Direction of Trade and Export Competitiveness of Chillies in India

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Abstract

India is the world's largest producer and leading exporter of chilli in the global market. This paper has studied the direction of trade of chillies by Markov chain analysis and has shown that USA is the most stable market of chilli, followed by UAE and Sri Lanka, while Malaysia, Bangladesh and Pakistan are the unstable importers. The paper has found that during 2011-12, the major markets for Indian chilli were Malaysia (24.83%) and Sri Lanka (14.70%). The estimated NPCs have indicated that the Indian chilli was price competitive during the study period 2006-07 to 2010-11. A comparison of competitiveness of Indian chilli against Chinese red chilli has revealed that Indian red chilli is globally price competitive for three years in the study period of five years, 2006-07 to 2010-11.

Key words: Chillies, export competitiveness, direction of trade, nominal protection coefficient, Markov chain analysis

JEL Classification: Q12, Q13

Introduction

India is one of the leading producers of chillies contributing close to 39.78 per cent of global production, followed by China (8.67 %) and Peru (4.74 %). Besides India, other major producers and exporters of chillies are China, Pakistan, Morocco, Mexico and Turkey. This shows that the major share of chilli production is in the Asian countries, though it is produced throughout the world. The top 10 chilli producing countries, India, China, Thailand, Pakistan, Ghana, Ethiopia, Peru, Bangladesh, etc., accounted for more than 85 per cent of the world's production in 2013. With an estimated global production of 34.58 lakh tonne in 2013, chilli was cultivated on an area of approximately 19.74 lakh ha land (FAO). However, the productivity of chillies is quite low in India (1.75 t/ha) in comparison with countries such as Cape Verde, Jamaica and Morocco, where yield levels are higher than 10 t/ha.

Chilli is the major spice contributing 40-42 per cent by volume and 20-22 per cent by value to total spices exported from India. The exports of Indian chillies have grown significantly in the recent years.

On the export front, there is a good demand for chillies in Malaysia, particularly for BSS-273 variety because of its medium pungency. In India, Andhra Pradesh tops in chilli production with 2.10 lakh ha area, 6.85 lakh tonnes production and 3.3 t/ha yield (2014-15). Across states, chillies are exported from Andhra Pradesh to Tamil Nadu, Kerala, Uttar Pradesh, Maharashtra, Gujarat, etc. Generally, the production in Andhra Pradesh, Madhya Pradesh and Karnataka influence the domestic price of chillies.

One of the key export commodities is the spices (Rajur and Patil, 2013). About 25 per cent of India's

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share in global trade is in spices. The country exported 2,40,000 tonnes of chillies worth ₹ 1535.54 crore during 2010-11(Spice Board of India, 2014). The present study has analysed the export competitiveness and direction of chilli export from India.

Data and Methodology

To study export performance of chillies, the data on export pertaining to the period 2006-07 to 2010-11 were used and to work out trade direction, data from 2004-05 to 2010-11 were used. The statistical techniques used were Markov chain analysis to study direction of trade and, nominal protection co-efficient (NPC) to assess export competitiveness.

Markov Chain Analysis

Markov chain analysis is based on the estimation of the transitional probability matrix P. The element P_{ij} of this matrix indicates the probability that exports will switch from the country i to the country j with time. The diagonal element P_{ii} measures the probability that the export share of a country will be retained. Hence, examination of diagonal element indicates the loyalty of an importing country to a particular country's exports. In the context of the current application, the average exports to a particular country was considered to be a random variable which depended only on its past exports to that country and which can be denoted as Equation (1):

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

where,

E_{jt} = Exports from India to the jth country during the year t,

E_{it-1}= Exports to the ith country during the year t-1,

e_{jt} = The error-term which is statistically independent of E_{it-1}, and

r = Number of importing countries.

The transitional probabilities P_{ij}, which can be arranged in a (c×r) matrix, have the following properties

$$O < P_{ij} < 1 \qquad \ldots(2)$$

$$\sum_{i=1}^{r} P_{ij} = 1 \text{ for all } i \qquad \ldots(3)$$

Thus, the expected export shares of each country during period t were obtained by multiplying the exports to these countries in the previous period (t-1) with the transition probability matrix.

The transition probability matrix was estimated in the linear programming (LP) framework by the method referred to as Minimization of Mean Absolute Deviation (MAD), the LP formulation is stated as:

$$\text{Min O'P* + Ie} \qquad \ldots(4)$$

Subject to, XP* + V = Y

$$GP^* = 1$$

$$P^* > 0$$

where, P* is a vector of the probabilities P_{ij}, O is a vector of zeros, I is an appropriately dimensional vector of areas, e is the vector of absolute errors (|U|), Y is the vector of exports to each country, X is a block diagonal matrix of lagged values of Y, V is the vector of errors, and G is a grouping matrix to add the row elements of P arranged in P*, to unity.

The nominal protection coefficient (NPC) was computed as the ratio of domestic price P^D and global price P^R of red chilli. The domestic price used in this computation could either be the procurement price or the farm gate price, while the world reference price is the international price adjusted for transportation cost, packing cost, port clearing charge, insurance, etc. Symbolically,

$$\text{NPC}= P^D/P^R \qquad \ldots(5)$$

If NPC is greater than one, then the commodity is protected, compared to the situation that what would prevail under free trade and if NPC is less than one the commodity is not protected. The NPC helps in measuring the divergence of domestic price of international price and thus determines the degree of protection of the commodities in question.

Results and Discussion

Table 1 presents transitional probabilities depicting broad changes in the direction of trade. The period considered for analysis was 2004-05 to 2010-11. The major countries considered for the analysis were Malaysia, Sri Lanka, Bangladesh, USA, Pakistan and UAE and the remaining chillies-importing countries were grouped as 'others'.

Table 1. Transition probability matrix of chilli exports from India: 2004-05 to 2010-2011

Country	Malaysia	Sri Lanka	Bangladesh	USA	Pakistan	UAE	Others
Malaysia	**0.0000**	0.2467	0.0000	0.1299	0.0000	0.1294	0.4939
Sri Lanka	0.1104	**0.1487**	0.0417	0.1700	0.0000	0.0000	0.5292
Bangladesh	0.3557	0.0000	**0.0000**	0.0000	0.6443	0.0000	0.0000
USA	0.0000	0.7053	0.0000	**0.2947**	0.0000	0.0000	0.0000
Pakistan	0.4723	0.2359	0.0000	0.0000	**0.0000**	0.2660	0.0258
UAE	0.0000	0.0000	0.4659	0.0000	0.0000	**0.2354**	0.2987
Others	0.5240	0.0000	0.2860	0.0000	0.0000	0.1140	**0.0760**

The transitional probability matrix in Table 1 indicated that Malaysia lost its share to Sri Lanka, USA, UAE and others to the extent of 24.67 per cent, 12.99 per cent, 12.94 per cent and 49.39 per cent, respectively. It gained 11.04 per cent, 35.57 per cent, 47.23 per cent and 52.40 per cent from Sri Lanka, Bangladesh, Pakistan and others, respectively. Sri Lanka retained its original share to the extent of 14.87 per cent only and it lost its share to Malaysia (11.04 %), Bangladesh (4.17 %), USA (17.0 %) and others (52.90 %). Bangladesh could not retain even its original share. It lost a major share of 85.57 per cent to Malaysia, followed by Pakistan (64.43 %). However, it gained 4.1 per cent from Sri Lanka, 46.59 per cent from UAE and 28.60 per cent from others.

The chilli exports to USA could retain its share of 29.47 per cent. USA lost its major share to Sri Lanka (70.47 %). However, it gained from the shares of Malaysia (12.99%) and Sri Lanka (17.00 %). Pakistan is also another unstable importer of chillies, because it could not retain its original share. It lost its major share to Malaysia (47.23%), Sri Lanka (23.59%), UAE (26.60%) and some extent to other countries. UAE is the stable importer of chillies, as it retained its original share of 23.54 per cent. It lost its major share of 46.59 per cent to Bangladesh, followed by others (29.87%). The group of countries pooled under 'others' retained 7 per cent of its original share, it lost its share to Malaysia, Bangladesh and UAE, and it gained from Malaysia (49.39%), Sri Lanka (52.92%), Pakistan (2.58%) and UAE (29.87%). These results are in line with the finding of Rajur and Patil (2013).

Thus, it was clear that Malaysia, Bangladesh and Pakistan were the most unstable importers of chillies as they could not retain their original shares. Sri Lanka, USA, and UAE could be termed as stable importers and potential destinations for the Indian chillies in future.

Projection of Indian Chilli Exports to Major Destinations

The export share of Indian chillies in export to different countries was computed using transitional probability matrix. The future market shares of Indian chillies to the major importing countries were projected to 2016-17. A close look at the actual and predicted shares of chillies exported from India to different countries during the study period (Table 2) revealed that the observed proportions of exports shares are inconsistent with the predicted share of exports, which were derived from the Markov chain process.

The actual share of Bangladesh in chilli export had fluctuations over the study period (2004-05 to 2010-11) on the whole, it decreased from 21.03 to 20.10 per cent, whereas with respect to prediction share, it increased from 21.26 to 24.83 per cent. The projections for 2016-17 (Table 3) suggested a decrease from 24.83 to 22.40 per cent.

With regard to Sri Lanka, the actual and predicted export shares showed fluctuations from 18.76 to 14.20 per cent and 22.03 to 14.70 per cent, respectively between 2004-05 and 2010-11. The estimation for 2016-17 suggested an increase from 14.70 to 15.17 per cent. The actual proportion of Bangladesh share in imports from India showed an increasing trend from 0.41 to 13.64 per cent. The predicted export share decreased from 12.81 to 11.90 per cent during the study period and the projections for 2017-18 suggested an increase from 11.90 to 12.29 per cent.

With respect to USA, the actual proportion of exports showed a decreasing trend, i.e. it decreased

Table 2. Actual and estimated shares of chilli export from India to different countries, 2004-05 to 2010-11

(in tonnes)

Year	Malaysia		Sri Lanka		Bangladesh		USA		Pakistan		UAE		Others	
	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted	Actual	Predicted
2004-05	29040	29353	25898	30411	565	17692	27454	16268	134	364	4928	10659	50054	33326
	(21.03)	(21.26)	(18.76)	(22.03)	(0.41)	(12.81)	(19.88)	(11.78)	(0.10)	(0.26)	(3.57)	(7.72)	(36.25)	(24.14)
2005-06	2608	33123	27582	16568	670	21367	16579	9915	549	432	8737	8974	56449	22796
	(2.30)	(29.27)	(24.37)	(14.64)	(0.59)	(18.88)	(14.65)	(8.76)	(0.49)	(0.38)	(7.72)	(7.93)	(49.88)	(20.14)
2006-07	43625	28371	21822	23279	28425	15002	13058	13228	255	18315	11818	11917	30019	38911
	(29.27)	(19.04)	(14.64)	(15.62)	(19.07)	(10.07)	(8.76)	(8.88)	(0.17)	(12.29)	(7.93)	(8.00)	(20.14)	(26.11)
2007-08	51782	45141	29505	33745	34679	21800	19713	17555	11350	22344	15813	18704	46158	49712
	(24.78)	(21.60)	(14.12)	(16.15)	(16.59)	(10.43)	(9.43)	(8.40)	(5.43)	(10.69)	(7.57)	(8.95)	(22.09)	(23.79)
2008-09	40615	41986	37792	32058	1923	24838	15793	16358	22376	1239	18813	21414	50688	50106
	(21.60)	(22.33)	(20.10)	(17.05)	(1.02)	(13.21)	(8.40)	(8.70)	(11.90)	(0.66)	(10.01)	(11.39)	(26.96)	(26.65)
2009-10	45545	42422	34788	28963	28173	27822	17744	17063	160	18152	23232	17602	54358	51977
	(22.33)	(20.79)	(17.05)	(14.20)	(13.81)	(13.64)	(8.70)	(8.36)	(0.08)	(8.90)	(11.39)	(8.63)	(26.65)	(25.48)
2010-11	48248	59601	34072	35281	32742	28560	17362	17180	25712	21096	20703	24928	61161	53354
	(20.10)	(24.83)	(14.20)	(14.70)	(13.64)	(11.90)	(7.23)	(7.16)	(10.71)	(8.79)	(8.63)	(10.39)	(25.48)	(22.23)

Note: The figures within the parentheses indicate percentages to total exports of chilli.

Table 3. Projected export of Indian chilli to major importing countries: 2011-12 to 2016-17

(in tonnes)

Year/Country	Malaysia	Sri Lanka	Bangladesh	USA	Pakistan	UAE	Others
2011-12	59601	35281	28560	17180	21096	24928	53354
	(24.83)	(14.70)	(11.90)	(7.16)	(8.79)	(10.39)	(22.23)
2012-13	51976	37045	28345	18807	18401	25274	60151
	(21.66)	(15.44)	(11.81)	(7.84)	(7.67)	10.53	(25.06)
2013-14	54383	35938	30525	18595	18263	24427	57868
	(22.66)	(14.97)	(12.72)	(7.75)	(7.61)	10.18	(24.11)
2014-15	53775	36186	29431	18658	19667	24242	58041
	(22.41)	(15.08)	(12.26)	(7.77)	(8.19)	10.10	(24.18)
2015-16	54167	36447	29404	18639	18963	24513	57866
	(22.57)	(15.19)	(12.25)	(7.77)	(7.90)	10.21	(24.11)
2016-17	53762	36404	29491	18729	18946	24420	58248
	(22.40)	(15.17)	(12.29)	(7.80)	(7.89)	(10.18)	(24.27)

Note: The figures within the parentheses indicate percentages to total exports

from 19.88 per cent in 2004-05 to 7.23 per cent in 2010-11. The predicted proportion also showed a decrease from 11.78 to 7.16 per cent. The actual export to Pakistan and UAE increased in absolute and relative percentages to the total export from India during 2004-05 to 2010-11 and projections for 2016-17 have suggested a decreasing trend.

With respect to 'others', the actual and predicted export shares showed a decrease from 36.25 to 25.0 per cent and from 24.14 to 22.23 per cent between 2004-05 and 2010-11 and the estimation for 2017-18 suggested an increase to 24.27 per cent.

Export Competitiveness

The global competitiveness of chilli was evaluated using nominal protection co-efficient (NPC) (Gulati *et al.*, 1994), which is a measure of actual divergence or distortion between any given commodity's domestic price and international (border) price. The underlying rationale is that such divergence represents the presence of market interventions such as taxes, subsidies and other policy instruments (Appleyard, 1987). The chilli being a dominant commodity of India's export basket, NPC was calculated under exportable hypothesis, when the domestic good competes at a foreign port. The NPC value less than one indicates global competitiveness of the commodity under consideration; the NPC value less than 0.5 denotes high competitiveness and from 0.5 to 1.0 shows moderate competitiveness. The

commodity is not competitive for export, if NPC value exceeds unity.

Under the exportable hypothesis, the estimated NPCs varied from 0.46 to 0.69 during the period 2006-07 to 2010-11 indicating that Indian red chilli was globally price competitive (Table 4).

Export Competitiveness of Indian Red Chilli vis-à-vis Chinese Red Chilli

A product has to be competitive in the international market to sustain and increase its exports. Apart from competitive pricing, factors like quality, timely shipment, honoring export commitments, regularity of supply, etc. also play an important role in capturing international markets. The analysis of export competitiveness in general showed that chilli is competitive for export to other countries, as evident from the nominal protection coefficients (NPCs). Therefore, the export competitiveness of chilli needs to be exploited by India through proper planning and development of suitable infrastructure. In chilli, the nominal protection coefficient (Table 4) was less than one from 2006-07 to 2010-1, indicating its high export competitiveness.

The export competitiveness of Indian red chilli vis-a-vis Chinese red chilli indicated that red chilli was globally price competitive for three years of the five year period studied. (Table 5).

Table 4. Nominal protection coefficients (NPC values) of red chilli under exportable hypothesis

Particulars	2006-07	2007-08	2008-09	2009-10	2010-11
Wholesale price of red chilli in Guntur market (₹/q)	4,767	4,525	3,505	3,825	6,500
AMC cess 1% (₹/q)	48	45	35	38	65
Transport from cold storage/market yard (₹/q)	36	36	36	36	36
Repacking in 25 kg bags (₹)	100	100	100	100	100
New gunny bags cost (₹)	214	214	214	214	214
Loading (₹)	20	20	20	20	20
Lorry to Chennai (₹/q)	125	125	133	140	140
Margin 5% (₹)	238	226	175	191	325
Total (₹/q)	5,548	5,291	4,218	4,564	7,400
Ocean freight /THC BL charges to New York (₹/q)	34	34	34	34	34
Wharfage charges, fumigation/survey, spices board fee, health certificate, phyto fees (₹/q)	114	114	114	114	114
Handling/customs, SB processing, cargo inspection, loading mamool, MOT charges, GSP certification, etc. (₹/q)	371	371	371	371	371
Total (₹/q)	6,067	5,810	4,737	5,083	7,919
Service tax (10.3%)	625	599	488	524	816
Landed price at New York	6,692	6,409	5,225	5,607	8,735
Exchange rate (₹/US$)	40.79	39.80	48.27	45.69	45.02
Landed price at New York (US$)	164.06	161.03	108.26	122.72	194.02
FOB at New York (US$/q)	254.70	234.26	235.87	253.05	358.51
NPC	0.64	0.69	0.46	0.48	0.54

Table 5. Export competitiveness of Indian red chilli vis-à-vis Chinese red chilli: 2006-07-07 to 2010-11

Years	Indian FOB price (US$/q)	Chinese FOB price (in US$/q)	NPC
2006-07	254.7	248.43	1.03
2007-08	234.26	374.85	0.62
2008-09	235.87	312.74	0.75
2009-10	253.05	261.84	0.97
2010-11	358.51	350.96	1.02

Conclusions

The direction of trade in Indian chillies, studied by Markov chain analysis, has shown USA to be the most stable market, followed by UAE and Sri Lanka. The countries like Malaysia, Bangladesh and Pakistan have been found highly unstable importers of Indian chilli. A higher demand of chillies in the overseas markets helps to fetch a better price, thereby providing more profits to farmers. The computation of nominal protection coefficients has indicated that chilli is competitive for exports to several countries and India should encash this competitive advantage by developing modern infrastructure.

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