The protection coefficients worked out in the previous chapter indicate the relative incentives among the commodities and across the years. It is not the absolute prices that matter, but the relative prices of commodities that reveal the potential incentive of an activity. In fact, the relative incentives accorded to a particular commodity have implications for efficiency of its production. On the other hand, the measures of comparative advantage show the relative efficiency, which have implications for incentives. The protection/incentive indicators are per se of little use for making policy considerations to promote an economic activity. Once the incentive structure of a sector is known, it is equally important to know how the incentives promote efficiency in production. Thus, the coefficients of protection and measures of comparative advantage are complementary as policy making combine the considerations of both incentives and efficiency (Tsakok, 1990). The efficient production of tradable goods helps the country to identify the thrust areas in which investment and policy decisions on trade can be taken to exploit the global differences in product and factor demand and supply. The country has comparative advantage in the production of a commodity, if that production is efficient, if not it has comparative disadvantage. Comparative advantage guides the reallocation of resources into an efficient activity from the inefficient production.

This chapter focuses on measuring comparative advantage of Indian dairy products. The chapter is organized into the following sections. The next section reviews the recent developments in
theoretical work on quantifying comparative advantage. The subsequent section presents the empirical results of comparative advantage of Indian dairy products. The last section analyzes factors influencing the comparative advantage of dairy products in India.

6.1. Theoretical Review on Measurement of Comparative Advantage
Comparative advantage is an important concept focal to the international trade theories. Several researchers attempted to quantify the international differences in comparative advantage through various methods. Often, these methods failed to prove their theoretical properties through empirical studies. Consequently, the old measures were invalidated and the new alternative measures started emerging. The debate for finding an appropriate method with proven properties to measure comparative advantage of the commodity pattern across countries is still continued in the literature. This section reviews the theoretical attempts undertaken to quantify the comparative advantage.

The very earliest theory of international trade can be traced to the work of Adam Smith. According to Adam Smith’s Absolute Advantage theory, one country has an absolute advantage over the other in one line of production and the other country has an absolute advantage over the first country in the other line of production. That is, a country will export a good when it is the lowest cost of producer of that good, and import that good when it is the highest cost of producer of the good. David Ricardo, who refined the notion of comparative advantage, argued that even if the countries did not have absolute advantage in any line of production over the others, international trade would be beneficial, bringing gains from trade to all the participating countries. He contended that it is not the prices of individual goods that matter, but the differences in the prices of one good relative to another.
determine the trade between the countries. Assuming two countries and two commodities model, one country has comparative advantage in the production of one of the two goods, while the second country has a comparative advantage in the production of the other, so long as the two countries’ opportunity cost for one good differ. Though, it is easy to understand that the countries producing goods relatively cheaper than their trading partner would export them, but the interpretation of comparative advantage is quite complex. Because, in real world situation the relative autarkic prices of different goods is unobservable and cannot match with the actual trade flows. The international trade itself changes the prices of goods and services.

However, Ricardo gave an explanation for cost differences in the production of goods and services between the countries. According to him, the differences in relative costs between the countries are due to differences in efficiency of resource use, which is measured by productivity of labour. Another set of theories also emerged offering the differences in the factor costs as the explanation for the relative cost difference in the production of goods between the countries. The Heckscher-Ohlin model views the cause of international trade as the difference in the factor endowment between the trading countries. That is, the international differences in the supply of factors of production determine the comparative advantage of countries. Considering capital and labour as the factors of production, the capital rich country would export the capital-intensive goods, while the labour abundant country would export labour-intensive goods. Heckscher-Ohlin model was further extended to incorporate other factors like technology to explain the relative cost difference between the countries.
Besides inter-industry trade, intra-industry trade models were also developed to explain the situation why the countries simultaneously export and import the same products. Many scholars predicted that some form of product differentiation either in terms of quality or simply different varieties of the same product are the causes of intra-industry trade between the countries (Krugman, 1979; Lancaster, 1980; Falvey, 1981; Brander and Krugman, 1983).

It is clear from the above discussion that the theoretical concept of comparative advantage is based on pre-trade relative prices, which are not observable in post trade equilibria. The empirical researchers, however, confront with the data generated by the post-trade environment. If comparative advantage is to be measured empirically, it should be measured indirectly using post-trade measures, which may have direct relation with autarkic events. In fact, Hillman (1980) established that there is an exact relation between comparative advantage as indicated by pre-trade relative prices and the observed trade pattern. This relation between the comparative advantage and pre-trade relative prices is given by the direction of trade, with an economy exporting a good that would be relatively cheaper domestically in an autarkic equilibrium. Based on this premise, a number of measures have been used in empirical studies to quantify the comparative advantage. Though there is plethora of measures available now, only the popular indices of comparative advantage are reviewed here.

The early attempt to measure the comparative advantage was made by H. H. Liesner in 1958. Based on post-trade data, Liesner (1958) used relative export performance index as an indicator of comparative advantage to assess the possible effects of entry into the
European Common Market on British Industry. He developed a composite index based on relative export levels and relative export growth between Britain and countries of European Community for 60 manufactured products during the period 1953-56. The composite index was approximated as bilateral comparative advantage between Britain and European countries.

Balassa (1965) extended the Liesner’s methodology to analyse the enduring effects of trade liberalization following the Kennedy- round of GATT. Balassa contended that comparative advantage is the outcome of number of factors, some measurable, others not, some easily pinned down, others less so. Observing the difficulties to explain the actual trade flows by applying the general principles of theory, Balassa suggested “Revealed Comparative Advantage (RCA)” based on observed trade pattern. On the assumption that the commodity pattern of trade reflects relative costs as well as differences in non-price factors, the revealed comparative advantage indicates the relative trade performance of individual countries in particular commodities.

Initially, Balassa introduced two measures of comparative advantage namely relative export shares and export-import ratios. Later, he rejected the export-import ratios on the grounds that it is biased by the degree of protection prevailing across the countries. In fact, Balassa’s contention was that the assumption of the uniformity of tastes and uniform incidence of duties is not fulfilled in the real world. Inter country differences in tastes as well as inter industry disparities in the degree of protection affect the imports (Balassa, 1965; Balassa, 1977). Thus, greater weight was given to export performance than to export-import ratios. Revealed comparative advantage based on relative export shares was obtained by dividing a country’s share in the exports
of a given commodity category by its share in the combined exports of manufactured goods of the countries under consideration. The normalized relative export share is expressed as follows.

\[ RCA_i = \left( \frac{x_i}{X_w} \right) \left( \frac{X_i}{X_w} \right) \]

where \(X\) refers to exports, \(i\) is a country, \(j\) is a commodity, \(t\) is total exports and \(w\) represents world.

The Balassa index has been widely used in empirical research to assess the commodity pattern of comparative advantage across the countries (Yeats, 1992; Amity, 1999; Kaitila, 1999; Moyi and Kimuyu, 1999; Richardson and Zhang, 1999; Proudman and Redding, 2000; Ferto and Hubbard, 2002; Ferto and Hubbard, 2003; Klasra and Fidan, 2004; UNDP, 2004).

Besides Balassa’s index, there are two more trade only indices of comparative advantage (Ballance et al, 1987). One developed by UNIDO (1982) and the other by Dangers and Riedel (1977). These indices are indicators of inter and/or intra-industry trade. They can be expressed as follows.

**UNIDO index**

\[ \frac{T_i}{XM_i} = \frac{T_i}{X_i + M_i} \]

**Dangers and Riedel index**

\[ D - R_i = \left( \frac{T_i}{X_i + M_i} \right) \left( \frac{T_i}{X_i + M_i} \right) - 1 \cdot \text{sign} T_i \]

Where \(T\) is net trade \((X - M)\), \(t\) is total of all manufactured products.

Both of these indices are not popular among the researchers and are not used extensively in empirical studies. In fact, they are not considered as measures of comparative advantage, as both focus on a
single commodity and thus, do not fulfill the contrasting dimensions inherent in the principle of comparative advantage (Vollrath, 1991). Further, the impact on trade and welfare enhancing inter and/or intra industry trade is not clear.

Meanwhile, Kunimoto (1977), using probabilistic framework provided a basis to evaluate the validity of trade intensity measures. He suggested using only indices that could be interpreted as the measure of "actual to expected trade". To give an economic interpretation to this concept, Kunimoto developed a "Geographical Intensity Index" focusing trade between two countries.

Bowen (1983) criticized the theoretical basis of Balassa's index of revealed comparative advantage. He contended that Balassa’s index is based only on exports when comparative advantage is properly a net trade concept. The index implicitly assumes that "a country exports every commodity and the value of index above (below) unity cannot be used to infer a country’s relative advantage (disadvantage) in any given commodity". Because of this method's failure of the theoretical framework, Bowen developed an alternative measure of revealed comparative advantage using two indices- "net trade intensity" index and "production intensity" index. These indices have been derived based on the relationship between a country's production, consumption and trade in a commodity to what would exist in a hypothetical neutral comparative advantage world. Bowen's alternative measure of revealed comparative can be expressed as follows.
\[ I_{ij}^T = (I_{ij}^Q - 1) \]

Where, \( I_{ij}^T = T_{ij} / (Y_i / Y_w)Q_{jw} \) is net trade intensity index

\[ I_{ij}^Q = Q_{ij} / (Y_i / Y_w)Q_{jw} \] is net production intensity index

\( T \) is net trade, which is difference between domestic production and domestic consumption

\( Q_{ij} \) is domestic production

\( Y \) is gross national product

Bowen’s alternative measures of comparative advantage are not devoid of theoretical difficulties. Bowen’s proposed definition of revealed comparative advantage has some conceptual problems. Vollrath (1991) argued, “Bowen’s claim to represent comparative advantage through net trade, was a focus on absolute advantage rather than relative advantage, which was clearly an inappropriate emphasis when referring to theoretical concept of comparative advantage”. Vollrath questioned the validity of the index for other reasons like the assumption of identical and homothetic preferences, neutralization of demand or supply determinants of comparative advantage and the neglect of aggregation phenomenon. Based on the cross-country regression analysis Ballance et al (1985) also rejected the applicability of Bowen’s homothetic preference hypothesis, thus invalidating his alternative measures of comparative advantage.

Vollrath (1991) proposed a concept called “revealed competitive advantage” on the basis of analysis of trends in international competitiveness in agriculture in his earlier studies. He introduced three global trade intensity measures namely relative trade advantage (RTA), relative export advantage (RXA) and revealed competitiveness
Keeping the essence of Balassa's index of relative comparative advantage, these indices take into account a country's exports as well as imports relative to the rest of world's export and import a particular commodity under neo-classical framework. These indices can be summarized as follows.

\[
RTA_u = \frac{(x_u / x_u)}{(X_J / X_J)} - \frac{(M_J / M_J)}{(M_J / M_J)}
\]

\[
RXA_u = \ln \left( \frac{(x_u / x_u)}{(X_J / X_J)} \right)
\]

\[
RC_u = \ln \left( \frac{(x_u / x_u)}{(X_J / X_J)} \right) - \ln \left( \frac{(M_J / M_J)}{(M_J / M_J)} \right)
\]

Where, \( r \) refers to the world minus country \( i \), while \( t \) refers to all traded commodities minus commodity \( j \) and \( M \) is imports.

The relative trade advantage (RTA) index comprises two components namely relative export advantage and relative import advantage. The \( RXA \) is the logarithm of relative export advantage only, while the \( RC \) is the logarithm of both the indices. Vollrath's relative export advantage is simply the Balassa's index, however the former differs from the latter on the following respects. (i) Since, the indices make distinction between a specific commodity and all other commodities, and between a specific country and the rest of the world, they eliminate country and commodity double counting in world trade. And (ii) as they take into account all the traded products and all the countries, the indices are global in nature.

Vollrath’s revealed competitive advantage measures have been used in empirical studies to measure comparative advantage (Bender and Li, 2002; Ferto and Hubbard, 2002; Ferto and Hubbard, 2003). However, Vollrath’s global trade intensity indices have some limitations. Vollrath contended both Liesner and Balassa's index is restricted in terms of commodity and country coverage and excluded low and
medium income countries, agricultural goods and non-factor services. As a result, besides a country's export value of a particular commodity he also takes into account import data. But, in today's world of agriculture, imports are still heavily protected with tariffs, subsidies, quota etc. Vollrath himself noted that both RTA and RC are more susceptible to policy-induced distortions than RXA. Further, Vollrath took logarithm of relative export advantage to overcome the asymmetric problem of Balassa's measure of comparative advantage. But, the index is not defined when a country's exports of a sector is zero.

Dalum et al (1998) argued that Balassa's revealed export advantage index is asymmetric and the use of which in the econometric analysis results in biased estimates. He suggested that Balassa index should be made symmetric, because the RCA is not comparable on both sides of unity as it varies from one to infinity if a country has comparative advantage in a product groups and from zero to one for the those if the country has comparative disadvantage in it. Because of this asymmetry problem, the mean of the index tend to be higher than median, thus resulting in the skewed distribution of the index towards right. This leads to overstating the relative weight of sectors with value of index greater than one when compared to the sectors with the value of index less than one (Dalum et al, 1998; Laursen, 1998). To overcome this problem Dalum et al proposed an alternative index called "Revealed Symmetric Comparative Advantage (RSCA)."

\[ RSCA_y = \frac{(RCA_y - 1)(RCA_y + 1)}{RCA_y} \]

The value of RSCA ranges from -1 to +1 and avoids the problem of zero values. This measure gives same weight for the changes in the value of Balassa index above unity and below unity. This measure has
recently been used by Laursen (1998) to analyse the comparative advantage of manufactures among 19 OECD countries and by Ferto and Hubbard (2004) who studied the changing pattern of Central European agri-food exports to the EU.

**Comparative Advantage of Indian Dairy Products**

It is clear from the theoretical review on measurement of comparative advantage that it can be measured at the global level, regional or sub-regional level or as bilateral trade between two countries or trading partners. This section analyses the comparative advantage of Indian dairy products. In this study, Balassa's revealed comparative advantage (RCA) and its improved version of revealed symmetric comparative advantage (RSCA) are applied. As discussed in the previous section, though Balassa index has some difficulties, yet the index is robust and is not very sensitive to growth and business cycle differences across the trading partners (Richardson and Zhang, 1999). The comparative advantage of Indian dairy products relative to SAARC (South Asian Association of Regional Cooperation) region as a unit and at the global level is analyzed for the period 1990 to 2003. SAARC comprises seven countries viz., Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. These countries are treated as one unit to assess the comparative advantage of India's dairy products in the region as a whole. The total export value of agricultural products is used as the denominator to calculate the export share.

An attempt has been made to study the factors that might be influencing the pattern of RCA changes overtime. Unlike the conventional variables like factor productivity in Ricardian model and factor abundance in Heckscher-Ohlin model that determine the country's exports, the factors that influence the comparative advantage
at the commodity specific levels are quite different. To examine the factors affecting comparative advantage, the idea of opportunity cost should be brought in to the producer decision-making framework (Kendrick, 1990). The producer's decision to undertake one form of enterprise or another depends on among other variables, the factor abundance and factor cost. Thus, the proposed model should reflect the producer's choice in allocating resources to or away from milk production. The variables selected should represent a range of alternative activities that the milk producer might face. Accordingly, the following model has been proposed to analyze the factors that influence the RCA of Indian dairy products. The alternative activities to milk production considered are meat, eggs, rice and wheat production. Additionally, an exogenous variable, the percent industry value added to GDP is included in the model. This variable accounts for growth and the relative size of non-agricultural sector or the relative levels of industrialization in the country.

\[
RSCA_{dairy} = \beta_0 + \beta_1 Meatpro + \beta_2 Eggpro + \beta_3 Ricepro + \beta_4 Wheatpro + \\
\beta_5 VAGDP + \epsilon,
\]

Where, \(RSCA_{dairy}\) is the SAARC revealed symmetric comparative advantage index

- \(Meatpro\) is the total annual meat production
- \(Eggpro\) is the total egg production
- \(Ricepro\) is annual rice production
- \(Wheatpro\) is annual meat production
- \(VAGDP\) is the percent industry value added to GDP
- \(\epsilon\) is the error term

FAOSTAT (Food and Agricultural Organization Statistics) forms the database for calculating the indices of RCA. RCA of India was
calculated for three major products namely milk powder, butter and cheese and curd. A mapping was done to make aggregation into these products. For instance, the aggregate milk powder was obtained by summing seven product lines. Basic Animal Husbandry Statistics published by Ministry of Agriculture provides all India production data on meat and eggs. Rice and wheat production data were compiled from Agricultural Statistics at A Glance. The industry value added and GDP data were collected from National Accounts Statistics published by Central Statistical Organization.

6.2. Revealed Comparative Advantage of Indian Dairy Products

Table 6.1. Revealed Comparative Advantage of India’s Dairy Products in SAARC Region

<table>
<thead>
<tr>
<th>Year</th>
<th>Milk Powder</th>
<th>Butter</th>
<th>Cheese and Curd</th>
<th>Milk Powder</th>
<th>Butter</th>
<th>Cheese and Curd</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>0.51</td>
<td>0.82</td>
<td>0.59</td>
<td>-0.32</td>
<td>-0.10</td>
<td>-0.26</td>
</tr>
<tr>
<td>1991</td>
<td>1.52</td>
<td>0.79</td>
<td>0.12</td>
<td>0.21</td>
<td>-0.12</td>
<td>-0.78</td>
</tr>
<tr>
<td>1992</td>
<td>0.65</td>
<td>1.31</td>
<td>0.00</td>
<td>-0.21</td>
<td>0.14</td>
<td>-1.00</td>
</tr>
<tr>
<td>1993</td>
<td>1.13</td>
<td>1.03</td>
<td>0.23</td>
<td>0.06</td>
<td>0.02</td>
<td>-0.63</td>
</tr>
<tr>
<td>1994</td>
<td>1.20</td>
<td>1.12</td>
<td>0.17</td>
<td>0.09</td>
<td>0.06</td>
<td>-0.70</td>
</tr>
<tr>
<td>1995</td>
<td>1.10</td>
<td>1.09</td>
<td>0.11</td>
<td>0.05</td>
<td>0.04</td>
<td>-0.79</td>
</tr>
<tr>
<td>1996</td>
<td>1.05</td>
<td>1.10</td>
<td>0.82</td>
<td>0.03</td>
<td>0.05</td>
<td>-0.10</td>
</tr>
<tr>
<td>1997</td>
<td>1.05</td>
<td>0.43</td>
<td>0.57</td>
<td>0.02</td>
<td>-0.39</td>
<td>-0.27</td>
</tr>
<tr>
<td>1998</td>
<td>1.24</td>
<td>1.18</td>
<td>0.82</td>
<td>0.11</td>
<td>0.08</td>
<td>-0.10</td>
</tr>
<tr>
<td>1999</td>
<td>1.43</td>
<td>1.26</td>
<td>0.36</td>
<td>0.18</td>
<td>0.12</td>
<td>-0.47</td>
</tr>
<tr>
<td>2000</td>
<td>1.41</td>
<td>1.27</td>
<td>0.94</td>
<td>0.17</td>
<td>0.12</td>
<td>-0.03</td>
</tr>
<tr>
<td>2001</td>
<td>1.36</td>
<td>0.66</td>
<td>1.23</td>
<td>0.15</td>
<td>-0.20</td>
<td>0.10</td>
</tr>
<tr>
<td>2002</td>
<td>1.30</td>
<td>1.29</td>
<td>1.26</td>
<td>0.13</td>
<td>0.13</td>
<td>0.11</td>
</tr>
<tr>
<td>2003</td>
<td>1.05</td>
<td>1.07</td>
<td>1.08</td>
<td>0.02</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Mean</td>
<td>1.14</td>
<td>1.03</td>
<td>0.59</td>
<td>0.05</td>
<td>-0.003</td>
<td>-0.35</td>
</tr>
<tr>
<td>CV (%)</td>
<td>21.83</td>
<td>25.45</td>
<td>73.51</td>
<td>30.747</td>
<td>-5458.30</td>
<td>-107.47</td>
</tr>
</tbody>
</table>

The commoditywise RCA of India was examined relative to the SAARC market as well as the world market for the period 1990 to 2003. Table 6.1 provides the Balassa’s index of RCA and its alternative version of RSCA. The RCA of a commodity greater than one indicates that India
is efficient in exporting that commodity in the South Asian market. India has revealed comparative advantage in milk powder and butter. The comparative advantage appears to be relatively stronger in milk powder than butter over the period of time. Except 1990 and 1992, the value of RCA for milk powder was greater than one. Compared to early nineties, the comparative advantage gained strength during late nineties and then started weakening during recent periods. India had comparative disadvantage in butter during 1990 and 1991 and thereafter it disappeared, but again lost its revealed comparative advantage during 1997 and 2001. The mean value of RCA of butter for the entire period was greater than one indicating that by and large, India was efficient in exporting butter to SAARC countries market. The relatively low value of coefficient of variation for milk powder and butter indicates that the index is relatively stable during the periods under study. The value of RCA for cheese and curd was less than one till 2000, revealing that India had stable comparative disadvantage till that year. However, it gained revealed comparative advantage in the export of cheese and curd in the market of SAARC countries from the year 2001 onwards.

The RSCA index also shows the same pattern in the distribution of comparative advantage of dairy products as RCA. The positive value of RSCA for a commodity indicates that the country has comparative advantage, while the negative value indicates country's comparative disadvantage in that product. The increasing positive value of RSCA for milk powder during late nineties suggests that India is gaining specialization in milk powder. A contrasting result of RSCA from RCA is that the mean value of RSCA of butter for the entire period under study was below unity. It shows that, India has by and large, comparative disadvantage in the export of butter. However, the mean value appears
to be very small to arrive at such conclusion. Moreover, a high positive correlation between the productwise RCA and RSCA indicates that both the indices are consistent and reveal the same pattern of comparative advantage or disadvantage of India's milk products over the period of time.

Table 6.2. Revealed Comparative Advantage of India's Dairy Products in the World Market

<table>
<thead>
<tr>
<th>Year</th>
<th>Balassa Index (RCA)</th>
<th>RSCA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Milk Powder</td>
<td>Butter</td>
</tr>
<tr>
<td>1990</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>1991</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>1992</td>
<td>0.02</td>
<td>0.06</td>
</tr>
<tr>
<td>1993</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>1994</td>
<td>0.17</td>
<td>0.08</td>
</tr>
<tr>
<td>1995</td>
<td>0.05</td>
<td>0.04</td>
</tr>
<tr>
<td>1996</td>
<td>0.01</td>
<td>0.04</td>
</tr>
<tr>
<td>1997</td>
<td>0.03</td>
<td>0.02</td>
</tr>
<tr>
<td>1998</td>
<td>0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>1999</td>
<td>0.09</td>
<td>0.13</td>
</tr>
<tr>
<td>2000</td>
<td>0.18</td>
<td>0.17</td>
</tr>
<tr>
<td>2001</td>
<td>0.34</td>
<td>0.15</td>
</tr>
<tr>
<td>2002</td>
<td>0.21</td>
<td>0.16</td>
</tr>
<tr>
<td>2003</td>
<td>0.12</td>
<td>0.13</td>
</tr>
<tr>
<td>Mean</td>
<td>0.10</td>
<td>0.08</td>
</tr>
<tr>
<td>CV (%)</td>
<td>100.61</td>
<td>68.70</td>
</tr>
</tbody>
</table>

The pattern of revealed comparative advantage of India's dairy products in the world market is completely different from the one analyzed above. Both Balassa index and RSCA of India's dairy products is presented in the Table 6.2. India has relatively global revealed comparative disadvantage in all the three dairy products under considerations. The value of RCA was less than one for milk powder, butter and cheese and curd during the entire period of study. This shows that India is not the efficient competitor of milk products in the world market. India's revealed comparative disadvantage of milk powder
and butter in the world market, however, is weakening during the recent periods. India is not at all having relative comparative advantage for cheese and curd in the world market.

The RSCA index also shows the pattern of relative comparative advantage of India’s milk products in the world market. As discussed above, RSCA also suggest that the comparative disadvantage for milk powder and butter is weakening in recent periods. The low value of coefficient of variation indicates that RSCA index is relatively stable over the period of time. The commoditywise global RCA and RSCA are highly correlated implying that both the indices are consistent overtime.

6.3. Factors Influencing the Changing Pattern of Comparative Advantage

The estimated regression model to examine the factors affecting the changing pattern of revealed comparative advantage is given below. The model takes into account the possible alternative activities that the milk producer might face to reallocate his resources based on the opportunity cost principle, however, there is no justification to suggest that these variables are the complete ones. The model was corrected for serial correlation and multicollinearity.

\[
RSCA_{\text{dairy}} = -5.85 - 0.007 \text{Meatprot} + 0.006 \text{Eggprot} - 1.37 \text{Riceprot} + 0.75 \text{Wheatprot} - 5.49 \text{VAGD}
\]

\[
\begin{align*}
(-0.10) & \quad (-0.33) & \quad (1.67^*) & \quad (-1.86^*) & \quad (1.15) & \quad (-1.87^*)
\end{align*}
\]

\[R^2 = 0.79\]

(Figures in parenthesis represent ‘t’ values)

* significant at 10 per cent level

The results of the estimated equation show that meat production affects the revealed comparative advantage of dairy products in SAARC region. However, the magnitude of the coefficient of meat production is
very small to reduce the RCA of dairy products and it is also not statistically significant. The independent variables in the model explain about 79 per cent of total variation in RCA of dairy products. The estimated results indicate that there is trade off between milk production and rice production. The increase in rice production reduces the value of revealed comparative advantage of milk products. That is, the producers have greater opportunity cost associated with their decision to produce milk. The regression coefficient of rice production is statistically significant at 10 per cent level. Egg production and wheat production do not affect the RCA of India's dairy products. However, these results are to be interpreted in a broader context of varying regional differences in cropping pattern, dominance of a particular type of livestock enterprises, market access, relative risk factor etc. The coefficient of the percent industry value added to GDP is negative and statistically significant at 10 per cent level. This shows that there is an inverse relationship between the revealed comparative advantage of milk products and the level of industrialization.

6.4. Implications of RCA of Dairy Products
The results of the analysis show that India has revealed comparative advantage to export milk powder and butter in the SAARC countries. However, the values of RCA are quite fluctuating over the period of time. Though, the values of RCA are increasing during recent periods, yet, on the whole India has comparative disadvantage in cheese and curd export to the South Asian countries market. The values of the revealed comparative advantage relative to the world market are different from the SAARC market. India has global revealed comparative disadvantage in the export of all the products under consideration. RSCA index also reveals the same pattern of comparative disadvantage as RCA.
It can be understood from the analysis of previous chapter that the dairy production at the farm level is efficient, while the production of dairy manufactured products at the processing is inefficient which has major bearing on the comparative cost advantage. It is also evident from the previous studies that the technical efficiency at the products manufacturing level is less than unity indicating that the resources are not used efficiently (Singh et al, 2000). However, it needs to be further investigated whether dairy products factories achieved technological progress overtime. There is also a contention that trade liberalization induces productivity growth in manufacturing industries due to flow of capital, new technology etc. The relation between trade liberalization and productivity growth are examined in the next chapter.