

SECTORAL ANALYSIS OF FOREIGN DIRECT INVESTMENT IN INDIA DURING FIRST GENERATION REFORM PERIOD

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Abstract Since 1991, India has cautiously and slowly opened almost all the sectors, except a few related to strategic importance, for foreign investors. Degree of openness of various industrial sectors for FDI has been increased to the extent of 100 percent by consistently liberalising industrial policies of the sectors. The purpose of the paper is to study pattern and trends of sectoral distribution of FDI within the background of the first generation reforms and liberalised industrial policies during 1991-2001.

The paper has used series of the dynamics and stylistic indices and statistical tools such as three level indices, index of rank dominance, and correlation matrices for explaining the pattern of FDI distribution across sectors during 1991-2001. The results show that electrical, transportation, chemical, telecommunication, and service sectors are most dominating sectors and represent almost 75 percent of total FDI received during 1991-2001. Index of rank dominance indicates distribution of FDI across the sectors is top heavy.

Keyword: Foreign Direct Investment, Industrial Policy, Industrial Sectors, Ranks Dominance, Correlation

INTRODUCTION

India made appropriate changes in its policy since 1991 for attraction of FDI. The sweeping changes in the policy introduced since 1991 mark a radical departure from the past and reflect a positive approach towards foreign capital. The changes provide freedom to foreign investors to enter into Indian industry. Under the ongoing policy phase the thrust is on providing access to capital, technology, and market in order to induce greater industrial efficiency and integration of the domestic economy with the global economy. FDI is now permitted in almost all sectors except a few lists of strategic concern reserved for the state. The enlarged spheres for FDI entry now include print media, defence, mining, oil exploration, refining and marketing, power generation, and telecommunication, which were earlier reserved for the state sector.

Since 1991, India has cautiously and slowly opened almost all the sectors, except a few related to strategic importance, for foreign investors. Degree of openness of various industrial sectors for FDI has been increased to the extent of 100 percent by consistently liberalising industrial policies of the sectors.

Objectives of the Study

The purpose of the paper is to study pattern and trends of sectoral distribution of FDI within the background of the

first generation reform periods and liberalised industrial policies during period 1991-2001.

Plan of the Study

In second section, we shall be discussing the literature review. Third section lays out data source and research methodology. The subsequent section contains all the results and analysis. The last section is about conclusions.

LITERATURE REVIEW

Bajpai and Dasgupta (2004) opine that electrical, engineering, and electronic goods sectors accounted for the major share of FDI flow into India between 1992 and 2002. In 1999-00, these three sectors accounted for a major 32 percent of the total actual FDI flows. FDI was rarely available for infrastructure projects. None of the infrastructure sectors figured in the first 10 major sectors that attracted FDI flows during 1999-00. FDI in the computers and service sectors gained momentum towards the end of the 1990s. FDI in the chemicals, finance, food and dairy products, and pharmaceutical sector have shown a remarkable decline since the mid-1990s. FDI in engineering industries displayed a downward trend, but still could retain an 8 percent share in 2001-02. The service sector attracted the most FDI in 2002 (38 percent of the total FDI, leaving 61 percent for the manufacturing sector). On the whole, it transpires from the table that while FDI in the service sector showed a rising trend,

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in the manufacturing sector, only electronics and computers could attract significant FDI during 2000-02. On the whole, it is observed that in India, FDI is flowing into areas where skilled labour is a major input.

Jha (2003) points out that unless FDI makes its own contributions towards technology progress, productivity spillovers and a consolidation of niche export markets, it may be considered as a part of the level of general investment in the economy. FDI needs certain types of domestic policy support in order to flourish. This paper emphasizes the view that an enlightened FDI policy, both at the national and the states level, is to be seen as part of a general policy of enhancing investment in this economy under condition of sustained production efficiency.

Kumar (2003) has overviewed the evolution of Indian government's attitude towards FDI, examined the trends and patterns in FDI inflows during the 1990s and has considered its impact on a few parameters of development in a comparative East Asian perspective. The paper finds a good correspondence between industrial growth rate in a year and the FDI inflows in the following year. The industrial growth seems to signal to the foreign investors about the prospects of the economy. Therefore, it appears that policy liberalisation may be a necessary but not a sufficient condition for FDI inflows.

When the relative importance of incentives vis-à-vis infrastructure in attracting private investment was gauged, it was found that the infrastructure status plays a significant role, (Venkatesam & Varma, 1998; Padhi, 2002).

RESEARCH METHODOLOGY

Date Source

Sector-wise FDI data in terms of actual and approval have been taken from SIA Newsletter- various monthly and annual issues. These data have been maintained by Department of Industrial Policy and Promotion, Ministry of Industry and Commerce, Government of India (<http://dipp.gov.in/>). The period of study is 1991 – 2001.

Indices of Sectoral Distribution

We have measured a set of formalised and stylised indices at three points of time of sectors for actual FDI inflows and approval of FDI.

I level of Indices

It is ratio of FDI in a particular sector with respect to FDI average of all sectors for both actuals and approvals of FDI.

(i) Relative index of FDI Approval w.r.t. sectors

$$F_{rt}^{A_p} = \frac{F_t^{A_p}}{\left[\sum_{A_p=1}^n F_t^{A_p} / n \right]}$$

where, t = 1991, 1996, 2001

$$A_p = 1, 2, \dots, 38$$

$$n = 38$$

$F_{rt}^{A_p}$ = FDI ratio of A_p th sector with respect to overall average FDI approval (in Rs. crores) in tth period.

(ii) Relative index of FDI Actual inflows w.r.t. sectors.

$$F_{rt}^{A_c} = \frac{F_t^{A_c}}{\left[\sum_{A_c=1}^n F_t^{A_c} / n \right]}$$

where, t = 1991, 1996 and 2001

$$A_c = 1, 2, \dots, 38$$

$$n = 38$$

$F_{rt}^{A_c}$ = FDI ratio of A_c th sector with respect to overall average FDI actual inflows (in Rs. crores) in tth period.

II level of Indices

It is a temporal ratio of first ratio at two point of time for both approvals and actuals.

(i) Temporal Index of FDI approval w.r.t. sectors

$$RF_{t't}^{A_p} = \frac{F_{rt}^{A_p}}{F_{t't}^{A_p}}$$

$RF_{t't}^{A_p}$ = Relative index of FDI approval w.r.t. sectors.

The relative index of FDI approval measures changes in relative position of the FDI index of a particular sector over between two period of time. These yield two indices between 1996 and 1991 and between 2001 and 1996.

(i a) Average Ratio of Relative FDI Approval

$$ARF_T^{A_p} = \sum_{A_p=1}^n RF_{t't}^{A_p} / n$$

ARF_T = Average of relative ratio of FDI approval w.r.t. sectors between two point of time.

(i b) Change in FDI Approval Average

$$ARF_{T'T} = \frac{ARF_{T'}^{A_p}}{ARF_T^{A_p}}$$

$ARF_{T'T}$ = Change in average relative ratio of FDI approval between two points of time.

(ii) Temporal index of FDI actual inflows w.r.t. sectors

$$RF_{t't}^{A_c} = \frac{F_{t't}^{A_c}}{F_{t't}^{A_c}}$$

$RF_{t't}^{A_c}$ = Relative index of FDI actual inflow w.r.t. sectors.

The relative index of FDI actual inflow measures changes in relative position of the FDI index of a particular sector over between two periods of time. These yield two indices between 1996 and 1991 and between 2001 and 1996.

(ii a) Average Ratio of Relative FDI Actual

$$ARF_T^{A_c} = \sum_{A_c=1}^n RF_{t't}^{A_c} / n$$

$ARF_T^{A_c}$ = Average of relative ratio of FDI actual inflows w.r.t. sectors between two points of time.

(ii b) Change in FDI Actual Average

$$ARF_{T'T} = \frac{ARF_{T'}^{A_c}}{ARF_T^{A_c}}$$

$ARF_{T'T}$ = change in average relative ratio of FDI actual between two point of time.

III level of Indices

It is ratio between the temporal indices of actual FDI inflows and corresponding temporal indices of approval of FDI.

(i) $RR_t = \frac{RF_{t't}^{A_c}}{RF_{t't}^{A_p}}$

(a) $ARR_T = \sum RR_t / n$

(b) $ARR_{T'T} = \frac{ARR_{T'}}{ARR_T}$

Power of these indices lies in exposing what is the relative position of each sector with respect to overall average both in terms of FDI approval and FDI actual inflow. Also its tell us the change in relative position over time with the help of temporal indices. Overall change is measured by average across the sectors.

Analysis of Sector Identity among Top Five Sectors

FDI approvals

To measure the correlation of sector identity amongst the top five sectors, we have observation on ‘T’ years.

To measure rolling correlation, we have developed following measure:

$$C_{RA_p} = Carr(I_{nt}, I_{nt+1})$$

where, C_{RA_p} = Rolling correlation amongst top five sectors in case of approvals.

T = 1995, 1996, 2000

I_n = Number of Industries/sectors.

To measure comparative correlation with the base year, we have developed following model

$$C_{BA_p} = Carr(I_{no}, I_{nt+1})$$

where, C_{BA_p} = comparative correlation with the base year (1995), amongst top five sectors in case of approvals.

t = 1996, 1997, 2001.

Actual Inflows of FDI

To measure the correlation of sector identity amongst the top five sectors, we have observation on ‘T’ years.

To measure rolling correlation, we have developed following model:

$$C_{RA_c} = Corr(I_{nt}, I_{nt+1})$$

where, C_{RA_c} = Rolling correlation amongst top five sectors in case of amount of FDI received.

t = 1991, 1992, 2000

I_n = Number of Industries/sectors.

To measure comparative correlation with the base year (1991), we have developed following model:

$$C_{BA_c} = Corr(I_{n0}, I_{nt+1})$$

where, C_{BA_c} = comparative correlation with the base year (1991), amongst top five sectors in case of amount of FDI received.

t = 1992, 1993, 2001

Rank Dominance in the Sectors

Among the top five sectors, which sector had the dominant position for the longest period was estimated with the help of index of rank dominance:

$$I_{RD} = \frac{\sum_{i=1991}^{2001} (Rank\ Score)_i}{Maximum\ Rank\ Score \times No.\ of\ Years}$$

I_{RD} is the index of rank dominance.

Rank score = 5, 4, 3, 2, 1 (in decreasing order of rank).

The value of I_{RD} lies between 0 and 1 i.e.

$$0 < I_{RD} \leq 1$$

I_{RD} is measured in relative term with most dominant state over a number of years in attracting FDI. The value of I_{RD} lies between zero and one but never becomes zero because only those sectors are included in I_{RD} which have presence in top five sectors over the said period. The maximum value of I_{RD} for a particular sector shall be one provided that the particular sector had been at top rank in all years in attracting FDI.

Because of dynamic changes, it is not possible for any single sector to show dominating investment pattern for whole period. Even if a sector is not among top five for one or more years, it can still be dominating. There is a need to have a measure which shows how much the dominant sector deviates from maximum possible period of remaining at top rank.

Sector Dominance in the States

Earlier we have calculated rank dominance of sectors based on annual basis. Here, we measure sectors dominance in states during period August 1991 to December 2001 on an aggregate basis. Sector dominance in the states means sectors attract and have great importance for FDI and are in top five ranks in most of the states. If a sector is at top in attraction of FDI in all the states, then this sector would be most dominating sector in the states.

To measure sector dominance in the states, top five rank sectors in every state are selected and then index of sector dominance in the states is calculated.

$$IS_j = \frac{\sum_{i=1}^s R_{ji}}{\text{Max } R \times S}$$

where, IS_j = index of sector dominance of j^{th} sectors in the states.

$S = 1, 2, 3, \dots, 16$ (maximum number of states)

R_{ji} = Ranks of j^{th} sectors in i^{th} states.

Rank = 5, 4, 3, 2, 1 (in decreasing order)

The value of IS_j lies between 0 and 1, i.e.

$$0 < IS_j \leq 1$$

IS_j measures in relative term with most dominant sector in the states on an aggregate basis. The value of IS_j is between zero and one, but never becomes zero because in this index, only those sectors are included which are at top five ranks in attraction of FDI inflows in at least one state. The maximum value of IS_j would be one provided a sector is at top rank in all the states.

Because of dynamic changes, it is not possible for any single sector to be dominating in all states. Even if a sector is not among top five in one or more states, it can still be dominating in the states. There is a need to have a measure which shows the dominant sector in the states deviate from top rank.

EMPIRICAL RESULTS AND ANALYSIS

General Trends of Sector-wise FDI Distribution

The sectoral distribution of foreign direct investment inflows approved during August 1991 to December 2001 is given in Table 1. It shows that fuels and telecommunication are the largest beneficiaries of FDI approvals with shares of 28.07 percent and 20.16 percent in the total approved during August 1991 and December 2001. Electrical equipment is the third largest recipient of FDI approved with a share of 9.71 percent. Transportation industry received 7.13 percent of the FDI approved during this period and occupied the fourth rank. Service sector just received 6.14 per cent of

Table 1: Sectoral Break-up of Foreign Direct Investment Approved (during August 1991 to December 2001)

(Rupees Million)

Sector	Amount of FDI approved	Percent share of the total
Fuels (Power & Oil Refinery)	768028.4	28.07
Telecommunications	551499.5	20.16
Electrical Equipment (Incl. S/W & Elect)	265604.3	9.71
Transportation Industry	195126.2	7.13
Service Sector	167872.1	6.14
Metallurgical Industry	153427.3	5.61
Chemical (other than fertilizers)	125859.6	4.60

Sector	Amount of FDI approved	Percent share of the total
Food Processing Industry	91195.01	3.33
Hotel & Tourism	48433.56	1.77
Textiles (incl. Dyed, Printed)	34057.31	1.24
Others	334668.73	12.24
Total	2735772.01	100

Source : SIA, Newsletter, Annual Issue, 2002.

FDI approved. Metallurgical industries, chemicals, and food processing industries were other industries, which received 6 percent to 2 percent of FDI approved during this period.

Three Level Indices

Table 2 shows the performance and position of the various sectors in terms of attraction of FDI inflows over different points of time. The top five gainer sectors are service sector, textiles, metallurgical industries, ceramics, and fuels (power and oil refinery) and the top five loser sectors are mechanical engineering, chemicals, drugs and pharmaceuticals,

electrical equipment, and transportation industries in 1996 with respect to 1991. The top five gainers sectors are commercial, office and household equipment, cement, mechanical and engineering, transportation industry, and industrial machinery and the top five loser sectors are industrial instrument, drugs and pharmaceuticals, leather, glass, and fermentation industries in 2001 with respect to 1996.

Table 2 shows that overall of FDI approval has increased more than three times in 1996/1991 but decreased in 2001/1996. Standard deviation of sector-wise FDI approvals have been on increasing trend in 1996/1991 and 2001/1996.

Table 2: Indices of Sector-wise Distribution of FDI

Sectors	Approval(Rs Crore)			FDIi/Av.FDI			Ratios' Proportion	
	1991	1996	2001	1991	1996	2001	1996/1991	2001/1996
Mettallurgical Industries	819.35	2316.38	963.06	2.62	2.43	3.26	0.93	1.34
Fuels (Power & Oil Refinery)	2340.54	5752.59	7583.96	7.48	6.05	25.66	0.81	4.24
Boilers & Steam Generating Plants	19.32	13.40	0.50	0.06	0.01	–	0.23	0.12
Prime Movers other than Electrical	3.51	35.89	–	0.01	0.04	–	3.36	–
Electrical Equipment	554.58	3122.19	1981.27	1.77	3.28	6.70	1.85	2.04
Telecommunications	3603.78	4436.21	9265.45	11.52	4.66	31.35	0.40	6.72
Transportation Industry	594.94	2879.04	1065.86	1.90	3.03	3.61	1.59	1.19
Industrial Machinery	286.90	197.62	116.50	0.92	0.21	0.39	0.23	1.90
Machine Tools	12.42	74.08	7.22	0.04	0.08	0.02	1.96	0.31
Agri. Mach.	32.28	56.38	–	0.10	0.06	–	0.57	–
Earth-moving Mach.	2.59	–	137.25	0.01	–	0.46	–	–
Misc. Mechanical & Engineering	50.35	295.66	87.24	0.16	0.31	0.30	1.93	0.95
Comm.,Off.& Household Equipment	58.24	157.50	0.13	0.19	0.17	–	0.89	–
Medical Appliance	34.13	2.87	33.10	0.11	–	0.11	0.03	37.20
Industrial Instrument	12.27	42.51	4.39	0.04	0.04	0.01	1.14	0.33
Scientific Instruments	9.35	1.79	–	0.03	–	–	0.06	–
Fertilizers	0.73	242.04	–	–	0.25	–	109.19	–
Chemicals	711.88	3029.89	284.34	2.28	3.18	0.96	1.40	0.30
Photographic Raw Film & Paper	4.98	0.30	–	0.02	–	–	0.02	–
Dye-stuffs	5.15	4.51	5.23	0.02	–	0.02	0.29	3.73
Drugs & Pharmaceuticals	81.95	118.22	372.70	0.26	0.12	1.26	0.47	10.15
Textiles	312.72	415.43	29.15	1.00	0.44	0.10	0.44	0.23
Paper & Pulp	90.86	1062.66	101.95	0.29	1.12	0.34	3.85	0.31
Sugar	10.70	13.25	52.81	0.03	0.01	0.18	0.41	12.83
Fermentation Industries	157.61	83.30	137.24	0.50	0.09	0.46	0.17	5.30
Food Processing Industries	479.27	3384.77	362.01	1.53	3.56	1.23	2.32	0.34
Veg.Oils & Vanaspati	8.76	4.00	3.84	0.03	–	0.01	0.15	3.09
Rubber Goods	23.45	343.16	13.27	0.07	0.36	0.04	4.81	0.12

Sectors	Approval(Rs Crore)			FDIi/Av.FDI			Ratios' Proportion	
	1991	1996	2001	1991	1996	2001	1996/1991	2001/1996
Leather	27.44	29.13	237.38	0.09	0.03	0.80	0.35	26.23
Glass	75.89	302.95	244.44	0.24	0.32	0.83	1.31	2.60
Ceramics	75.53	194.56	2.45	0.24	0.20	0.01	0.85	0.04
Cement	79.55	156.15	420.03	0.25	0.16	1.42	0.65	8.66
Consultancy Services	35.63	524.49	423.39	0.11	0.55	1.43	4.84	2.60
Service Sector	633.17	5269.71	1563.11	2.02	5.54	5.29	2.74	0.95
Hotel & Tourism	366.58	449.09	193.25	1.17	0.47	0.65	0.40	1.39
Trading	25.82	285.26	219.78	0.08	0.30	0.74	3.63	2.48
Soaps, Cosmetics & Toilet Preparations	20.40	28.60	0.93	0.07	0.03	–	0.46	0.10
Misc. Industries	225.75	824.31	941.47	0.72	0.87	3.19	1.20	3.68
Average	312.85	951.31	295.51	1.00	1.00	1.00	4.10	3.82
Change in Average	–	3.04	0.31	–	–	–	–	0.93
Standard Deviation	690.71	1587.52	1907.93	–	–	–	17.56	7.52
Coefficient of Variation (CV)	220.78	166.88	645.64	–	–	–	427.85	196.68
CV Ratio	1.32	1.00	3.87	–	–	–	2.18	1.00

Actual(Rs Crore)			FDIi/Av.FDI			Ratios' Proportion		Act Ratio/App Ratio	
1991	1996	2001	1991	1996	2001	1996/1991	2001/1996	1996/1991	2001/1996
0.16	127.58	124.64	0.02	0.47	0.25	20.37	0.53	21.91	0.39
1.67	349.33	536.88	0.24	1.28	1.06	5.35	0.83	6.62	0.20
–	2.60	–	–	–	–	–	–	–	–
–	44.33	–	–	0.16	–	–	–	–	–
7.22	767.05	1875.73	1.03	2.80	3.70	2.72	1.32	1.47	0.65
–	752.98	4227.25	–	2.75	8.34	–	3.03	0.00	0.45
4.01	499.39	1143.68	0.57	1.83	2.26	3.18	1.24	2.00	1.04
0.70	29.62	74.91	0.10	0.11	0.15	1.09	1.36	4.79	0.72
0.32	74.64	13.66	0.05	0.27	0.03	5.96	0.10	3.04	0.31
–	0.05	–	–	–	–	–	–	–	–
–	–	0.48	–	–	–	–	–	–	–
19.93	88.41	299.00	2.85	0.32	0.59	0.11	1.83	0.06	1.92
–	54.42	13.54	–	0.20	0.03	–	0.13	–	52.56
–	7.23	186.45	–	0.03	0.37	–	13.91	–	0.37
–	11.68	0.10	–	0.04	–	–	–	–	0.01
–	2.45	10.47	–	0.01	0.02	–	2.31	–	–
–	1.10	–	–	–	–	–	–	–	–
37.31	588.08	163.98	5.34	2.15	0.32	0.40	0.15	0.29	0.50
–	–	–	–	–	–	–	–	–	–
–	19.89	–	–	0.07	–	–	–	–	–
11.23	242.69	147.23	1.61	0.89	0.29	0.55	0.33	1.16	0.03
0.29	152.07	18.29	0.04	0.56	0.04	13.63	0.06	31.20	0.29
–	308.08	50.14	–	1.13	0.10	–	0.09	–	0.28
–	0.08	–	–	–	–	–	–	–	–
–	12.53	29.80	–	0.05	0.06	–	1.28	–	0.24
2.12	641.15	146.82	0.30	2.34	0.29	7.74	0.12	3.33	0.36
–	–	–	–	–	–	–	–	–	–
–	47.66	3.08	–	0.17	0.01	–	0.03	–	0.28
0.13	8.20	31.57	0.02	0.03	0.06	1.61	2.08	4.62	0.08
–	19.82	22.50	–	0.07	0.04	–	0.61	–	0.24
0.15	59.44	10.04	0.02	0.22	0.02	10.47	0.09	12.36	2.25

–	10.23	590.95	–	0.04	1.17	–	31.18	–	3.60
–	–	234.00	–	–	0.46	–	–	–	–
0.03	1010.69	781.42	–	3.69	1.54	860.74	0.42	314.48	0.44
–	44.43	36.25	–	0.16	0.07	–	0.44	–	0.32
–	65.07	201.64	–	0.24	0.40	–	1.67	–	0.67
–	–	–	–	–	–	–	–	–	–
180.38	4354.06	8290.69	25.80	15.91	16.35	0.62	1.03	0.51	0.28
6.99	273.61	506.98	1.00	1.00	1.00	62.30	2.01	15.18	0.53
–	39.14	1.85	–	–	–	–	0.03	–	–
29.72	728.64	1499.82	–	–	–	220.96	5.78	–	–
425.10	266.31	295.84	–	–	–	354.65	288.05	–	–
1.60	1.00	1.11	–	–	–	1.23	1.00	–	–

Source: SIA, Newsletter, Annual Issue, 2002 and Author's Estimation

Coefficient of variation (CV) has decreased by more than one-fourth in 1996/1991, but increased by almost four times in 2001/1996. This shows foreign investors' interest in different sectors at different points of time.

Temporal Indices: Average of temporal index of 2001/1996 has decreased in comparison to 1996/1991. CV ratio has been following trends of temporal indices of coefficient of variation.

There is generally a time gap between FDI approval and actual FDI inflows. This time gap depends on to what extent bureaucracy and red-tapism create hurdles for actual FDI inflows. Due to this, actual FDI inflow is different from FDI approvals in any particular year. FDI inflows have been significantly increased by almost 40 times in 1996/1991 due to positive changes in industrial policies and openness of Indian economy for foreign investment since 1991. FDI inflows have also quantitatively increased but rate of growth of FDI inflows declined in 2001/1996 due to East Asian crisis.

With manifold increased FDI inflows, standard deviation also increased by 20 times and more than two times in 1996/1991 and 2001/1991 respectively. Standard deviation follows the patterns and trends of overall average in 1991, 1996 and 2001. Coefficient of variation and CV Ratio decreased in 1996/1991 and slightly increased in 2001/1996.

Overall average of temporal index has significantly decreased in 2001/1996 in comparison to 1996/1991. With decrease in overall average, standard deviation of temporal index also decreases in 2001/1996 and represents only 3 percent of 1996/1991. Standard deviation, coefficient of variation and CV ration follow trends of overall average of temporal index.

The comparison of temporal indices of actual FDI and approved FDI indicates that the top five gainer sectors are service sector, textiles, metallurgical industries, ceramics, and fuels (power and oil refinery) and the top five loser sectors are mechanical and engineering, chemicals,

drugs and pharmaceuticals,; electrical equipment, and transportation industries in 1996/1991. The top five gainer sectors are commercial, office and household equipment, cement, mechanical and engineering, transportation industry, and industrial machinery and the top five loser Sectors are industrial instrument, drugs and pharmaceuticals, leather, glass, and fermentation industries in 2001/1996.

Table 2 shows metallurgical, fuels, electricals, transportation, industrial machinery, machine tools, drugs, textiles, food processing, leather, ceramics, and service sectors have received actual FDI more than approved FDI in 1996/1991 while transportation, mechanicals and engineering, household and office equipment, ceramics, and cements sectors have received more than approved FDI in 2001/1996. Thus, the dynamics of sectors attraction for FDI were different in 2001/1996 than 1996/1991.

Correlation Analysis

FDI approvals

This is a correlation amongst identity numbers of top five sectors attracting FDI during 1995 to 2001. Scale of measure of this correlation analysis is as follows:

1. If $r = +1$: It means sectors at top five in the base year are same sectors in top five and hold same position in subsequent relevant years as in base year.
2. If $r = 0$: It means some sectors at top five in the base year are different and/or their position changes in subsequent relevant years in comparison to the base year.
3. If $r = -1$: It means sectors at top five in subsequent years are totally different from sectors at top five in the base year.

Hypothesis H1: Our hypothesis is that all sectors at top five in the base year (i.e. 1995) have also retained their same position in top five sectors in the subsequent years.

Table 3: Correlation Matrix of Sector identity amongst top five sectors (Approvals) during period 1995 to 2001

	SNO1995	SNO1996	SNO1997	SNO1998	SNO1999	SNO2000	SNO2001
SNO1995	1.00						
SNO1996	0.67*	1.00					
SNO1997	0.41	-0.24*	1.00				
SNO1998	0.90*	0.52	0.49	1.00			
SNO1999	0.18	0.55	-0.21	0.43	1.00		
SNO2000	0.48	0.29	-0.13	0.65	0.43	1.00	
SNO2001	0.79	0.14	0.84	0.73	-0.23	0.16	1.00

Source: Author's Estimation.

The values of correlation w.r.t. to base year (i.e. 1991) are positive in each subsequent year. Value of correlation is high in 1998. It means base year sectors are retained in top five. However their position among top five may change.

In case of rolling correlation analysis, correlation between 1996 and 1997 has only negative sign and other correlations have positive sign. It means sectors at top five in 1997 have changed from sectors at top five in 1996 but their magnitudes do not change too much high (Table 3).

However, as per correlation analysis, our hypothesis does not hold good in the absolute term.

Actual FDI Inflows

This is a correlation amongst identity numbers of top five sectors received FDI during 1991 to 2001. Scale of measure of this correlation analysis is same as in case of approvals of FDI.

Hypothesis H2: Our hypothesis is that all sectors at top five in base year (i.e. 1991) retain their position in the subsequent years.

The change in sign of correlation values indicate top five sectors in base year have been changing in subsequent years.

Value of correlation is high and positive in 1993 and high and negative in 1996. The value and direction of rolling correlation have also been changing during the period (Table 4). Thus, hypothesis does not hold good.

It may be concluded that the magnitude and direction of sector-wise FDI approvals are more consistent than actual FDI inflows during 1991-2001.

Rank Dominance in the Sectors

FDI Approval

RIRD is relative index of sectors' rank dominance in approval of FDI.

There are nine sectors which have shown presence for at least one time in the top five ranks in attracting FDI during 1995-2001. Fuels, telecommunications, electricals, service, and transportations are most dominant sectors and represent more than 80 percent of dominance in attracting FDIs and rest of sectors represent only upto 15 percent dominance during given periods (Table 5).

Table 4: Correlation Matrix of Sector Identity among top five sectors (Actuals) during period 1991 to 2001

	SNO1991	SNO1992	SNO1993	SNO1994	SNO1995	SNO1996	SNO1997	SNO1998	SNO1999	SNO2000	SNO2001
SNO1991	1.00										
SNO1992	-0.30	1.00									
SNO1993	0.79*	-0.67	1.00								
SNO1994	0.68	0.13	0.11	1.00							
SNO1995	0.02	-0.36	-0.18	0.35	1.00						
SNO1996	-0.56*	-0.18	-0.52	-0.24	0.78*	1.00					
SNO1997	0.00	0.80	-0.61	0.62	0.16	0.02	1.00				
SNO1998	-0.16	0.18	0.15	-0.67	-0.55	-0.17	-0.29	1.00			
SNO1999	-0.27	-0.41	0.33	-0.75	-0.56	-0.24	-0.84	0.37	1.00		
SNO2000	0.03	-0.88	0.27	-0.11	0.72	0.62	-0.57	-0.33	0.14	1.00	
SNO2001	0.58	-0.10	0.70	-0.07	-0.41	-0.51	-0.26	0.71	0.10	-0.21	1.00

Source: Author's Estimation

Table 5: Sector (Approval): Index of Rank Dominance

Sector	Presence	Weighted score	Dominance	RIRD
Fuels (Power & Oil Refinery)	7	30	0.86	0.29
Telecommunications	7	28	0.80	0.27
Electrical Equipment	4	11	0.31	0.11
Service Sector	5	9	0.26	0.09
Transportation Industry	3	9	0.26	0.09
Mettallurgical Industries	4	8	0.23	0.08
Chemicals	3	6	0.17	0.06
Food Processing Industries	1	2	0.06	0.02
Drugs & Pharmaceuticals	1	1	0.03	0.01
Total			2.97	1.00
Average			0.33	
Standard Deviation			0.30	
Coefficient of Variation			90.26	

Source: Author's Estimation

Actual FDI Inflows**Table 6: Sector (Actual): Index of Rank Dominance**

Sector	Presence	Weighted score	Dominance	RIRD
Electrical Equipment	11	38	0.69	0.24
Transportation Industry	8	28	0.51	0.18
Chemicals	9	27	0.49	0.17
Telecommunications	5	14	0.25	0.09
Service Sector	5	12	0.22	0.08
Food Processing Industries	5	11	0.20	0.07
Fuels (Power & Oil Refinery)	4	11	0.20	0.07
Mechanical & Engineering	2	5	0.09	0.03
Drugs & Pharmaceuticals	2	5	0.09	0.03
Trading	1	3	0.05	0.02
Textiels	1	2	0.04	0.01
Comm., Off & Household Equipment	1	2	0.04	0.01
Cement	1	1	0.02	0.01
Total			2.89	1.00
Average			0.22	
Standard Deviation			0.21	
Coefficient of Variation			96.23	

Source: Author's Estimation.

RIRD is relative index of sectors' rank dominance in receiving of FDI.

There are 13 sectors which show presence for at least one time in the top five ranks during 1991-2001. Out of these 13 sectors, electricals sector is present maximum number of times i.e. 11 times in top five ranks and is most dominating sector in top five ranks and receiving FDIs. Cement industry is present only one time and least dominating sector among all the 13 sectors. Electricals, transportations, chemicals, telecommunications, and service sectors are most dominating sectors and represent almost 75 percent of total FDI received during 1991-2001.

The comparison between actual and approvals shows that some sectors are common such as telecommunications, electricals, service sector but their positions in rank dominance are different.

The coefficient of variation across sectors in case of FDI approval is less than coefficient of variation across sectors in case of FDI actual inflows. So variation in dominance pattern in case of approvals of FDI is less than variation in dominance pattern in case actual amounts of FDI received.

Sector Dominance in the States**Table 7: Sectors Dominance in the States during August 1991 to December 2001**

Sector	Presence	Weighted score	Dominance	RIRD
Fuels	14	67	0.84	0.28
Electricals	12	37	0.46	0.16
Transportation	9	24	0.30	0.10

Telecommunicatin	6	20	0.25	0.08
Chemicals	6	19	0.24	0.08
Metallurgicals	6	14	0.18	0.06
Services	5	11	0.14	0.05
Hotel & Tourism	4	9	0.11	0.04
Textiles	2	8	0.10	0.03
Cements	2	6	0.08	0.03
Paper	2	5	0.06	0.02
Food Processing Industries	3	4	0.05	0.02
Sugar	1	2	0.03	0.01
Drugs & Pharmaceuticals	1	2	0.03	0.01
Photographic	1	2	0.03	0.01
Industrial Machinery	1	2	0.03	0.01
Ceramics	1	2	0.03	0.01
Earth-Moving	1	2	0.03	0.01
Comm., Off & Households	1	1	0.01	0.00
Total			2.96	1.00
Average			0.16	
Standard Deviation			0.20	
Coefficient of Variation			130.95	

Source: Author's Estimation

RIRD is relative index sectors' rank dominance in states.

There are 19 sectors which are at least once in top five ranks in a state. Out of these 19 sectors, fuels sector has attracted FDI in 14 states out of total 16 states. Commercial, office and household sector is at the bottom in the sectors dominance in the states.

Fuels, electricals, transportation, telecommunication, and chemicals are most dominating sectors and attract large amount of FDI in the states respectively. These five sectors represent 70 percent of dominance in attraction of FDI in the states and the rest of sectors represent only 30 percent of dominance in attraction of FDI in the states. Coefficient of variation of dominance across the sectors in the states is high (Table 7).

CONCLUSION

Three level indices show that metallurgical, fuels, electricals, transportation, industrial machinery, machine tools, drugs, textiles, food processing, leather, ceramics, and service sectors have received actual FDI more than approved FDI in 1996/1991, while transportation, mechanicals and engineering, household and office equipment, ceramics, and

cement sectors have received more than approved FDI in 2001/1996. Thus, the dynamics of sectors attraction for FDI were different in 2001/1996 than 1996/1991.

Correlation Matrix: The magnitude and direction of sector-wise FDI approvals are more consistent than actual FDI inflows.

Rank Dominance: The comparison between actual and approvals shows that some sectors are common such as telecommunications, electricals, service sector but their positions in rank dominance have changed.

Sectors Dominance in the States: Fuels, electricals, transportation, telecommunication, and chemicals are most dominating sectors and attract 70 percent of FDI in the states. Coefficient of variation of dominance across the sectors in the states is high. It is top heavy distribution of FDI across sectors.

The dynamics of FDI inflows in sectors have been changing during first generation reform periods i.e. 1991-2001. The change of FDI inflows in sectors indicates significance of the sectors in Indian economy. In general, transportation, fuel, mechanicals and engineering, telecom, electrical, chemical, service sectors etc. have been increasingly attracting and receiving more FDI inflows in India during first generation period.

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