ISSN 2454-5597

ISFIRE WORKING PAPER SERIES

STATE-LEVEL ANALYSIS OF EMPLOYMENT IN THE CONSTRUCTION SECTOR OF INDIA

Kadambari Chheda
Anuradha Patnaik

Working Paper-11
http://iire.in/ojs/index.php
Issue-June 2015

ABOUT US

ISF Institute of Research and Education (IIRE), a branch of **Inner Search Foundation, a public charitable trust.** It has been established to facilitate education and research in diverse fields. The aim of IIRE is to create integrated educational and research programs which enhance the capability, productivity and employment potential of individuals in their respective fields.

IIRE is a part of a multi-faceted, multi-disciplinary **ISF Group**, which has nearly two decades of experience, providing Consultancy, Business Management, Academic Management, Technical Management and Learning & Development solutions for various organizations. ISF Group believes in creating value for its customers and stakeholders by providing innovative services and solutions that are based on cutting edge research. The R&D activities of the Group are channelized with exclusive focus on leveraging innovation and creativity, of the scientific, technical and management resources across the globe. The group facilitates converting the generated body of knowledge into practical use through development of innovative products, services and solutions. There are three major verticals under the ISF Group:

1. **ISF Maritime Services** – *Provides services spanning the entire eco-system of the shipping industry*
2. **ISF HR Services** – *Provide organizational development and talent management services to organizations across industries*
3. **Inner Search Foundation** – *Guides individuals and helping organizations to expand their horizons and experiencing happy, healthy and fulfilling existence.*

For more information please log on to www.isfgroup.in

This page is intentionally blank

STATE-LEVEL ANALYSIS OF EMPLOYMENT IN THE CONSTRUCTION SECTOR OF INDIA

Kadambari Chheda[1]
Anuradha Patnaik[2]

Abstract

Increase in the pace of employment generation in India's construction sector is evident from the several recent National Sample Survey reports. This study estimates the employment elasticity of the construction sector at the aggregate and state (regional) levels. These employment elasticities have been interpreted from the perspective of the productivity of labour, and panel regression analysis and compound annual growth rate (CAGR) method have been employed to estimate these elasticities. The results reveal that, the construction sector is emerging as a major employment generator both at the aggregate and state levels. It is also absorbing the spillover of workers from the agricultural sector because of which a possibility of disguised unemployment exists in the construction sector.

Key Words: Construction sector, Employment, Structural change, Employment elasticity, Panel Regression.

JEL Code(s): E24, L74.

[1] Research Scholar, Department of Economics, University of Mumbai, Mumbai.
Email: kadambarichheda@gmail.com (Corresponding author).

[2] Assistant Professor, Department of Economics, University of Mumbai, Mumbai.
Email: apatnaik@economics.mu.ac.in

Authors thank Bhavesh Salunkhe for his valuable inputs during the working of this paper.

1. INTRODUCTION

Construction is the world's biggest and most challenging industry (Tucker, 1986). India's construction sector contributed approximately 8 percent of the country's gross domestic product (GDP) during 2011-12. The gross value added by India's construction industry increased from Rs.149950 crores in 1999-00 to Rs.228855 crores in 2004-05; and further to Rs.412412 crores in 2011-12. This was complemented by an increase in employment from approximately 1.7 crore workers in 1999-00 to 2.6 crores in 2004-05 and further to approximately 4.9 crore workers in 2011-12. Besides, construction industry was the second largest employer in 2009-10, employing approximately 11 per cent of India's workforce following agricultural sector which employed 36 percent (Soundarajan, 2013). Employment in the construction sector has been largely casual, however this sector indicated a striking increase in the organized construction lately. In 2011-12, approximately 40 per cent of the total construction employment was in the organised segment (Mehrotra *et al,* 2014).

A close examination of the quinquennial reports of employment-unemployment surveys (EUS) of National Sample Survey Office (NSSO) for 1999-00, 2004-05 and 2011-12, reveals a gradual structural change in the employment pattern of India. Though total output of the agricultural sector decreased between 1999-00 and 2004-05, approximately 2.2 crore workers were added to the primary sector. This indicated that no structural occurred from agriculture to other sectors till 2004-05. The structural shift was witnessed in India for the first time only after 2004-05. This shift of employment from agriculture sector increased the work-participation rates in the non-agricultural sectors. According to Mehrotra *et al,* (2014), the increase in nonagricultural employment was majorly seen in labour-intensive sub-sectors where construction industry proved to be the fastest employment provider as compared with the other nonagricultural sectors. Along with several strong "push" factors such as low productivity in the agricultural sector, "pull" factors such as expansion of casual employment in public works also existed. Employment through the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGA) was instrumental in increasing the employment in the construction sector,

particularly in the rural areas of India (Thomas, J., 2014). During 2004-05 and 2011-12, total employment in the non-agricultural sector increased by approximately 4.8 crore of workers, wherein share of the construction industry constituted of approximately 2.5 crores (that is approximately 50 percent of the total employment growth in the non-agriculture sector).

Currently, the construction sector is playing a critical role in generating employment in the country. Understanding the pattern of employment expansion in this sector at regional level is essential as large number of jobs are being created in this sector. To the best of our knowledge, no major studies have explored the regional pattern of employment in India's construction sector. This study therefore employs techniques such as employment elasticity, panel regression analysis and spatial auto-correlation measures to empirically analyse the employment pattern of construction sector at regional (state) level. The remainder of paper is structured as follows. Section Two reviews literature on the structural change in the employment pattern of India and employment changes in the construction sector. Section Three briefly discusses the dynamics of state-level employment of the construction industry in India. Section Four present a brief idea about the database and step-wise methodology used in the study. Section Five presents the stepwise empirical results of employment elasticity, panel regressions and spatial autocorrelation and finally, Section Six discusses the final results, conclusions and scope for further study.

2. LITERATURE REVIEW

'Structural change' is usually defined as a long-term persistent change in the sectoral structure of the entire economy (Syrquin, 2007). It includes the relocation of workforce from agriculture to non-agricultural production in the modern development scenario (Roy, 2008). Lewis (1954) revealed that the major concern of developing countries was having surplus labour supply in addition to along lower investment and savings. He verified that the surplus labour moves from traditional (agricultural) sector to the modern (non-agricultural) sector for faster economic development, thereby increasing wages in the rural

sector, in addition to increasing aggregate incomes and the overall productivity of the economy.

India has experienced a shift in workforce from the agricultural sector to the non-agricultural sector from 2004-05 to 2011-12. Chaudhury (2011) analysed that a major decline in the proportion of employment in the agricultural sector from 2004-05 to 2011-12, has been compensated by an increase in employment in the construction sector, both in the rural and urban areas. He further added that this compensation in the rural areas was mainly due to MGNREGA that involved construction work; and that it was attributed to rapid development in real estate in urban areas. Mehrotra *et al* (2014) presented that in addition to MGNREGA and real estate investments, infrastructure investment of $500 billion during 11th plan period (2007-12) from 4 per cent to 7 percent also increased employment opportunities in this sector. Furthermore, large private and public investments in the infrastructure sector as well as in the housing and development projects such as Indira Awas Yojan and Pradhan Mantri Gram Sadak Yojana, increased employment opportunities in this sector. Thus, construction sector seems to be one of the critical avenues for employment today.

Construction sector is largely interconnected to most of the other economic activities of the economy (Ramachandra et. al., 2013). It causes maximum multiplier effects through its wide-spreading backward and forward linkages with other sectors of the economy. (Osei, 2013). Thakurta (1970) stated that the construction sector is considered be the shock-absorbing industry for employment, in the developed countries, however it is usually regarded for absorbing a large influx of unemployed people in the developing countries. The recent NSS employment-unemployment reports have revealed that employment in the construction sector in urban areas and more notably in the rural areas of India has grown rapidly. This study analyses the employment in India's construction sector at the regional level.

3. STATE-LEVEL EMPLOYMENT DYNAMICS OF THE CONSTRUTION SECTOR IN INDIA

The secondary sector (industrial sector) in India comprises of manufacturing, construction, mining and quarrying and public utilities. In several countries construction industry is a part of the tertiary (service) sector, however it is within the secondary sector in India. Secondary sector plays a significant role for providing non-agricultural employment to the job seeking labour-force. Recent NSSO reports have revealed that employment in the construction sector has been increasing rapidly compared with that in other non-agricultural sub-sectors. It can be seen in Table No.1 that the percentage share of construction sector in the total employment of the country and within the secondary sector has increased, for the studied years.

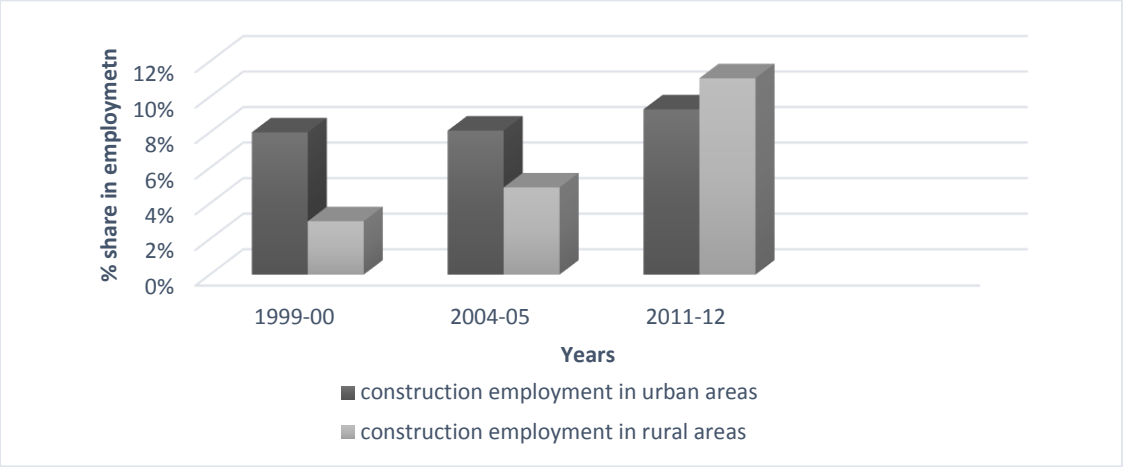
Table 1: Percentage share of construction sector in the total employment of India and within the secondary sector.

Years	Share in total employment of India	Share in secondary-sector employment
1999-00	5.6	25.9
2004-05	6.4	27.1
2011-12	10.6	43.3

Source: NSSO (EUS) reports of 1999-00, 2004-05 and 2011-12.

The Table.1 indicates the percentage share of the construction sector in the total employment of the construction sector's employment in total employment has risen marginally during 1999-00 to 2004-05 from 5.6 per cent to 6.4 percent. Comparatively, the share of construction sector's employment has augmented to 10.6 percent from 2004-05 to 2011-12, thus emerging as one of the faster growing employment providing sub-sector in India. Correspondingly, the share of construction sector's employment in the secondary sector increased slightly from 25.9 percent in 1999-00 to 27.1 percent in 2004-05, and escalated to 43.3 percent during 2004-05 to 2011-12. Clearly, the employment growth in the construction sector has been massive during these years. Furthermore, in Figure 1, illustrates the rural and urban divide of employment in the construction sector, for the period under study.

Figure 1: Composition of construction sector's employment between rural and urban areas



Source: NSSO (EUS) reports of 1999-00, 2004-05 and 2011-12.

The share of urban areas in the total construction employment has risen slightly from approximately 8 percent in 1999-00/2004-05 to 9.3 percent in 2011-12. Relatively, the share of rural areas in the total employment in construction sector has been improving (from 3 to 4.9 percent during 1999-00 and 2004-05; and further surging to 11.05 percent in 2011-12). Thus, such a pattern of employment growth implies that employment generation has not increased significantly in urban areas. Employment generation has more than doubled in rural areas from 2004-05 to 2011-12.

Table 2 presents a temporal illustration of the percentage share of the states of India in the total employment of the construction industry for 1999-00, 2004-05 and 2011-12. This table indicates that approximately 50 percent share of the employment in the construction sector is generated in Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan in 2011-12. Thus, we see that construction sector employment is highly generated in the less developed and chiefly agrarian states (Thomas, 2014). Also, manufacturing and service sector played a small role in absorbing the large labour reserves in India (Thomas, 2012). Uttar Pradesh has indicated the highest percentage share of construction workers for all the examined years. Ranjan (2009) has stated that such a rise in the construction sectors employment in Uttar Pradesh must be distress driven and could be increasing as this sector essentially depends largely on casual, seasonal and unspecialized labour. Bihar, Uttar

Pradesh, Madhya Pradesh, Punjab, Haryana and Mizoram have indicated incessant rise in their percentage shares of employment from 1999-00 to 2011-12. Conversely, Andhra Pradesh, Gujarat, Karnataka and Kerala have experienced constant decline in their percentage share of employment. A detailed study of the rural-urban employment composition of NSSO reports shows that the percentage employment shares for both rural and urban areas have increased constantly for Bihar, Haryana and Mizoram in the construction sector. While, Uttar Pradesh and Punjab have shown higher employment rise in rural construction employment, Madhya Pradesh has experienced higher rise in urban construction employment.

4. DATABASE AND METHODOLOGY

Given the above backdrop, this study regionally evaluates the employment pattern of the construction sector in India during the years 1999-00, 2004-05 and 2011-12. The three hypothesis to be tested are as follows: -

(a) Employment elasticity (EE) in the construction sector differs across states.

(b) Employment in the construction sector is rising due to spillover of workforce from the agricultural sector and rising aggregate GDP of the country.

(c) There is a significant clustering of employment generation in the construction sector across states.

Table 2: State-wise Share of Construction Workers in the Total employment of the Construction Industry.

State	1999-00	2004-05	2011-12
Andhra Pradesh	10.7	7.7	6.3
Arunachal Pradesh	0.1	0.1	0.05
Assam	1.5	1.4	1.4
Bihar	8.3	9.5	11.6
Goa	0.3	0.2	0.08
Gujarat	5.2	3.8	2.4
Haryana	1.1	2.1	2.3

Himachal Pradesh	1.1	1.6	1.0
Jammu and Kashmir	1.4	1.4	1.8
Karnataka	5.9	4.9	3.1
Kerala	5.6	4.8	4.3
Madhya Pradesh	7.0	7.7	9.4
Maharashtra	9.2	9.3	6.0
Manipur	0.1	0.1	0.4
Meghalaya	0.2	0.1	0.2
Mizoram	0.1	0.04	0.07
Nagaland	0.1	0.1	0.05
Orissa	4.2	4.1	4.1
Punjab	2.5	2.7	2.8
Rajasthan	9.1	8.1	10.3
Sikkim	0.04	0.06	0.04
Tamil Nadu	7.4	6.7	8.0
Tripura	0.3	0.3	1.1
Uttar Pradesh	12.2	17.4	17.8
West Bengal	5.5	5.6	5.5

Source: NSSO (EUS) reports of 1999-00, 2004-05 and 2011-12.

4.1 Database

NSSO provides the most extensive and comprehensive employment-unemployment data of India. The data from quinquennial rounds of NSSO have been specifically used as it comprises of a large sample of workers. For this study, the data was taken from the three quinquennial NSSO rounds, pertaining to the years 1999-00 (55th round), 2004-05 (61st round) and 2011-12 (68th round). NSSO rounds do not specifically provides sector-wise absolute number of workers but only sector-wise "work participation rates" (WPR). Therefore, we primarily extract the absolute number of aggregate workforce from the census population (using aggregate WPR provided by NSSO) and then calculate workforce of the construction sector (in absolute number). We calculate as follows:

Aggregate employment (in absolute numbers) = [WPR (aggregate employment) ×
Population (of the specific year)] ----------(1)

Construction sector employment (in absolute numbers) = [WPR (construction sector) ×
Aggregate employment (in absolute numbers)] ----------(2)

The GDP data has been sourced from the Central Statistical Organization (CSO) website. However, the population data has been collected from census reports (which has a wider coverage) and employment data is collected from NSS rounds (which has a comparatively narrower coverage) (Kasturi, 2015), which is a major limitation of the study. The new states of Chattisgarh, Jharkhand and Uttarakhand have been merged with their parent states Madhya Pradesh, Bihar and Uttar Pradesh respectively.

4.2 Steps of Empirical Analysis

Step 1: Measuring 'E' of the construction sector in India and across states, using:

(a) Panel Regression Approach- Fixed-Effect Model (for aggregate level)

(b) CAGR Approach (for state level)

Step 2: Estimating the 'impact of spillover of the workforce from agricultural sector and aggregate GDP of the country on the employment of the construction sector' (estimating structural change in employment), using:

(a) Panel Regression Analysis (Fixed-Effect Model)

Step 3: Measuring 'The clustering in the employment of construction industry', using:

(a) Moran's I

4.2.1 . *Explanation of Step 1*: Measuring 'EE' of the construction sector in India and across states.

There are four methods to measure employment intensity: (1) labour-captial ration (2) labour-value added ratio (3) employment multipliers and (4) employment elasticities. All the four methods have certain advantages and disadvantages. However, the selection of the any of these method should be on the basis of data availability and purpose of the

measurement of employment intensity (Treganna, 2015). Due to data limitations in the construction sector, we chose employment elasticity (EE) measure.

EE is the percentage change in employment with respect to one percent change in GDP. It is one of the most extensively used measures for analyzing the working of labour markets as it captures the sensitivity of the labour market to the changes in macroeconomic conditions (Islam and Nazara, 2000). It is also an indicator of how employment growth varies across time and for the different population subsets in the economy, thus assisting in examining structural changes in employment (Kapsos, 2005).

The two types of EE used are: (1) arc elasticity and (2) point elasticity

Arc elasticity: It is calculated between two different points of time. The CAGR approach is used in calculating arc elasticity in this study. The formula for arc elasticity is expressed as follows:

$$E = \frac{\frac{\Delta L}{L}}{\frac{\Delta Y}{Y}} \text{ ----------(3)}$$

where,

'E' represents employment elasticity,

'L' represents employment,

'Y' represents GDP. The numerator indicates percentage change in employment and denominator shows percentage change in GDP.

Point elasticity: It is calculated for year on year (*i.e*. all the years taken together) using the following point elasticity regression equation:

$$\boldsymbol{log\ L = \alpha + \beta\ log\ Y} \text{ ----------(4)}$$

where,

'L' represents employment,

'Y' represents GDP,

'Log' represents natural logarithm of the related variable,

'α' is the intercept

'β' is the co-efficient of the employment variable which measures the EE.

Primarily in this study, the EE is measured at the aggregate level for the construction sector by taking all the major states together for 1999-00 to 2011-12, using the fixed-effect panel regression model. The following additional three panel regressions were run to sieve out relative contributions of groups of states, in the aggregate employment of the construction sector.

(a) Excluding the major contributing states (that are, Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan),

(b) Excluding the lowest contributing states (that are, Sikkim, Nagaland, Arunachal Pradesh and Mizoram), and

(c) Excluding the seven sister states (that are, Assam, Tripura, Manipur, Sikkim, Nagaland, Arunachal Pradesh and Mizoram).

The following four panel regression equations (equation no. 5-8) represent each of the above mentioned regression models: -

Model 1:

$$\log Y(\text{aggconsemp})_{it} = \alpha_i + \log \beta\, \text{GDPcons}(\text{agg})_{it} + w_{it} \quad \text{----------(5)}$$

(Model 1 measures the EE results of all the states taken together for the construction sector)

Model 2:

$$\log Y\,(\text{exctopstates})_{it} = \alpha_i + \log \beta\, \text{GDPcons}(\text{exctopstates})_{it} + w_{it} \quad \text{----------(6)}$$

(Model 2 measures the EE results after excluding the top four highest contributing states in the total construction employment).

Model 3:

$$\log Y(\text{excbottomstates})_{it} = \alpha_i + \log \beta\, \text{GDPcons}(\text{excbottomstates})_{it} + w_{it} \quad \text{----------(7)}$$

(Model 3 measures the EE results after excluding the bottom four least contributing states in the total construction employment)

Model 4:

$$\log Y(\text{excsevensisters})_{it} = \alpha_i + \log \beta \, \text{GDPcons}(\text{excsevensisters})_{it} + w_{it} \text{ --------(8)}$$

(Model 4 measures the EE results after excluding the seven sister states)

where,

i = 1,….,N;

t = 1,….,T;

$Y(aggconsemploy)_{it}$ = construction sector's employment including all the major states,

$Y(exctopstates)_{it}$ = construction sector's employment excluding the top four states,

$Y(excbottomstates)_{it}$ = construction sector's employment excluding the bottom four states,

$Y(excsevensisters)_{it}$ = construction sector's employment excluding the seven sister states,

$GDPcons\ (agg)_{it}$ = GDP of construction sector including all the major states,

$GDPcons\ (exctopstates)_{it}$ = GDP of construction sector excluding the top four states,

$GDPcons\ (excbottomstates)_{it}$ =GDP of construction sector excluding the bottom four states, $GDPcons(excsevensisters)_{it}$ = GDP of construction sector excluding the seven sister state;

'β' = regression co-efficient which is the employment elasticity;

log = natural logarithm of the related variable;

'α'= fixed-effect intercept; and

w_{it} = error term of the panel regression.

4.2.2 Explanation of Step 2: Estimating the 'impact of spillover of the workforce from agricultural sector and aggregate GDP of the country on the employment of the construction sector' (estimating structural change in employment).

A panel data analysis surveys the influence of diverse independent variables on a single unit across a year as well repeatedly over a period of time (Frees, 2004). The following two fixed effect panel regression models have been used to estimate the impact of the spillover of workforce from agricultural sector and the aggregate GDP growth of the country on the construction employment:

The model 1 is expressed as:

$$Y_{it} = \alpha_i + \beta_1 GDPcon_{it} + \beta_2 EMPagri_{it} + w_{it} \text{ ----------(9)}$$

The model 2 is expressed as:

$$Y_{it} = \alpha_i + \beta_3 GDPagg_{it} + \beta_2 EMPagri_{it} + w_{it} \text{ ----------(10)}$$

where:

i=1,….,N;

t=1,….,T;

'Y_{it}' is for employment in the construction industry,

'$GDPcons_{it}$' is GDP of the construction sector,

'$GDPagg_{it}$' is aggregate GDP of the country,

'$EMPagri_{it}$' is employment in agricultural sector,

'w_{it}' is the error term of the panel regression;

'α' is the intercept of fix-effect model;

'β_1','β_2'and 'β_3' are the co-efficient of the explanatory variables GDP of construction industry, employment in agricultural sector and aggregate GDP of the country, respectively. Fixed effect model is used as it controls for the unobservable confounding variables that fluctuate across units, but are constant over time.

4.2.3 Explanation of Step 3: Measuring the 'clustering in the employment of the construction industry'.

Spatial auto-correlation is a study where the values of variables situated within the definite geographic area experiences a similar pattern. Moran's I a commonly used measure of spatial autocorrelation is used in the study. Moran's I is estimated as follows:

$$I = \left(\frac{n}{s_0}\right) \sum_{J=1}^{N} w_{ij}\ x_i\ x_j \,/\, \sum_{i=1}^{n} x_i^2 \text{ ----------(11)}$$

Where 'n' is number of observations; 'w_{ij}' is the element in the spatial weight matrix 'w' corresponding to the regions (i,j); observations 'x_i' and 'x_j' are the deviations from average values for the I and j regions respectively; 'S_0' acts as the normalising factor equal to the sum of elements of the weight matrix *i.e.* $s_0=\sum_I \sum_j w_{ij}$. For each geographic unit,

a spatial weight matrix is constructed on the basis of a local neighbourhood around each geographical unit. In this study, the following weights are row standardised, with zero on the diagonal and some non-zero off the diagonal. The null hypothesis states of no global spatial autocorrelation, the expected value of I is states as:

$$E(I) = \frac{-1}{N-1} \quad \text{----------(12)}$$

If computed I is greater than the expected value, then the overall distribution variable y is shown as being characterized by positive spatial autocorrelation; whereas computed I is smaller than the expected value, then the overall distribution of y variable is characterised by negative spatial autocorrelation. Moran's I ranges between -1 to 1, positive values of I shows very strong spatial correlation and vice versa (Patnaik and Deshpande, 2013).

5. RESULTS OF EMPERICAL ANALYSIS:

Results of Step 1: Results of measuring the 'EE' of the construction sector in India and across states.

Table 3 indicates the results of the construction sector's EE at the aggregate level (that is, four models discussed earlier in section 4, equation no. (5) - (8). Tregenna (2015) pointed out that mathematically, higher employment intensity and labour productivity have an inverse that is, high employment intensive sector have low levels of labour productivity. The Model 1 results show that the co-efficient of GDP of construction sector is 1.017, which is significant at 1 percent level. This indicates that a 1 percent increase in the construction sector's GDP increases employment in this sector by 1.017. This means that the EE of the employment sector is elastic due to GDP in the construction sector and precisely leads to higher labour employment. It therefore can be concluded that employment in the construction sector in India may be labour-intensive. However, the greater than one EE can also be interpreted as negative productivity (Pattnaik and Nayak, 2013). This negative productivity could be due to massive implementation of MGNREGA scheme and declining agricultural employment post 2004-05. In many areas the MGNREGA scheme generated employment in non-viable investments. The Model 2

results indicate that after excluding the top four states which had highest employment share in the construction employment, the EE declines from 1.017 to 0.66. The Model 3 results indicates that EE has increased from 1.1017 to 1.11 after excluding the bottom four states. It can be said that labour productivity of the low employment generating states must be higher. The Model 4 indicates similar type of results where EE has marginally increased after excluding the seven sister states.

Table 3: Employment Elasticity results of the Construction industry at the aggregate level between 1999-00 to 2011-12.

	Co-efficient (β)	**Employment Elasticity**	**p-value**
Model 1	Aggregate Level	1.017***	(4.633e-11)
Model 2	Excluding top states	0.66***	(2.91e-08)
Model 3	Excluding bottom states	1.11***	(1.026e-10)
Model 4	Excluding seven sister states	1.02***	(2.754e-08)

Note: '***' 1% level of significance**.**

It can thus be concluded that, while top four states are major employment generating states in the construction sector, the bottom four states and the seven sister states are emerging as the states with higher labour productivity in the sector. Moreover, there may be disguised unemployment (due to MGNREGA in the top four states). Further, in the Table 4 below, CAGR approach is used to calculate the state-level employment elasticity to give a peek into EE at the micro-level. Table 4 indicates that the states can be divided into four clubs according to their employment elasticities.

(1) **States with extremely high employment elasticity (greater than 1) in the construction sector:** Manipur, Himachal-Pradesh, Jammu and Kashmir, Orissa, Rajasthan, Tripura and Uttar-Pradesh.

(2) **States with high employment elasticity (between 0.7 and 1) in the construction sector:** Assam, Bihar, Haryana, Madhya-Pradesh, Punjab, Tamil-Nadu and West-Bengal.

(3) **States with moderate employment elasticity (0.3-0.7) in the construction sector:** Andhra Pradesh, Kerala, Maharashtra, Meghalaya, Mizoram and Sikkim.

(4) **States with low or negative employment elasticity regions (below 0.3) in the construction sector:** Arunachal Pradesh, Gujarat, Karnataka, Nagaland and Goa.

Table 4: Employment Elasticity results of the Major regions in the Constructions Sector between 1999-00 to 2011-12.

States	**Employment elasticity**
Andhra Pradesh	0.33
Arunachal Pradesh	0.05
Assam	0.76
Bihar	0.72
Goa	-0.57
Gujarat	0.08
Haryana	0.89
Himachal Pradesh	1.62
Jammu and Kashmir	2.26
Karnataka	0.25
Kerala	0.49
Madhya Pradesh	0.92
Maharashtra	0.50
Manipur	3.07
Meghalaya	0.37
Mizoram	0.57
Nagaland	0.18
Orissa	1.77
Punjab	0.93
Rajasthan	1.20
Sikkim	0.61
Tamil Nadu	0.79
Tripura	1.43
Uttar Pradesh	1.01
West Bengal	1.00

Note: Authors own calculations based on data of NSSO rounds and CSO.

Section 3 indicates that 50 percent of the share of the employment in the construction sector was from Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan. The above elasticity results authenticate the observation. The only state with negative EE in the construction sector is Goa.

Results of Step 2: Results of estimating the 'impact of agricultural sector's employment and aggregate GDP of the county on the employment of the construction sector' (estimating for structural change in employment).

We construct the following two panel regression models (equations (9) and (10) discussed earlier in section 4) to estimate the impact of the agricultural employment and aggregate GDP of the country on the construction sector's employment. Table 5 and 6 indicates the panel regression results for the above Model 1 and 2 respectively.

Table 5: Model 1

	Estimated co-efficient	**p-value**
β_1 (GDP of Construction Sector)	1.02***	5.591e-11
β_2 (Agricultural Employment)	-0.0028***	0.013

Note: '*' shows 10% level of significance, '**' 5% level of significance and '***' 1% level of significance.

Table.6: Model 2

	Estimated co-efficient	**p-value**
β_3 (Aggregate GDP of country)	0.088***	1.76e-08
β_2 (Agricultural Employment)	-0.00179***	0.019

Note: '*' shows 10% level of significance, '**' 5% level of significance and '***' 1% level of significance.

The panel regression results in the Table 5 and 6 clearly highlight the structural change in the employment potential of the agriculture and the construction sector. The significant negative sign of the co-efficient of agriculture employment (β_2) highlights the migration of workers from agricultural sector to construction sector. Also, significant

positive sign of the co-efficient of the aggregate GDP of the country (β_3) shows positive impact of the overall GDP growth of the country on employment generation in the construction sector.

Results of Step 3: Results for measuring the 'clustering in the employment of construction industry'.

Employment generation in the construction sector may be similar in the adjoining states. This is tested by using the Moran's I measure (equations 11-12, earlier discussed in section 4).

Table.7: Moran's I results for testing spread effects:

Years	Moran's I	p-value
1999-00	0.3903951***	0.0033
2004-05	0.3129612***	0.0099
2011-12	0.3509542***	0.0044

Source: Authors' own calculations, NSSO reports of 1999-00, 2004-05 and 2011-12.

The positive significant Moran's I values implies that states with similar employment generating capacities are clustered. This can also be interpreted by the point of view of migration of labour in the construction sector from low employment generating states to the high employment generating states.

6. CONCLUSIONS

The results of empirical analysis show that our three hypotheses (which are mentioned in Section 4.) were correct. The results of empirical analysis are as follows: -

First, EE of the construction sector for all the 25 major states is 1.017 for 1999-00 to 2011-12. An EE (greater than one) implies that this sector must be highly labour-intensive and that negative labour productivity must be existing (Pattnaik and Nayak, 2013). After excluding the top four states which have highest percentage share in construction

employment (*i.e*. Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan), the EE declines to 0.66. Conversely, EE increased after excluding bottom four states having lowest percent share in construction employment (*i.e*. Sikkim, Nagaland, Arunachal Pradesh and Mizoram), which implies that labour productivity must be higher in these states. Similarly, the EE slightly increased after excluding the seven sister states.

Second, the panel regression results indicated that there is a small but significant structural shift in the pattern of employment (from agriculture sector to the construction sector). Also, the construction employment growth is positively related to the aggregate GDP growth of the economy.

Third, the positive significant Moran's I values implies that there exist states with similar employment generating capacities in the construction sector. This indicates migration of labour from the low construction employment generating states to the high construction employment generating states.

It can thus be concluded that the construction sector is emerging as a major employment generator both at aggregate and regional level. It is also absorbing the spillover of workers from the agricultural sector due to which there is a possibility of disguised unemployment (greater than one EE) in the construction sector. This disguised unemployment might be prevailing in the four high employment generating states in the construction sector (*i.e*. Uttar Pradesh, Bihar, Madhya Pradesh and Rajasthan). Also, significant clustering of the employment generation is evident from the empirical testing A detailed study of the region-wise impact of MGNREGA scheme as well as region-wise study of the structural shift of workforce from agricultural to construction sector post 2004-05 would further supplement the findings of this study.

REFRENCES

Chowdhury, S. (2011). Employment in India: What does the latest data show? *Economic and Political Weekly*, 46(32), 23-26.

Frees, E. (2004). *Longitudinal and Panel Data: Analysis and Applications for the Social Sciences*. Cambridge University Press, Cambridge, 1-3.

Islam,I and Nazara, S. (2000). Estimating Employment Elasticity for Indonesian Economy. Technical note on Indonesian Labour Market, ILO-Jakarta, Indonesia.

Kapsos, S. (2005). The Employment Intensity of Growth: Trends and Macroeconomic Determinants. *Employment Strategy Papers*. 2005/12, ILO.

Kasturi, K. (2015). Comparing Census and NSS data on Employment and Unemployment. *Economic and Political Weekly*, 50(22), 16-19.

Lewis, A. (1954). *Economic Development with Unlimited Supplies of Labour.* Manchester School, 22 (2), 139-91.

Mehrotra, S.; Parida, J.; Sinha, S. and Gandhi, A. (2014). Explaining Employment Trends in Indian Economy: 1993-95 to 2011-12. *Economic and Political Weekly*, 49(32), 49-57.

Misra, S. and Suresh, K. (2014). Estimating Employment Elasticity of Growth for the Indian Economy. *RBI Working Paper Series WPS (DEPR): 06/2014*, Department of Economic and Policy Research.

National Sample Survey Organisation (1999-00), Employment and Unemployment Situation in India, 1999-00, NSS 55th Round, Report No.458.NSSO, New Delhi.

----------(2004-05), Employment and Unemployment Situation in India, 2004-05, NSS 61st Round, Report No.515.NSSO, New Delhi.

----------(2011-12), Employment and Unemployment Situation in India, 2011-12, NSS 68th Round, Report No.554.NSSO, New Delhi.

Osei, V. (2013). The Construction Industry and its Linkages to the Ghanaian Economy-Policies to improve the sector's performance. *International Journal of Development and Economic Sustainability*, 1(1), 56-72.

Papola, T.S. (2013). Economic Growth and Employment Linkages: The Indian Experience. *Institute for Studies in Industrial Development Working Paper No.2013/01*, New Delhi.

Patnaik, A. and Deshpande, V. (2013). Income Convergence in Maharashtra: Myth or Reality? *ArthVijnana*, 55(4), 421-36.

Pattanaik, F and Nayak, N. C. (2013). Employment Intensity of Secondary Sector in India: Trends, Patterns and Determinants. *Journal of Regional Development and Planning*, 2(2), 157-73.

Ranjan, S. (2009). Growth of Rural Non-Farm Employment in Uttar Pradesh: Reflections from Recent Data", *Economic and Political Weekly*, 44(35), 63-70.

Ramachandra, T, Rotimi, J. and Rameezdeen, R. (2013). Direction of the Causal Relationship between Construction and the National Economy of Sri Lanka. *Journal of Construction in Developing Countries*, 18(2), pp. 49-63.

Reserve Bank of India's Handbook of Statistics on the Indian Economy (2013-14).

Roy, S (2008). Structural Change in Employment in India since 1980s: How Lewisian is it?" *Institute for Studies in Industrial Development Working paper 2008/05*, New Delhi.

Soundarajan, V. (2013). Construction Workers: Amending the Law for More Safety. *Economic and Political Weekly*, 48(23), 21-25.

Syrquin, M. (2007). Kuznets and Pasinetti on the Study of Structural Transformation: Never the twain shall meet? *International Center for Economic Research Working paper no.46/2007*, Italy.

Tregenna, Fiona (2015). Sectoral dimensions of employment targeting. *Employment policy department, Employment working paper No. 166*, ILO.

Thakurta, G. (1970). Employment in the Construction Industry- Does it have to be so Unsrable? *Economic and Political Weekly*, 5 (12), 521-27.

Thomas, J. (2014). The Demographic challenge and economic growth in India. *Economic and Political Weekly*, 49(6), 15-17.

Thomas, J. (2012). India's Labour Market during the 2000s: Surveying the Changes. *Economic and Political Weekly*, 48(51), 39-51.

Tucker, R.L. (1986). Management of Construction Productivity. *Journal of Management in Engineering*, 2(3), 148-56.

Published by:

ISF INSTITUTE OF RESEARCH AND EDUCATION
410, Gemstar Commercial Complex, Ramchandra Lane Ext, Kachpada,
Off Link Road, Malad (W), Mumbai 400 064,
India