Competitiveness and Trade Performance of India's Dairy Industry

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ABSTRACT

The study investigates the pattern, trends, competitiveness, and determinants of the export of dairy products from India—the world's largest milk producer. Data show that exports of dairy products from India have witnessed a remarkable growth in recent years. Our estimates also establish that India has price competitiveness and comparative advantage in the production of milk. Some instability is observed in the export markets of Indian dairy products, as notably shown by the high probabilities of Bangladesh and the UAE to gain market shares from the other importers of Indian dairy products. Furthermore, the results indicate that dairy export from India is elastic to the world market size, price divergence, exchange rate, and trade policy. Based on the findings, it is recommended that India focus on improving the quality of its dairy products to get a premium price in the world market.

Keywords: India, dairy, quality competitiveness, Markov chain model, domestic resource cost
JEL Classification: Q17, F14, C22

INTRODUCTION

India is the world's largest producer of milk; its 2011 production of 127.9 million tons accounts for 17 percent of the world's total milk production. Export of dairy products from India has been becoming increasingly important for the food-deficit developing countries (Verma et al. 2012). India is the largest net exporter of dairy products in Asia. It is widely known that to promote domestic production, the Indian dairy industry was protected from cheap subsidized imports of dairy products (milk powder and butter oil) through various strategies such as import-substitution, quantitative restrictions, and canalization of imports and exports. With the establishment of the World Trade Organization (WTO), the trade liberalization policy has gained greater momentum and the WTO-related compliances have induced India (a founding member of the WTO) to reduce quantitative restrictions on imports (Ohlan 2010). In the new import-export policy announced in April 2000, the Union Government allowed the free import and export of most dairy products. Milk and other dairy products thus became freely importable from 1 April 2001 following the withdrawal of quantitative restrictions (QRS) by the government under the Indo-US Agreement on Removal of QRS.

The Indian dairy industry has the potential to increase the volume of its production and export because the country is the largest producer of milk and is well endowed with natural resources necessary to increase the dairy production (World Bank 2011). In terms of cost of milk production, India is a competitive producer (Ohlan 2012a). The country has also a locational advantage with respect to access to the Asian markets, which are the net importers of dairy products. However, the milk yield of 6.8 kilograms per day for crossbred cow in India in 2010–2011 was far below that of other leading producers.

With improved domestic production and marketing efficiency, enhanced competitiveness, and better access to the expanding world market, India has the potential to augment its export of dairy products. Nonetheless, there is still much to gain from further improvements in market conditions. Besides, concerns have also been raised about the necessity to improve and expand supply capacity to augment the dairy export from India. Thus, a deeper knowledge of the determinants of the export performance of the dairy industry in India would contribute toward designing the future dairy export marketing strategy. It is imperative to assess the pattern and competitiveness of the export of dairy products from India and to identify the ways and means of overcoming the problems.

A few studies have attempted to assess the price competitiveness of the Indian dairy industry, and have come up with mixed results. For instance, Rajarajan, Kumar, and Singh (2007) found that Indian dairy products, namely ghee (a class of clarified butter), skim milk powder, and whole milk powder were competitive during the post-liberalization period (i.e., 1992–2001) and un-competitive during the pre-liberalization period (i.e., 1982-1991). Rakotoarisoa and Gulati (2006), Jha (2003), Elumalai and Sharma (2008) and Kumar, Rai, and Choudhary (2011) reported that Indian dairy products lacked export competitiveness during both the pre- and post-liberalization periods. On the other hand, Sharma and Datta (2001) found that the Indian dairy industry was globally competitive.

From the relevant literature, we observed that the generic issues related to the international marketing of dairy products, future dairy self-sufficiency, and net trade of Indian dairy industry were yet to be addressed. These included the following:

1. To what extent is the loyalty of the importers of India's dairy products?

2. Which are India's most reliable export markets?
3. Has India diversified its dairy products' export markets?
4. What factors affect the export demand for Indian dairy products?
5. Has India acquired quality competitiveness in the export of dairy products?
6. Does India have comparative advantage in the export of dairy products?
7. How can the competitiveness of the Indian dairy industry be enhanced in a fast globalizing world to benefit the incomes of milk farmers?

In the present study, we seek to answer these questions. The main aim of our study is to investigate the prospects for increasing the volume of export of dairy products from India. The specific objectives of our study are:

1. To investigate the export performance of the Indian dairy industry;
2. To analyze the dynamics of changes in the export of dairy products from India;
3. To determine India's comparative advantage in dairy products; and
4. To estimate the exports demand function for the Indian dairy industry.

The remainder of the study is organized as follows. Section 2 describes the methods of analysis used in the study and mentions the sources of data. The empirical results and discussion are presented in section 3. The final section summarizes the main findings of the study and offers policy implications for speeding up the growth of dairy exports from India.

METHODOLOGY

To quantify the changes in direction of dairy export from India, we use the first-order finite Markov chain model. The validity of the results of the model is verified using the chi square ($\chi 2$) test. The trends in the degree of diversification in dairy export are examined using the Herfindahl Index. The export demand function in the log-linear form is estimated using the multiple regression analysis for a period of 50 years, 1961–1962 to 2010–2011. India's comparative advantage in milk production is worked out using the standard measure (i.e., the domestic resource cost ratio).

During the last two decades, India's dairy export surplus and unit value export have grown significantly. So, the unit export value is used as an indicator of quality.[1] Accordingly, the quality of Indian dairy products is measured by comparing India's unit export value with that of the world average. An attempt is also made to assess the price competitiveness of Indian dairy products using the nominal protection coefficient measure. A brief introduction of the methods of analysis used in the study is in order.

Direction of Trade

In order to get a better approximation of the loyalty of importers of Indian dairy products, we use the Markov chain model. Following Dent (1967), the changes in shares of countries importing Indian dairy export are predicted using the first-order finite Markov chain model. Other examples of its uses include those by Kemeny and Snell (1982), Dardis and Prem

1 Aiginger (1997) proposes an easy way to split industries into those where the unit value (UV) predominantly signals costs and those where it signals quality. If a low unit value of export (exp) leads to a quantity (Q) surplus (UV exp < UV imp → Q exp > Q imp and vice-versa) then it is revealed that the cost side dominates, since the economic theory tells us that most goods are price-elastic. If a high unit value leads to a quantity surplus (UV exp > UV imp → Q exp > Q imp and vice-versa), then demand is dominated by quality, since the economic theory tells us that prices can be higher for a good, only if the market is vertically differentiated and one firm concentrates on the higher quality segment.

(1992), Azzam and Guest (1993), Burton (1997), Kilmer and Hahn (1978), Atkin and Bladford (1982), and Zimmermann and Heckelei (2012). It is a stochastic process that has specific features such as: (1) the finite number of possible states, (2) the random nature of the process, (3) the condition that the outcome of this period is affected only by the previous period's outcome, and (4) the stationary condition. The model may be expressed algebraically as follows:

$$E_{jt} = \sum_{i=1}^{r} E_{it-1} P_{ij} + e_{jt} \quad (1)$$

where:
E_{jt}=export of dairy products from India during the period t to jth country,
E_{it-1}=export to ith country during the year t–1,
P_{ij}=probability that export will shift from ith country to jth country,
e_{jt}=error term, which is statistically independent of e_{jt-1}, and
r=number of importing countries.

Transitional probabilities P_{ij}, which can be arranged in a (c × r) matrix, have the following properties: $0 \leq P_{ij} \leq 1$ and $\sum_{i=1}^{r} P_{ij} = 1$ for all i. Thus, the estimated share of each country during the period t may be obtained by multiplying the export of those countries in the previous period (t–1) with the transitional probability matrix.

The transitional probability matrix is estimated in a linear programming framework by applying the mean absolute deviation method in which the objective function is to minimize the sum of absolute errors, subject to the constraints of the equation, the row sum condition, and the non-negativity condition. It is as follows:

$$\min OP^* + \frac{1}{r(n-1)} I_e \quad (2)$$

subject to $XP^* + e = Y$, $GP^* = 1$, $P^* \geq 0$,

where:
P^*=vector of the probabilities P_{ij},
0=vector of zeros,
I=identity matrix,
e=vector of absolute errors,
Y=vector of export of each county,
X=a block diagonal matrix of lagged values of Y,
G=a grouping matrix to add the row elements of P^* to unity,
n=number of time periods considered for the analysis,
r=number of importing countries.

To test whether the observed shares of different dairy product importers and the estimated shares from the Markov chain model follow similar distributions, we apply the $\chi 2$ test (Kendall and Stuart 1963).

Degree of Diversification

The Herfindahl Index (HI) is used in this study to measure the degree of diversification based on the shares of various importing countries in India's total dairy products export at a point of time. The index is computed by taking the sum of the squares of the proportion of each importing country (Hirsch and Lev 1971). Algebraically,

$$HI = \sum_{i=1}^{n} P_i^2 \quad i = 1,2,\ldots,n. \quad (4)$$

where:
P_i=proportion of ith country in India's total dairy export, and
n=number of all importing countries.

Nominal Protection Coefficient

The nominal protection coefficient (NPC) is a simple device for measuring the competitiveness of a commodity in the world market. It is the ratio of the domestic price to the world reference price of the commodity under

consideration. The NPC helps in measuring the divergence of the domestic price from the world reference price and thus determines the degree of domestic protection/un-protection of the commodity in question (Rakotoarisa and Gulati 2006; Ohlan and Vedpal 2006; Ohlan 2010). It is defined as:

$$NPC_i = \frac{P_i^d}{P_i^w} \quad (5)$$

where:

NPC_i=nominal protection coefficient of the commodity i,

P_i^d=domestic price of the commodity i, adjusted for transportation, handling, and marketing expenses,

P_i^w=world reference price of the commodity i, adjusted for transportation, handling, and marketing expenses.

If the value of NPC is greater (lesser) than unity, then the commodity is protected (un-protected), unlike what would be obtained in a free-trade scenario. The value of NPC that is less than unity indicates that the domestic price is less than the world market price, and vice-versa.

Domestic Resource Cost

The domestic resource cost (DRC) is the most widely used and comprehensive measure of the resource use efficiency in an economy (Masters and Winter-Nelson 1995; Ohlan and Neelam 2008). It determines the true resource cost to the economy and represents the opportunity costs of the factors of production. It is defined as the value of the factors of production needed to earn a unit of foreign exchange through the export of the commodity under consideration. Alternatively, the DRC is the ratio of the cost of domestic non-tradable resources (evaluated at shadow prices) to net foreign exchange earnings. Accordingly,

$$DRC_i = \frac{\sum_{j=k+1}^{n} A_{ij} P_j^s}{P_i^w - \sum_{j=1}^{k} A_{ij} P_j^w} \quad (6)$$

where:

$DRCi$=domestic resource cost of the ith commodity,

A_{ij}=requirement of the jth input to produce one unit of the ith commodity,

P_j^s=shadow price of the jth non-tradable input,

P_i^w=world price of the ith commodity adjusted for the value of by-product,

P_j^w=world price of the jth tradable input adjusted for transpor tation, handling, and marketing expenses.

If the value of DRC is greater than unity (DRC>1), it means that the domestic resources can be put to better use in an alternative way, and if less than unity (DRC<1), then producing the commodity in question is a relatively sound use of resources. Alternatively, the value of DRC that is less than unity indicates that to earn every INR 1 of foreign exchange through the export of the commodity under investigation, there is a cost of less than INR 1 and vice-versa (for details, see Ohlan 2010).

Determinants of Dairy Export Demand

The export demand function is here estimated in a log-linear form using the ordinary least squares (OLS) method (for details, see Winters 1981). The analysis covers a period of 50 years spanning 1961–1962 to 2010–2011. In specifying the empirical model, we use two approaches to specify the explanatory variables that are used in the analysis. First, we rely on the descriptive analysis above. Second, we consult the empirical literature on the determinants of dairy exports. In doing so, our main model of interest is:

$$\ln Y = a + b_1 \ln ITD + b_2 \ln PR + b_3 \ln ER + b_4 \ln Q + b_5 D + u \quad (7)$$

where:

Y=demand for dairy export from the country ('000 tons),

ITD=amount of international trade in dairy ('000 tons),

PR=ratio of India's unit value export to the

world's unit value export of dairy products,
ER = exchange rate (INR/USD),
Q = milk production in India ('000 tons),
D = dummy variable for removal of restrictions for dairy export from India (its value is equal to zero before 2001 and one after),
a = intercept term,
b_i = elasticity of export with respective variable,
u = error term.

Sources of Data

The study is based on secondary data. The data on the production and trade of dairy products (both in quantity and value terms), and producer prices come from the FAOSTAT database. The unit value of export is the quotient of the nominal export divided into kilograms. The data on the nominal exchange rate are taken from the Economic Survey (2012), released by the Indian government's Ministry of Finance. The data on domestic wholesale prices of dairy products in India are collected from Agricultural Prices in India (2012), published by the Indian Government's Ministry of Agriculture. The data on shares of various countries in dairy import from India are taken from various issues of Foreign Trade and Balance of Payments (1990 to 2012), the annual publication of the Centre for Monitoring the Indian Economy. The data used in the study are annual figures.

RESULTS AND DISCUSSION

Trade Performance of India's Dairy Industry

We begin by analyzing the trade profile of the Indian dairy industry. Table 1 presents the time profile of India's dairy trade in terms of the value of export, import, and net dairy trade; also shown are the shares of these export and import figures in India's total farm export and import, and in the world's total dairy export and import, over the trienniums starting 1982 and ending in 2010. It may be seen from Column 2 of Table 1 that India's average annual dairy export was negligible in the triennium ending (TE) 1982, at USD 1.41 million, but increased slightly from USD 2.15 million in TE 1985 to USD 6.48 million in TE 1994, and further to USD 9.86 million in TE 1997. After the adoption of the dairy trade liberalization policy in 2000–2001, India's dairy export registered a commendable rise. During the 2000s, the average annual value of India's dairy export has increased more than eight times, from USD 29.05 million in TE 2000 to USD 254.99 million in TE 2009. In TE 2010, the value of Indian dairy export was set back slightly to USD 208.27 million, perhaps due to the global economic slowdown.

The share of dairy exports in India's total farm export increased from 0.06 percent in TE 1982 to 0.11 percent in TE 1988, which declined to 0.09 percent in TE 1991 and again increased to 0.20 percent in TE 1994, as seen in column 3 of Table 1. It fell again to 0.17 percent in TE 1997 followed by a reversal in the downward trend during post-TE 2000. There has been a healthy rise in the share from 0.59 percent in TE 2000 to its peak of 1.77 percent in TE 2006. During the period 2006–2010, due to faster growth in agricultural exports, the share of dairy exports in total farm export has seen a decline, dropping to 1.52 percent in TE 2009 and further to 1.18 percent in TE 2010. It may be seen from column 4 of Table 1 that the share of India's dairy export in the world's total dairy export has improved substantially, increasing from 0.01 percent in TE 1982 to 0.42 percent in TE 2009.

On the other hand, the import of dairy products fell drastically from USD 166.66 million in TE 1982 to USD 9.99 million in TE 1997 but showed a sign of little revival thereafter. It fell again from USD 16.30 million in TE 2003 to USD 14.68 million in TE 2006. During 2007–2010, the value of India's dairy import has exhibited an increasing trend,

Table 1. Time profile of India's dairy trade

Year (TE)	Dairy Export Value (million USD)	Share in India's Total Farm Export (%)	Share in World Dairy Export (%)	Dairy Import Value (million USD)	Share in India's Total Farm Import (%)	Share in World Dairy Import (%)	Share in World Total Dairy Trade (%)	Dairy Net Trade (million USD)
1982	1.41	0.06	0.01	166.66	6.75	1.21	0.63	-165.24
1985	2.15	0.09	0.02	73.33	3.23	0.61	0.32	-71.18
1988	2.47	0.11	0.02	74.99	3.28	0.44	0.23	-72.53
1991	2.49	0.09	0.01	15.76	0.58	0.08	0.04	-13.26
1994	6.48	0.20	0.03	11.45	0.37	0.05	0.04	-4.97
1997	9.86	0.17	0.03	9.99	0.18	0.03	0.03	-0.12
2000	29.05	0.59	0.11	21.22	0.44	0.08	0.09	7.83
2003	45.22	0.81	0.16	16.30	0.27	0.05	0.11	28.92
2006	157.88	1.77	0.37	14.68	0.16	0.03	0.21	143.20
2009	254.99	1.52	0.42	35.10	0.22	0.06	0.25	219.89
2010	208.27	1.18	0.33	86.78	0.47	0.15	0.24	121.49

spiralling upward from USD 14.68 million in TE 2006 to USD 86.78 million in TE 2010. The share of dairy import in India's total farm import has followed the same trajectory. It declined from 6.75 percent in TE 1982 to 0.16 percent in TE 2006 before increasing slightly to 0.47 percent in TE 2010. The share of India's dairy import in the world's total dairy import is negligible and exhibits a declining trend—dropping from 1.21 percent in TE 1982 to 0.06 percent in TE 2009.

A look at column 8 of Table 1 makes it clear that after the removal of quantitative restrictions from dairy trade in India in 2000–2001, its share in the world's total dairy trade (export + import) exhibited an increasing trend. It has increased more than double from 0.09 percent in TE 2000 to 0.25 percent in TE 2009. However, it has not fully recovered, mainly due to the slow growth in its dairy import.

It may be seen from column 9 of Table 1 that India was a net importer of dairy products until TE 1997. This scenario has changed sharply from TE 2000 indicating the good export potential of the sector, as export exceeded import sizably. The value of India's dairy trade surplus has increased from USD 7.83 million in TE 2000 to USD 219.89 million in TE 2009 before dipping slightly to USD 121.49 million in TE 2010.

It is evident from the analysis of the trends in dairy trade performance indicators that the growth of India's dairy export is noteworthy, while the reverse has been observed in that of import. The dairy trade liberalization measures initiated in 2001 seem to have further improved the performance of India's dairy export.

It may be noted here that India has traditionally played a small role in the world's total dairy trade. The key reasons attributed to its below-par export performance are high population pressure, low level of milk processing, high transportation cost, stringent food safety measures, occasional ban on export of dairy products, poor quality and hygiene standards of dairy products being exported, insufficient international marketing efforts, and highly protected world dairy markets (Ohlan 2013c). However, it reflects the country's domestic policy orientation as well.

Growth in India's Dairy Export

The compound annual growth rates of the values and quantities of India's dairy export and import are given in Table 2. In order to illustrate more clearly the impact of the WTO regime on the growth rates of the variables under consideration, the period under analysis has been divided into two parts: Period 1 (1980–1981 to 1994–1995) represents the pre-WTO period and Period 2 (1995–1996 to 2010–2011), is the post-WTO period. It may be seen from the results presented in Table 2 that the growth rates of India's dairy export and import in both value and volume terms are statistically significant during both periods. The table depicts

Table 2. Compound annual growth rates: value and volume of India's dairy export and import

Time	Value (%)		Volume (%)	
	Export	Import	Export	Import
1980–2010	21.8*	–4.6*	16.9*	–5.3*
1980–1994	10.2*	–21.3*	16.67*	–21.2*
1995–2010	28.2*	14.2*	24.16*	8.7*

Note: * indicates statistical significance of growth rate at 1% level

that during the last three decades India's dairy export has registered an impressive growth of 21.8 percent per annum in value terms. During the post-WTO period, the growth rates of both dairy export and import have increased but the export has grown faster than that of import in both value and volume terms.

The compound annual growth rates of India's dairy export and import values have increased from 10.2 percent for export and –21.3 percent for import during the pre-WTO period to 28.2 percent for export and 14.2 percent for import during the post-WTO phase, respectively. This may partially be attributable to the removal of quantitative restrictions from dairy export in 2001. Under the WTO regime, India's dairy export value has grown faster (28.2% per annum) than that of volume (24.16% per annum). A similar trend has been observed for dairy import. However, in the case of dairy imports, the difference between the growth rates is much higher.

Composition of India's Dairy Export

Table 3 illustrates the composition and trends in the export of different dairy products from India in terms of value and as a share of total dairy export during trienniums starting 1992 and ending in 2010. The table shows that the export of skim milk powder, butter, whole milk powder, casein, and ghee have gone up considerably in value terms during the last two decades.

However, there were fluctuations in the export of dairy products. In TE 1992, ghee (40.35%), whole milk powder (27.01%), and skim milk (25.98%) constituted a major share of export of dairy products. In TE 2010, the share of casein in India's dairy export was highest (34.21%), closely followed by skim milk (31.91%), and farther down by ghee (19.17%), whole milk powder (8.65%), cheese (4.72%), whey (1.07%), and butter (0.19%). It may be noted that the cheese export has grown faster but because of a low base, it still accounts for a small share in total dairy export. Over the period under study, the Indian dairy export basket has been diversified. It is evident from the analysis of the export trends that the performance of the dairy exports has been remarkable.

The estimates of the compound annual growth rates of India's major dairy exports, in both value and volume terms, for the period 1990–2010, are presented in Table 4. The table shows that during the period under investigation, India's export of dairy products has grown at a robust pace of 28.2 percent annually in value terms and 26.1 percent per annum in quantity terms.

The export of casein in terms of value has registered the highest growth—a whopping 46.7 percent per year during the period 1990 to 2010. It is closely followed by whey (46.4%) and cheese (44.8%); and somewhat farther away by skim milk (29.2%), whole milk (11.8%), and butter (11.5%). In volume terms, the cheese export has grown fastest (59.1%), followed by casein (41.7%), whey (41.5%), butter (34.6%), skim milk (29.1%), ghee (17.8%), and whole milk (11.2%). It may be noted here that for the dairy products casein, whey, skim milk, and whole milk, the export values have grown faster than the export volumes.

India's share in global export of dairy products

Table 5 depicts the trends in India's share in the world's total export of different dairy products during the trienniums for the period 1992–2010; these trends reflect the outcome of the competitive process. The table demonstrates that India's share in the world's total export of dairy products has been meager. It has, however, increased from 0.01 percent in TE 1992 to 0.46 percent in TE 2007 before dropping slightly to 0.33 percent in TE 2010. However, in the case of ghee, India has emerged as a significant exporter. Its share in the world's total ghee

Table 3. Trends in export of major dairy products from India, million USD (%)

Year (TE)	Butter	Skim Milk	Whole Milk	Cheese	Whey	Ghee	Casein	Dairy
1992	0.03	0.87	1.01	0.01	0.00	1.12	0.11	3.17
	(1.50)	(25.98)	(27.01)	(0.83)	(0.00)	(40.35)	(4.17)	(100)
1995	0.02	4.88	1.37	0.01	0.00	1.77	0.39	8.44
	(0.16)	(52.88)	(19.14)	(0.18)	(0.00)	(23.50)	(4.12)	(100)
1998	0.17	1.49	0.33	0.13	0.15	1.55	6.35	10.18
	(1.34)	(16.58)	(3.39)	(1.17)	(1.87)	(15.48)	(59.97)	(100)
2001	0.05	16.02	3.69	0.23	0.08	4.91	19.46	44.91
	(0.09)	(32.51)	(8.05)	(0.45)	(0.16)	(12.14)	(45.75)	(100)
2004	0.27	26.98	5.76	0.64	0.52	6.66	23.51	64.85
	(0.62)	(38.89)	(7.52)	(1.30)	(0.57)	(12.08)	(38.29)	(100)
2007	3.91	98.18	19.26	4.06	5.63	20.35	76.47	229.73
	(1.34)	(43.95)	(8.99)	(1.67)	(2.39)	(8.54)	(32.43)	(100)
2010	0.39	67.89	19.90	9.23	2.36	41.09	67.19	208.26
	(0.19)	(31.91)	(8.65)	(4.72)	(1.07)	(19.17)	(34.21)	(100)

Note: Figures in parentheses indicate share in the total dairy export in terms of percentage
Ghee includes butter oil as well

Table 4. Estimates of compound annual growth rates of export of dairy products from India, 1990–2010 (%)

Products	Quantity	Value
Butter	34.6*	11.5*
Skim milk powder	29.1*	29.2*
Whole milk powder	11.2*	11.8*
Cheese	59.1*	44.8*
Whey	41.5*	46.4*
Ghee	17.8*	16.7*
Casein	41.7*	46.7*
Dairy	26.1*	28.2*

Note: In case of cheese, butter and whey estimates are for 1993-2010, 1995-2010, and 1997-2010, respectively
* indicates statistical significance of growth rate at 1% level

Table 5. India's share in world trade of dairy products (%)

Year (TE)	Ghee	Butter	Skim Milk	Whole Milk	Cheese	Whey	Casein	Dairy
1992	1.257	0.001	0.028	0.028	0.000	0.000	0.017	0.014
1995	2.946	0.000	0.145	0.031	0.000	0.000	0.044	0.032
1998	10.263	0.004	0.046	0.007	0.001	0.020	0.819	0.036
2001	31.690	0.001	0.484	0.078	0.002	0.010	2.392	0.168
2004	32.939	0.006	0.757	0.096	0.005	0.047	2.598	0.188
2007	38.609	0.059	1.962	0.272	0.020	0.231	5.649	0.466
2010	36.479	0.005	1.112	0.190	0.037	0.098	5.389	0.334

export has shot up from 1.26 percent in TE 1992 to 38.61 percent in TE 2007 before declining slightly to 36.48 percent in TE 2010.

It may be noted here that in TE 2007, India enjoyed the status of the world's largest exporter of ghee. Similarly, in the case of casein, India's share in world's export value has jumped up from 2.39 percent in TE 2001 to 5.38 percent in TE 2010. It ranked as the world's fifth largest exporter of casein in value terms in TE 2010. Skim milk export share has also increased from 0.48 percent in TE 2001 to 1.96 percent in TE 2007 before declining to 1.11 percent in TE 2010. All other dairy products constituted less than one percent share in the world's total dairy products export during the whole period under analysis. It may be seen from Table 5 that the export shares of all dairy products have presented a rising trend. However, in 2010–2011 India accounted merely for 0.29 percent of the world's total dairy trade.

Direction of India's dairy export

We now turn to examine how the direction of India's dairy export has changed over the years. There are ten countries importing Indian dairy products in large quantities, namely: USA, UAE, Bangladesh, Egypt, Nepal, Saudi Arabia, the Philippines, Morocco, Yemen, and Singapore. The remaining importing countries are pooled under the 'others' category. The percentage shares of these top 10 importers of dairy products from India are reported in Table 6. The table shows that most of the Indian dairy products go to the USA, UAE, Egypt, and Bangladesh. The USA, Egypt, Nepal, Saudi Arabia, Morocco, and Yemen have experienced a gain in their importance as destinations for Indian dairy products. On the other hand, Bangladesh and the Philippines have seen a significant decline in their shares. In 2010–2011, these top 10 importers accounted for about 78 percent of India's total dairy export. Their relative shares were as follow: USA (26.66%), UAE (12.23%), Bangladesh (8.22%), Egypt (7.82%), Nepal (6.31%), Saudi Arabia (4.82%), the Philippines (3.84%), Morocco (3.17%), Yemen (2.48%), and Singapore (2.32%).

Dairy export market diversification

This paper examined the trend in the degree of diversification of India's dairy products export markets using the Herfindahl index (Equation 4). This measure was derived based on the shares of the first 10 leading importing countries in total export, over the period 1999–2011. The results presented in Table 7 show that the Herfindahl index exhibits a declining trend. It has declined from 0.17 in 1999–2000 to 0.11 in 2010–2011, representing a 35.1 percent fall. On the average, the value of the Herfindahl index decreased from 0.11 during 1999–2004 to 0.06 during to 2005–2010, or a drop of 43.65 percent. It means that India's dairy export has experienced an increase in the degree of export market diversification.

It helps to make India's dairy products export performance largely invulnerable to the vagaries of the global economy. However, the level of export market diversification is still moderate.

Loyalty among India's dairy export markets

We have quantified the structural changes in the direction of India's dairy export using the Markov chain model (Equation 1). The main findings from the estimation are summarized in Table 8. Figures in the principal diagonal of the transitional probability matrix are the retention percentages. A retention percentage of an import partner is the proportion of its market share from last year that is retained this year. For example, in Table 8, during the period 1999–2010 Bangladesh averaged a retention percentage of 62, while other countries averaged 47. The figures across the rows, excluding those on the principal diagonal, are the average percentage of market share of a particular import partner,

Table 6. Country-wise share of export of dairy products from India (%)

Country	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
USA	6.42	5.94	3.36	12.87	20.27	12.70	12.72	7.88	6.03	8.01	19.43	26.66
UAE	21.98	18.38	22.43	13.96	13.02	11.28	8.41	13.16	9.74	12.51	13.18	12.23
Bangladesh	33.70	30.90	22.69	24.06	9.55	23.86	9.39	9.66	13.84	5.16	15.36	8.22
Egypt	0.00	0.46	4.26	1.29	0.00	4.21	0.00	11.14	8.18	11.79	1.62	7.82
Nepal	0.74	1.39	1.59	2.16	9.21	4.06	3.43	4.52	2.83	2.93	6.75	6.31
Saudi Arab	0.29	0.67	3.64	2.19	0.43	2.71	3.09	3.56	2.51	5.91	4.88	4.82
Philippines	3.24	0.63	0.47	1.34	0.26	1.47	0.61	2.43	3.27	4.17	2.42	3.84
Morocco	1.55	0.21	1.16	2.46	1.76	2.11	5.08	2.40	4.53	1.94	1.10	3.17
Yemen	0.52	1.77	2.53	2.87	1.93	0.89	5.73	3.09	2.12	0.66	2.30	2.48
Singapore	1.62	1.64	1.49	2.66	1.65	2.17	2.14	3.22	2.30	3.28	2.30	2.32
Others	29.94	37.98	36.39	34.14	41.93	34.55	49.39	38.93	44.63	43.63	30.65	22.12

Source: Author's calculation based on data available in Foreign Trade and Balance of Payments (1990 to 2012), Centre for Monitoring Indian Economy, Mumbai

Table 7. Trend in degree of India's dairy export diversification

Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Percentage Change during 2005-2010 over 1999-2004
Herfindahl index	0.17	0.13	0.11	0.10	0.08	0.09	0.04	0.05	0.04	0.05	0.09	0.11	-43.65

Table 8. Transitional probability matrix of India's dairy export, 1999-2010

Country	USA	UAE	Bangladesh	Egypt	Nepal	Saudi Arabia	Philippines	Morocco	Yemen	Singapore	Others
USA	0	0	0	0	0	0	0	0	0	0	1
UAE	0.441	0	0	0	0	0	0	0	0	0	0.559
Bangladesh	0	0.256	0.616	0	0	0.011	0	0.025	0.065	0.012	0.019
Egypt	0.586	0.217	0.025	0	0	0.146	0.027	0	0	0	0
Nepal	0	0	0	0.409	0	0	0	0.392	0	0	0.199
Saudi Arab	0.192	0	0	0	0.808	0	0	0	0	0	0
Philippines	0	0	1	0	0	0	0	0	0	0	0
Morocco	0	0	0	0.241	0	0	0.759	0	0	0	0
Yemen	0	0	0	0	0	0	0	0	0	0	1
Singapore	0	0.855	0	0	0	0	0.145	0	0	0	0
Others	0.077	0.118	0.045	0.063	0.071	0.075	0	0.018	0.017	0.050	0.467

lost to the competing importer from one year to the next.

For example, in Table 8, the UAE lost 44 percent of its market share to the USA, and 55.9 percent to the rest of the other countries combined. Bangladesh lost 25.6 percent to the UAE, 1.1 percent to Saudi Arabia, 2.5 percent to Morocco, 6.5 percent to Yemen, 1.2 percent to Singapore, nothing to USA, Egypt, Nepal, the Philippines, and 1.9 percent to the rest of the other countries combined. Singapore lost 85.5 percent of its market share to UAE, and 14.5 percent to the Philippines. The Philippines lost its entire previous share to Bangladesh, and the USA and Yemen 100 percent of their share to the rest of the other countries combined. It may be noted that the majority of importers of Indian dairy products could not retain their previous shares. For example, Morocco lost 24.1 percent of its entire share to Egypt and 75.9 percent to the Philippines. These importers proved to be unstable markets for Indian dairy products.

The figures down a column are the countries from which market share is gained. For example, again in Table 8, USA on average gained 44.1 percent of UAE's market share, from the previous year, 58.6 percent of Egypt's market share, 19.2 percent of Saudi Arabia's, and 7.7 percent of the rest of other countries' combined market share from the previous year. It indicates that there is a likely shift in the shares of export of Indian dairy products from Saudi Arabia and UAE. to the USA. The Philippines gained 75.9 percent of Morocco's market share, 2.7 percent of Egypt's market share, and 14.5 percent of Singapore's market share.

It is evident from Table 8 that during the period 1999–2010, Bangladesh emerged as one of the stable importers of Indian dairy products as reflected in the high probability of retention at 0.616. It indicates the probability that Bangladesh retains its export share of 61.6 percent. It is interesting to note that the other countries retain their share of 46.7 percent.

The major gainer among the importers of Indian dairy products over the period is UAE, which has a transfer probability of 0.256 from Bangladesh, 0.217 from Egypt, 0.855 from Singapore, and 0.118 from 'other countries'. The USA may gain 44 percent from UAE, 58.6 percent from Egypt, and 19.2 percent from Saudi Arabia. Similarly, Egypt is likely to gain from Nepal, Morocco, and other countries with respective probabilities of gain of 0.409, 0.241, and 0.063, respectively. The probability of gain to Nepal is mainly at the cost of Saudi Arabia (0.808) and to some extent from other countries (0.071). Other countries gain 55.9 percent from USA, 1.9 percent from Bangladesh, and 19.9 percent from Nepal.

Notice that the sum of percentages across rows adds up to 100 percent. This is intuitive because what is not retained must be lost. On the other hand, the sum of the percentages down a column does not have to add up to 100. The reason is that those figures are not percentages of one country's market share from the previous year, but rather percentages of market shares from different countries.

Dairy products export projection to major destinations

The shares of the major importing countries of Indian dairy products have been predicted up to 2016 using the transitional probability matrix (Eq. 2). The actual and projected shares and values of major importing countries are presented in Table 9. A comparison of projected shares with actual shares shows no significant difference between observed and projected shares ($\chi 2=23.55$, $p<.01$). It implies that the model is reasonably efficient, and the structural changes captured in the pattern of import of Indian dairy products are fairly accurate.

On the basis of these findings, the shares of existing importing nations for the years 2012–2013 to 2016–2017 have been projected on the assumption that the same forces for

Table 9. Actual and projected share and value of India's major dairy importers, million USD (%) [second half of table below)

Year	U.S.A.		U.A.E.		Bangladesh		Egypt		Nepal		Saudi Arabia	
	A	P	A	P	A	P	A	P	A	P	A	P
2000	1.14	1.14*	3.67	3.67*	5.95	5.95*	0.06	0.06*	0.22	0.22*	0.1	0.1*
	(6.12)	(6.12)	(19.69)	(19.69)	(31.92)	(31.92)	(0.32)	(0.32)	(1.18)	(1.18)	(0.54)	(0.54)
2002	3.06	2.17	7.29	2.57	9.19	4.26	1.14	0.53	0.73	0.54	1.17	0.56
	(7.77)	(11.62)	(18.50)	(13.77)	(23.32)	(22.82)	(2.89)	(2.84)	(1.85)	(2.89)	(2.97)	(3.00)
2004	10.05	5.18	8.05	4.93	13.86	6.66	2.15	1.34	3.69	1.93	1.46	1.31
	(14.64)	(13.13)	(11.73)	(12.50)	(20.20)	(16.88)	(3.13)	(3.40)	(5.38)	(4.89)	(2.13)	(3.32)
2006	15.74	7.01	14.77	8.16	13.73	10.51	6.12	3.42	5.56	2.96	4.73	2.34
	(10.88)	(10.20)	(10.21)	(11.88)	(9.49)	(15.30)	(4.23)	(4.98)	(3.84)	(4.31)	(3.27)	(3.41)
2008	17.06	16.06	27.02	15.75	22.87	13.45	24.27	7.83	6.99	8.49	10.27	5.97
	(7.04)	(11.10)	(11.15)	(10.88)	(9.44)	(9.29)	(10.01)	(5.41)	(2.88)	(5.87)	(4.24)	(4.12)
2010	15.69	36.34	15.32	29.54	16.49	28.54	8.72	11.47	8.02	15.89	6.21	11.81
	(10.91)	(14.98)	(10.65)	(12.18)	(11.47)	(11.76)	(6.06)	(4.73)	(5.58)	(6.55)	(4.32)	(4.87)
2012		16.62		12.91		16.35		6.93		8.22		4.04
		(11.57)		(8.99)		(11.38)		(4.82)		(5.72)		(2.81)
2014		15.69		15.32		16.49		8.72		8.02		6.21
		(10.91)		(10.65)		(11.47)		(6.06)		(5.58)		(4.32)
2016		17.58		16.07		17.08		8.15		9.19		5.86
		(12.21)		(11.16)		(11.87)		(5.66)		(6.38)		(4.07)

Table 9 continued

Philippines		Morocco		Yemen		Singapore		Others		Total	
A	P	A	P	A	P	A	P	A	P	A	P
0.3	0.3*	0.13	0.13*	0.25	0.25*	0.31	0.31*	6.54	6.54*	18.64	18.64*
(1.61)	(1.61)	(0.70)	(0.70)	(1.34)	(1.34)	(1.66)	(1.66)	(35.09)	(35.09)	(100)	(100)
0.35	0.14	0.7	0.35	1.06	0.5	0.8	0.4	13.93	6.64	39.4	18.67
(0.89)	(0.75)	(1.78)	(1.87)	(2.69)	(2.68)	(2.03)	(2.14)	(35.36)	(35.57)	(100)	(100)
0.8	0.67	1.39	0.77	0.8	0.83	1.4	0.81	25.01	15.02	68.63	39.45
(1.17)	(1.70)	(2.03)	(1.95)	(1.17)	(2.10)	(2.04)	(2.05)	(36.44)	(38.07)	(100)	(100)
1.88	1.31	5.88	2.24	6.84	1.33	3.69	1.42	65.69	28.01	144.62	68.71
(1.30)	(1.91)	(4.07)	(3.26)	(4.73)	(1.94)	(2.55)	(2.07)	(45.42)	(40.77)	(100)	(100)
9.04	5.16	7.8	3.71	3.34	2.01	6.79	3.45	106.94	62.88	242.37	144.74
(3.73)	(3.57)	(3.22)	(2.56)	(1.38)	(1.39)	(2.80)	(2.38)	(44.12)	(43.44)	(100)	(100)
4.06	7.56	4.84	5.23	2.2	3.3	3.54	5.62	58.72	87.26	143.81	242.59
(2.82)	(3.12)	(3.37)	(2.16)	(1.53)	(1.36)	(2.46)	(2.32)	(40.83)	(35.97)	(100)	(100)
	3.23		4.71		1.66		2.03		66.96		143.67
	(2.25)		(3.28)		(1.16)		(1.41)		(46.61)		(100)
	4.06		4.84		2.2		3.54		58.72		143.81
	(2.82)		(3.37)		(1.53)		(2.46)		(40.83)		(100)
	4.42		4.61		2.07		3.13		55.78		143.94
	(3.07)		(3.20)		(1.44)		(2.17)		(38.75)		(100)

Note: Figures in parenthesis are percentage share from the total. A and *=actual values, and P=projected value. The $\chi 2$ calculated=23.55; $\chi 2$ tabulated at 40 degree of freedom at 1% significance level=63.69.

change, which existed during the period under analysis will prevail in the future. The shares of USA, Egypt, Saudi Arabia, Morocco, Nepal, the Philippines, and Yemen show an increasing trend and are projected to increase further during the period 2012–2016. In terms of ranking the projected shares of countries importing dairy products from India for the period 2002–2016, USA emerges as first, followed by UAE.

These results suggesting the rising share of the USA in the export of Indian dairy products is in contrast with a conclusion reached by Kumar (2010) using the gravity model that India may be inclined to export dairy products more with its neighboring countries.

It may be seen from the results presented in Table 9 that the value of Singapore as an export market is predicted to increase. However, its share in total dairy products from India is predicted to fall. The group of other countries is projected to account for a major share (40.83%) of total dairy products export from India in 2014. Thus, the diversification of export markets of Indian dairy products may boost the export.

The projected export of dairy products from India follows an increasing trend over the period and, hence, greater efforts are called for to increase the production and processing of milk in the country to be able to meet the growing export and domestic demand. India should also focus on the quality of dairy products produced, to get a premium price in the world market. Next, we estimate India's dairy export demand function.

Determinants of Export Demand for Indian Dairy Products

It appears from our above-mentioned discussion that despite being the world's largest producer of milk, India is not a significant exporter of dairy products. Therefore, to identify the factors affecting the demand for export of Indian dairy products, the multiple log-linear regression model (Equation 8) has been carried out using time-series data for the period 1961–1962 to 2010–2011. Different regression models were tried and multiple log-linear specification was best-fitted. The results are given in Table 10.

Table 10. Estimates of export demand model for Indian dairy products, 1961-2010

Variable	Coefficient	Standard error	*t*-statistic	*p*- value
Constant	-11.367**	4.735	-2.400	0.021
Volume of international trade in dairy products (market size)	3.353***	0.650	5.157	0.000
Ratio of India's and the world's export unit values	-0.736**	0.298	-2.467	0.018
Exchange rate (INR/USD)	1.181**	0.541	2.184	0.034
Domestic production of milk	-1.555	1.087	-1.431	0.160
Dummy variable for export liberalization	0.641***	0.142	4.520	0.000
Diagnostic				
R^2	0.95			
	0.94			
F-test	165.65***			0.000
Ramsey RESET Test	0.01			0.99
Heteroskedasticity Test: Breusch-Pagan-Godfrey	5.68			0.33
Jarque-Bera Normality Test	0.416			0.812

It may be seen from the table that five factors taken together explain 95 percent of the total variation in the export of dairy products from India. These five factors consist of the following: the volume of international trade in dairy products, the ratio of India's and the world's unit values export, the exchange rate, the domestic production of milk, and a dummy variable for export policy change. The results of the diagnostic tests for regression analysis given in the last four rows of Table 10 show that our estimates of export demand function parameters are fit for reliable interpretation. In the export demand function, the estimates for all the variables, except the domestic production of milk, are statistically significant and have expected signs as per economic logic. The estimate for the world dairy market size shows that for a 1 percent increase in the world's total dairy export, the export demand for Indian dairy products would increase by 3.35 percent. The coefficient of the ratio of India's unit export value to the world's average unit export value is negative and significant at 5 percent level. It indicates that international prices have a positive effect on export demand for Indian dairy products while India's export prices have a negative bearing on the same. This result is in sharp contrast to a conclusion reached by Kumar (2010) that the ratio of international and domestic prices did not influence the export of dairy products. This divergence in results may partially be because of differences in model specification.

Domestic milk production is shown to have no significant impact on dairy products export from the country. This may be because the level of milk processing in the country is very low at 35 percent. More importantly, a major proportion (58%) is processed by an informal sector that converts milk mainly into traditional products such as cottage cheese, ghee, cottage butter, khoya, curd, malai, and other products for which the world demand is low. The sign of the estimate for domestic production is negative. It may be because domestic production has coincided with the increased international production, causing a depressed international price and, hence, lower export from India. However, this conclusion is again different from the finding by Kumar (2010) that domestic production had a significant positive influence on exports of dairy products. This divergence in results may again be partially traced to differences in model specification.

The estimate for the exchange rate is significant and has a theoretically correct positive sign. A high exchange rate shows a low purchasing power of domestic currency in relation to a standard currency like the US dollar. In other words, an increase in the exchange rate lowers the export price of the commodity for a foreign buyer, thereby increasing the export demand of dairy products . Therefore, it may be concluded that the exchange rate does play a significant role in the export of dairy products from India. Lastly, the estimate for the dummy variable for dairy products export liberalization is significant ($p<.01$). The high level of significance for this estimate indicates that India's export policy is a stronger determinant for its dairy products export. It suggests that there is a direct relationship between export liberalization and the growth of dairy exports.

Extent of Competitiveness in Indian Dairy Products

We have assessed the competitiveness of Indian dairy products. Figure 1 illustrates the price competitiveness of India's major dairy products using the nominal protection coefficient (NPC) measure for the year 2010–2011. The figure shows that Indian dairy products (except raw milk) lack export competitiveness as the values of NPC are above unity. However, our estimate of protection of the dairy industry is much lower than the estimate reported by

Elumalai and Sharma (2008). One of the major reasons for the lack of export competitiveness may be the low quality of dairy products being exported from India.

Quality competitiveness of Indian dairy products

We computed the average estimates of the extent of the quality competitiveness of the Indian dairy industry for the 21-year period 1990–2011. These estimates which were derived using the ratio of unit value export are reported in Figure 2.

A cursory look at Figure 2 clearly shows that on average the quality of Indian dairy products is below the world average with the value of the ratio of unit export values less than unity. The situation is worse for skim milk (0.49), whey (0.76), butter (0.99), and whole milk (0.99). The quality of Indian ghee (5.25) is best. It may be noted here that India ranks first in the export of ghee. It follows from our earlier discussion that Indian dairy products get lower prices in the world market. This finding is consistent with results obtained by Rajarajan, Kumar, and Singh (2007). However, they interpreted low free-on-board prices of Indian dairy products as price competitiveness, which is not true. In order to get better access in the world market, India should focus on improving the quality of its dairy products. The improvement in the international marketing of dairy products is also highly desirable.

Domestic Resource Cost of Milk Production in India

We have worked out the domestic resource cost (DRC) of milk production in India. Table 11 gives the estimates of the DRC of milk production by crossbreed cow in India's major milk-surplus states.[2] The values of DRC are found to be less than unity for all these states. It indicates that to earn INR 1 of foreign exchange through the export of milk, there is a cost of less than INR 1. For example, the value of DRC for Punjab state is less than unity (i.e., 0.60). It indicates that to earn INR 1 of foreign exchange through the export of milk, Punjab state has to use its resource worth only INR 0.60 (= DRC). The DRC results indicate that it is worthwhile for the country as a whole to devote more resources toward increasing the production of milk in order to augment its export.

CONCLUDING REMARKS

In this study we have investigated the pattern, trends, competitiveness, and determinants of export of dairy products from India. Our tools for investigation comprised the Markov chain model, chi square (χ^2) test, domestic resource cost ratio, unit export value, nominal protection coefficient, Herfindahl index, and log-linear regression model. These methods were used to study the structural changes in direction of dairy exports from India, comparative advantage, quality and price competitiveness, export market diversification, and factors affecting export performance. We noted that India's dairy export has registered a commendable rise and that the dairy trade liberalization policy has augmented its growth. India has become the world's largest producer as well as exporter of ghee. On the other hand, India's import of dairy products has been insignificant in recent years. India, which was a net importer of dairy products until TE 2000, has become a net exporter post-TE 2000—a development that indicates a good export potential for the dairy industry.

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2 It may be noted here that in these states the per capita availability of milk is generally above the country's average.

Figure 1. Nominal protection coefficient for Indian dairy products under an exportable hypothesis

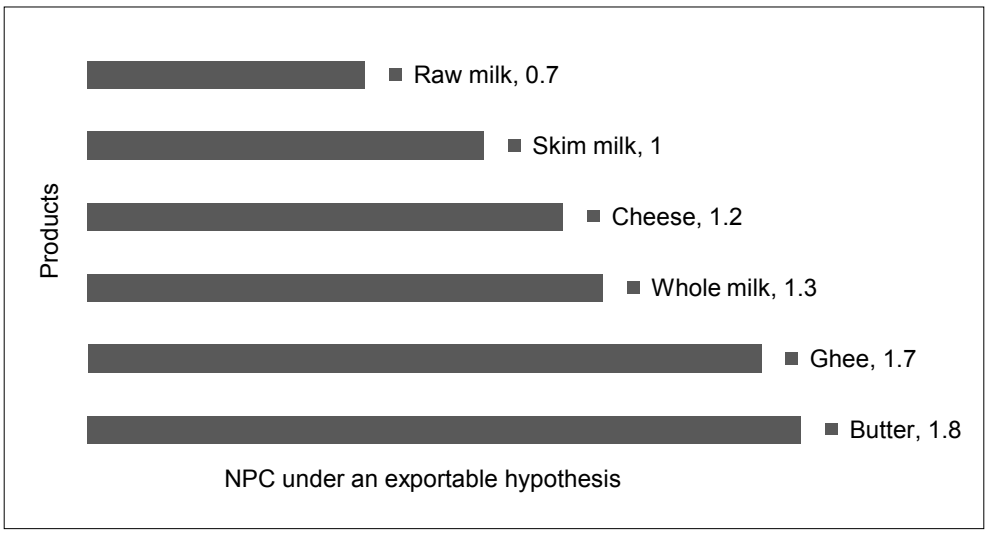

Figure 2. Quality competitiveness of Indian dairy industry

Table 11. Domestic resource cost of milk production in India, 2010–2011

States	Domestic Resource Cost
Uttar Pradesh	0.68
Punjab	0.60
Haryana	0.64
Rajasthan	0.66
Gujarat	0.63
Himachal Pradesh	0.78
Andhra Pradesh	0.69
Jammu & Kashmir	0.75
Uttarakhand	0.72

In the context of the relative competitive strength of different importers, it has been established that the import markets of Indian dairy products were unstable. Bangladesh and UAE showed high probabilities to gain market shares from other importers. Our results of the export demand function showed that the dairy export from India were elastic to the world market size, the ratio of India's and the world's unit export values, the exchange rate, and dairy trade policy. The removal of quantitative restrictions from the export of dairy products has statistically significantly improved the volume of India's dairy export. The policy implication of the finding is that to spur the export of dairy products from India the further liberalization of its dairy products export policy is highly desirable.

We found that India has the comparative advantage in milk production with the value of domestic resource cost ratio below unity. It implies that a decision to devote more resources to increase milk production for enhancing its export is socially as well as privately desirable and a profitable proposition. With respect to price competitiveness, we observed that India's raw milk is price-competitive. However, most of Indian dairy products lacked price competitiveness. This points toward a problem of inefficiency in milk processing plants.

It may be added here that over the past two decades, the global competition for milk production has witnessed a downward trend. In contrast, India has maintained a steady rise in milk production market share (Ohlan 2012a). It implies that India's dairy industry is improving its competitiveness. A similar trend has been observed in India's share in the world's total dairy export and its dairy trade surplus. More importantly, a recent study carried out by Ohlan (2013a) found that during the last two decades, the productivity of the Indian dairy manufacturing industry grew significantly. These findings again indicate an opportunity for the Indian dairy industry to expand its export. However, on the average, the unit export value realized by Indian dairy products is below the world's average unit export value. It reveals that India's quality competitiveness is rather poor. The policy implication of our finding clearly stresses the need for India to focus on the quality of dairy products produced to get a premium price in the world market.

We noted that India's dairy export has experienced an increase in export market diversification. However, the level of export market diversification is moderate. It implies that there is a scope for greater market opportunities in the emerging markets in Asia and other parts of the world for Indian dairy products. India needs to give priority to the diversification of export markets. In order to increase the volume of dairy product export in the world market, especially in Asia and other potential markets such as the USA, India should implement appropriate measures to increase the milk yield per cow and to improve the quality of its dairy products. India should strive to increase the volume of export through the expansion of the milk processing industry, and through better transportation and port facilities.

In order to enhance the competitiveness of the Indian dairy industry, efforts should be made to reduce the cost of processing, increase the productivity of dairy species, and institute better health care and breeding methods. If India is to emerge as an exporting country, it should develop proper production, processing, and marketing infrastructure which is capable of meeting international quality requirements. A comprehensive strategy for producing high quality and safe dairy products should be formulated with suitable legal backup. The challenge for global marketers is to identify the features which can be standardized and build a core product.

Based on our findings, we can state that in order to maintain and capture the market

share from the major global competitors, India needs to undertake marketing promotion and research strategies. Finally, India's export marketing strategies for its dairy products should encompass the following: market institutions to commercialize production, intensified awareness and efforts to produce quality dairy products with reduced safety risks, higher standards to meet sanitary and phyto-sanitary specifications for food export, greater productivity, and increase in the scale of the collection, distribution, and processing of dairy products.

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