

# New Zealand forestry - an analysis of comparative advantage

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## Abstract

New Zealand is endowed with natural resources such as land, soil and climate giving rise to comparative advantage in the production of land-based products. A study into New Zealand's comparative advantage found that New Zealand lost comparative advantage in some forestry products in 1999 compared to 1985. The Ministry of Agriculture and Forestry in its latest publication, SONZAF highlighted the strong competition from Canada and the Russian Federation in some of our major export markets viz., China, Japan, and Korea. Both these conclusions imply that New Zealand's comparative advantage in forestry sector is undermined by increasing comparative advantage of its competitors. This study shows that New Zealand's comparative advantage decreased in low value products but increased in high value products within the forestry sector and there is a good potential to increase high value products particularly to China.

## Introduction

New Zealand is heavily dependent on international trade. Trade accounts for 31.5% of New Zealand's GDP which is significantly higher compared with other countries. In the case of Australia this ratio is 20.9%, for US it is 11.7%, and for Japan it stands at 10.6% (OECD 2005). This can be attributed to the fact that large countries need not have to depend on the external sector as much as the small countries with a small market size. Small countries, on the other hand, tend to depend on the external sector to achieve higher economic growth and maintain a higher standard of living (Greenway 1998, Baldauf 2000). Being a small, open economy, New Zealand's potential to generate economic prosperity is directly dependant on its international competitiveness. In a study of New Zealand's changing pattern of exports, the New Zealand Institute of Economic Research (NZIER) concluded that New Zealand is dependent on export earnings to achieve long-term sustainable growth, and to improve the standard of living by providing goods and services it can not produce competitively in the domestic market (NZIER 2005).

A distinguishing feature of New Zealand's external trade is that a significant portion of export income comes from bulk commodities such as meat and dairy products, wood and pulp. Although there has been a change in the export structure over the years, primary commodities still dominate New Zealand's exports. In the 60's the share of primary commodities was over 85%. Currently, New Zealand's land-based exports of about 67% is the highest in the developed world. This is against the trend in other developed countries wherein the primary export share is decreasing as manufacturing and services exports are rising (NZIER 2005, Skilling & Boven 2005). The export structure is a reflection of New Zealand's comparative advantage in the production of primary commodities arising from its natural resource endowment. Ballingall and Briggs (2002) analysed New Zealand's comparative advantage in 706 commodities and ranked top fifty goods by the magnitude of Revealed Comparative Advantage (RCA) index. They found that forty five out of the top fifty sectors were in the primary sector i.e. agricultural, horticultural, and forestry

industries. As can be expected, the study found that New Zealand tends to export more in these sectors, forestry being an important sector. The aim of this paper is to examine the changes in New Zealand's comparative advantage in forestry sector vis a vis its competitors in selected export markets.

## Objectives and Methodology

Forestry is an important component of the New Zealand economy in terms of its contribution to GDP and employment. The New Zealand Forest Owners Association (NZFOA) reported that in the year 2005, forestry sector contributed 3.1% of the GDP and accounted for 11% of merchandise exports. The NZFOA and the Ministry of Agriculture and Forestry (MAF) project a substantial increase in the share of forestry sector in GDP and merchandise exports. The forecasts show that forestry sector's contribution to GDP will increase from 4% in 2004 to 14% by the year 2025, and forestry will be the largest export sector. The MAF estimates a 47% increase in the export of forestry products by 2010 compared to 2006. The achievement of these forecasts, inter alia, requires a substantial increase in the forestry sector's comparative advantage. However, a study of New Zealand's changing patterns of comparative advantage between 1985 and 1999 found that New Zealand has lost its comparative advantage in a number of goods including some forestry and wood products (Ballingall & Briggs 2002).

One possible reason cited for this decline was that New Zealand's competitors were able to produce these goods more efficiently at a lower per unit cost than New Zealand. MAF (2006) also stated that strong competition for wood from Canada and Russia in some major export markets such as China, Japan and South Korea has resulted in decreasing market share to the New Zealand forestry industry. This suggests that New Zealand is losing its comparative advantage in forestry products while some of its competitors are gaining in this sector.

In light of the above, this study aims to examine the relative performance of New Zealand's forestry sector and identify the scope for improvement. This is achieved by:

- i computing New Zealand's gains/losses in comparative advantage in low value and high value forestry products and compare the same with that of Canada and the Russian Federation from whom New Zealand faces

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- strong competition in some major export markets viz., China, Japan and Korea;
- ii examining changing market shares for New Zealand's forestry products in the above markets in comparison with Canada and the Russian Federation; and
  - iii identifying the products and markets with a potential to increase New Zealand's forestry exports.

## Revealed Comparative Advantage (RCA)

International trade occurs *inter alia*, due to differences in factor endowments. The relative differences in factor endowments results in differences in comparative advantage enabling a country to produce certain goods in abundance at a lower opportunity cost compared to other countries. The *Heckscher - Ohlin* theorem states that each country exports the commodity which requires for its production relatively intensive use of the factor in relative abundance in that country (Mikic' 1998). New Zealand has comparative advantage in the production of land based products such as forestry, as the country is endowed with appropriate natural resources viz., abundant land, fertile soil and suitable climate.

The comparative advantage of the forestry industry is measured using Balassa's Index of Revealed Comparative Advantage (RCA). RCA reveals the extent of a country's revealed comparative advantage in regards to a particular industry on the basis of the industry's export performance. Havrila & Gunawardana (2003) used RCA to analyse Australia's comparative advantage in Textile and Clothing Industries. Some other studies which applied Balassa's RCA to analyse a country's comparative advantage include Fertö, Imre & Hubbard, L. J.(2003), Ballingall & Briggs (2002), Bojnec, Stefan (2001), Chow, Peter C.Y (1990), Peterson, John (1988), and Ariff, Mohamed & Hill, Hal (1985).

$$(1) \quad RCA_{ij} = 100 \star \left[ \frac{\bar{X}_{ij}}{\bar{X}_j} \div \frac{\bar{X}_{iw}}{\bar{X}_w} \right]$$

Where,  $RCA_{ij}$  = Revealed Comparative Advantage Index

$X$  = exports

$i$  = commodity (forestry products)

$j$  = country

$w$  = world

If the ratio is greater than 100 a country has a comparative advantage in the production of forestry products i.e. its share in world exports of forestry is greater than the country's share of total world exports. On the other hand, a ratio of less than 100 indicates comparative disadvantage of the country with regard to forestry products. The value of the index will reflect the magnitude of comparative advantage a country has in a particular industry. Higher values of the index reveal higher potential for a country's exports of a particular product (Xiaodi & Xiaozhong 2004).

Although, RCA reveals a country's resource based comparative advantage, it is quite likely that a country's

comparative advantage is influenced by other variables. RCA indices are computed using post-trade data. The exports of a commodity may depend more on demand factors rather than on cost factors. Bowden (1983) argued that differences in comparative advantage may arise due to differences in consumption patterns and not solely due to differences in production costs. Hiley (1999) in his study of the changing comparative advantage in the Asia-Pacific region suggested that changes in resource endowment, technology and demand can result in changes in comparative advantage. Despite its inability to capture all the relevant variables, RCA is widely used in economics literature to measure comparative advantage.

The New Zealand forestry exports broadly consist of logs and wood chips, sawn timber, wood pulp, paper and paperboard, and panel products. Newsprint has been ignored due to non-availability of comparable data. Logs and wood chips are considered to be of low value products whereas the others are considered to be of high value products in terms of application of technology and further processing. In order to make a product-wise analysis, the 4-digit level classification of the Harmonised System-1996 has been used.

The period of this study is for the years 1996 - 2005. New Zealand's performance is compared with two strong competitors viz., Canada and the Russian Federation in three major export markets i.e. China, Japan and Korea. In the year 2005, these three markets accounted for 38% of New Zealand's forestry exports. Data is sourced from UNCOMTRADE database.

## Empirical Analysis

The application of Balassa's RCA index reveals mixed results in that New Zealand has gained comparative advantage in some products and lost in some while Canada and the Russian Federation also recorded similar fluctuations (Table -1). In 2005 New Zealand and the Russian Federation have gained in seven out of eleven products compared to 1996, whereas Canada gained in six products respectively. The market share of each of the above countries for individual products is expressed as a per cent of total imports of that product by each of the importing countries (Table - 2). Scope for diversification depends on the relative changes in the RCA values and increase in the imports by the importing countries. A product-wise analysis is presented below.

New Zealand *lost* comparative advantage in the following products.

### 4403-Logs and Poles<sup>2</sup>

#### Comparative Advantage

Logs and Poles are relatively low value products and accounted for 13% of New Zealand's total forestry exports in 2005. New Zealand's comparative advantage in 2005

<sup>2</sup> The numbers next to the title of each of the products are the Harmonised System Classification codes used by the United Nations Statistics Division as well as by Statistics New Zealand.

has decreased by 52% compared to 1996 while Canada and the Russian Federation gained 122% and 38% respectively. However, New Zealand's RCA index of 1466 is much higher than Canada's 160 and Russian Federation's 1207 indicating that New Zealand has relatively high degree of comparative advantage in logs and poles.

#### *Market Share*

In all the three markets Canada and the Russian Federation recorded an impressive growth in their respective market shares. New Zealand's share remained constant in China (2%) and in Japan (6%) but increased by 25% in Korea. The Russian Federation outperformed both New Zealand and Canada in all the three markets particularly in China. In 1996 Russian Federation accounted only for 11% of China's imports in this category but increased to 50% by 2005. In Japan its share increased from 13% to 27% while in Korea it rose from 7% to 21%. In 1996 Canada's share was less than one per cent in each of the three markets but increased to 14% in Japan and to 6% in Korea. Thus, there is clear evidence that New Zealand is lagging behind its competitors in these important markets.

#### *Export potential*

Given that New Zealand has relatively a higher magnitude of comparative advantage in logs and poles and China's imports have increased considerably, suggest that there is a good potential for New Zealand to increase its exports to China. However, this potential is constrained by strong competition from the Russian Federation. Since logs and poles are low value products, cost reduction and subsequent price reduction (if economical) seems to be the way to increase the exports.

#### **4401 - Wood chips**

##### *Comparative Advantage*

This is another category where New Zealand's comparative advantage declined by 27% in 2005 but both Canada (19%) and the Russia Federation (40%) recorded an increase. New Zealand has relatively a higher degree of comparative advantage (307) compared to Canada's 181. However, the Russian Federation has a comparative disadvantage with an RCA value of 80 in 2005 which is higher than 57 in 1996 i.e. the Russian Federation is moving in the direction of gaining comparative advantage in this category.

##### *Market Share*

New Zealand exports wood chips only to Japan but not to China and Korea. There has been no improvement in New Zealand's share in Japan's imports which remained at 2%. Canada and the Russian Federation recorded a decline their respective shares in the Chinese market.

##### *Potential to increase exports*

There is scope for New Zealand to diversify into China as Canada and the Russian Federation do not have any substantial presence in this market. Equally, there is an

opportunity for New Zealand to increase its share in Japan as the competition from these two countries is not very significant.

#### **4410 - Particle Board**

##### *Comparative Advantage*

New Zealand's comparative advantage has decreased by 43%, from 428 in 1996 to 243 in 2005. The Russian Federation does not have a comparative advantage in this category with RCA values of <100 and recorded a decline of 54%. Canada has improved its comparative advantage by 79% and with an RCA value of 970 in 2005 has a distinct advantage over New Zealand and the Russian Federation.

##### *Market Share*

New Zealand and Canada have lost their market shares in all the three markets. Russian Federation's share has been nil.

##### *Potential to increase exports*

There has been a significant increase in the imports both by China and Korea. Since New Zealand has comparative advantage there is potential for NZ to improve its share in both these markets.

#### **4411 - Fibre Board**

##### *Comparative Advantage*

New Zealand's comparative advantage decreased by 46% where as Canada achieved an increase of 69%. The Russian Federation not only has a comparative disadvantage but also recorded a decline. However, New Zealand has a higher degree of comparative advantage with a value of 1015 in 2005 against Canada's 194.

##### *Market Share*

New Zealand's share has increased in all the three markets. Canada's share declined in all the three markets. Russian Federation's share in Japan and Korea is nil and its share China is less than one per cent as against New Zealand's 11%.

##### *Potential to increase exports*

There is good potential for New Zealand to increase its share as there has been an increase in the value of imports by all the three countries and New Zealand has a relatively higher degree of comparative advantage in this category.

In the following products New Zealand has gained comparative advantage during the period of this study.

#### **4407 - Sawn Timber**

##### *Comparative Advantage*

All the three countries have comparative advantage in this category. However, Canada's comparative advantage decreased by 26%. New Zealand's comparative advantage increased by 85% and the Russian Federation's by 55%. The value of RCA index for New Zealand is much higher (725) than Russian Federation's (243) indicating that New Zealand has a better export potential in this category.



## *Market Share*

This is another important component of New Zealand's forestry exports accounting for 25% total forestry exports in 2005. However New Zealand's share remained relatively constant in Japan and Korea but recorded an increase from 2% to 3% in China. Russian Federation increased its share in all the three markets. Canada's share increased in Korea only but declined in the other two markets. In each of the three markets New Zealand's share is less than 5%.

## *Potential to increase exports*

Given that New Zealand has relatively higher comparative advantage and China's imports have increased considerably (700%) suggests potential for New Zealand to increase its market share.

## **4701 - Mechanical Wood Pulp**

### *Comparative Advantage*

New Zealand has a high degree of comparative advantage compared to Canada (comparable data is not available for the Russian Federation). During the period of study, New Zealand gained 72% while Canada lost 50% of its comparative advantage.

## *Market Share*

In all the three markets there has been a decline in the value of imports in 2005 compared to 1996. New Zealand's share has increased both in China and Japan. New Zealand has outperformed Canada and the Russian Federation in Japan. Korea does not import Mechanical Wood Pulp from New Zealand.

## *Potential to increase exports*

The possibility of entering the Korean market is practically nil as their total imports were less than one million dollars in 2005. However, there is scope for New Zealand to increase its share in China and Japan as New Zealand has a higher degree of comparative advantage in this product.

## **4703 - Chemical Wood Pulp**

### *Comparative Advantage*

New Zealand recorded a modest increase of 4% while Canada's comparative advantage decreased by 28% (comparable data is not available for the Russian Federation). However, Canada has a higher degree of comparative advantage than New Zealand.

## *Market Share*

New Zealand's share has increased in China and Korea but declined in Japan. Even Canada's share has declined in Japan. However, the Russian Federation achieved considerable growth in Japan.

## *Potential to increase exports*

There is potential for New Zealand to increase its share in China as the total imports by China increased by 440% in 2005 compared to 1996. In addition both Canada and

Russian Federation did not achieve any increase in their respective shares thus giving a scope for New Zealand to improve its position.

## **4810 - Paper and paperboard**

### *Comparative Advantage*

All the three countries have a comparative disadvantage in this category. However, New Zealand is moving in the direction of gaining comparative advantage with an RCA value of 87 in 2005 compared to 41 in 1996. Canada which had a comparative advantage in 1996 with a value of 109 recorded a decline of (-) 14% in 2005 in this category and achieved a value of 94 i.e. comparative disadvantage. The Russian Federation has a distinct comparative disadvantage in this category with an RCA value of only 1.25.

## *Market Share*

Canada and Russian Federation are not competitors to New Zealand in any of these markets in any significant way. The imports in all the three markets have increased particularly in China and Korea. New Zealand's share is less than one per cent in each of the markets and recorded a growth only in China.

## *Potential to increase exports*

There is potential for New Zealand to improve its share in all the three markets as the consumption is increasing particularly in China. It may also be noted that New Zealand is relatively in a better position in that it is moving closer to gaining comparative advantage in contrast to Canada which lost comparative advantage and the Russian Federation is far away from achieving comparative advantage.

## **4412 - Plywood**

### *Comparative Advantage*

All the three countries achieved a gain in this category. Canada and the Russian Federation achieved a growth of 52%, New Zealand's comparative advantage increased by 20%. However, New Zealand has a higher degree of comparative advantage with an RCA value of 447 in 2005 compared to Canada's 147 and Russian Federation's 214. Canada has moved from a position of comparative disadvantage in 1996 to a position of comparative advantage in 2005.

## *Market Share*

New Zealand's and Russian Federation's shares have improved in Japan although they do not account for a significant per cent of imports. Canada's share declined substantially. Russian Federation has recorded a significant growth in China.

## *Potential to increase exports*

There has been a decrease in imports by all the three markets. New Zealand does have a comparative advantage of a higher degree and should aim at improving its share in Japan. This is because the value of imports by Japan is substantially higher than the other two countries.

#### 4408 - Veneer

##### Comparative Advantage

New Zealand has achieved an impressive gain in this category recording 800% rise in the comparative advantage. Canada recorded a 10% gain which is much less than New Zealand. The Russian Federation does not have a comparative advantage in this category with a value of 19 in 2005. New Zealand with a value of 900 in 2005 is in a better position compared to Canada with a value of 388.

##### Market Share

New Zealand recorded an increase in its share in all the three markets particularly in Japan from 3% to 12% while Canada's share decreased from 8% to 1%. In China also NZ recorded a significant growth higher than Canada and the Russian Federation.

##### Potential to increase exports

In light of New Zealand's comparative advantage and increase in imports by Korea and China there is a good potential for NZ to increase its exports.

##### Conclusions

The following conclusions can be drawn from the above analysis. New Zealand's comparative advantage has decreased in two low value products viz., Logs and poles, and Wood chips. Canada and the Russian Federation gained comparative advantage in both these products indicating tough competition in this category. New Zealand's comparative advantage has decreased in two high value products i.e. Particle board and Fibre board whereas Canada gained in these products. In relative terms, New Zealand has gained comparative advantage in almost all the other high value products viz., Sawn timber, Mechanical wood pulp, Chemical wood pulp, Paper and paperboard, Plywood and Veneer. New Zealand has also improved its market share for high value products such as Fibre Board, Mechanical wood pulp, Chemical wood pulp, Plywood and Veneer. The study reveals that there is a good potential for New Zealand to increase its exports of mainly high value products particularly to China.

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*Table 1: The Balassa RCA Index Values, New Zealand Forestry, 1996-2005.*

HSCode	Product	New Zealand			Canada			Russian Federation		
		1996	2005	% Change	1996	2005	% Change	1997	2005	% Change
4403	Logs and Poles	3048	1466	(-)52	72	160	122	876	1207	38
4401	Wood chips	547	397	(-)27	152	181	19	57	80	40
4407	Sawn timber	392	725	85	1009	749	(-)26	157	243	55
4701	Wood pulp Mechanical	8769	15087	72	543	271	(-)50	1.66	na	–
4703	Wood pulp Chemical	484	503	4	860	615	(-)28	na	137	–
4810	Paper and paper-board	41	87	112	109	94	(-)14	0.5	1.25	150
4410	Particle Board	428	243	(-)43	541	970	79	54	25	(-)54
4411	Fibre Board	1886	1015	(-)46	115	194	69	82	52	(-)38
4412	Plywood	373	447	20	97	147	52	141	214	52
4408	Veneer	99	900	809	353	388	10	10	19	90

*Source: Calculations based on data sourced from UNCOMTRADE*

Table II: Import of Forestry Products, 1996-2005

Japan								
Partner	New Zealand		Canada		Russian Fed		Total Imports	
Product	1996	2005	1996	2005	1996	2005	1996	2005
	%	%	%	%	%	%	(\$m)	(\$m)
4403	6	6	0.8	14	13	27	4436	1698
4401	2	2	2.3	1	0.4	0.3	2225	2057
4407	1.6	1.3	46	37	2	9	4578	2625
4701	49	73	41	21	0.03	0	158	98
4703	0.95	0.04	45	39	0.13	3	1459	967
4705	4	5	96	89	0	0	27	19
4801	0	0	41	19	0	0	554	241
4810	0.1	0	0.78	0.09	0	0	512	547
4410	26	20	35	18	0	0	169	147
4411	35	45	2.7	0.08	0.03	0	188	193
4412	1	1.4	5	0.67	0	0.31	2601	1935
4408	3	12	8	1	0.08	0.6	179	99

Korea								
Partner	New Zealand		Canada		Russian Fed		Total Imports	
Product	1996	2005	1996	2005	1996	2005	1996	2005
	%	%	%	%	%	%	(\$m)	(\$m)
4403	31	39	0.8	6	7	21	963	708
4401	0	0	0	9.5	0	0	99	95
4407	5	4.4	5	13	0.4	6	465	225
4701	0	0	2.3	17	0	0	3	0.8
4703	2	3	23	24	6	5	1096	1128
4705	5	0.96	92	99	0	0	158	78
4801	0	0	34	0	0.7	0	70	14
4810	0.4	0	7	0.01	0	0	68	148
4410	1	0	18	3	0	0	77	100
4411	8	10	2.5	1	0	0	26	101
4412	0.17	0.01	0.6	0.16	0.02	0.08	531	423
4408	0.04	0.22	1	1	0	0.8	67	91

China								
Partner	New Zealand		Canada		Russian Fed		Total Imports	
Product	1996	2005	1996	2005	1996	2005	1996	2005
	%	%	%	%	%	%	(\$m)	(\$m)
4403	2	2	0.12	0.6	11	50	458	3244
4401	0	0	1.6	0	0	0	5	125
4407	2	3	7	5	1	10	180	1508
4701	7	12	61	81	0.9	3	74	26
4703	0.6	2.5	37	20	13	14	539	3060
4705	0	11	92	84	0.4	0	13	360
4801	3	4	32	1	22	16	196	73
4810	0.29	0.7	1	0.6	0	0.08	680	1279
4410	5	0.6	10	0.9	0	0	20	115
4411	4	11	3	2	0.05	0.2	70	229
4412	0.01	0.01	0.1	0.3	0	3	644	277
4408	0.08	1.6	0.7	3	0	0.8	94	121

Source: Calculations based on data sourced from UNComtrade