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An Empirical Study of Elasticity of Employment Generated in Micro, Small and Medium Manufacturing Enterprises (Manufacturing MSMEs) in India

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ABSTRACT

World over SMEs are playing a major role in the sphere of socio-economic enhancement of lives of millions. In India, the Micro, Small & Medium Enterprises (MSMEs) contribute 8 per cent to the country's GDP, 45 per cent to the manufactured output and 40 per cent to the country's exports. They provide employment to 101 million people through 45 million enterprises. As an employment generator, MSMEs are the second largest employment opportunity provider only behind the agriculture sector. The MSMEs also act as a catalyst for social change by helping reduce the income inequality among various social classes as also between regions. Within MSMEs, the performance of the MSME manufacturing sector has been particularly worth considering. No study has been done yet to evaluate the elasticity of employment of the MSME manufacturing sector. Our paper aims to ascertain the value of employment elasticity in the MSME manufacturing sector by way of application of appropriate econometric techniques for the period 1973-74 to 2012-13.

Keywords: MSMEs, Elasticity of Employment, Autoregressive distributed Lag (ARDL) model, Structural break, Non stationarity, Cointegration.

JEL Classification Codes: C01, E01, E24

INTRODUCTION

Industrial development in the country has come a long way since independence. Before the arrival of the Britishers, India was industrially more developed than some of the West European countries. The Britishers systematically destroyed the industrial base of India. As a result at the time of independence, the country inherited a weak industrial base with a crippling industry infrastructure. Since independence with focus on industrialisation of the country in various five year plans, the industrial sector has evolved over time. The share of industry increased from 16.6 per cent in 1950-51 to 27.7 per cent in 1990-91; 27.0 per cent in 2011-12 (2004-05 Prices) and 31.2 per cent in FY 2015-16 (2011-12 prices). The industrial sector in the country comprises of mining & quarrying, manufacturing, construction, electricity, gas and water supply.

The small scale industries (SSIs) or the manufacturing MSMEs constitute a vital constituent of Indian industrial sector. It contributes significantly to India's gross domestic product and export earnings besides including that of providing employment opportunities to millions of people across the country. The SSIs and later the manufacturing MSMEs covers a wide spectrum of industries categorised under:

a. Small scale industrial undertaking;

b. Ancillary industrial undertaking;

c. Export oriented units;

d. Artisans , village and cottage industrial and

e. Women entrepreneurs' enterprises i.e.; a small scale unit where one or more have net less than 5.1 per cent financial holding.

2. DEFINITION OF SSIs/MSMEs

The investment limits for SSIs have changed over time. In 1977, industrial units having investment of less than Rs.10 Lakh was defined as SSI undertakings, while for ancillary units, the investment limit was Rs.15 Lakh. In 1991, the year of economic reforms, the investment limits for SSIs was revised to Rs.60 Lakh, similarly for ancillary units to Rs.75 Lakh and for tiny enterprises to Rs.5 Lakh. In the year 2000, the investment limit for SSI was further increased to Rs.1 crore and for ancillaries to Rs.25 Lakh. Consequent to the enactment of Micro, Small and Medium Enterprises Development (MSMED) Act 2006, the definition of SSIs was done away with and new definitions such as micro, small and medium enterprises came into existence with effect from October 2, 2006. Further, separate investment limits have been fixed for manufacturing & service enterprises. The new definition categorises manufacturing units with investment in plant & machineries up to Rs. 25 lakh as micro enterprises, investment in plant & machinery of more than Rs. 25 lakh up to Rs. 5 crore as small enterprise and investment in plant & machinery of more than Rs. 5 crore and up to Rs. 25 crore as medium enterprises. Similarly, in the realms of the services sector, units with investment in equipment for rendering services up to Rs. 10 lakh has been categorised as micro enterprises, investment of more than Rs. 10 lakh and up to Rs. 2 crore as small enterprise and investment of more than Rs. 2 crore and up to Rs. 5 crore has been categorised as medium services enterprises (Table 1).

Table 1: Classification of MSMEs (Investment Limits)

Definition of MSMEs as per MSME Development Act, 2006

Sector	Micro enter-	Small enterprises	Medium enterprises
Manufacturing	Up to Rs. 25 Lakh	Above Rs. 25 Lakh but does not exceed Rs. 5 crore	Above Rs.5 Crore but does not exceed Rs.10 crore
Service	Up to Rs.10 Lakh	Above Rs. 10 Lakh, but does not exceed Rs. 2 crore	Above Rs. 2 crore but does not exceed Rs. 5 crore

Source: MSME Development Act. 2006.

2.1 The Micro, Small and Medium Enterprises Development (Amendment) Bill, 2015

The Micro, Small and Medium Enterprises (Amendment) Bill, 2015 was introduced in the Lok Sabha on April 20, 2015. The Bill amends the Micro, Small and Medium Enterprises Act, 2006. The Act classifies and regulates enterprises as micro, small and medium enterprises. The Bill seeks to increase the allowance for investment in plants and machinery in micro, small and medium enterprises. The limit of investment in plant or machinery for enterprises engaged in the manufacture or production of goods, and the limit of investment in equipment for enterprises engaged in services has been proposed to be increased (Table 2).

Table 2: Proposed new Classification of MSMEs (Investment Limits) as per the

Sector	Micro enterprises	Small enterprises	Medium enterprises
Manufacturing	Up to Rs. 50 Lakh	Above Rs. 50 Lakh but does not exceed Rs. 10 crore	Above Rs.10 Crore but does not exceed Rs.30 crore
Service	Up to Rs.20 Lakh	Above Rs. 20 Lakh, but does not exceed Rs. 5 crore	Above Rs. 5 crore but does not exceed Rs. 15 crore

Source: Press Information Bureau, GoI.

The bill has been introduced in the Lok Sabha in April 2015. However, it has not been passed by the Lok Sabha till today.

In our paper, we have attempted to ascertain the value of employment elasticity in the MSME Manufacturing sector by way of application of appropriate econometric techniques for the period 1973-74 to 2012-13.The paper is divided into 8 sections. While section 3 outlines the contribution of MSMEs to GDP, employment and exports, section 4 briefly reviews existing literature. Section 5 notes the limitations of using elasticity of employment in analysis. Methodology followed in the study is described in section 6, while section 7 discusses the data used and actual estimation of the value of elasticity of employment for the MSME manufacturing sector in India in the study. Section 8 concludes the paper.

3. CONTRIBUTION OF MSMES TO GDP, EMPLOYMENT AND EXPORTS

MSME sector has emerged as a highly vibrant and dynamic sector of the Indian economy. MSMEs not only play crucial role in providing large employment opportunities at comparatively lower capital cost than large industries but also help in industrialization of rural & backward areas, thereby, reducing regional imbalances, assuring more equitable distribution of national income and wealth. MSMEs complement the large industries as ancillary units and this sector contributes enormously to the socio-economic development of the country. The Sector consisting of 36 million units, as of today, provides employment to over 80 million persons. The sector through more than 6,000 products contributes about 8% to GDP including 45% to the total manufacturing output and 40% to total exports from the country.

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Table 3: Share of MSMEs in GDP

Year	Gross value of output (Rs. Crore)	Share of Manufacturing MSME sector in total	Share of Services Sector MSME in total	Total	Share of MSME Manufacturing output in Total manufac-
2006-07	1198818	7.73	27.4	35.13	42.02
2007-08	1322777	7.81	27.6	35.41	41.98
2008-09	1375589	7.52	28.6	36.12	40.79
2009-10	1488352	7.45	28.6	36.05	39.63
2010-11	1653622	7.39	29.3	36.69	38.50
2011-12	1788584	7.27	30.7	37.97	37.47
2012-13	1809976	7.04	30.5	37.54	37.33

Source: Annual Report for FY 2015-16, Ministry of Micro, Small & Medium Enterprises, Government of India. (At 2004-05 prices)

The share of MSME sector in total GDP has increased to 37.54% in FY 2012-13 as compared to 35.13% in FY 2006-07. Within this, while the share of MSME services has increased, the share of MSME manufacturing has remained stagnant. This is in line with the increasing share of services sector in the overall GDP in recent times and the stagnant share of the manufacturing sector. The contribution of MSME manufacturing to the national GDP is around 7 per cent which is significant considering the fact that the contribution of the entire manufacturing sector to the national GDP is only 16 per cent and that of the industrial sector (incl. construction sector) to the national GDP is around 31 per cent.

Our study specifically attempts to look at the employment generating capacity of MSME manufacturing sector in the country by way of measuring its employment elasticity. We could not include MSME service sector in our analysis due to absence of required authentic data. The year wise details of MSME output, employment and exports from the MSMEs during 1973-74 to 2012-13 are given below (Table 4).

Table 4: **Year wise Output-Employment and Exports by MSMEs Manufac-**

Sr. No.	Year	Employment (Million)	Output (Rs. Billion)	Exports from the MSMEs (Rs. Billion)
1	1973-74	4.0	342	4
2	1974-75	4.0	361	5
3	1975-76	4.6	425	5
4	1976-77	5.0	468	8
5	1977-78	5.4	528	8
6	1978-79	6.4	582	11
7	1979-80	6.7	664	12
8	1980-81	7.1	722	16
9	1981-82	7.5	783	21
10	1982-83	7.9	847	20
11	1983-84	8.4	935	22
12	1984-85	9.0	1046	25
13	1985-86	9.6	1181	28
14	1986-87	10.1	1336	36
15	1987-88	10.7	1505	44
16	1988-89	11.3	1699	55
17	1989-90	12.0	1899	76
18	1990-91	15.8	847	97
19	1991-92	16.6	874	139
20	1992-93	17.5	922	178
21	1993-94	18.3	988	253
22	1994-95	19.1	1088	291
23	1995-96	19.8	1212	365
24	1996-97	20.6	1349	392
25	1997-98	21.3	1463	444
26	1998-99	22.1	1575	490
27	1999-00	22.9	1704	542
28	2000-01	24.1	1844	698
29	2001-02	24.9	2823	712
30	2002-03	26.0	3068	860
31	2003-04	27.1	3363	976
32	2004-05	28.3	3729	1244
33	2005-06	29.5	4189	1502
34	2006-07	80.5	11988	1825
35	2007-08	84.2	13228	2020
36	2008-09	88.1	13756	3439
37	2009-10	92.2	14884	3912
38	2010-11	96.5	16536	5077
39	2011-12	101.2	17886	6301
40	2012-13	106.1	18100	6973

Since, data on MSME manufacturing is available till FY 2012-13 only, the study period in our research analysis has been taken up to FY 2012-13. Employment opportunities created by the MSME units increased from 4 million in 1973-74 to 106.1 million in FY 2012-13, recording a CAGR of 8.6 per cent. The gross value of MSME output increased from Rs. 342 billion in 1973-74 to Rs. 18,100 billion in FY 2012-13, a CAGR of 10.4 per cent. Similarly, the value of MSME manufacturing exports increased from Rs. 4 billion in 1973-74 to Rs. 6973 billion in FY 2012-13, growing at a CAGR of 20.5 per cent.

The goal of development planning in India has been to provide for increasing employment opportunities not only to meet the backlog of the unemployed but also the new additions to the labour force i.e. incremental labour supply. The role of MSMEs manufacturing in providing employment opportunities is crucial. Through the estimation of elasticity of MSME manufacturing sector, our study will highlight the importance of the MSME manufacturing sector in this sphere.

4. REVIEW OF LITERATURE

The literature on the evolving MSME sector in India is vast and rich. However, with reference to the employment elasticity of employment in the sector, the existing literature is limited. Let us have a look towards the existing literature in our area of interest.

Sangita Mishra and Anoop K Suresh (2014) in their study titled 'Estimating Employment Elasticity of Growth for the Indian Economy' have ascertained that the aggregate employment elasticity estimates for India have declined over the decades and vary from 0.18 to 0.20 during the post reform period i.e. 1993-94 to 2011-12. For the purpose of estimating the employment elasticity, they have followed two approaches namely the Compound Annual Growth Rate (CAGR) approach and the regression approach. Manufacturing employment elasticity has hovered around 0.3. Within manufacturing, the employment elasticity for organized manufacturing sector based on various estimates is in the range of 0.4-0.5 for 2000s.

Roy, Satyaki (2013) in his study titled '*Towards employment augmenting manufacturing growth*' has estimated employment elasticity of various sub sectors under the manufacturing sector for the period 1981 -82 to 2011-12 annual growth approach. The study argues that there is a need to revive the manufacturing sector in order to create more employment opportunities.

Dixit and Pandey (2011) applied cointegration analysis to examine the causal relationship between SMEs output, exports, employment, number of Small and Medium Enterprises (SMEs) and their fixed investment and India's GDP, total exports and employment (public and private) for the period 1973-74 to 2006-07. Their study reveals the existence of positive causality between SMEs output and India's GDP.

Chan Yu Jiun and Janice L. H. Nga (2011) in a study based on the Malaysian Economy have found that the employment elasticity of manufacturing sector is found at 0.59 per cent for the period 1970-09.For the purpose of estimating the employment elasticity, they have followed the ordinary least square (OLS) regression approach. The employment elasticity of labour force participation rate (supply side) is found to be only 0.02 per cent. This model is an improvement over the one carried out for the Indonesian economy (Daniel et al 2007) so far as it also considers the supply side of the labour market. The Indonesian model takes economic growth as a proxy for the labour demand and labour force participation rate as a measure of labour supply.

Daniel Suryadarma, Asep Suryahadi & Sudarno Sumarto (2007) in a study of the Indonesian economy, have found that in the Indonesian economy 10 per cent growth in output leads employment to increase by 0.08 per cent in Urban Agriculture, 0.01 per cent in Urban Industrial sector and 0.66 per cent in urban services sector. This model only stresses the demand side of the labour which is a flaw as the supply side of the issue cannot be ignored to reach a definitive conclusion.

Dipak Mazumdar and Sandip Sarkar (2004) in their study titled 'Employment Elasticity in organised Manufacturing in India' have estimated different values of elasticity of employment during different periods viz. 0.99 per cent during the period 1974-80, (-) 0.17 per cent during 1980-86, 0.33 per cent during 1986-96 and a value of (-)1.39 per cent during 1996-2002.

UNIDO (1969) in a study based on evidence from a number of developing countries indicated that small enterprises with a lower level of investment per worker tend to achieve a higher productivity of capital than do the larger, more capital intensive enterprises.

A startling revelation that came out while reviewing the literature is the fact that there is no study which is explicitly concerned with the employment elasticity of the MSME sector in India. Our paper will try to fill up this void in the literature.

5. LIMITATIONS OF THE STUDY

Several limitations of using employment elasticity as an analytical tool should be borne in mind before attempting to draw inferences from them regarding employment performance of a particular sector.

i. It is because there can be host of other factors whose effect on employment elasticity may be insignificant but they do exist and in any econometrics analysis it is not even theoretically possible to include all the possible variables;

ii. The elasticity presented in this study does provide a clear indication of how MSME employment and MSME output have historically varied together over time. The results should thus be interpreted as evidence of correlation rather than of cause and effect relations;

iii. Besides, it would be imprudent to assume that favorable trend in employment elasticity of the MSME sector is a panacea for all unemployment problems in the country. The MSME sector too has its own limitations and the sector alone may not be able to solve the unemployment problem in the country. A comprehensive approach in terms of planning for the development of all the sectors in the economy to ward off problems like unemployment and poverty would be the right approach going ahead.

6. METHODOLOGY

There are five methods that have generally been used for calculation of employment elasticity. These are the descriptive approach based on employment and output growth. The prominent descriptive approach is the one based on the compound annual growth rate (CAGR) method that gives the ‘arc’ elasticity i.e. between the two time periods. Besides, there is annual average method which basically relies on annual average growth rates to estimate the employment elasticity. The co-integration approach and particularly with the help of ARDL bounds test approach, the short run employment elasticity can be estimated.

Another proven and accepted approach to estimation of employment elasticity is the regression approach which gives the point elasticity. The panel regression approach comes into picture when we deal with Panel data having both cross section and time series dimension.

6.1 Method 1 (CAGR Approach)

The formula for calculation of 'arc' elasticity of employment is generally as under:

$$e = \frac{dN}{N} \bigg/ \frac{dQ}{Q} \quad \ldots\ldots(1)$$

where N denotes employment and Q denotes MSME output. The numerator refers to the percentage change in employment, while the denominator refers to the percentage change in output, which is essentially the growth rate of MSME output. From above, we can proceed as follows:

$$e = (Q / N)\ X\ (dN / dQ) \ \ldots\ldots\ldots(2)$$

where *dN / dQ* is nothing but the change in employment (N) as a result of change in output (Q). In a regression equation of the following form:

$$N = \beta_1 + \beta_2 Q + e \ \ldots\ldots\ldots\ldots(3)$$

β_2 denotes dN / dQ. Once we obtain β_2, we can derive employment elasticity (e) by multiplying with it the ratio of average of output (Q) to average of employment (N). The usual method under the CAGR approach, however, involves finding out the ratio of CAGR of employment to the CAGR of output for a given time period to arrive at the employment elasticity with respect to output.

6.2 Method 2 (Annual Average Growth Method)

The third method in obtaining employment elasticity is by taking the ratio of the average annual growth rates for total employment and real output.

e = {Simple average of YoY growth of employment (N)} / {Simple average of YoY growth of output (Q)}

For example, suppose we have a time series data on employment (N) and output (Q) for the period from 1973-74 to 2012-13. This would give us annual YoY growth in employment and output from FY 1974-75 onwards and up to FY 2012-13. The elasticity of employment can be obtained by way of dividing the simple average of YoY growth in employment during the period with the simple average of YoY growth in output. 6.3 **Method 3 (Regression Approach)**

An alternative way to compute the elasticity is to estimate a log linear regression equation between employment and GDP that generates the point elasticity of employment. The conventional form of the equation is:

$$\ln N = \beta_1 + \beta_2 \ln Q + e_t \text{ ………(4)}$$

Where variables 'N' and 'Q' denote MSME employment and MSME output, respectively, and 'ln' stands for the natural logarithm of the relevant variable. Here, the regression coefficient β_2 serves as the employment elasticity. In other words,

$$e = (dN/N) / (dQ/Q) = (d \ln N) / (d \ln Q) \text{ ………. (5)}$$

6.4 Method 4 (Co-integration approach)

Ever since the seminal paper by Engle and Granger (1987), co-integration analysis has increasingly become the favoured methodological approach for analysing time series data containing stochastic trends. If the data generating processes (DGPs) underlying the time series are integrated of order one, $I(1)$ (which is the case for most economic variables), or higher, usual regression analysis can lead to spurious results. Instead of taking first differences of the data, which was the common prior solution but leads to a loss of long-run information, this problem can be tackled by identifying possibly existing stationary linear combinations of two or more non -stationary time series. which can be interpreted as long run equilibrium relationships between the variables considered and, therefore, according to the Granger representation theorem (Engle and Granger, 1987), can be characterized by being generated through an error correction mechanism.

To test for cointegration among the variables in the long run, various cointegration tests may be used such as the Johansen test (Johansen, 1988) method and the two steps Engle and Granger (1987) approach. The major advantage of the Johansen method is that it allows estimation of multiple cointegrating vectors where they exist. However, its application presupposes that the underlying regressors are all integrated of order one (Pesaran and Shin, 1999) and in the presence of a mixture of stationary series and series containing a unit root, standard statistical inference based on conventional likelihood ratio tests is no longer valid and the Johansen procedure may lead to erroneous inferences. Pesaran and Shin (1999) develop a new ARDL bounds testing approach for testing the existence of a cointegration relationship that is applicable irrespective of whether the underlying series are I(0), I(1). This approach rehabilitates the ARDL framework while overcoming the problems associated with the presence of a mixture of I(0) and I(1) regressors in a Johansen-type framework. An ARDL model is a general dynamic specification, which uses the lags of the dependent variable and the lagged and contemporaneous values of the independent variables, through which the short-run effects can be directly estimated, and the long-run equilibrium relationship can be indirectly estimated. Pesaran and Shin (1999) introduce the bounds test for cointegration that can be employed within an ARDL specification. This method has definite advantages in comparison to other cointegration procedures since it can be employed regardless of whether the underlying variables are I(0), I(1) or fractionally integrated. Thus, the bounds test eliminates the uncertainty associated with pre-testing the order of integration. Secondly, it can be used in small sample sizes, whereas the Engle–Granger and the Johansen procedures are not reliable for relatively small samples (Narayan, 2004). The ARDL approach involves two steps for estimating the long-run relationship. The first step is to examine the existence of a long-run relationship among all variables in the equation under examination. Conditional upon cointegration is confirmed, in the second stage, the long-run coefficients and the short-run coefficients are estimated using the associated ARDL and ECMs. While the bounds test procedure is applicable irrespective of whether the underlying explanatory variables are integrated of order zero (I(0)) or one (I(1)), an important condition is that none of the variables is integrated of order two. Hence, it is important to test the univariate stationarity property of the series.

One of the most famous cointegration approaches is the autoregressive distributed lag (ARDL) bounds testing approach to co-integration. This method, which was introduced by Pesaran and Shin (1999) and Pesaran*et al.* (2001), has received considerable attention over the past years. The advantage of this approach is that information regarding the order of integration of the variables included in the analysis is not necessarily needed. Hence, the pretesting for unit roots, which is required for other co-integration approaches, can be omitted. Rather, the significance of a long-run relationship is tested using critical value bounds, which are determined by the two extreme cases that all variables are $I(0)$ (the lower bound) and that all variables are $I(1)$ (the upper bound).

In the light of the ARDL approach, our model will look like the following:

$$\ln N_t = \beta_1 + \beta_2 \ln Q_t + \beta_3 \ln Q_{t-1} + \beta_4 \ln N_{t-1} + \epsilon_t \ldots\ldots\ldots (6)$$

where variables 'N' and 'Q' denote MSME employment and MSME output, respectively, and 'ln' stands for the natural logarithm with base 'e'. $\ln Q_{t-1}$ shows the value of $\ln Q_t$ with a lag of one period and $\ln N_{t-1}$ shows the value of '$\ln N_t$' with a lag of one period. Finally, ϵ_t is the error term which is white noise. Here, the regression coefficient β_2 serves as the employment elasticity.

Method 5 (Panel Regression Approach)

One more method involves using the panel regression approach which is applicable when we have panel data at hand. Panel data is a combination of cross section and time series data wherein various attributes of a variable is studied at different time periods. Taking the above example of employment and output, suppose we have employment data of different sectors namely agriculture, industry and services sector along with corresponding cross section data for the agricultural, industrial and services output. In such a case, we have to use the panel regression model because the variables employment (N) and output (Q) have both time as well as cross section dimensions.

Above, we have given a glimpse of all the procedures to arrive at the employment elasticity. While the CAGR approach is popular in India, it gives only the arc elasticity i.e. employment elasticity between the time periods. The second approach based on average annual growth rates can be viewed as an extension of the CAGR method. The third one i.e. the cointegration approach is the most sophisticated one in the sense it does not requires the underlying data to be stationary which leads to loss of vital long run information. The fourth method of regression technique is the one that dwells on stationary data series to produce elasticity value under a more conventional framework.

In our study, we have used the first four methods namely, the CAGR approach, the simple average technique, the conventional regression approach and the co-integration approach to find out the elasticity of employment in the MSME sector. The fifth method of panel regression would not be applicable in our study since the data at hand has only time dimension and no cross section dimension.

7. DATA FOR THE MODEL AND ESTIMATION

The available time series data for the variables MSME employment (N) and MSME output (Q) along with their natural logarithm for the period 1973-74 to 2012-13 are given below:

TABLE 5: DATA FOR THE MODEL

Financial Year	Employment 'N' (Million)	Output 'Q' (Rs. Billion)	ln 'N'	ln 'Q'
1973-74	3.97	342	1.38	5.83
1974-75	4.04	361	1.40	5.89
1975-76	4.59	425	1.52	6.05
1976-77	4.98	468	1.61	6.15
1977-78	5.40	528	1.69	6.27
1978-79	6.38	582	1.85	6.37
1979-80	6.70	664	1.90	6.50
1980-81	7.10	722	1.96	6.58
1981-82	7.50	783	2.01	6.66
1982-83	7.90	847	2.07	6.74
1983-84	8.42	935	2.13	6.84
1984-85	9.00	1046	2.20	6.95
1985-86	9.60	1181	2.26	7.07
1986-87	10.14	1336	2.32	7.20
1987-88	10.70	1505	2.37	7.32
1988-89	11.30	1699	2.42	7.44
1989-90	11.96	1899	2.48	7.55
1990-91	15.83	847	2.76	6.74
1991-92	16.60	874	2.81	6.77
1992-93	17.48	922	2.86	6.83
1993-94	18.26	988	2.90	6.90
1994-95	19.14	1088	2.95	6.99
1995-96	19.79	1212	2.99	7.10
1996-97	20.59	1349	3.02	7.21
1997-98	21.32	1463	3.06	7.29
1998-99	22.06	1575	3.09	7.36
1999-00	22.91	1704	3.13	7.44
2000-01	24.09	1844	3.18	7.52
2001-02	24.93	2823	3.22	7.95
2002-03	26.02	3068	3.26	8.03
2003-04	27.14	3363	3.30	8.12
2004-05	28.26	3729	3.34	8.22
2005-06	29.49	4189	3.38	8.34
2006-07	80.52	11988	4.39	9.39
2007-08	84.20	13228	4.43	9.49
2008-09	88.08	13756	4.48	9.53
2009-10	92.18	14884	4.52	9.61
2010-11	96.52	16536	4.57	9.71
2011-12	101.17	17886	4.62	9.79
2012-13	106.14	18100	4.66	9.80

7.1 Estimation of Employment Elasticity Using CAGR Approach:

The compound annual growth rate approach to elasticity or the descriptive method gives us the arc elasticity of employment. In case of CAGR approach, the elasticity of employment can be obtained by using the formula mentioned under equation 1 above which is reproduced as under:

$$e = \frac{dN}{N} \Big/ \frac{dQ}{Q}$$

It is important to remember here that the formula mentioned above gives us the arc elasticity of employment i.e. employment elasticity between two time periods.

TABLE 6:
EMPLOYMENT ELASTICITY USING CAGR APPROACH

Year	CAGR of MSME Employment (%)	CAGR of MSME output (%)	Employment Elasticity (%)
1973-74 to 1977-78	8.0	11.5	0.70
1977-78 to 1981-82	8.6	10.4	0.83
1981-82 to 1985-86	6.4	10.8	0.59
1985-86 to 1989-90	5.6	12.6	0.45
1989-90 to 1993-94	11.2	-15.1	-0.74
1993-94 to 1997-98	3.9	10.3	0.38
1997-98 to 2001-02	4.0	17.9	0.22
2001-02 to 2005-06	4.3	10.4	0.41
2005-06 to 2009-10	33.0	37.3	0.88
2009-10 to 2012-13	4.8	6.7	0.71
1973-74 to 2005-06	**6.5**	**8.1**	**0.79**
1974-75 to 2005-06	**6.6**	**8.2**	**0.80**
2006-07 to 2012-13	**4.7**	**7.1**	**0.66**
1973-74 to 2012-13	**8.8**	**10.7**	**0.82**

Source: Self-estimation.

We observe that using the CAGR approach, employment elasticity for the period 1973-74 to 2012-13 is estimated at 0.82. What we observe is a gradual decrease in employment elasticity of the MSME sector till FY 2005-06. During the period of FY 1973-74 to FY 2005-06, the employment elasticity of the MSME sector is estimated at 0.79 per cent where as for the period from FY 2006-07 to FY 2012-13, employment elasticity is estimated at 0.66 per cent. It means the small scale industries were more employment generating than the MSME manufacturing units. For the whole period from FY 1973-74 to FY 2012-13, employment elasticity is estimated at 0.82 per cent. We have also calculated the employment elasticity of the MSME sector during the pre-reform as well as the post-reform period. During the pre-reform period i.e. during 1973-74 to 1990-91 employment elasticity of the sector is calculated at 1.55 per cent whereas for the post reform period i.e. during 1991-92 to 2012-13, employment elasticity is calculated at 0.59 per cent.

7.2 Estimation Of Employment Elasticity Through Annual Average Growth Approach

TABLE 7:
ANNUAL AVERAGE METHOD FOR ESTIMATION OF EMPLOYMENT ELASTICITY

Year	Average YoY growth in MSME Employment (%)	Average YoY growth in MSME output (%)	Employment Elasticity (%)
1974-75 to 1986-87	7.55	11.09	0.68
1987-88 to 1999-00	6.70	4.22	1.59
2000-01 to 2012-13	17.47	25.54	0.68
1974-75 to 2005-06	**6.60**	**9.43**	**0.70**
2006-07 to 2012-13	**28.76**	**32.74**	**0.88**
1974-75 to 2012-13	**10.57**	**13.62**	**0.78**

Source: Self-estimation.

Under this method employment elasticity is estimated by dividing the simple average of year over year (YoY) growth of employment with the simple average of YoY growth in output.

Based on the annual average method of employment elasticity, we observe that the employment elasticity for the period FY 1974-75 to 2012-13 was estimated at 0.78 per cent for the MSME manufacturing sector which is strictly comparable with the employment elasticity obtained using the CAGR approach for the same period i.e. FY 1974-75 to FY 2012-13 at 0.80 per cent.

During the pre-reform period i.e. 1974-75 to 1990-91, employment elasticity for the sector is estimated at 1.17 per cent using the annual average method for the sector where as for the post reform period i.e. 1991-92 to 2012-13, employment elasticity is calculated at 0.65 per cent. We observe that under annual average method also the employment elasticity during the post reform period was lower than the employment elasticity during the pre-reform period.The results are quite similar as the results obtained under CAGR approach.

7.3 Estimation of Employment Elasticity Using the Regression Approach

The traditional proven and accepted approach to estimation of employment elasticity is the regression approach which gives the point elasticity. Under this method elasticity is estimated by a log linear regression equation between employment and GDP that generates the point elasticity of employment. The conventional form of the equation is:

$$\ln N_t = \beta_1 + \beta_2 \ln Q_t + \epsilon_t$$

where variables ‘N’ and ‘Q’ denote MSME employment and MSME output, respectively, and ‘ln’ stands for the natural logarithm with base ‘e’. Here, the regression coefficient β_2 serves as the employment elasticity (0.46). We observe that under the conventional regression approach or framework, without taking into account the structural break, the elasticity of employment of the MSME Manufacturing sector during the period FY 1973-74 to FY 2012-13 comes out to be 0.46. This implies that during the period under consideration a one per cent increase in MSME Manufacturing output led to 0.46 per cent increase in MSME manufacturing employment in the country.

On the other hand when we take into account the structural break into account under this framework, the sample period gets divided into two sub-samples i.e. one 1973-74 to 1989-90 and FY 1990-91 to FY 2012 -13. Under this set up, we get an employment elasticity value of 0.64 for the period FY 1973-74 to FY 1989-90 and 0.44 for the period of FY 1990-91 to FY 2012-13.

However, this method suffers from usual limitations of the OLS method. For instance, while using the OLS model for estimating the employment elasticity, we had to make the variables stationary which were otherwise not. In doing so vital, long run information contained in the data is lost which is undesirable.

7.4 Estimation of Employment Using The Co-Integration Approach

The above problem can be tackled by identifying possibly existing stationary linear combinations of two or more non-stationary time series. Such stationary linear combinations indicate common stochastic trends (i.e. co-integration), which can be interpreted as long run equilibrium relationships between the variables considered and, therefore, according to the Granger representation theorem (Engle and Granger, 1987), can be characterized by being generated through an error correction mechanism. One of the most famous cointegration approaches is the autoregressive distributed lag (ARDL) bounds testing approach to co-integration. This method was introduced by Pesaran and Shin (1999) and Pesaran*et al.* (2001). The advantage of this approach is that information regarding the order of integration of the variables included in the analysis is not necessarily needed. Hence, the pretesting for unit roots, which is required for other co-integration approaches, can be omitted. Rather, the significance of a long-run relationship is tested using critical value bounds, which are determined by the two extreme cases that all variables are $I(0)$ (the lower bound) and that all variables are $I(1)$ (the upper bound).

In our study, since, we would be using the log values of the variables i.e. MSME employment and MSME output for the estimation of employment elasticity under both the regression and cointegration approach, we refer to Table 5. It is pertinent to mention here that log transformation of a variable takes care of the problem of heteroscedastcity, if it is present in the level values. Nevertheless, we would be test checking the presence of heteroscedasticity in our model through appropriate tests.

One of the conditions under the ARDL bounds test approach is that none of the variables to be used in the model should be integrated of order 2 i.e. I(2). This requires us to test for the degree of integration of the variables in our study i.e. 'ln N' and 'ln Q'. We have used the Augmented Dickey Fuller (ADF) and Philips – Perron (PP) unit root tests.

Table 8: Summary Results of Unit Root Tests

Variable	Augmented Dickey Fuller	Philips – Perron
ln 'N'	First difference stationary *I(1)*	First difference stationary *I(1)*
ln 'Q'	First difference stationary *I(1)*	First difference stationary *I(1)*

From deliberations both under ADF as well as PP unit root tests, we came to know that the variable 'ln Q' is I (1) and so as 'ln N'. With this we confirmed that none of the variables in our study are I(2) which is an essential assumption under the bounds test approach.

7.4.1. ***Long Run Relationship Between The Variables:*** After ascertaining that none of the variables or data series under consideration are I(2) and they are first difference stationary, the next task at hand is to find out whether there exists any long run relationship between the variables i.e. MSME output and MSME employment. For this purpose we have used the following model:

$$\Delta \ln N_t = \beta_1 + \beta_2 \Delta \ln Q_{t-1} + \beta_3 \Delta \ln N_{t-1} + \beta_4 \ln Q_{t-1} + \beta_5 \ln N_{t-1} + \beta_6 Dummy + \epsilon_t \ldots\ldots\ldots\ldots(7)$$

The above model is an ARDL model which will be tested by the ordinary least square (OLS) method to find out if there is any long run association between the variables under consideration.

TABLE 9:

TEST FOR LONG RUN RELATION BETWEEN THE VARIABLES

Dependent Variable: D(LN_N)
Method: Least Squares
Date: 07/23/17 Time: 11:50
Sample (adjusted): 3 40
Included observations: 38 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.997173	0.414234	-2.407267	0.0220
D(LN_Q_LAG1)	-0.041649	0.139941	-0.297622	0.7679
D(LN_N_LAG1)	0.021107	0.189140	0.111597	0.9118
LN_N_LAG1	-0.474028	0.164930	-2.874110	0.0071
LN_Q_LAG1	0.301622	0.107555	2.804366	0.0085
DUMMY	0.306171	0.119333	2.565687	0.0152

R-squared	0.214599	Mean dependent var	0.086014
Adjusted R-squared	0.091880	S.D. dependent var	0.159299
S.E. of regression	0.151805	Akaike info criterion	-0.788502
Sum squared resid	0.737431	Schwarz criterion	-0.529936
Log likelihood	20.98153	Hannan-Quinn criter.	-0.696506
F-statistic	1.748699	Durbin-Watson stat	2.110403
Prob(F-statistic)	0.151953		

The representation form of the above estimation will be as under:

D(LN_N) = C(1) + C(2)*D(LN_Q(-1)) + C(3)*D(LN_N(-1)) + C(4)*LN_N(-1) + C(5)*LN_Q(1) + C(6) *dummy ……… (8)

In equation 8, we have to check whether C(4) and C (5) which are equivalent of β_4 & β_5 are statistically different from zero or not. If they are not statistically different from zero, we can conclude that co-integration exists between MSME Employment (N) and MSME Output (Q). This is being tested using the wald test.

Here the null hypothesis (H_0) is that there is no co-integration among the variables under consideration whereas the alternative hypothesis (H_1) is that there do exist co-integration among the variables under consideration.

TABLE 10:

WALD TEST FOR CONFIRMING THE LONG RUN RELATIONSHIP

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	4.144552	(2, 32)	0.0251
Chi-square	8.289105	2	0.0159

Null Hypothesis: C(4)=C(5)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(4)	-0.474028	0.164930
C(5)	0.301622	0.107555

Restrictions are linear in coefficients.

In the framework of ARDL model, we will be using the bounds test approach here. Our null hypothesis in the above case is that no co-integration or long run relationship exists between MSME Employment (N) and MSME output (Q).

Pesaran M. H., Shin Y., Smith R. J., (1999) have given different types of bound test values, such as:

Case I: No intercept & no trend;

Case II: Restricted intercept & no trend;

Case III: Unrestricted intercept & no trend;

Case IV: Unrestricted intercept and restricted trend;

Case V: Unrestricted intercept and unrestricted trend.

Our case fits into Case III i.e. Unrestricted intercept & no trend. In the realms of ARDL bounds test approach 'k' denotes the number of regressors or the independent variable in the model. In our model k = 2. With 'k' as two, the lower bound value and the upper bound value under the bounds test approach are 3.17 and 4.14 respectively at 10 per cent level of significance. From Table 10 the estimated value of test statistic is 4.145, which exceeds the upper bound value just. This implies that the null hypothesis of no Co-integration between MSME Manufacturing Employment (N) and MSME Manufacturing Output (Q) can be rejected. As a result, we accept the alternative hypothesis that there exists co-integration or long run association between the two variables under consideration. After ascertaining the status of long run relationship between the variables, we next move to find out the short run elasticity of employment.

7.4.2. ***Structural Breaks In the Data Series:*** Prima facie, we observe that in the year 1990-91 (18^{th} Serial number sample) there is a marked change in the time series for MSME output. This makes us enquire about the possibility of structural breaks in the time series. A structural break is an unexpected shift in a macroeconomic time series which can lead to huge forecasting errors and unreliability of the model in general. This issue was popularised by David Hendry. In case of India, though the immediate factor behind the 1991 crisis and the resultant structural changes across all sectors of the economy was the Gulf war with the rise in oil prices and fall in remittances because of return of workers from the Middle East, the domestic situation was fragile both economically, high short term borrowings, and politically, weak governments unable to take decisions. The concept of structural changes in the Indian economy during the beginning of 1990s is well researched: (Agarwal&Ghosh2015); (Choudhery2014). We can detect the possibility of structural breaks in the data series by using Chow Breakpoint Test. The details are given here under:

Null Hypothesis: There are no structural breaks at the designated sample point.

Alternative Hypothesis: There are structural breaks at the designated data point.

TABLE 11:

SUMMARY OUTPUT OF THE CHOW BREAKPOINT TEST AT THE DESIGNATED SAMPLE POINT

Chow Breakpoint Test: 18
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1 40

F-statistic	113.4031	Prob. F(2,36)	0.0000
Log likelihood ratio	79.51591	Prob. Chi-Square(2)	0.0000
Wald Statistic	226.8062	Prob. Chi-Square(2)	0.0000

Interpretation: As we know the 'p' value indicates the exact level of significance at which the null hypothesis can be rejected. In other words, interpreting it differently, the 'p' value indicates the probability of the null hypothesis becoming true. Higher the 'p' value, stronger is the null hypothesis i.e. probability of acceptance of the null hypothesis is higher. In our case, we observe that the 'p' value is zero, implying that the null hypothesis is very weak and thus can be rejected. Therefore, we accept the alternative hypothesis that there is structural break at the designated sample point i.e. in the year 1990-91. Now, since there is a structural break in the data series, the same needs to be taken into account in our econometrics model in order to reflect the impact of structural break on the value of employment elasticity. This makes us introduce an inter-action dummy variable in our model. The dummy variable 'D' has a value of zero for the period 1973-74 to 1989-90 and has a value of 'one' for the period 1990-91 to 2012-13. A value of zero indicates that there are no structural breaks and a value of one indicates the opposite. Through chow test, we have come to know that the structural break in the data series has occurred from the period 1990-91. Incorporating the slope dummy will make our model given in equation 2 look like the following:

$$\ln N_t = \beta_1 + \beta_2 \ln Q_t + \beta_3 \ln Q_{t-1} + \beta_4 ln\ N_{t-1} + \beta_5 ln Q_t * D_t + \beta_6\ ln\ Q_{t-1} * D_{t-1} + \epsilon_t \ldots\ldots\ldots (9)$$

Where, the composite variable Q_t*D is a slope dummy which denotes the impact of the presence of the structural break on the value of employment elasticity and $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5,$ *and* β_6 are the coefficients.

7.4.3. *Calculation of Employment Elasticity through the Co-integration Approach:* After ascertaining the structural breaks, the next logical step is to estimate the value of elasticity of employment in the light of the relevant model and relevant time series data.

TABLE 12:

ELASTICITY OF EMPLOYMENT FOR MSME MANUFACTURING SECTOR

Dependent Variable: LN_N
Method: ARDL
Date: 04/16/17 Time: 21:08
Sample (adjusted): 3 40
Included observations: 38 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Hannan-Quinn criterion (HQ)
Dynamic regressors (4 lags, automatic): LN_Q LN_Q___DUMMY
Fixed regressors: C
Number of models evalulated: 100
Selected Model: ARDL(1, 1, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LN_N(-1)	0.890426	0.101402	8.781147	0.0000
LN_Q	0.709799	0.063008	11.26522	0.0000
LN_Q(-1)	-0.643454	0.098852	-6.509289	0.0000
LN_Q___DUMMY	0.127123	0.012126	10.48311	0.0000
LN_Q___DUMMY(-1)	-0.120711	0.017594	-6.861053	0.0000
C	-0.232566	0.178994	-1.299291	0.2031

R-squared	0.995807	Mean dependent var	2.940464
Adjusted R-squared	0.995151	S.D. dependent var	0.923576
S.E. of regression	0.064310	Akaike info criterion	-2.506273
Sum squared resid	0.132344	Schwarz criterion	-2.247707
Log likelihood	53.61918	Hannan-Quinn criter.	-2.414277
F-statistic	1519.842	Durbin-Watson stat	1.942039
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

(1) (2) (3) (4) (5)

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + 0.709*\ln Q_t - 0.643*\ln Q_{t-1} + 0.127*\ln Q_t*D_t - 0.121*\ln Q_t*D_{t-1} \quad ..(10)$$

(6)

From equation 10, we find an employment elasticity value of 0.709 for the period 1973-74 to 2012-13 for the MSME manufacturing sector in India which implies that a one per cent increase in MSME output during the period under consideration had increased MSME employment by 0.709 per cent. The elasticity value of 0.709 is valid with the assumption that there are no structural breaks in the data series. This is clear from the fact that in the event the value of $D_t$is zero indicating no structural breaks, the value of the portion (5) of equation 4 above will be zero and thus the value of elasticity of employment will be 0.709.

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + \underline{\mathbf{0.709*\ln Q_t}} - 0.643*\ln Q_{t-1} + \underline{\mathbf{0.127*\ln Q_t*0}} - 0.121*\ln Q_t*D_{t-1}$$

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + \underline{\mathbf{0.709*\ln Q_t}} - 0.643*\ln Q_{t-1} + \underline{\mathbf{0}} - 0.121*\ln Q_t*D_{t-1}$$

By adding up the values of the variable $\boldsymbol{lnQ_t}$ above, we will get the following:

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + \underline{\mathbf{0.709*\ln Q_t}} - 0.643*\ln Q_{t-1} - 0.121*\ln Q_t*D_{t-1} \ldots\ldots(11)$$

However, we observe that the data series contains a structural break and the value of $D_t$is 'one' rather than 'zero'. In that case, equation 4 can be substituted with the value of $\boldsymbol{D_t = 1}$ and will look as under:

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + 0.709*\ln Q_t - 0.643*\ln Q_{t-1} + 0.127*\ln Q_t*\underline{\mathbf{1}} - 0.121*\ln Q_t*D_{t-1}$$

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + 0.709*\ln Q_t - 0.643*\ln Q_{t-1} + 0.127*\ln Q_t - 0.121*\ln Qt*D_{t-1}$$

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + 0.709*\ln Q_t - 0.643*\ln Q_{t-1} + 0.127*\ln Q_t - 0.121*\ln Q_t*D_{t-1}$$

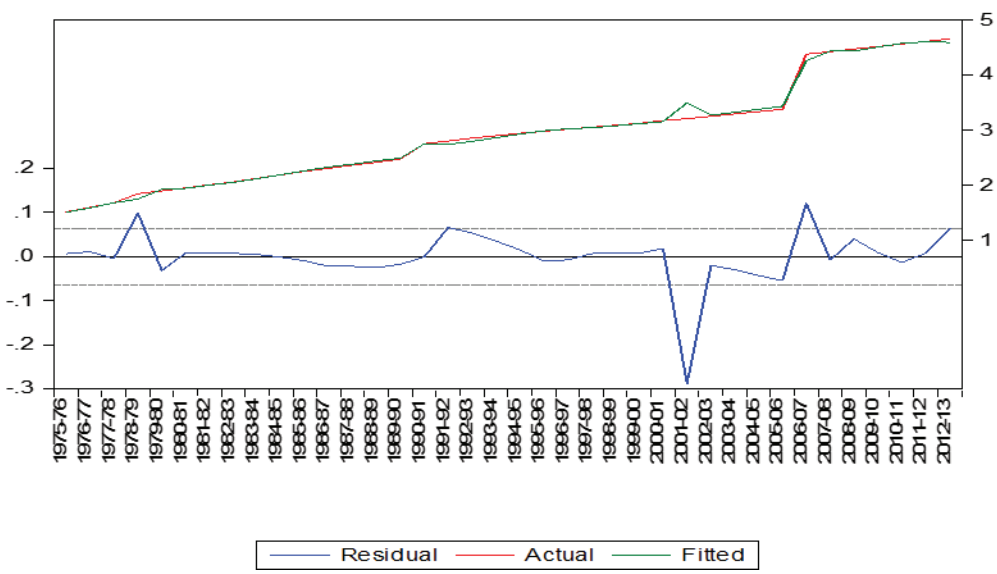
By adding up the values of the variable lnQtabove, we will get the following:

$$\ln N_t = -0.232 + 0.890*\ln N_{t-1} + 0.836*\ln Q_t - 0.643*\ln Q_{t-1} - 0.121*\ln Q_t*D_{t-1} \ldots\ldots(12)$$

Therefore, we observe that in the presence of structural break in the data series, which is originally the case in our study, the value of elasticity of employment for the MSME manufacturing sector in India is found to be 0.836 per cent. This implies that during the period 1973-74 to 2012-13, a one per cent increase in MSME manufacturing output has resulted in MSME manufacturing employment increasing by 0.836 per cent during the same period. The DW statistic close to 2 per cent also bolsters our results. A high R2of more than 99 per cent makes the model a good fit.

FIGURE 1:

ESTIMATION OF EMPLOYMENT ELASTICITY (1973-74 TO 2012-13)

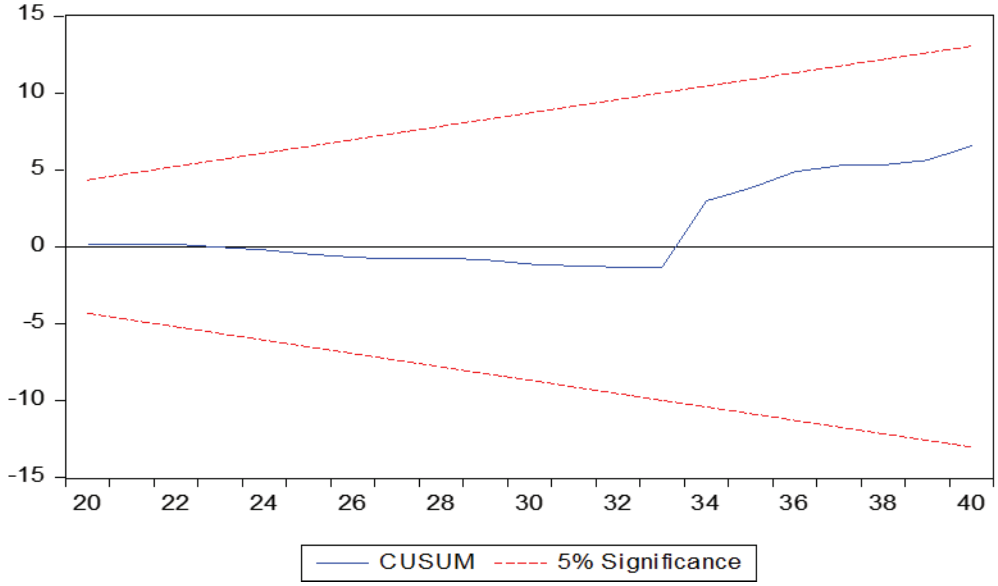


Moreover, with an ‘R’ square value of 0.99, we are assured of the fact that we have a robust fit as far as the regression model is concerned.

7.4.4. ***Stability of the model:*** In order to ascertain the stability of our model, we will be employing a test known as the CUSUM test. In statistical quality control, the CUSUM (or cumulative sum control chart) is a sequential analysis technique developed by E. S. Page of the University of Cambridge. It is typically used for monitoring change detection. As per the methodology under the CUSUM test, the CUSUM line should remain within the upper bound and lower bound indicated by the red dotted lines.

FIGURE 2:

CUSUM STABILITY CHART



It is observed from figure 2 that the CUSUM line lies within the red dotted lines for the model, thus indicating that our model is stable.

7.4.5. ***Test of autocorrelation and heteroscedasticity:*** Now, the next step is to verify whether the model suffers from any of the problems of autocorrelation and heteroscedasticity. For verifying the presence of autocorrelation, we will be using the Breush – Godfrey serial correlation LM test. On the other hand, for verifying the presence of heteroscedasticity, we will be using the Breusch-Pagan-Godfrey heteroscedasticity test. Using both tests as mentioned above, we came to know that our model does not suffer from the problems of autocorrelation and heteroscedasticity.

7.4.6. ***Test of Autocorrelation Using Breush – Godfrey Serial Correlation LM Test:*** Under this test, the following null and alternative hypothesis is being tested:

Null Hypothesis: There are no autocorrelation in the model.

Alternative Hypothesis: Autocorrelation exists in the model.

TABLE 13:

SUMMARY OUTPUT OF THE TEST OF AUTOCORRELATION

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.182674	Prob. F(2,30)	0.8340
Obs*R-squared	0.457205	Prob. Chi-Square(2)	0.7956

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 04/16/17 Time: 22:48
Sample: 3 40
Included observations: 38
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN N(-1)	-0.045700	0.138553	-0.329836	0.7438
LN_Q	-0.005703	0.065758	-0.086722	0.9315
LN_Q(-1)	0.030389	0.118472	0.256508	0.7993
LN Q DUMMY	6.75E-05	0.012453	0.005421	0.9957
LN_Q___DUMMY(-1)	0.004395	0.020176	0.217830	0.8290
C	-0.073788	0.235176	-0.313756	0.7559
RESID(-1)	0.057549	0.226127	0.254499	0.8008
RESID(-2)	0.127860	0.213796	0.598047	0.5543

R-squared	0.012032	Mean dependent var	-1.51E-15
Adjusted R-squared	-0.218494	S.D. dependent var	0.059807
S.E. of regression	0.066018	Akaike info criterion	-2.413114
Sum squared resid	0.130751	Schwarz criterion	-2.068359
Log likelihood	53.84917	Hannan-Quinn criter.	-2.290453
F-statistic	0.052192	Durbin-Watson stat	1.996139
Prob(F-statistic)	0.999752		

From Table 13, we observe that the ‘p’ value is very high at more than 79 per cent, meaning that we cannot reject the null hypothesis of no autocorrelation. Therefore, we conclude that our model is free from the problems of autocorrelation.

7.4.7. ***Test of heteroscedasticity Using Breusch-Pagan-Godfrey test:*** Under this test, the following null and alternative hypothesis is being tested:

Null Hypothesis: The model has homoscedasticity i.e. it does not suffer from heteroscedasticity.

Alternative Hypothesis: The model suffers from the problems of hereoscedasticity.

TABLE 14:

SUMMARY OUTPUT OF THE TEST OF HETEROSCEDASTICITY

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	2.022272	Prob. F(5,32)	0.1020
Obs*R-squared	9.124180	Prob. Chi-Square(5)	0.1042
Scaled explained SS	47.64779	Prob. Chi-Square(5)	0.0000

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 04/19/17 Time: 22:24
Sample: 3 40
Included observations: 38

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.039245	0.035338	1.110559	0.2750
LN_N(-1)	0.018477	0.020020	0.922968	0.3629
LN_Q	0.035658	0.012440	2.866521	0.0073
LN_Q(-1)	-0.047498	0.019516	-2.433814	0.0207
LN_Q___DUMMY	0.004907	0.002394	2.049784	0.0487
LN_Q___DUMMY(-1)	-0.005981	0.003473	-1.721991	0.0947

R-squared	0.240110	Mean dependent var	0.003483
Adjusted R-squared	0.121377	S.D. dependent var	0.013545
S.E. of regression	0.012697	Akaike info criterion	-5.751038
Sum squared resid	0.005158	Schwarz criterion	-5.492472
Log likelihood	115.2697	Hannan-Quinn criter.	-5.659042
F-statistic	2.022272	Durbin-Watson stat	1.969824
Prob(F-statistic)	0.102025		

From Table 14, we observe that the 'p' value comfortably at more than 10 per cent, implying that we cannot reject the null hypothesis of homoscedasticity. Therefore, we conclude that our model is free from the problems of heteroscedasticity.

8. CONCLUSION

With regard to our original model and the hypothesis, we reject the null hypothesis that the MSME sector does not have any employment intensity i.e. the coefficient of output variable in our model has a zero value. Accordingly, we accept the alternative hypothesis that the Indian MSME sector does have employment elasticity i.e. the coefficient of output variable in our model has a non-zero value. We have also checked the same after making the data stationary which also implies that the problem of spurious regression is taken care of as well. We have also cross checked for various regression assumptions e.g. no autocorrelation, homoscedasticity etc. Our model satisfies all the tests and important assumptions.

Using the available data, the employment elasticity of the Indian MSME manufacturing under the autoregressive distributed lag model is estimated at 0.836 per cent for the period 1973-74 to 2012-13. This implies that during the period under consideration i.e. from 1973-74 t 2012-13, a one per cent increase in MSME Manufacturing output has resulted in MSME Manufacturing employment rising by 0.836 per cent. About the results obtained under different methods, we observe that while the results obtained under CAGR method, Annual Average Method & ARDL model are similar, the results obtained under the traditional two variable linear regression model is far from satisfactory. In view of the relative weakness of the traditional linear regression model and the comparable results of other three methods namely the CAGR approach, the annual average method and the ARDL model, we accept the elasticity results given by the ARDL model. We also observe that the findings are statistically significant at 1 per cent level of significance as well as at 5 per cent level of significance. The CAGR model which gives the arc elasticity gives an employment elasticity value of 0.82. This implies that the value of employment elasticity for the Indian MSME Manufacturing Sector vary from 0.82 (arc elasticity) to 0.836 (point elasticity) for the period 1973-74 to 2012-13. This elasticity value for the Indian MSME manufacturing sector is encouraging and calls for attention of various stake holders including the central government and state governments, monetary authority, etc. so that the sector's potential can be harnessed in creating more employment opportunities in the country. The main aim of the paper has been to computation of employment elasticity of the MSME manufacturing sector in India. Studies on employment elasticity at greater disaggregation – MSME sub sector wise and state-wise - could be an area of future research, albeit, the limitations in the form unavailability of subsector wise employment and output data need to be looked into first.

REFERENCES

Enders, Walter (2010): *Applied Econometric Time Series,* New Jersey: John Wiley & Sons Inc.

Garg, Ishuand Walia, Suraj(2012),"Micro, Small & Medium Enterprises (MSMEs) in post Reform India: Status & Performance", *International Journal of latest trends in Engineering & Technology*, Vol 1, Issue 3, pp. 134-141.

Gujurati, D. (2007): *Basic Econometrics,* New Delhi: Tata McGraw Hill.

Jiun, Chan Yu and Nga, Janice L. H.(2011), "Economic Growth, Employment Elasticity and Poverty: A Case of Malaysia" ,*Prosiding Persidangan Kebangsaan Ekonomi Malaysia,* Ke VI, JILID 1, pp. 468-481.

Jethwant, Nidhi (2010): *Micro, Small & Medium Enterprises – In Today's Perspective*, New Delhi: Axis Publications.

Jaynal, Ud-din Ahmed and Rashid, Md. Abdul (2014): *Micro, Small & Medium Enterprises (MSMEs) in India: Institutional Framework, Problems and Policies,* New Delhi: New Century Publications.

Kapsos, Steven (2005), "The employment intensity of growth: Trends and macroeconomic determinants", *International Labour Office (ILO): Employment strategy papers*, Series 2005/12, pp. 1-50.

Lohana, Sarika (2014): *Micro, Small & Medium Enterprises for Inclusive Growth,* New Delhi: New Century Publications.

Mishra, Sangita and Suresh, Anoop K (2014), "Estimating Employment Elasticity Of Growth for the Indian Economy", *RBI, Working Paper Series,* WPS 06 / 2014, pp. 1-20.

Mazumdar, Dipakand and Sarkar, Sandip (2007), "Employment Elasticity in Organized Manufacturing in India", *IPC working paper series,* No. 42, pp. 1-45.

Ministry of Micro, Small and Medium Enterprises, Government of India, 2015-16,*"Annual Report" Department of publication, Government of India*.

Sahu, Partha Pratim(2007), "Expanding Productive Employment Opportunities: Role and Potential of the Micro and Small Enterprises Sector", *Institute for Studies in Industrial Development (ISID),*Working Paper Series, 2007/05, pp. 1-44.

Suryadarma, Daniel, Suryahadi, Asep and Sumarto, Sudarno (2007),"Reducing Unemployment in Indonesia: Results from a Growth-Employment Elasticity Model", *SMERU working paper*, pp. 1-33.

Subrahmanya, Bala M. H. (2004), "Small Industry and Globalization: Implications, Performance and Prospects", *Economic and Political Weekly*, Volume XXXIX, No.18, pp. 1826-1834.

Upender, M. (2006), "Output Elasticity of Employment in the Indian Economy: An Empirical Note", *Applied Econometrics and International Development*, Vol. 6 – 1 (2006), pp. 197-206.