiveness are entailed from the view point of measurement rather than definition itself.

Measurement of competitiveness is divided into two categories, ex-post appraisal and ex-ante appraisal. Ex-post appraisal is a measurement which evaluates changes in performances actually realized in a market. It has macroeconomic aspects. Representative indices for ex-post measurement of competitiveness are revealed comparative advantage index(RCA) and its variations, and market share. Ex-ante appraisal is focused on factors which affect changes in competitiveness. Thus, it has micro - economic aspects rather than macroeconomic aspects. In this context, ex-ante measure of competitiveness includes price competitiveness, quality competitiveness, technology competitiveness, etc. The former evaluates competitiveness more comprehensively than the latter. However, the latter can provide timely data and be used for a firm or a nation to cope with the situation compared to the former. Thus, international competitiveness can not be measured in a single form. It should consider multidimensional aspects of competitiveness under the consideration of the purpose of measurement.

1. Revealed Comparative Advantage(RCA) Index

Balassa was the first to develop a measure of revealed comparative

advantage. His analysis showed that observed trade patterns generate estimates of revealed comparative advantage. RCA index is written as:

RCA = $(X_{ij}/X_{wj})/(X_{it}/X_{wt})$
where X_{ij} = country i's exports of good j
       X_{wj} = world exports of good j
       X_{it} = country i's exports of all goods
       X_{wt} = world exports of all goods.

The bigger the RCA index, the stronger international competitive is revealed. Advantages of using this index are applicability of data, comprehensiveness containing price and non-price factors affecting competitiveness. However, this index does not consider import structure of the industry and it is a disadvantage of using the index.

2. Revealed Competitive Advantage(RC)

Revealed competitive advantage index is developed as a more comprehensive one capturing import structure. This index includes imports as well as exports and permits intra-industry trade. The bigger the RC index the stronger international competitive is revealed. The revealed competitive advantage index is written as:

RC = RCA - $(M_{ij}/M_{wj})/(M_{it}/M_{wt})$
where M denotes for imports and other subscripts are the same as in RCA.

3. Comparative Advantage by Countries(CAC) Index

Both RCA index and RC index represent a country's competitiveness in the world market. However, the country's performance can be better in some markets than in others. Both RCA index and RC index can not capture a country's market performance in a specific region or country. CAC index is developed to evaluate a country's market performance in a specific market. As CAC index is formulated by using a country's export data in a specific market, it has shortcomings

of ignoring the role of import structure. The bigger the CAC index the stronger international competitive is revealed. CAC index is written as:

$$CAC = (SXij/SXit)/(Xij/Xit)$$
where SXij = country i's exports of good j to a specific market S
       SXit = country i's exports of all goods to a specific market S
       Xij = country i's exports of good j
       Xit = country i's exports of all goods.

4. Comparative Advantage by Import Structure(CAI) Index

Comparative advantage by import structure(CAI) index can capture the change of import structure by including import data for a importing country and the world market. The bigger the CAI index the stronger international competitive is revealed. CAI index is written as:

$$CAI = CAC/\{(SMjt/SMt)/(Mjw/Mwt)\}$$
where SMjt = total imports of good j in a specific market S
       SMt = imports of all goods in a specific market S
       Mjw = world imports of good j
       Mwt = world imports of all goods.

5. Comparative Advantage(CA) Index

Comparative advantage(CA) index is composed of both exporter's and importer's behavior in a specific market. Thus, it represents a country's competitiveness in a specific market relatively well. When we compare each competitor's competitiveness in some market, CA index is useful. However, this index does not explain a country's relative competitiveness in different markets. The bigger the CA index the stronger international competitive is revealed. CA index is written as:

$$CA = (SXij/SXit)/(SMjt/SMt)$$
where SXij = country i's exports of good j to a specific market S
       SXit = country i's exports of all goods to a specific market S

SMjt = total imports of good j in a specific market S
SMt = imports of all goods in a specific market S.

6. Market Share

Market share indicates the result of a country's export accomplishment, and it thus becomes one of the indices representing competitiveness. Market share index is written as:

$MSij = (Mij/ Mij) \times 100$
where, $MSij$ = country i's market share of good j
Mij = imports of good j from country i.

7. Price Competitiveness(PC)

International competitiveness is determined by two components, i.e. price and non-price competitiveness. Price competitiveness is largely affected by efficiencies in production and marketing, taxes, and exchange rates. Factors affecting non-price competitiveness are mainly quality and product differences. However, non-price competitiveness is difficult to measure.

Price competitiveness can be measured in terms of production cost, domestic price adjusted by exchange rate, and export price. Relative production cost can be a fair indicator for competitiveness assuming same marketing costs across competing countries. But each country has different marketing systems and distribution costs are quite different. Thus wholesale prices, consumer prices, and export prices are usually far from production costs and can be quite different even if production costs are the same across countries. Production costs are difficult to measure and to collect data. Exchange rate adjusted domestic prices have similar problem as production costs. Competitiveness in marketing and shipping efficiencies are ignored in comparison of domestic prices. In general, export prices are applied to measure price competitiveness in foreign markets. Export prices comprehend differences in efficiencies of production, marketing, shipping, and polices. Export prices also have advantages in data collection and practicality. But, in many cases, this index is

distorted by export subsidies and can mislead true efficiency comparison.

PC = Pcj/Pej
where, Pcj = competitor's price of good j
Pej = exporting country's price of good j.

As we can find from the equation, PC index implies relative price of a competitor(c) to the price of an exporting country(e). Therefore, when the index is bigger than 1 exporting country e is supposed to maintain price competitiveness relative to the competitor c and the bigger the PC index the stronger international competitive is revealed.

III. Competitiveness of New Zealand Agricultural Products

New Zealand's major agricultural products exported are beef, lamb, dairy products and wool(greasy and degreased). In this study, international competitiveness of New Zealand's agricultural products is measured for these export products, beef, lamb, dry milk as a representative dairy product and wool. In order to evaluate New Zealand's market performance in Korea, three out of four products(beef, lamb and wool) which have been exported to Korea fairly continuously are selected. Dry milk has not been exported to Korea with consistency.

New Zealand's economic reform took place in 1984. The major goal of the reform was enhancement of international competitiveness. To figure out competitive position current as well as before the economic reform, data analyzed include 1979 to 1993 for international market. However, agricultural trade between Korea and New Zealand has been activated since 1988. As we could find agricultural trade data between Korea and New Zealand from 1988, New Zealand's competitive position before the reform could not be captured in Korean market. Comparison of competitiveness indices between those two different periods will provide changes in agricultural competitiveness triggered by the reform even if we cannot tell this change is fully come from the reform. In order to

compare changes in competitiveness before and after the reform, three year average competitiveness indices are measured, i.e. 1981-83 for before the reform and 1986-88 and 1991-1993 for after the reform. Competitiveness indices for 1991-93 may indicate competitive position after the adjustment period.

Among the five RCA-type indices introduced above RC and CAI indices are applied to measure the performance in international market and Korean market, respectively. In addition, market share and price competitiveness indices are provided. Data sources are FAO's Yearbook of International Trade, Statistical Yearbook of Trade for Korea and New Zealand, and UN Statistical Yearbook of Trade.
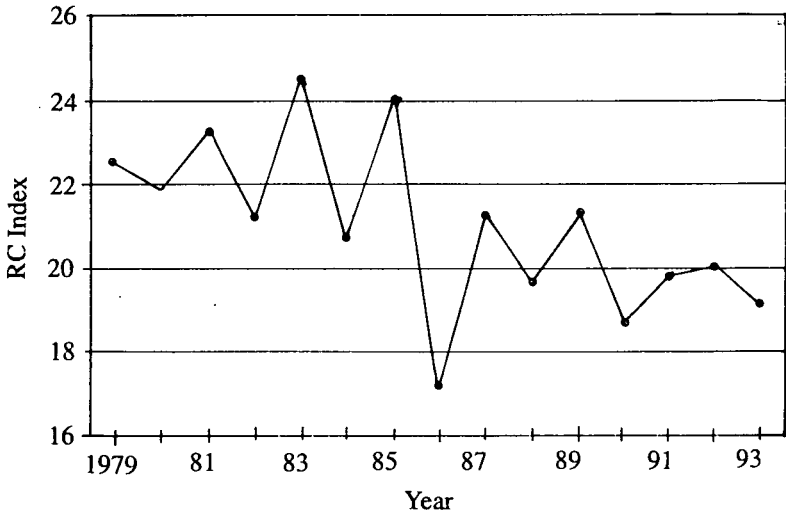
1. Beef

RC index indicates that New Zealand retains very high international competitiveness in the beef sector. RC index clings at the range of 17 to 25 for the last 15 year period. However, international competitiveness becomes weaker as three year average RC decreases from 22.7 for 1981-83, to 19.3 and 19.7 for 1986-88 and 1991-93. Market share shows downward trends, above 6% before the reform and below 6% after the reform. Export price of New Zealand beef is lower than those of the U.S. and average of the world. New Zealand faces severe competition to Australia. Canada has higher price competitiveness than New Zealand. After the reform, New Zealand found weaker competitiveness in the beef sector and we do not find significant recovery until 1993.

In order to evaluate New Zealand's market performance in Korea, CAI index is measured. The index is available only after 1988 since Korea does not import significant amount of beef before that year. The index increases from 0.3 in 1989 to 1.3 in 1994. Market share also increases from 2.9% in 1989 to 13.7% in 1994. Export price of New Zealand beef is lower than those of the U.S. and Canada. New Zealand faces severe competition to Australia. New Zealand's market performance was poor at the beginning of entry of themarket partly because of non-tariff barriers. However, New Zealand's competitiveness is growing in Korean market.
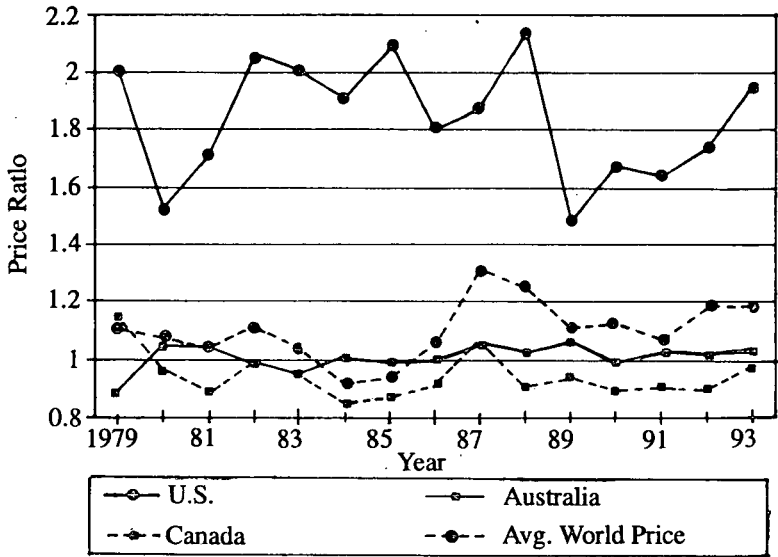
FIGURE 1 RC Index for Beef

FIGURE 2 Market Share for Beef
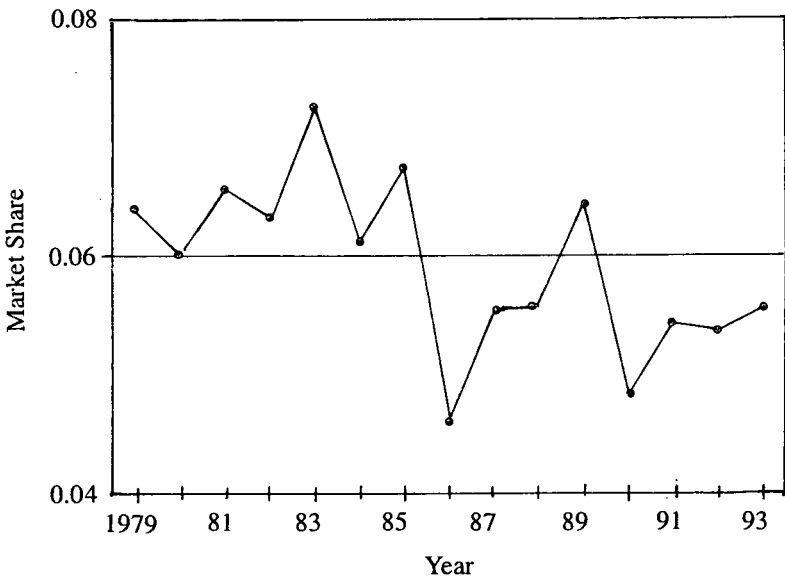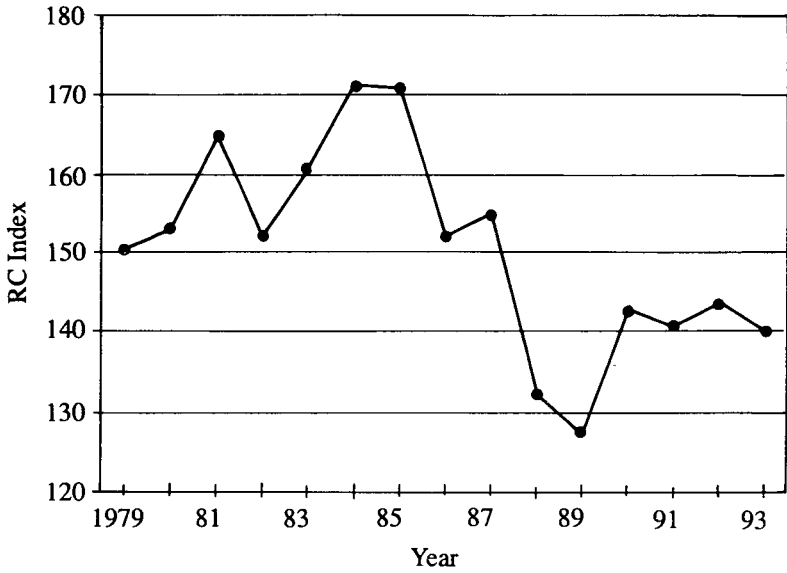
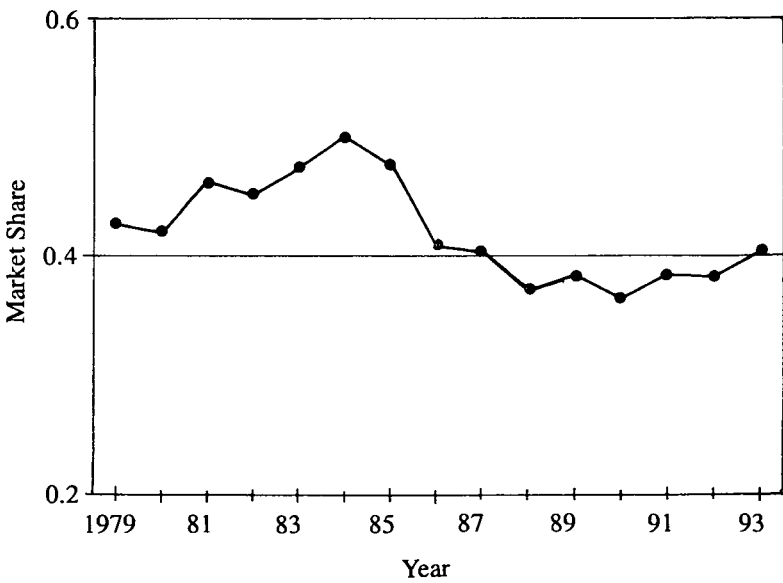**FIGURE 3** Price Competitiveness for Beef

2. Sheep Meat

New Zealand retains very high international competitiveness in the sheep meat sector as RC index remains at the range of 170 to 130 for the last 15 year period. RC index for sheep meat was around 160 and increasing before the reform. However, RC index decreased after the reform, to 141 for the 1991-93 period from 159 for the 1981-83 period. It indicates that New Zealand's international competitiveness of sheep meat becomes weaker after the reform. Market share shows downward trends, from about 50% before the reform to below 40% after the reform. Export price of New Zealand sheep meat is lower than those of England and average of the world. New Zealand faces severe competition to Australia and Mongolia. However, New Zealand loses price competitiveness to Australia and Mongolia recently. After the reform, New Zealand found weaker competitiveness in the sheep meat sector.
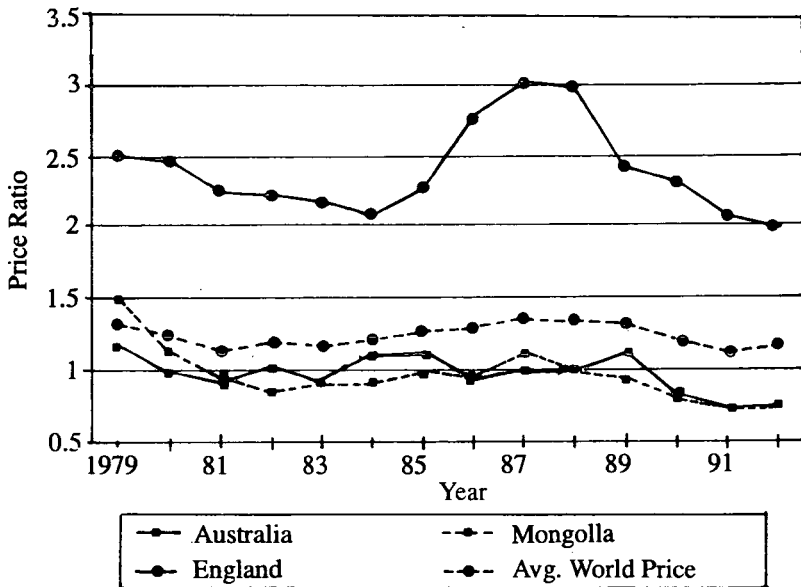
New Zealand's CAI index for sheep meat declines significantly. The index decreases from 1.268 in 1988 to 0.206 in 1994. Competitiveness of New Zealand's sheep meat industry is getting weaker not only in world market but also in Korean market.

FIGURE 4 RC Index for Sheep Meat

**FIGURE 5** Market Share for Sheep Meat
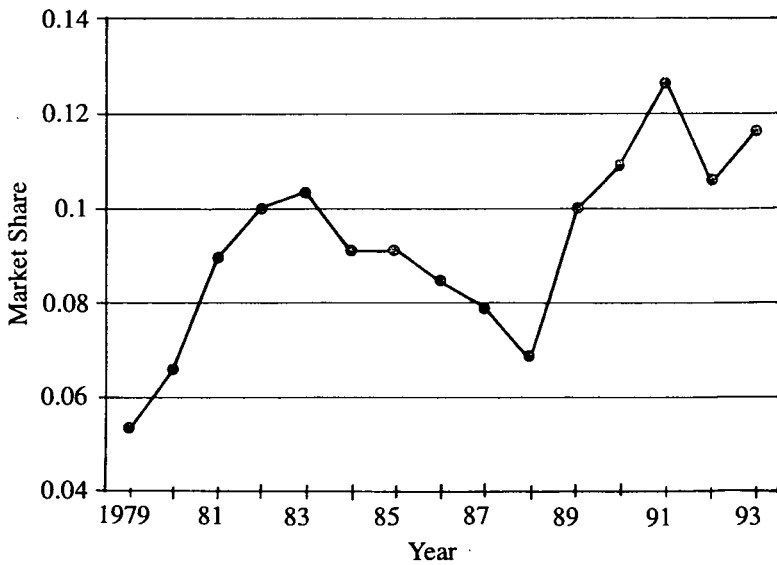
**FIGURE 6** Price Competitiveness for Sheep Meat

3. Dry Milk

New Zealand's RC index for dry milk remains at the range of 20 to 45 for the last 15 year period. This index was increasing before the reform, from 19 in 1979 to 35 in 1983. However, it was decreased to 25 in 1988, the lowest level during the last 15 year period. After reaching the bottom, it has been recovering quickly. This indicates that New Zealand's international competitiveness of dry milk becomes stronger even if it has paid some adjustment costs for the reform. RC index decreased just after the reform, to 28 for the 1986-88 period from 33 for the 1981-83 period. But it has recovered to 42 for the 1991-93 period. Market share for New Zealand's dry milk shows the same trend as RC index. The share was increasing from 5% in 1979 to 10% in 1983. After the reform, it declined to 7% in 1988. It took about 5 years of adjustment period. Export price of New Zealand's dry milk is low compared to most competitors except the U.S. Before the reform, New Zealand's price competitiveness of dry milk was declining. New Zealand's agricultural reform resulted in stronger price competitiveness for dairy industry.

FIGURE 7 RC Index for Dry Milk
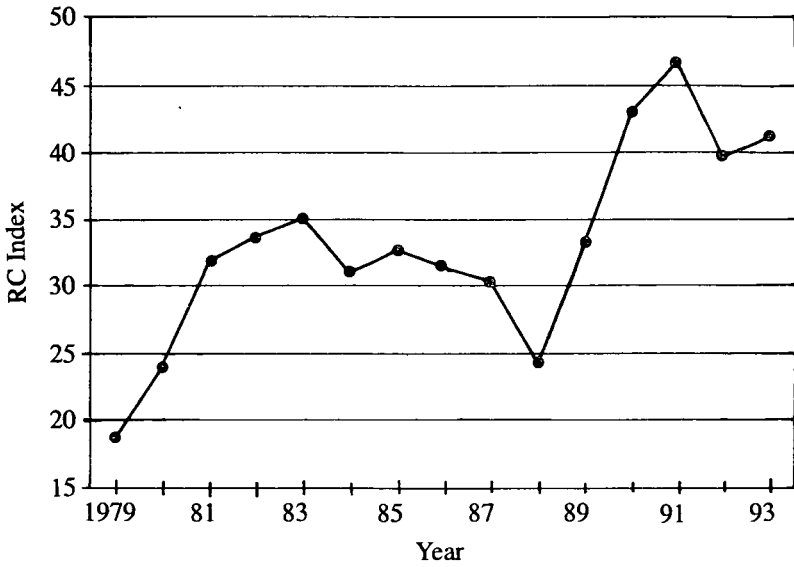
FIGURE 8 Market Share for Dry Milk

FIGURE 9 Price Competitiveness for Dry Milk
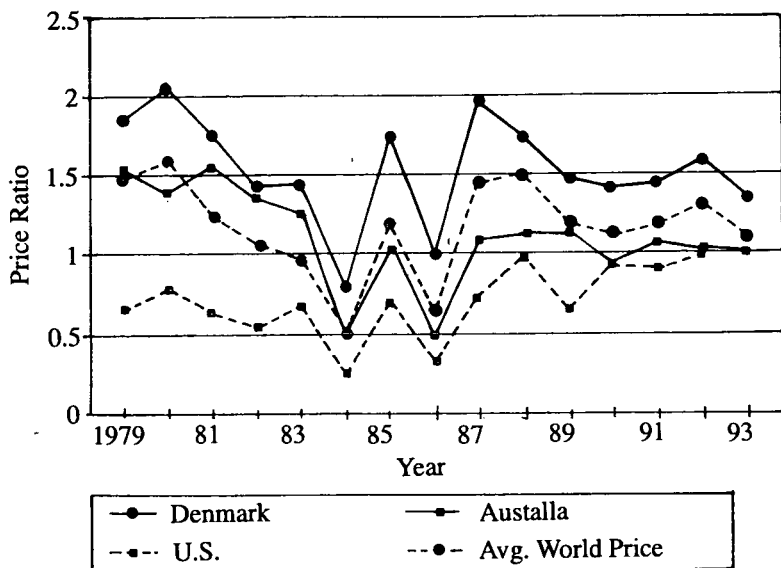
4. Wool

New Zealand's RC index for wool remains at the range of 95 to 150 for the last 15 year period. This index decreases significantly in the 1990s. RC index decreases from 126.2 for 1981-83, to 123.7 and 104.6 for 1986-88 and 1991-93. This indicates that New Zealand's international competitiveness for wool becomes weaker after the reform. Market share for New Zealand's wool shows the same trend as RC index. The share remained above 30% in the 1980s. However this share remains below 30% in the 1990s. Export price of New Zealand's wool is lower than those of Australia and average of the world. New Zealand faces severe competition to Argentina and Uruguay.

5. Summary

New Zealand retains very high international competitiveness in the major agricultural sector as RC indices are well above 1. While New Zealand's agricultural reform resulted in stronger competitiveness for

FIGURE 10 RC Index for Wool
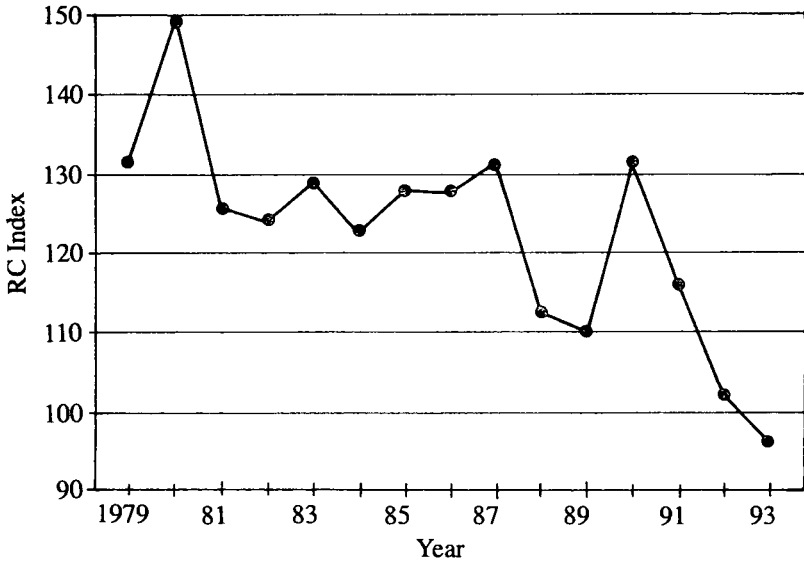
FIGURE 11 Market Share for Wool
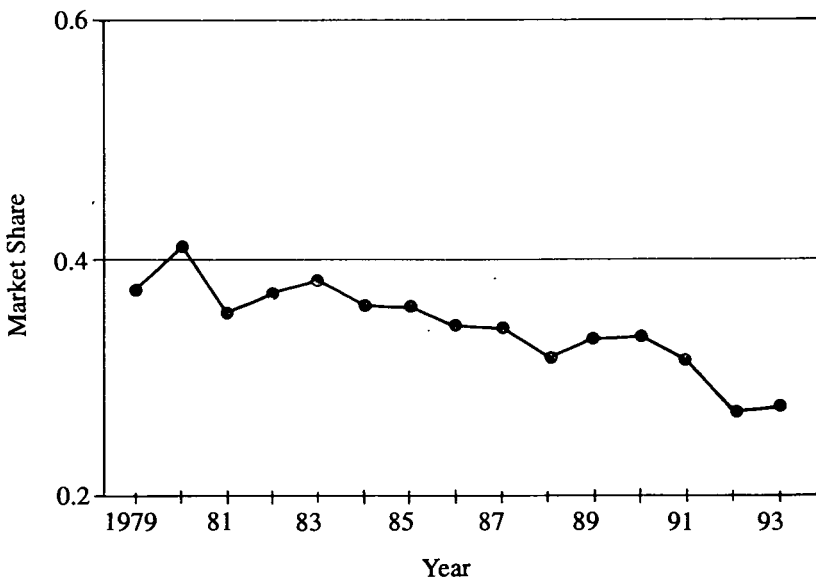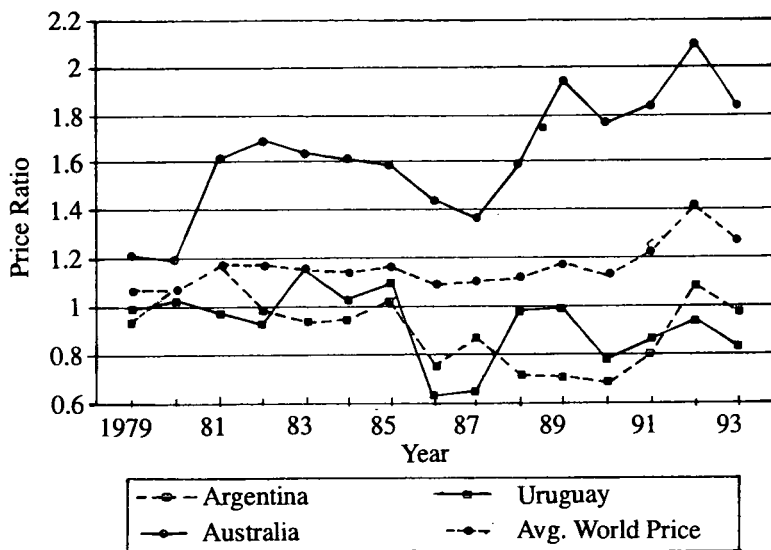
FIGURE 12 Price Competitiveness for Wool

dairy industry international competitiveness becomes weaker in beef, sheep meat and wool sectors. Different level of producer subsidy was one of the major factors of triggering this kind of structural change. Before the reform the meat sector, beef and sheep meat, was one of the biggest beneficiaries of subsidy policy. But the diary sector's subsidy was relatively small. During the 1982-84 period, i.e., just before the reform, direct output subsidy on dairy was 26.7% of the meat sector. That means that the dairy sector would be more competitive than the meat sector under the competitive market situation. Therefore, agricultural reform brought about resource reallocation in a more efficient way i.e., production resources moved into the more efficient sector from the less efficient sector.

IV. Conclusions

Comparative advantage is a statement about the trade patterns which would arise in an undistorted world based on differences in relative prices or costs between countries in the absence of trade. These prices equal the true relative social costs of producing the outputs. A country

TABLE 1 Assistance to the livestock sector

Unit : Million NZ$

Assistance	1970	1975	1980	1982	1983	1984	1988	1989	1990
On output	-13	141	136	457	863	694	42	35	35
-- diary	-13	108	129	62	95	15	0	0	0
-- meat	0	0	-44	99	270	274	0	0	0
-- common	0	33	51	296	498	405	42	35	35
On inputs	9	33	79	74	71	73	14	14	18
On value added factors	27	59	189	245	258	326	487	235	153
Total assistance	23	233	405	776	1,192	1,093	543	284	206
Total value of output	722	960	2,621	3,165	3,540	3,631	4,575	5,407	6,148
PSE	3	24	16	25	34	30	12	5	3
ERA	-8	38	12	49	123	98	15	-1	-6

Note: PSE implies producer subsidy equivalent. ERA implies effective rate of
     assistance and a negative ERA indicates the cost excess exceeds total
     assistance.
Source: Ron Sandrey and Russell Reynolds, Farming without Subsidies. 1990.
     MAF.

will export the good which it produces relatively efficiently and in
which it has a relatively lower price in the absence of trade. Further
comparative advantage does not depend on absolute cost comparisons.

The world is not free of distortions. Governments carries out
policies, both domestic and foreign trade, which alter relative prices.
Competitiveness is a statement about differences in market prices and
in absolute prices for the same quality of products. These prices are
influenced by policies, exchange rates, institutions, etc. Thus,
concepts of comparative advantage and competitiveness are not
always linked. The concept of competitiveness is a practical way of
substituting comparative advantage, a very theoretical concept.

Therefore, in this study, we discussed the definition of
interantional competitiveness and some methodology of measurement
of competitiveness which is highly dependent on the purpose of
measurement. Then the change of interantional competitiveness of
New Zealand's major agricultural products after economic reform was
analyzed.

Measurement of competitiveness is divided into two categories, ex-post appraisal and ex-ante appraisal. Ex-post appraisal is a measurement which evaluates changes in performances actually realized in a market. Representative indices for ex-post measurement of competitiveness are revealed comparative advantage index(RCA) and its variations, and market share. Ex-ante appraisal is focused on factors which affect changes in competitiveness. Thus, it has micro-economic aspects rather than macroeconomic aspects. In this context, ex-ante measure of competitiveness includes price competitiveness, quality competitiveness, technology competitiveness, etc. In this study, RC index, CAI index and market share were measured as a ex-post measurement of competitiveness. For ex-ante index of competitiveness, price competitiveness was calculated for some of major New Zealand's agricultural products.

New Zealand retains very high international competitiveness in the major agricultural sector as RC indices are well above 1. While New Zealand's agricultural reform resulted in stronger competitiveness for dairy industry international competitiveness becomes weaker in beef, sheep meat and wool sectors. Different level of producer subsidy was one of the major factors of triggering this kind of structural change. Agricultural reform brought about resource reallocation in a more efficient way i.e., production resources moved out of the less efficient sector in to the more efficient sector(Sandry, et al. 1990).

In Korean market, New Zealand's market performance of beef export was poor at the beginning of entry of the market partly because of non-tariff barriers. However, New Zealand's competitiveness of beef is growing in Korean market. Competitiveness of New Zealand's sheep meat and wool industries is getting weaker in Korean market. We could not compare CAI index before and after the reform. Furthermore, this result was drawn under the constraints of quantitive restrictions on New Zealand's agricultural products.

APPENDIX

TABLE 1 RC Index and Market Share by Commodity

	Beef		Sheep Meat		Dry Milk		Wool	
	RC	MS	RC	MS	RC	MS	RC	MS
1979	22.4	0.064	150.4	0.427	18.6	0.053	131.3	0.373
1980	21.8	0.060	152.9	0.419	23.9	0.065	149.5	0.411
1981	23.2	0.065	164.9	0.464	31.7	0.089	125.7	0.355
1982	21.1	0.063	151.8	0.453	33.7	0.100	123.9	0.371
1983	24.6	0.073	160.9	0.476	35.0	0.104	128.9	0.382
1984	20.7	0.061	171.1	0.501	30.9	0.091	122.5	0.360
1985	24.1	0.067	170.7	0.477	32.6	0.091	127.9	0.359
1986	16.9	0.045	152.1	0.408	31.3	0.084	127.5	0.343
1987	21.3	0.055	155.0	0.403	30.3	0.079	131.2	0.342
1988	19.7	0.056	131.9	0.371	24.2	0.068	112.4	0.317
1989	21.3	0.064	127.3	0.384	33.1	0.100	110.1	0.333
1990	18.7	0.048	142.7	0.364	42.9	0.109	131.0	0.335
1991	19.9	0.054	140.6	0.383	46.6	0.127	116.0	0.315
1992	20.1	0.054	143.5	0.382	39.7	0.106	101.8	0.271
1993	19.1	0.055	140.0	0.403	41.0	0.117	95.9	0.276

TABLE 2 CAI Index by Commodity

Year	Beef	Sheep Meat	Wool
1988	0.052	1.268	0.883
1989	0.295	0.929	0.746
1990	0.556	0.653	0.625
1991	0.978	0.369	0.507
1992	0.634	0.382	0.180
1993	0.947	0.254	0.170
1994	1.263	0.206	0.172

REFERENCES

Chung, C. Y. et al. 1978. *The Measurement of Comparative Advantage*, The Korea Economic Research Center, Report No. 1-102.

FAO, Yearbook of International Trade, Various Years.

Han, J. Y. et al. 1989. *Measurement of International Competitiveness*, Korea Institute for Industrial Economics and Trade, KIET Report No. 168.

Irfan ul Haque, *International Competitiveness: interaction of the public and the private sectors*, World Bank, EDI Seminar Series.

Kim, D. H. 1990. "Industrial Determinants of International Competitiveness of Processed Foods", *Korea Rural Economic Review*, Vol. 17 No. 3.

Koo, B. H. et al. 1994. "Trade and Industrial Policies Promoting Export Competitiveness and Technology Development in an Open Economy", Hanyang Journal of Economic Studies, vol. 15, No. 2.

Mahmood Z. 1994. "Assessing the Potential and Direction of International Trade Flows in Agricultural Commodities: A Case Study of Pakistan", ESCAP Regional Seminar on Assessing the Potential and Direction of Agricultural Trade within the ESCAP Region, Bangkok.

Park, J. S. 1994. *Analysis of International Competitiveness for Korean Industries Under the Era of Internationalization*, Korea Institute for Industrial Economics and Trade, KIET Report No. 321.

Sandrey, R. et al. 1990. Farming without Subsidies; New Zealand's Recent Experience, edited by R. Sandrey and R. Reynolds, Ministry of Agriculture and Forestry, New Zealand.

Shim, Y. S. et al. 1995. Korea's Competitiveness in Export Market by Region, Korea Institute for Industrial Economics and Trade, KIET Report No. 369.

United Nations, Statistical Yearbook of Trade, Various Years.

Yamauch, H. 1994. "Analysis of Shifting Patterns of Production, Specialization and Trends of Selected Trade Indices", ESCAP Regional Seminar on Assessing the Potential and Direction of Agricultural Trade within the ESCAP Region, Bangkok.