



## *RESULTS AND DISCUSSION*

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## IV. RESULTS AND DISCUSSION

The results of the study relating to the topic is discussed under the following:

- A. Growth of number of factories
- B. Indices of some important variables such as net value added, employment, wages and fixed capital
- C. Analysis of elasticities

### 1. GROWTH OF NUMBER OF FACTORIES

The growth of number of factories during pre and post liberalization period under study for the select industries are presented in Table-1, Figure 1 and 2 illustrates the same diagrammatically.

**TABLE - 1**  
**GROWTH OF NUMBER OF FACTORIES**

S.NO	Industries	B.L	A.L
1	Manufacture of food products, beverages and tobacco	3.781 (2.2320)* $R^2 = .99$	3.1362 (0.3976) $R^2 = .12$
2	Manufacture of textile products	2.9714 (0.5800) $R^2=0.68$	2.2946 (2.747)** $R^2=.93$
3	Manufacture of wood and wood products	-6.1052 (-0.0718) $R^2 = .29$	2.7454 (.3955) $R^2=0.55$
4	Manufacture of paper and paper products	0.9296 (0.3984) $R^2=0.65$	2.9287 (3.6877)* $R^2=.23$
5	Manufacture of leather and leather products	5.3179 (1.5722) $R^2=0.88$	3.8572 (.9849) $R^2=0.86$

Foot note : Calculations are based on ASI data

B.L-Before Liberalisation

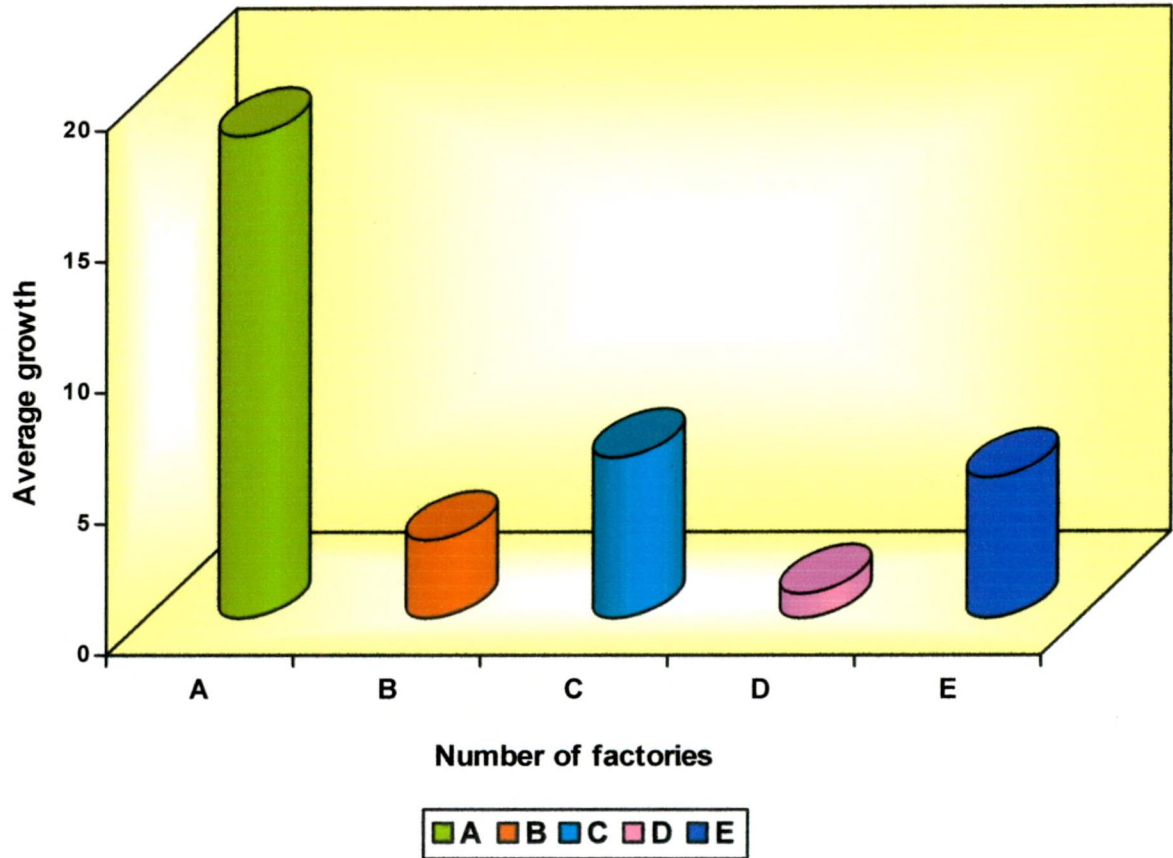
A.L-After Liberalisation

\* Significance at 1% level

\*\* Significance at 5% level

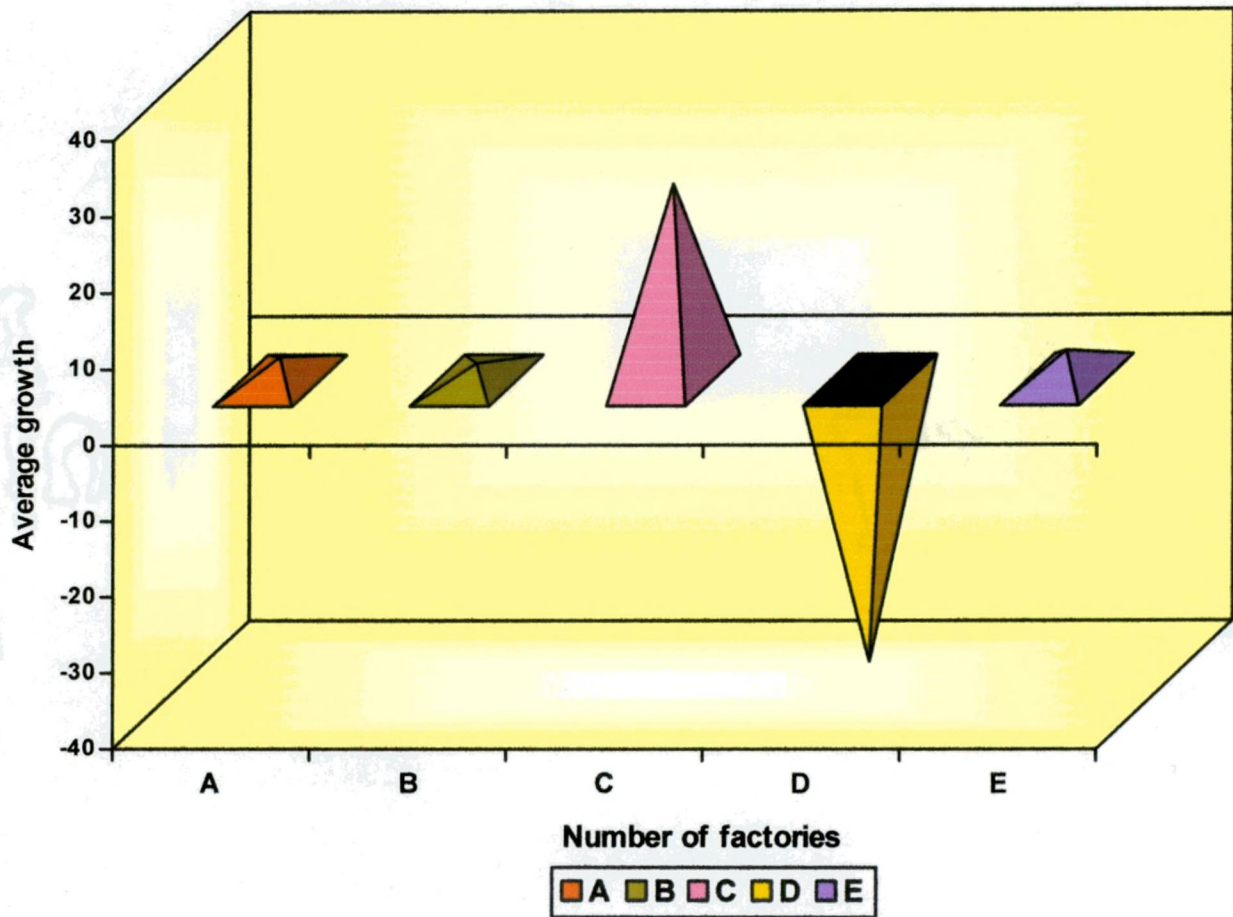
**FIGURE - 1**

**AVERAGE GROWTH OF NUMBER OF FACTORIES IN THE  
PRE-LIBERALISATION PERIOD**



- A. Manufacture of food products, beverages and tobacco**
- B. Manufacture of textile products**
- C. Manufacture of wood and wood products**
- D. Manufacture of paper and paper products**
- E. Manufacture of leather and leather products**

**FIGURE - 2**  
**AVERAGE GROWTH OF NUMBER OF FACTORIES IN THE**  
**POST-LIBERALISATION PERIOD**



- A. Manufacture of food products, beverages and tobacco
- B. Manufacture of textile products
- C. Manufacture of wood and wood products
- D. Manufacture of paper and paper products
- E. Manufacture of leather and leather products

Details regarding the number of factories grown during pre and post liberalisation showed that significant growth rates were observed in the manufacture of food products, beverages and tobacco in the pre-liberalisation period and manufacture of textile products had grown significantly in the post-liberalisation period. All the growth rates recorded were positive except the manufacture of wood and wood products during post-liberalisation period.

## 2. INDICES OF FIXED CAPITAL, EMPLOYMENT, NET VALUE

### ADDED AND WAGES

The fixed base indices calculated considering the base year of both periods - pre (1976-1977 to 1990-1991) and the post (1991-1992 to 2005-2006) covering 15 years period each is presented in Table-2. Figure 3 and 4 illustrates the same graphically.

**TABLE - 2**  
**INDICES OF CERTAIN IMPORTANT VARIABLES IN THE**  
**AGGREGATE MANUFACTURING SECTOR IN THE PRE AND POST**  
**LIBERALIZATION PERIOD**

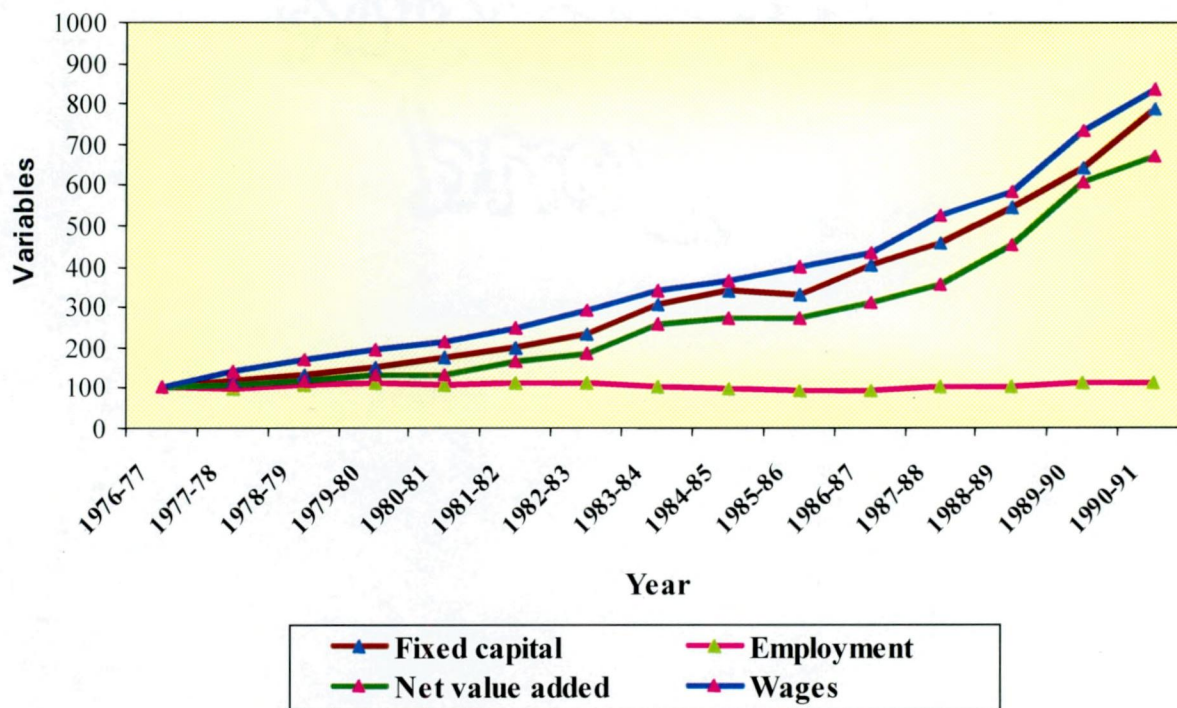
S. No	Fixed Capital		Employment		Net Value Added		Wages	
	B.L	A.L	B.L	A.L	B.L	A.L	B.L	A.L
1	100	100	100	100	100	100	100	100
2	117	262	98	108	108	111	142	118
3	132	330	107	109	115	159	172	128
4	152	499	110	117	130	197	194	155
5	176	556	108	121	132	215	213	185
6	201	653	114	121	164	240	248	208
7	235	746	114	125	185	239	291	217
8	305	769	102	150	255	289	340	413
9	340	814	96	182	273	302	365	532
10	330	901	93	188	270	338	399	701
11	401	929	93	212	312	359	432	836
12	454	1,052	102	214	355	387	525	797
13	544	1,019	101	215	450	391	583	827
14	639	1,103	112	220	608	433	734	892
15	787	1,235	112	227	672	551	834	1,004
$\bar{X}$	328	731	371	464	104	160	275	287

**Foot note:** Calculations are based on ASI data

B.L-Before Liberalisation

A.L-After Liberalisation

**FIGURE - 3**  
**GROWTH OF FIXED CAPITAL, EMPLOYMENT, NET VALUE ADDED AND WAGES IN THE PRE-LIBERALISATION PERIOD**



**FIGURE - 4**  
**GROWTH OF FIXED CAPITAL, EMPLOYMENT, NET VALUE ADDED AND WAGES IN THE POST-LIBERALISATION PERIOD**

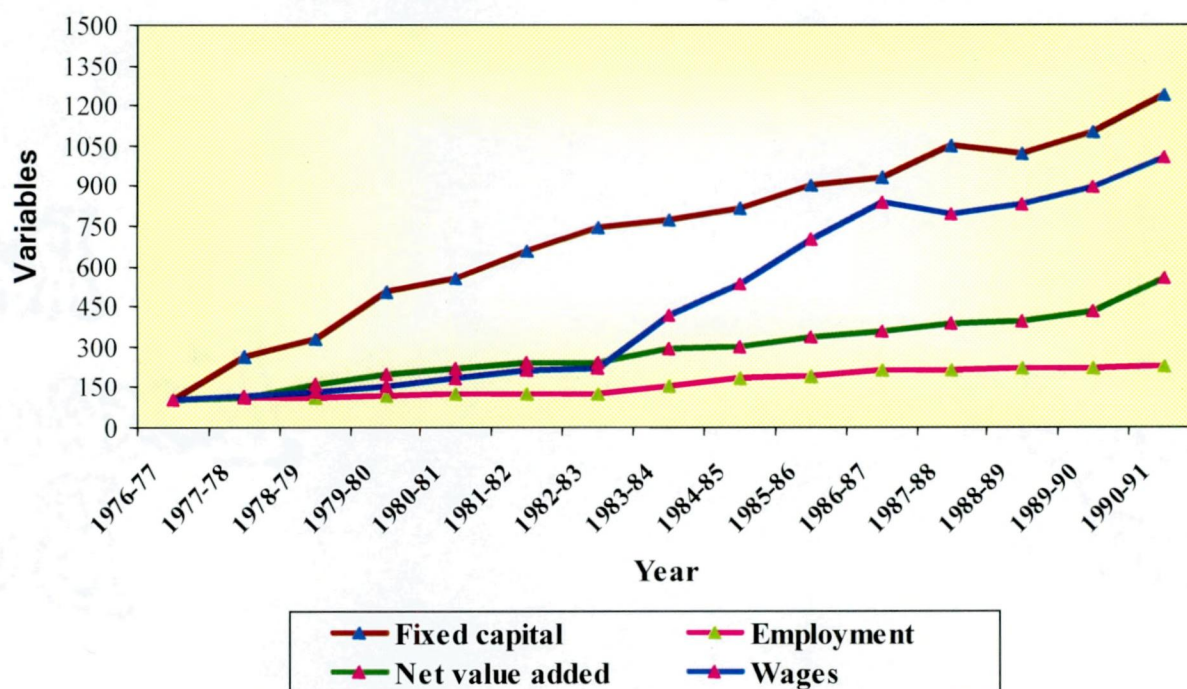


Table - 2 explains the fact that during pre-liberalisation period the growth of fixed capital, employment, net value added and wages over the beginning of the period during pre-liberalisation period was more than 7 fold (7.87), 8 fold (8.34), one fold (1.12), 6 fold (6.72) and 8 fold (8.34) respectively. On the other hand during post-liberalisation period it was 12 fold (12.35), 2 fold (2, 27), 5 fold (5.51) and ten fold (10.04) in the same variables respectively.

The figures relating to average indices of the variables show that it was 328, 371, 104, and 275 during pre-liberalisation period and 731, 464, 160 and 287 during post-liberalisation period respectively in the above mentioned variables.

### **3. ANALYSIS OF ELASTICITIES**

Before investigating elasticities, the variables involved in the functions were tested for the presence of stationary by applying Augmented Dickey Fuller (ADF) test. The results of stationary test for the first difference for all the industries are presented in Table-3.

**TABLE - 3**  
**AUGMENTED DICKEY – FULLER (ADF) TEST FOR**  
**FIRST DIFFERENCE**

S. No.	Industry / Variable	ADF Value	
		B.L	A.L
1	<b>Food products, beverages and tobacco</b>		
	i. Labour productivity		
	ii. Employment	-2.3246	-5.3307*
	iii. Net value added	-11.4949*	-13.6764*
	iv. Fixed capital	-10.2816*	-68.8389*
2	<b>Textile products</b>		
	i. Labour productivity		
	ii. Employment	3.4082	-9.6652*
	iii. Net value added	-6.8078*	-8.5050*
	iv. Fixed capital	-11.3629*	-8.8050*
3	<b>Wood and wood products</b>		
	i. Labour productivity		
	ii. Employment	-19.0581*	-4.3502*
	iii. Net value added	-4.5112	-6.2851*
	iv. Fixed capital		
4	<b>Paper and paper products</b>		
	i. Labour productivity	-2.0050	-2.1787
	ii. Employment	-15.7891*	-6.4353*
	iii. Net value added	-4.1855*	-14.389*
	iv. Fixed capital	-25.9013*	-11.1564*
5	<b>Leather and leather products</b>		
	i. Labour productivity	3.7658	-4.1449*
	ii. Employment		
	iii. Net value added		
	iv. Fixed capital		
	<b>Paper and paper products</b>		
	i. Labour productivity	-3.1673	-4.2017*
	ii. Employment	-7.1623*	-5.3008*
	iii. Net value added	-2.2478	-8.0766*
	iv. Fixed capital	-19.4409*	-4.6298*
	<b>Leather and leather products</b>		
	i. Labour productivity	-2.7700	-5.7099*
	ii. Employment		
	iii. Net value added		
	iv. Fixed capital		
	<b>Leather and leather products</b>		
	i. Labour productivity	-3.6672	-4.3940*
	ii. Employment	-2.0349	-9.6968*
	iii. Net value added	-24.6532*	-10.5778*
	iv. Fixed capital	-9.9288*	-11.2710*
	<b>Leather and leather products</b>		
	i. Labour productivity	-2.6216	-2.7566
	ii. Employment		
	iii. Net value added		
	iv. Fixed capital		

Source: Estimation based on ASI data

\* Significant at five percent level

## 1. Employment Elasticity

Employment elasticity was calculated taking employment as dependent variable and net value added and fixed capital as independent variables.

Having established that the variables net value added (B.L) in the manufacture of leather and leather products and employment (B.L) in the manufacture of paper and paper products were non stationary the co-integration analysis was made. This procedure gave two likelihood ratios for the number of co-integrating vectors viz., the maximum eigen value test and the trace test. The results are presented in tables 4 and 5.

**TABLE - 4**  
**CO-INTEGRATION LIKELIHOOD RATIO TEST BASED ON THE**  
**MAXIMUM EIGEN VALUE OF THE STOCHASTIC MATRIX**

Industries Variables	Ho	Alternative	Statistics	Critical Value	Eigen Value
<b>Manufacture of Paper and paper products (B.L)</b> Employment	r = 0	r = 1	15.7133	4.1600	0.94080
<b>Manufacture of Leather and leather products (B.L)</b> Net value added	r = 0	r = 1	16.3781	9.600	0.62059

Source : Estimation based on ASI data

Foot note: B.L- Before Liberalisation

A.L- After Liberalisation

**TABLE - 5**  
**CO-INTEGRATION LIKELIHOOD RATIO TEST BASED ON THE**  
**TRACE OF THE STOCHASTIC MATRIX**

Industries Variables	Ho	Alternative	Statistics	Critical Value
<b>Manufacture of Paper and paper products (B.L)</b> Employment	r = 0	r = 1	15.7133	4.1600
<b>Manufacture of Leather and leather products (B.L)</b> Net value added	r = 0	r = 1	16.3781	9.600

Source : Estimation based on ASI data

Foot note : B.L- Before Liberalisation

A.L- After Liberalisation

The analysis confirmed the presence of one co-integrating vector for both the industries based on the statistical significance  $r = 0$ . Thus based on maximum eigen value and trace test, the number of co-integrating vector ( $r$ ) was taken as  $r = 1$ .

After having established co-integration among the variables, the relevant error correction term obtained from co-integrating regression was included in the model. Table 5.6) shows the estimated co-efficients along with VAR model.

**TABLE - 6**  
**EMPLOYMENT ELASTICITY**

S. No	Industry	Net value added			Fixed capital	
		B.L	Ecm1	A.L	B.L	A.L
1	Manufacture of food products, beverages and tobacco	-1.5591 (-2.7046)**	—	-0.6044 (-10.6844) ***	2.9199 (8.8816)*	67.5740 (1.7519)
2	Manufacture of textile products	-2.2278 (-1.7005)	—	0.2845 (0.2962)	3.9180 (5.6045)*	1.4729 (3.5002)*
3	Manufacture of wood and wood products	-0.2869 (-0.4954)	—	0.3982 (2.0895)***	1.7539 (5.1995)*	0.8969 (7.5774)*
4	Manufacture of paper and paper products	—	-0.7021 (-4.1721)**	0.4142 (0.5763)	0.8969 (7.577)*	1.1536 (2.4037)**
5	Manufacture of leather and leather products	—	-0.5992 (-4.7743)**	-0.5570 (-1.8269)	3.1318 (7.5149)*	1.7726 (8.9061)*

**Foot note:** Calculations are based on ASI data  
 B.L-Before Liberalization  
 A.L- After Liberalization  
 \* - Significant at 1 percent level  
 \*\* - Significant at 5 percent level  
 \*\*\* -Significant at 10 percent level  
 Figures in brackets indicate 't'values

### The error correction term of VAR

Variables	Term
Net value added	$Ecm1 = 0.004949* X1$
Employment	$Ecm2 = 0.0028239* X2$

Employment elasticity with respect to net value added during pre-liberalisation was negative during pre and post liberalization period. The elasticity co-efficient in relation to fixed capital was positive in the post-liberalisation period. Insignificant co-efficients were observed in the manufacture of wood and wood products in pre-liberalisation period and in the manufacture of textile products and manufacture of paper and paper products in the post-liberalisation period. From the table it is very clear that the factor which influences employment in these industries is capital. Negative elasticities with respect fixed capital implies that fixed capital used to be substitute for labour to a large extent in both pre and post liberalization period. This trend was more in the pre-liberalisation period in case of manufacture of all industries in relation to employment.

## 2. Output Elasticity

The output elasticity measures output with respect to employment of labour and fixed capital measures the change in output due to change in one unit of capital. The output elasticity of the industries taking net value added as dependent variable and fixed capital and employment as independent variables.

Having established that the variables fixed capital (A.L) and net value added (B.L) were non stationary, the co-integration analysis was made. This procedure gave two likelihood ratios for the number of co-integrating vectors viz., the maximum eigen value test and the trace test. The results are presented in Tables 7 and 8.

**TABLE - 7**  
**CO-INTEGRATION LIKELIHOOD RATIO TEST BASED ON THE**  
**MAXIMUM EIGEN VALUE OF THE STOCHASTIC MATRIX**

<b>Industries</b>	<b>Ho</b>	<b>Alternative</b>	<b>Statistics</b>	<b>Critical Value</b>	<b>Eigen Value</b>
<b>Manufacture of textile products (A.L)</b> Fixed capital	r =0	r =1	11.9435	4.1600	0.57391
<b>Manufacture of leather and leather products (B.L)</b> Net value added	r =0	r =1	41.6657	15.87	0.20670

Foot note: Calculations are based on ASI data  
 B.L- Before Liberalisation  
 A.L- After Liberalisation

**TABLE - 8**  
**CO-INTEGRATION LIKELIHOOD RATIO TEST BASED ON THE**  
**TRACE OF THE STOCHASTIC MATRIX**

<b>Industries</b>	<b>Ho</b>	<b>Alternative</b>	<b>Statistics</b>	<b>Critical Value</b>
<b>Manufacture of textile products (A.L)</b> Fixed capital	r =0	r =1	11.9435	4.1600
<b>Manufacture of leather and leather products (B.L)</b> Net value added	r =0	r =1	41.6657	15.87

Foot note: Calculations are based on ASI data  
 B.L- Before Liberalisation period  
 A.L- After Liberalisation period

The analysis confirmed the presence of one co-integrating vector for both the industries based on the statistical significance  $r = 0$ . Thus based on maximum eigen value and trace test, the number of co-integrating vector ( $r$ ) was taken as  $r = 1$ .

After having established co-integration among the variables, the relevant error correction term obtained from co-integrating regression was included in the model. Table 9 shows the estimated co-efficient along with VAR model.

**TABLE - 9**  
**OUTPUT ELASTICITY**

S.No	Industry	Employment			Fixed capital		
		B.L	Ecm1	A.L	B.L	A.L	Ecm1
1	Manufacture of food products, beverages and tobacco	-1.5591 (-2.7046)*	–	67.5740 (1.7519)	-0.6043 (-10.6844)*	2.9199 (8.8816)*	–
2	Manufacture of textile products	2.2278 (-1.7005)	–	0.2845 (0.2962)	3.9180 (5.6045)*	–	-0.5302 (-3.8492)*
3	Manufacture of wood and wood products	-0.2859 (-0.4954)	–	0.3982 (2.0895)***	1.7539 (5.1995)*	0.8968 (7.5774)*	–
4	Manufacture of paper and paper products	0.3396 (0.5260)	–	0.4142 (0.5763)	1.4900 (4.6557)*	1.1536 (2.4037)**	–
5	Manufacture of leather and leather products	–	-1.9502 (-2.2814)**	-0.5570 (-1.8269)	3.1318 (7.5149)*	1.7726 (8.9061)*	–

**Foot note:** B.L-Before Liberalization

A.L- After Liberalization

Calculations are based on ASI data

\*-significant at 1 percent level

\*\* -significant at 5 percent level

\*\*\* -significant at 10 percent level

Figures in brackets indicate 't' values

### The error correction term of VAR

Variables	Term
Fixed capital	$Ecm1 = 0.0024437 * X1$
Net value added	$Ecm1 = 0.0021451 * X1 - 0.0034855 * X2 + .24657$ $Ecm2 = -0.017982 * X1 + 0.0029987 * X2 + 1.5487$

The industry-wise observation of output elasticities with respect to fixed capital reveals that in the pre-liberalisation period except the manufacture of leather and leather products all the other industries recorded negative coefficient. In the post liberalization period the elasticity was small except in the manufacture of leather and leather products. Moreover the output elasticity with respect to employment for all the manufacturing industries was smaller than other industries.

### 3. WAGE ELASTICITY

Wage elasticity of the manufacturing sector during pre and post liberalization period was calculated taking into account the wages as dependent variable and labour productivity and net value added as independent variables.

Having established that labour productivity in the manufacture of food products, beverages and tobacco, manufacture of textile products, manufacture of wood and wood products (B.L) and net value added in the manufacture of wood and wood products (B.L and A.L) and manufacture of leather and leather products (A.L) and all the variables in the manufacture of paper and paper products (B.L) and wages in the manufacture of leather and leather products (B.L and A.L) were non-stationary, the combination of the series were tested for co-integration. The procedure gave two results of likelihood test viz., maximum eigen value and trace test.

TABLE – 10

**CO-INTEGRATION OF LIKELIHOOD RATIO TEST BASED ON THE  
MAXIMUM EIGEN VALUE OF THE STOCHASTIC MATRIX**

S.No.	Industries	Ho	Alternative	Statistics	Critical Value	Eigen Value
1.	<b>Manufacture of food products, beverages and tobacco (B.L)</b> Labour productivity	$r = 0$	$r = 1$	0.53623	4.1600	0.037578
2.	<b>Manufacture of textile products (B.L)</b> Labour productivity	$r = 0$	$r = 1$	8.2630	4.1600	0.44579
3.	<b>Manufacture of wood and wood products (B.L)</b> Net value added	$r = 0$	$r = 1$	6.5120	11.030	0.37195
	Labour productivity	$r \leq 1$	$r = 2$	0.2909	4.1600	0.2078
	<b>Manufacture of wood and wood products (A.L)</b> Net value added	$r = 0$	$r = 1$	9.6666	11.0300	0.49866
	Labour productivity	$r \leq 1$	$r = 2$	3.7034	4.1600	0.23243
4.	<b>Manufacture of paper and paper products (B.L)</b> Wages	$r = 0$	$r = 1$	8.0332	17.6800	0.43662
	Labour productivity	$r \leq 1$	$r = 2$	5.5142	11.0300	0.32556
	Net value added	$r \leq 2$	$r = 3$	3.4403	4.1600	0.21787
5.	<b>Manufacture of leather and leather products (B.L)</b> Wages	$r = 0$	$r = 1$	10.31619	4.1600	0.52295
	<b>Manufacture of leather and leather products (A.L)</b> Wages	$r = 0$	$r = 1$	16.2286	11.0300	0.68626
	Net value added	$r \leq 1$	$r = 2$	7.0360	4.1600	0.39505

**Foot note:** Calculations are based on ASI data

B.L- Before Liberalisation

A.L- After Liberalisation

**TABLE - 11**  
**CO-INTEGRATION LIKELIHOOD RATIO TEST BASED ON THE**  
**TRACE OF THE STOCHASTIC MATRIX**

S.No.	Industries	Ho	Alternative	Statistics	Critical Value
1.	<b>Manufacture of food products, beverages and tobacco (B.L)</b> Labour productivity	$r = 0$	$r = 1$	0.53623	4.1600
2.	<b>Manufacture of textile products (B.L)</b> Labour productivity	$r = 0$	$r = 1$	8.2630	4.1600
3.	<b>Manufacture of wood and wood products (B.L)</b> Net value added	$r = 0$	$r = 1$	6.5120	11.030
	Labour productivity	$r \leq 1$	$r = 2$	0.2909	4.1600
	<b>Manufacture of wood and wood products (A.L)</b> Net value added	$r = 0$	$r = 1$	9.6666	11.0300
	Labour productivity	$r \leq 1$	$r = 2$	3.7034	4.1600
4.	<b>Manufacture of paper and paper products (B.L)</b> Wages	$r = 0$	$r = 1$	8.0332	17.6800
	Labour productivity	$r \leq 1$	$r = 2$	5.5142	11.0300
	Net value added	$r \leq 2$	$r = 3$	3.4403	4.1600
5.	<b>Manufacture of leather and leather products (B.L)</b> Wages	$r = 0$	$r = 1$	10.31619	4.1600
	<b>Manufacture of leather and leather products (A.L)</b> Wages	$r = 0$	$r = 1$	16.2286	11.0300
	Net value added	$r \leq 1$	$r = 2$	7.0360	4.1600

**Foot note:** Calculations are based on ASI data

B.L- Before Liberalisation

A.L- After Liberalisation

Having established that labour productivity in the manufacture of food products, beverages and tobacco, manufacture of textile products, and manufacture of wood and wood products (B.L) and net value added in the manufacture of wood and wood products (B.L and A.L), and manufacture of leather and leather products (A.L) and all the variables in the manufacture of paper and paper products (B.L) and wages in the manufacture of leather and

leather products (B.L. and A.L) were non-stationary, the combination of the series were tested for co-integration. The procedure gave two results of likelihood test viz., maximum eigen value and trace test.

The analysis confirmed the presence of one co-integrating vector for manufacture of food products, beverages and tobacco (B.L), manufacture of textile products (B.L), leather and leather products (B.L) and two co-integrating vectors for manufacture of wood and wood products (B.L. and A.L) and manufacture of leather and leather products (A.L) and three co-integrating vectors for manufacture of paper and paper products (B.L).

**TABLE - 12**  
**WAGE ELASTICITY**

S. No.	Industry	Labour productivity			Value added			
		Ecm1	A.L	Ecm2	B.L	Ecm1	A.L	Ecm2
1	Manufacture of food products, beverages and tobacco	0.3970 (0.65536)	1.5697 (1.903)	–	1.4530 (6.1390)*	–	0.5006 (1.3801)	–
2	Manufacture of textile products	-1.3641 (-2.9746)**	-0.568 (-0.9946)	–	1.3611 (2.2437)**	–	1.7171 (4.8327)*	–
3	Manufacture of wood and wood products	-0.17814 (-0.014805)	–	-0.8187 (-0.83711)	–	-0.2262 (-0.51746)	0.6366 (3.6539)*	-0.6500 (-1.7651)
4	Manufacture of paper and paper products	1.4652 (0.19682)	-0.2501 (-0.6677)	–	–	-0.1383 (-0.55590)	1.3126 (4.5166)*	–
5	Manufacture of leather and leather products	-1.5196 (-3.4725)**	-0.6970 (-1.4944)	–	1.3126 (4.5166)*	–	1.8210 (6.1848)*	–

**Foot note:** B.L-Before Liberalization  
A.L- After Liberalization  
Calculations based on ASI data  
\* - Significant at 1 percent level  
\*\* - Significant at 5 percent level  
Figures in brackets indicate 't' values

### The error correction term of VAR

Industry / Variables	Term
<b>Manufacture of food products, beverages and tobacco (B.L)</b> Employment	$E_{cm1} = 0.012802 * X_1$
<b>Manufacture of textile products (B.L)</b> Employment	$E_{cm1} = 0.0011265 * X_1$
<b>Manufacture of wood and wood products</b> Net value added (B.L) Employment (B.L) Net value added (A.L) Employment (A.L)	$E_{cm1} = 0.026265 * X_1 - .0019742 * X_2$ $E_{cm2} = -.0020270 * X_1 - .6083420 * X_2$ $E_{cm1} = .0047747 * X_1 - .0046670 * X_2$ $E_{cm2} = .0057422 * X_1 + .0031590 * X_2$
<b>Manufacture of paper and paper products</b> Wages (B.L) Employment ((B.L) Net value added (B.L)	$E_{cm1} = 0.0113911 * X_1 - .011067 * X_2 + .0016345 * X_3$ $E_{cm2} = -.022155 * X_1 - .0063381 * X_2 - .0041608 * X_3$ $E_{cm3} = .0054566 * X_1 + .0024233 * X_2 - .0024901 * X_3$
<b>Manufacture of leather and leather products</b> Wages (B.L) Wages (A.L) Net value added (A.L)	$E_{cm1} = 0.015505 * X_1$ $E_{cm1} = .0011506 * X_1 + .0048960 * X_2$ $E_{cm2} = .011020 * X_1 - .0027792 * X_2$

**Foot Note:** B.L. – Before Liberalization  
A.L. – After Liberalization

Wage elasticity with respect to labour productivity and net value added had shown that the influence of net value added was statistically significant in both pre and post liberalization period for all the manufacturing industries under study. With regard to labour productivity, 2 out of 5 industries and 4 out of 5 industries recorded significant contribution for wage to be elastic in the pre-liberalisation period and post liberalization period respectively.

#### **Conclusion**

The co-efficient determination  $R^2$  calculated for both the periods for all the industries in all the periods for different elasticities recorded more than 95 percent which explains the fact that the fit was good. The contribution of the independent variables over influencing dependent variable was high. Only negligible percent of change would be brought about by related variables.