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# Revealed Comparative Advantage (RCA) and Constant Market Share Model (CMS) on Thai Natural Rubber

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## ABSTRACT

Thailand is an agricultural country and the world's leading rice and rubber exporter. Thailand produced natural rubber at 2.039 million tons in 1998 with export about 1.839 million tons. Revealed Comparative Advantage (RCA) and Constant Market Share Model (CMS) techniques are applied to natural rubber in Thailand, using 1991-1998 data. According to RCA index, Indonesian natural rubber shows a comparative advantage or specialization of trade in the U.S. market. Thailand, however, shows no comparative advantage in the U.S. market, with RCA at 0.42-0.96. Using CMS, Thailand was delighted in an actual export growth of natural rubber in the world at $425.91 million, comparing the year 1995-1996 to 1991-1993. By contrast, comparison of the period 1997-1998 to the period1995-1996, the actual export growth was −$125.35 million due to negative effects on standard growth effect, market effect and competitive effect.

**Key words :** Revealed Comparative Advantage (RCA), Constant Market Share Model (CMS), natural rubber

## INTRODUCTION

Agricultural sector always plays an important role in the Thai economy, in terms of capital accumulation, food self-sufficient, employment and export earnings. At present, Thailand is still one of the world's leading rice and rubber exporters. Such an important perennial tree as natural rubber, this paper will focus on natural rubber in Thailand. Natural rubber production, marketing and export from Thailand are introduced. Revealed Comparative Advantage (RCA) and Constant Market Share Model (CMS) are then shown. As an exporter like Thailand, RCA will provide the information of advantage to export such product comparing to other competitive countries. RCA, however, does not show sources of advantage so CMS will be used to show the advantage components: world growth, commodity composition, market distribution, and residue. RCA and CMS of Thai natural rubber are calculated and explained. Conclusion is finally stated.

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# METHOD

The paper starts from production, marketing and export backgrounds of natural rubber. Revealed Comparative Advantage (RCA) and Constant Market Share Model (CMS) techniques are applied to natural rubber in Thailand. Comparison of RCA indices between Thai natural rubber and Indonesian rubber are analyzed. Annual natural rubber (NR) export values in US$ , covering the period 1991 to 1998, was used. The world rubber export came from FAO Trade Yearbook. NR export from Thailand and Indonesia was received from Department of Commerce, U.S. Census Bureau. NR export from Thailand to Japan was received from Japan External Trade Organization (JETRO). Total export from Thailand and Indonesia was accessed from Quarterly Bulletin, Bank of Thailand.

**Revealed Comparative Advantage (RCA) and Constant Market Share Model (CMS)**

**Revealed Comparative Advantage (RCA)**

Balassa (1965) was the first to develop a measure of Revealed Comparative Advantage. A Balassa RCA index with value greater than unity (1.0) would imply a comparative advantage or specialization of trade in that commodity by country i. Balassa's index of Revealed Comparative Advantage (RCA) can be written as :

$$RCA = \frac{x_{ik} / x_i}{x_{wk} / x_w}$$

Where:

$x_{ik}$ = country i's export of goods k

$x_{wk}$ = world exports of goods k

$x_i$ = country i's export's of all goods

$x_w$ = world export's of all goods

**Constant Market Share Model (CMS)**

Constant Market Share (CMS) model, introduced by Richardson (1971), is based on the assumption that without changes abroad and maintained competitiveness at home, a country's share in the world market should remain unchanged overtime. Four components making a deviation are world trade, commodity composition, market distribution, and a residue. The constant market share identity is as follows:

$$V(t)-V(t-1) = r_{world}\ V(t-1) + \Sigma_i[r_i-r_{world}] + \Sigma_i \Sigma_j[r_{ij}-r_i]V(t-1)_{ij} + \Sigma_i\Sigma_j[V(t)_{ij} - V(t-1)_{ij}]$$

Where:

V = Value of A's exports in the world market.

$V_i$ = Value of A's exports of Commodity i.

$V_j$ = Value of A's exports to Country j.

$V_{ij}$ = Value of A's exports of Commodity i to Country j.

t = current year.

$r_{world}$ = percentage increase in total world exports from previous year to current year.

$r_i$ = percentage increase in world exports of Commodity i from previous year to current year.

$r_{ij}$ = percentage increase in world exports of Commodity i to Country

j from previous year to current year.

The first term, world trade effect (standard effect) estimates the export growth that attributes to the overall growth in the world exports. The second term, commodity-composition effect (product effect), estimates a difference in the growth rate of each commodity export compared to the world average. A positive value means a concentration of exports in commodities with growth rates higher than the world average. The third term, market effect, isolates the effect of differences in the growth rates of each commodity in each market. A positive value indicates concentration of exports on high growth market. The final term is the residual change and referred to as the competitive effect.

## RESULTS

### 1. Natural rubber production, marketing and export

**Production**

Rubber has been introduced into Thailand in the early of 1900s. The first rubber plantation was in the southern part of the country in Trang Province and has been increasing significantly throughout the southern region, eastern region and north-eastern region of the country with production growth rate of 4-7% per year. About 90% of all rubber plantations is the small holder farmer, at average of 2.4 hectares farm size. Thailand is currently the first producer and exporter of natural rubber in the world, with export volume approximately 1.839 million tons and production at 2.039 million tons in 1998. Three natural rubber grades are Ribbed Smoked Sheet (RSS), Standard Thai Rubber (STR), and latex concentrate which accounted for 56.94%, 26.14% and 13.40% respectively (Table 1). Table 1 also shows a decline in the share of rubber sheets (RSS) and increases in those of rubber blocks (STR) and latex during 1994 to 1998. The reasons of the production trends are the world demand trends toward STR grade, which is usually lower price than RSS, the shortage of the labour force in RSS industry and Thai government intervention for increasing the share of rubber blocks.

**Marketing and export**

Synthetic rubber (SR) is a substitution products of natural rubber. The U.S. is the first SR producer of the world, accounted for 2.61 million tons in 1998. On the other hand, Thailand is the first producer and export leader in the world. In 1998, Thailand produced 2.039 million tons of natural rubber and exported at amount of 1.839 million tons which means domestic consumption was only 0.200 million tons (Table 1). Indonesia, Malaysia and African countries are other major producers while China, Vietnam and India are other insignificant producers (Table 2).

### 2. Revealed Comparative Advantage (RCA) and Constant Market Share Model (CMS)

Table 3 shows estimated result for Balassa's index of Revealed Comparative Advantage (RCA) for Thailand and Indonesia. Indonesian RCA index is greater than unity (1.0) which shows a comparative advantage or specialization of trade in NR during 1991 to 1998. Thailand, yet, shows no comparative

**Table 1** Production and export of Thai natural rubber.

Unit : million tons.

| Year | Production | | | | | Export | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | RSS | STR | Latex | Others | Total | RSS | STR | Latex | Others | Total |
| 1994 | 1.134 | 0.336 | 0.163 | 0.085 | 1.718 | 1.106 | 0.300 | 0.132 | 0.067 | 1.605 |
| | (66.00) | (19.56) | (9.49) | (4.95) | (100) | (68.9) | (18.7) | (8.2) | (4.2) | (100) |
| 1995 | 1.144 | 0.367 | 0.206 | 0.088 | 1.805 | 1.087 | 0.316 | 0.169 | 0.064 | 1.636 |
| | (63.38) | (20.33) | (11.41) | (4.88) | (100) | (66.64) | (19.3) | (10.3) | (3.9) | (100) |
| 1996 | 1.250 | 0.394 | 0.246 | 0.080 | 1.970 | 1.180 | 0.324 | 0.203 | 0.056 | 1.763 |
| | (63.45) | (20.00) | (12.49) | (4.06) | (100) | (66.93) | (18.38) | (11.51) | (3.18) | (100) |
| 1997 | 1.228 | 0.510 | 0.249 | 0.046 | 2.033 | 1.095 | 0.457 | 0.225 | 0.060 | 1.837 |
| | (60.40) | (25.09) | (12.25) | (2.26) | (100) | (59.61) | (45.6) | (24.6) | (9.0) | (100) |
| 1998 | 1.161 | 0.533 | 0.273 | 0.072 | 2.039 | 1.047 | 0.456 | 0.246 | 0.090 | 1.839 |
| | (56.94) | (26.14) | (13.40) | (3.52) | (100) | (56.93) | (24.8) | (13.38) | (4.89) | (100) |

Source: Rubber Research Institute of Thailand, 1998.

Note: Figures in parenthesis represent the percentage.

**Table 2** Distribution of NR production by countries.

Unit: '000 tons

| Country | 1960 | 1970 | 1980 | 1990 | 1995 | 1996 | 1997 | 1998 |
|---|---|---|---|---|---|---|---|---|
| Malaysia | 785.4 (39.0) | 1269.2 (40.9) | 1530 (39.7) | 1291 (25.2) | 1089.3 (18.0) | 1082.5 (17.0) | 971.1 (15.2) | 885.7 (13.4) |
| Indonesia | 620.3 (30.8) | 815.2 (26.3) | 1020 (26.5) | 1262 (24.6) | 1454.5 (24.1) | 1527 (24.0) | 1504.8 (23.6) | 1744.7 (26.3) |
| Thailand | 170.9 (8.5) | 287.2 (9.3) | 501.1 (13.0) | 1275.3 (24.9) | 1804.8 (29.9) | 1970.4 (30.9) | 2032.7 (31.9) | 2039.0 (33.2) |
| India | 25.2 (1.3) | 89.9 (2.9) | 155.4 (4.0) | 323.5 (6.3) | 499.6 (8.3) | 540.1 (8.5) | 580.3 (9.1) | 561.9 (8.5) |
| China | N/A. N/A. | N/A. N/A. | 113 (2.9) | 264.2 (5.2) | 424 (7.0) | 430 (6.8) | 444 (7.0) | 450 (6.8) |
| Vietnam | 76.6 (3.8) | 28.5 (0.9) | 45.8 (1.2) | 103 (2.0) | 159 (2.6) | 189 (3.0) | 201 (3.2) | 217 (3.3) |
| African Countries | 149.5 (7.4) | 154 5.0) | 194.4 (5.0) | 296.1 (5.8) | 281.1 (4.7) | 271.1 (4.3) | 325.8 (5.1) | 333.8 (5.0) |
| Others | 187.1 (9.2) | 158.5 (14.8) | 290.3 7.7) | 304.9 (6.0) | 327.7 (5.4) | 359.9 (5.5) | 320.3 (4.9) | 238.8 (3.5) |
| World Total | 2015 (100) | 3102.5 (100) | 3850 (100) | 5120 (100) | 6040 (100) | 6370 (100) | 6380 (100) | 6630 (100) |

Source: IRSG Rubber Statistical Bulletin cited in International Rubber Marketing Conference 1999

Note: As percentage in the parenthesis

advantage in the U.S. market. RCA is between 0.422 to 0.958, at the same period of time, except only in the year 1993, which corresponded to the fact that the U.S. imported NR from Indonesia more than that of from Thailand.

Table 4 shows values of export which are used to calculate CMS. The CMS components of Thai trade on NR in the world over the period 1995-

**Table 3** Revealed Comparative Advantage Index (RCA) of Thailand and Indonesia.

| Year | Thai rubber export to USA. | Thai all goods export | World rubber export | World export of all goods to USA. | Thai RCA | Indonesian rubber export to USA. | Indonesian all goods export | Indonesian RCA |
|---|---|---|---|---|---|---|---|---|
| 1991 | 86,326 | 28,523 | 3,435,265 | 479,886 | 0.422 | 384,159 | 29,944 | 1.792 |
| 1992 | 121,716 | 33,747 | 3,661,208 | 539,005 | 0.654 | 444,984 | 33,393 | 1.966 |
| 1993 | 150,002 | 37,033 | 3,473,917 | 589,522 | 1.488 | 482,274 | 37,042 | 2.209 |
| 1994 | N/A. | 45,105 | 4,694,003 | 674,819 | N/A. | N/A. | 41,477 | N/A. |
| 1995 | 324,775 | 56,332 | 7,079,837 | 752,320 | 0.612 | 886,164 | 47,812 | 1.969 |
| 1996 | 276,039 | 59,986 | 6,970,848 | 759,930 | 0.501 | 805,079 | 51,133 | 1.716 |
| 1997 | 274,838 | 58,431 | 5,596,609 | 867,038 | 0.728 | 697,924 | 52,179 | 2.072 |
| 1998 | 234,492 | 54,460 | 4,071,477 | 905,750 | 0.957 | 530,532 | 55,121 | 2.141 |

Source: FAO Trade Yearbook, Department of Commerce, U.S. Census Bureau and Office of Economic Statistic.

Note: Thai and Indonesian NR export to the U.S. are underestimated , due to data availability. Data included only latex, smoked sheets and technically specified NR, excluded other.

**Table 4** Values of export.

Unit: million US $

| Year | World NR export | World all goods export | Thai NR export to | | | World NR export to | | |
|---|---|---|---|---|---|---|---|---|
| | | | USA | Japan | Other | USA. | Japan | Other |
| 1991 | 3,435 | 2,750,700 | 86 | 425.81 | 465.19 | 743 | 607 | 2,085 |
| 1992 | 3,661 | 2,991,200 | 121 | 332.85 | 655.15 | 859 | 594 | 2,208 |
| 1993 | 3,473 | 3,405,000 | 150 | 408.49 | 419.51 | 948 | 575 | 1,950 |
| Average | 3,525 | 3,048,967 | 119 | 389.05 | 513.28 | 850 | 592 | 2,081 |
| 1995 | 7,079 | 3,743,200 | 324 | 768.73 | 1,365.27 | 1,728 | 1,100 | 4,251 |
| 1996 | 6,970 | 3,344,100 | 276 | 703.73 | 1,520.27 | 1,564 | 1,064 | 4,342 |
| Average | 7,024.5 | 3,543,650 | 300 | 736.23 | 1,442.77 | 1,646 | 1,082 | 4,296.5 |
| 1997 | 5,596 | 4,260,000 | 274 | 576.91 | 1,051.09 | 1,315 | 890 | 3,391 |
| 1998 | 4,071 | 5,122,000 | 234 | 494.17 | 717.83 | 1,066 | 590 | 2,415 |
| Average | 4,833.5 | 4,691,000 | 254 | 535.54 | 884.46 | 1,190.5 | 740 | 2,903 |

Source: FAO Trade Yearbook, Department of Commerce, U.S. Census Bureau and Office of Economic Statistic.

Note: Thai and Indonesian NR export to the U.S. are underestimated , due to data availability. Data included only latex, smoked sheets and technically specified NR, excluded other. Data in 1994 was not completed to be calculated.

**Table 5** CMS analysis of NR export from Thailand.

Unit: million US$

| Period | Actual export growth | CMS decomposition | | | |
|---|---|---|---|---|---|
| | | (1) Standard growth effect | (2) Commodity growth effect | (3) Market growth effect | (4) Competitive effect |
| 1995-1997 compared to 1991-1993 | 425.91 | 118.27 | 170.50 | -30.39 | 167.54 |
| 1997-1998 compared to 1995-1997 | -125.35 | -93.57 | 14.41 | -10.44 | -35.75 |

1996 compared to those of 1991-1993 show an export increase. Three out of four components of change, namely, standard effect, competitive effect and commodity effect moved in the same direction, making an actual export growth at $425.91 million. By contrast, for the period between 1997 and 1998 compared to the period between 1995 and 1996 show that the growth rate is decomposed into 1) a standard growth effect of −$93.57 million 2) market effect of −$10.45 million 3) competitive effect of −$35.75 million 4) commodity effect of $14.41 million. The actual growth drops to about-$125.35 million. These results indicate that a decline of growth of Thai NR in the world in the period 1997-1998 can be attributed to the standard growth effect, market effect and competitive effect.

## CONCLUSION

Using RCA technique, the paper revealed results that Thailand has less comparative advantage than Indonesia in natural rubber export to the U.S. market. Similarly, using CMS model showed that comparing the period 1997-1998 to 1995-1996, Thailand experienced negative actual export growth which mainly came from standard growth effect, market effect and competitive effect. It implies that eventhough Thailand is a major natural rubber exporter of the world, Thailand faced a high competitive market.

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