Indian Gems and Jewellery Exports: A Cluster-Wise Analysis

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Abstract

The present research paper covers the major ports exporting gems and jewellery products from India to international markets. Various major clusters (ports) have been contributing to India's gems and jewellery sector, that is, Mumbai, New Delhi, Jaipur, Hyderabad, Chennai, Cochin, Nellore, Bangalore, Kolkata, Surat, and Coimbatore. Each of these clusters have been evolving with the help of factors like productive and skilled labor force, raw materials, cluster development, and special economic zones (SEZ) programs. The total gems and jewellery exports of the clusters have been continuously increasing with 12.60% growth rate per annum and Mumbai showed the highest percentage share of exports among the clusters during the period from 1990-91 to 2009-10. Mumbai is the largest and New Delhi is the second largest exporter of India's gems and jewellery products. On the basis of the trend values, various clusters have been classified in two categories - high and low potential categories. Thus, the study has analyzed the progressive behavior of various clusters and concludes that most of the clusters have a high potential for exporting India's gems and jewellery products in the global market.

Keywords : **growth, cluster, coefficient, exports, high potentiality, jems and jewellery**

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The Indian gems and jewellery sector is one of the fastest growing sectors in India and plays a prominent role in export oriented growth. Jewellery crafting and designing is spread over the country, with every village having a house of goldsmiths. India's main diamond cutting centres are located in Surat and Navsari followed by developing centres at Bhavnagar, Palanpur, and Mumbai. Bhavnagar is known for single cuts and Navsari for full cuts ; large sizes are generally cut in Mumbai (Kala, 2005). Ahmedabad and Surat are the major diamond clusters in Gujarat. Surat has more than 3,500 diamond processing units and exports almost 80% of the production. Various diamond processing units have also been established in Mumbai. The city is India's largest wholesale market in terms of volume and is the main centre for machine made jewellery.

Mumbai continues to be the main exporting hub for diamond exports. Almost 94% of the diamond exports are sent by Mumbai airport. Delhi and its neighboring states are also major key centres for manufacturing silver jewellery and articles. Calcutta and Trichur are famous centres for lightweight plain gold and jewellery. In addition, many other major clusters have been contributing to India's gems and jewellery sector, that is, Jaipur, Hyderabad, Nellore, and Coimbatore (India Brand Equity Foundation (IBEF), 2006). Each of these clusters has been evolving with help of the factors like productive and skilled labor force, raw materials, cluster development, and special economic zones (SEZ) programs (Mukherjee, 2008). All these clusters have supported India in creating international competitiveness for the gems and jewellery sector.

Review of Literature

To meet the objectives of the present paper, various literatures related with the gem and jewellery sector and its

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trade clusters were reviewed. Purani (2000) observed that diamonds have a lion's share in Indian gem and jewellery exports from various ports. He stated that India is considered to be one of the world's largest centers for cut and polished diamonds. Kala (2005) examined the various segments of Indian gem and jewellery industry and conducted a port-wise data analysis of gem and jewellery during the period from 1995-96 to 2004-05. Further, Gem and Jewellery Export Promotion Council (2000-2010) in their annual reports estimated the growth and market status and presented data related to the trade of the Indian gem and jewellery sector.

Shanoo and Regan (2010) reported that the Indian gem and jewellery sector has the capability to grow at an estimate of $ 45 billion to $100 billion by 2015. They explained that the sector features two main sub-segments - diamonds and gold, with the former constituting 80% of the jewellery market. Kala (2010) reported that export of gems and jewellery registered a 16 % increase in the total gems and jewellery exports in the year 2009-10. In addition, role of various gems and jewellery products in the total exports were also discussed.

Objectives of the Study

The objectives of the study are:-

(i) To evaluate the position of various clusters exporting gems and jewellery products.

(ii) To compare the growth trends of gems and jewellery exports by clusters.

(iii) To provide the suggestions for improvement of gems and jewellery exports by various clusters.

Research Methodology

The present paper is based on secondary data which were collected from Gem and Jewellery Export Promotion Council (GJEPC), Ministry of Commerce and Industry, Government of India, New Delhi. To analyze the trends in export of gems and jewellery and to make a comparative analysis of major ports (clusters), the following methodology had been used:

➲ **Compound Annual Growth Rate (CAGR) :** Compound growth rate or compound annual growth rate (CAGR) is calculated by using the following formula:

$$Y = ab^t \qquad \text{.....(1)}$$

where,

Y = gems and jewellery exports,
a = intercept,
t = time,
b = 1+ r and r is the compound annual growth rate.

The logarithmic transformation of this function gives

$$\text{Log } Y = \log a + t \log b, \text{ which is a log linear function}$$

The values of parameters a and b in equation are estimated by using the ordinary least square (OLS) method. The compound annual growth rate is computed as:

$$\text{CAGR}(g\%) = [\text{Antilog}(\log b) - 1] \times 100.$$

$$Y = a + bt \qquad \text{.....(2)}$$

where,
Y = export of gems and jewellery products,
a = intercept,
t = time,

b = linear trend.

In addition to this, coefficient of variation, which is considered as a relative measure of the inequality in the exports of gems and jewellery, was also found. Coefficient of variation is denoted by C. V. and is given by the following formula :

$$\text{Coefficient of Variation (C.V.)} = \frac{\sigma}{\bar{X}} \text{ x100}$$

Analysis and Findings

The research paper covers the major ports exporting gems and jewellery products from India to global markets. On the basis of trend values, growth rates, percentage share, and a comparative study, the export performance of

Table 1. Cluster-Wise Exports of Gems and Jewellery Products During the Period from 1990-91 to 2009-10

(Values in US $ Million)

		1	2	3	4	5	6	7	8	9	10
Year	**Total**	**Mumbai**	**New Delhi**	**Jaipur**	**Chennai**	**Cochin**	**Coimbatore**	**Bangalore**	**Kolkata**	**Surat**	**Hyderabad**
1990-91	2973.75	2803.85	81.31	80.91	6.25	0.52	0	0.91	0	0	0
1991-92	2924.13	2752.52	80.28	75.9	9.2	0.66	0	5.53	0.2	0	0
1992-93	3265.39	3107.39	77.84	62.75	8.43	0.78	0	8.61	0.37	0	0
1993-94	4134.27	3926.33	128.32	56.12	9.69	0.86	0	13.39	0.42	0	0
1994-95	4673.47	4411.93	137.18	84.53	14.63	1.66	0	24.84	0.36	0	0
1995-96	5417.08	5067.97	176.83	104.72	23.15	3.15	0	40.58	0.68	0	0
1996-97	5249.93	4818.02	249.18	112.5	16.43	6.39	0	46.49	1.02	2.24	0
1997-98	5560.77	5110.42	253.51	118	14.23	4.01	7.55	49.52	4.59	0.94	0
1998-99	6201.12	5742.26	238.62	147.05	14.93	7.63	6.38	40.45	18.47	1.25	1.08
1999-00	8136.04	7585.92	240.79	162.95	19.57	3.18	8.66	49.83	50.36	1.15	13.63
2000-01	7609.96	6949.07	297.03	164.94	20.5	3.00	13.7	48.44	53.88	46.69	12.71
2001-02	7401.01	6647.12	279.03	182.8	21.74	5.06	10.29	59.77	61.88	119.11	14.21
2002-03	8915.58	8069.9	313.69	218.1	28.84	6.55	7.3.00	64.43	75.94	115.96	14.87
2003-04	11601.74	9937.79	495.6	228.85	40.99	6.16	7.54	552.19	89.27	233.63	9.72
2004-05	15300.07	12937.38	682.66	277.63	106.9	8.71	2.95	912.63	130.13	231.49	9.59
2005-06	16706.05	14168.99	481.96	356.76	146.97	8.77	1.35	1022.47	220.36	282.22	16.2
2006-07	17116.7	13941.78	471.03	423.9	175.26	6.76	0.58	1441.33	417.88	225.55	12.63
2007-08	20849.72	17396.11	456.76	507.92	326.13	24.39	0.91	1077.97	651.26	378.88	29.39
2008-09	24771.17	15304.88	1522.9	502.95	404.39	34.24	0.6	364.86	910.99	529.18	27.17
2009-10	29370.19	15941.61	2015.77	535.17	538.05	54.29	0.88	500.7	1012.05	689.10	123.86
CAGR	**12.60**	**10.55**	**15.09**	**12.70**	**24.52**	**21.79**	**-23.25**	**34.79**	**67.27**	**53.16**	**15.35**
	(25.53*)	**(23.46*)**	**(11.90*)**	**(19.85*)**	**(11.03*)**	**(10.06*)**	**(-5.87)**	**(10.54*)**	**(18.43*)**	**(8.91*)**	**(3.17*)**
Trend	**1196.304**	**780.755**	**61.629**	**25.055**	**19.711**	**1.620**	**-0.887**	**54.645**	**44.645**	**46.277**	**5.246**
Values	**(9.63*)**	**(13.20*)**	**(4.70*)**	**(10.60*)**	**(5.07*)**	**(4.32*)**	**(-4.35)**	**(4.40*)**	**(5.30*)**	**(8.43*)**	**(2.31*)**

Source: Gem and Jewellery Export Promotion Council. (2000-2010). Various Annual Publications. Ministry of Commerce and Industry, Government of India, New Delhi.

Note: * The coefficients are significant at α = 0.05.

Figures in parentheses in the last two rows are *t* - values.

Table 2. Percentage Share of Gems and Jewellery Exports of Various Clusters to Total Exports of Gems and Jewellery During the Period from 1990-91 to 2009-10

(Values in US $ Million)

	1	2	3	4	5	6	7	8	9	10
Year	Mumbai	New Delhi	Jaipur	Chennai	Cochin	Coimbatore	Bangalore	Kolkata	Surat	Hyderabad
1990-91	94.28	2.73	2.72	0.21	0.01	0	0.03	0	0	0
1991-92	94.13	2.74	2.59	0.31	0.02	0	0.18	0.006	0	0
1992-93	95.16	2.38	1.92	0.25	0.02	0	0.26	0.01	0	0
1993-94	94.97	3.10	1.35	0.23	0.02	0	0.32	0.01	0	0
1994-95	94.40	2.93	1.80	0.31	0.03	0	0.53	0.007	0	0
1995-96	93.55	3.26	1.93	0.42	0.05	0	0.74	0.01	0	0
1996-97	91.77	4.74	2.14	0.31	0.12	0	0.88	0.01	0.007	0
1997-98	91.90	4.55	2.12	0.25	0.07	0.13	0.89	0.29	0.01	0
1998-99	92.60	3.84	2.37	0.24	0.12	0.10	0.65	0.08	0.02	0.01
1999-00	93.23	2.95	2.00	0.24	0.03	0.10	0.61	0.61	0.01	0.16
2000-01	91.31	3.90	2.16	0.26	0.03	0.18	0.63	0.70	0.61	0.16
2001-02	89.81	3.77	2.46	0.29	0.06	0.13	0.80	0.83	1.60	0.19
2002-03	90.51	3.51	2.44	0.32	0.07	0.08	0.72	0.85	1.30	0.16
2003-04	85.65	4.27	1.97	0.35	0.05	0.06	4.75	0.76	2.01	0.08
2004-05	84.55	4.46	1.81	0.69	0.05	0.01	5.96	0.85	1.51	0.06
2005-06	84.81	2.88	2.13	0.87	0.05	0.008	6.12	1.31	1.68	0.09
2006-07	81.45	2.75	2.47	1.02	0.03	0.003	8.42	2.44	1.31	0.07
2007-08	83.43	2.19	2.43	1.56	0.11	0.004	5.17	3.12	1.81	0.14
2008-09	61.78	7.76	2.03	1.63	0.18	0.002	1.47	3.67	2.84	0.10
2009-10	54.27	9.41	1.82	1.83	0.27	0.002	1.70	3.44	3.46	0.42

Source: Ibid., Table-1

various clusters has been analyzed. The Table 1 reveals a clear picture of India's cluster-wise export of gems and jewellery comprising of different dimensions during the study period from 1990-91 to 2009-10. The Column 2 of the Table clearly shows that the total gems and jewellery exports of the clusters were continuously increasing with 12.60% compound annual growth rate (CAGR).

In addition to this, its annual trend values (US $ 1,196.304 million) are statistically significant at $\alpha = 0.05$. Further, columns 3 to 12 of the Table depict the total gems and jewellery exports of the 10 clusters. It can be observed that Kolkata marked the highest growth rate, that is, 67.27% followed by Surat and Bangalore with 53.16% and 34.79 % CAGR respectively. The least growth rate was shown by Mumbai, that is, 10.55%. It is evident from the Table that all the growth rates have been found to be statistically significant at the 5% ($\alpha = 0.05$) level of significance.

The Table 2 represents the percentage share of 10 ports (clusters) of gems and jewellery to total exports of gems and jewellery for the period from 1990-91 to 2009-10. The figures show the fluctuating nature of export figures over the study period. Column 7 shows the diminishing rate of exports from Coimbatore in percentage with respect to total gems and jewellery exports of ports. Mumbai has been showing the highest percentage share of exports among the clusters during the study period. In addition to this, the last row of the Table shows the coefficients of variations of indices of the value of exports of gems and jewellery products from various clusters for the study period, and it can be observed that the lowest and highest coefficients of variations were for Mumbai and Bangalore respectively (ranges from 12.1845 to 102.8964). This type of analysis of the exports indices is very useful in formulating the appropriate policies about various export clusters of India.

Table 3. Cluster- Wise Indices of Value of Gems and Jewellery Exports During the Period from 1990-91 to 2009-10

(Values in US $ Million)

Year	Mumbai	New Delhi	Jaipur	Chennai	Cochin	Coimbatore	Bangalore	Kolkata	Surat	Hyderabad	Total
1990-91	100.000	100.000	100.000	100.000	100.000	-	100.000	-	-	-	100.000
1991-92	98.169	98.733	93.807	147.201	126.923	-	262.085	100.000	-	-	98.291
1992-93	112.892	96.960	82.674	91.630	118.181	-	155.696	185.000	-	-	111.697
1993-94	126.354	164.851	89.434	114.946	110.256	-	155.516	113.513	-	-	126.604
1994-95	112.367	106.904	150.623	150.980	193.023	-	185.511	85.714	-	-	113.058
1995-96	114.869	128.903	123.885	158.236	189.759	-	163.365	188.888	-	-	115.870
1996-97	95.068	140.915	107.429	70.971	202.857	-	114.563	150.000	100.000	-	96.948
1997-98	106.068	101.737	104.888	86.609	62.754	100.000	106.517	450.000	87.946	-	105.902
1998-99	112.363	94.126	124.618	104.919	190.274	84.503	81.684	402.396	583.756	100.000	111.817
1999-00	132.106	100.909	110.812	131.078	41.677	135.736	123.189	272.658	235.826	155.239	131.241
2000-01	91.604	123.356	101.221	104.752	94.339	158.198	97.210	106.989	172.160	93.250	93.236
2001-02	95.654	93.940	110.828	106.048	168.666	75.109	123.389	114.847	255.108	111.801	97.254
2002-03	121.404	112.421	119.310	132.658	129.446	70.942	107.796	122.721	97.355	104.644	120.464
2003-04	123.146	157.990	104.928	142.128	94.045	103.287	857.038	117.553	201.474	65.366	130.128
2004-05	130.183	137.744	121.315	260.795	141.396	39.124	165.274	145.771	99.084	98.662	131.877
2005-06	109.519	70.600	128.501	137.483	100.688	45.762	112.035	169.338	121.914	168.925	109.189
2006-07	98.3964	97.732	118.819	119.248	77.080	42.962	140.965	189.635	79.919	77.962	102.458
2007-08	124.776	96.970	119.820	186.083	360.798	156.896	74.789	155.848	167.980	232.699	121.809
2008-09	87.978	333.413	99.021	123.996	140.385	65.934	33.846	139.881	139.669	92.446	94.016
2009-10	104.160	132.363	106.406	133.052	158.557	146.666	137.230	111.093	130.220	455.870	109.230
C.V.	**12.1845**	**45.0767**	**13.9874**	**31.5165**	**49.2131**	**47.7148**	**102.896**	**56.5945**	**73.3315**	**73.7271**	**11.4436**

Source: Ibid., Table 1

Table 4. Cluster-wise/Rank-wise Trend Values of Gems and Jewellery Exports During the Period from 1990-91 to 2009-10

(Values in US $ Million)

Sr. No.	Export Clusters	Trend Values	Ranks
1	Mumbai	780.755 (13.20*)	1
2	New Delhi	61.629 (4.70*)	2
3	Bangalore	54.645 (4.40*)	3
4	Surat	46.277 (8.43*)	4
5	Kolkata	44.645 (5.30*)	5
6	Jaipur	25.055 (10.60*)	6
7	Chennai	19.711 (5.07*)	7
8	Hyderabad	5.246 (2.31**)	8
9	Cochin	1.620 (4.32*)	9
10	Coimbatore	-0.887(-4.35)	10

Source: Ibid., Table 1

Note: Figures in parentheses are *t* - values.

* The coefficients are significant at $\alpha = 0.05$

The Table 3 depicts the indices and coefficients of variations of the gems and jewellery exports from various clusters in value terms during the period from 1990-91 to 2009-10. The Table reveals that the indices of the exports of various ports increased tremendously (with the exception of Coimbatore) over the study period. However, the indices of Mumbai, New Delhi, Jaipur, Chennai, Cochin, Coimbatore, Bangalore, Kolkata, Surat, Hyderabad and the total of ports ranged from 87.8787 to 132.1069, 70.6003 to 333.4136, 82.6745 to 150.6236, 70.9719 to 260.7953, 41.6775 to 360.7988, 39.1246 to 158.1986, 33.8469 to 857.0386, 85.7142 to 450.0000, 79.9199 to 583.7563, 65.3665 to 455.8704, 93.2363 to 130.1288 (values in USD million), respectively. Further,

Table 5. Comparative Picture of Cluster-Wise Growth Rates of Gems and Jewellery Exports During the Period from 1990-91 to 1999-00 and 2000-01 to 2009-10

(Values in $ Millons)

Sr. No.	Clusters	CAGR	*t* - value	*F* -value	R^2
1	Mumbai	10.55	23.46*	550.82	0.968
	α	11.08	11.01*	121.34	0.938
	β	11.70	7.46*	55.32	0.874
2	New Delhi	15.09	11.90*	141.76	0.887
	α	16.74	7.94*	63.12	0.887
	β	20.29	4.34*	18.86	0.702
3	Jaipur	12.70	19.85*	394.21	0.956
	α	10.44	4.72*	22.29	0.735
	β	15.65	16.32*	266.63	0.970
4	Chennai	24.52	11.03*	121.83	0.871
	α	11.74	4.02*	16.17	0.669
	β	49.74	17.32*	300.20	0.974
5	Cochin	21.79	10.06*	101.35	0.849
	α	33.98	5.84*	34.17	0.81
	β	32.39	6.64*	44.10	0.846
6	Coimbatore	-23.25	-5.87	34.55	0.758
	α	29.38	3.78*	14.29	0.641
	β	-31.93	-7.50	56.26	0.875
7	Bangalore	34.79	10.54*	111.20	0.860
	α	46.43	5.38*	29.03	0.783
	β	36.02	2.83*	8.04	0.501
8	Kolkata	67.27	18.43*	339.87	0.952
	α	65.21	4.14*	17.16	0.682
	β	44.83	15.03*	226.15	0.965
9	Surat	53.16	8.91*	79.48	0.868
	α	3.03	1.05	1.11	0.122
	β	27.95	8.10*	65.61	0.891
10	Hyderabad	15.35	3.17*	10.06	0.501
	α	15.69	1.79	3.22	0.286
	β	19.75	2.89*	8.36	0.511

Source: Ibid., Table 1

Note: α : Denotes the period from 1990-91 to 1999-2000.
β Denotes the period from 2000-2001 to 2009-2010.
* The coefficients are significant at α = 0.05

the last row of the Table indicates the coefficients of variation of the indices of value of exports by clusters over the study period (1990-91 to 2009-10). It can be observed that the lowest coefficient of variations are for Mumbai and the highest coefficient of variations are for Bangalore (ranges from 12.1845 to 102.8964). The respective indices of several clusters depict a high potentiality for India's gems and jewellery exports in the global market.

The Table 4 shows the ranks and trend values of 10 main exporting clusters (ports) of gems and jewellery exports from India for the period from 1990-91 to 2009-10. It is clear from the Table that Mumbai is the largest and New Delhi is the second largest exporter of India's gems and jewellery products. The Table also reveals that Mumbai, New Delhi, Bangalore, Surat, and Kolkata are very efficient clusters not only because of being placed at the top ranks (1 to 5), but also because of their positive annual trend values, that is, US $ 780.755 million, US $ 61.629 million , US $ 54.645 million, US $ 46.277 million, and US $ 44.645 million, respectively. However, the trend value of Coimbatore is negative and statistically insignificant. Furthermore, on the basis of trends, we can classify the clusters in two categories. Likewise, the first five clusters can be included in the high potential category and rest of the clusters can be included in low potential category. This type of classification is very useful to know the role of various clusters in the economic sector.

The Table 5 reveals the comparative analysis of the cluster-wise growth rate of gem and jewellery exports during the period from 1990-91 to 2009-10. For the purpose of trend analysis, the data related to gem and jewellery exports from India is divided into two periods, that is 1990-91 to 1999-2000 and 2000-01 to 2009-10. It is clear from the Table that during the period from 1990-91 to 1999-2000, the growth rates of gem and jewellery clusters like Mumbai, New Delhi, Hyderabad, Cochin, Bangalore, and Chennai showed high growth rates as compared to the total period (1990-91 to 2009-10) except Coimbatore, Surat, and Kolkata. After examining the *t* - value, it was observed that most of the growth rates are statistically significant at the 5% ($\alpha = 0.05$) level of significance.

Policy Implications

Based on the results of secondary data on various clusters exporting gems and jewellery from India, several policy implications can be provided. It has been observed that exports of gems and jewellery products from India are mainly concentrated in few clusters like Mumbai, New Delhi, Bangalore, and Surat. Thus, the present paper stresses that it is necessary to classify export cluster portfolio and concentrate more on other clusters of the industry like Kolkata, Jaipur, Chennai, Hyderabad, Cochin, and Coimbatore. Furthermore, Kolkata showed an appreciable compound annual growth rate of 67.27 % during the study period, yet the trend values of this cluster have been low, so exports of gems and jewellery should be increased (in terms of quantity) from this cluster.

Conclusion

The study has analyzed the progressive behavior of various clusters exporting gems and jewellery products and concluded that Mumbai has been exporting the largest share of total gems and jewellery products with a compound annual growth rate of 10.55% and trend values of US $ 780.755 million over the study period. The comparative analysis of various clusters reveals that when the total exports of gems and jewellery products from all clusters were divided in two periods, that is, 1990-91 to 1999-00 and 2000-01 to 2009-10, the gem and jewellery clusters like Mumbai, New Delhi, Hyderabad, Cochin, Bangalore, and Chennai showed high growth rates as compared to the total period (1990-91 to 2009-10) with the exception of Coimbatore, Surat, and Kolkata. Furthermore, on the basis of trend values of gems and jewellery exports, Mumbai (US $ 780.755 million), New Delhi (US $ 61.629 million), Bangalore (US $ 54.645 million), Surat (US $ 46.277 million), and Kolkata (US $ 44.645 million) have been recognized as high-potential export clusters. On the other hand, Jaipur (US $ 25.055 million), Chennai (US $ 19.711 million), Hyderabad (US $ 5.246 million), Cochin (US $ 1.620 million), and Coimbatore (US $ -0.887 million) have been showing low export potential, which is a matter of concern for the gems and jewellery industry and requires immediate attention.

Scope for Further Research

Future researchers can conduct a study on astrological and medical uses of gems and their exports to other countries. A country-wise as well as product-wise trade analysis can be another potential research topic. A state-wise comparative study of the marketing of gems and jewellery may be taken up as a potential research work. The methodology for the analysis may be the same, as has been adopted in the present study.

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