

ROLE OF MINING LED INDUSTRIALIZATION IN STATE'S OUTPUT AND EMPLOYMENT IN ODISHA

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ABSTRACT

Keeping high economic growth as its prime objective, India has adopted different strategies where exploitation of mineral resources has been considered as a source of economic growth in many states including in Odisha. The economic benefits of mining not only confines to mining industries alone but it also benefits to other linking industries in infrastructure, manufacturing and construction which contribute significantly to state exchequer and hence regarded as prime driver of economic growth. However, this affluence from mining comes with its negative externalities on agriculture and agricultural productivity and affects human development adversely. This paper examines how state's output and employment are affected with vast mineral exploitation activities. Mining output is studied in terms of total value of mining production, its share in net state domestic product, revenue generation of the state from mining and its export and from minor minerals whereas employment is examined from the total workers directly employed in different major mines of the state. Further, role of mining is studied in terms of share in total NSDP of the state from the time series data. Stationarity of variables in time series data are tested using ADF test in E-Views. The long-run relationship between mining and NSDP is shown through VAR model and the elasticity of mining employment due to mining output is tested by Double-log model in Excel spread sheet. The paper is divided into four sections where first section covers the introduction, second section describes the methodologies used, third section explains its role in output and employment of the state and the last section concludes the paper.

Keywords: Mining, Output, NSDP, Mining Revenue and Mining employment.

JEL Classification -L72, O14, J21

Introduction

Keeping high economic growth as its prime objective, India has adopted different strategies where industrialisation is one of them, which plays a major role in the economic development and an indispensable pillar in the process of structural transformation of the underdeveloped countries (Kuznet, 1973). India as well as Odisha is rich in mineral resources like iron, coal, bauxite, chromite, mica, limestone, uranium, manganese and kyanite etc, which opened a vast scope for mining led industrialization in the country. Mining led industrialisation is one where mineral resources play key role for industrialisation and thereby boost the economic growth as well as employment and hence can reduce the poverty. According to Bebbington, Hinojosa, Bebbington, Burneo and Warnaars (2008), the relationship between mining and development is contentious and ambiguous. Gonzalez (2002) has pointed out that mining is necessary for meeting global demand in development as it has played a leading role in creating social structure and infrastructure as well as generator of wealth. Venkatesan, (2007) and Kumar (2011)

have also agreed with the view that mining is booster of output and employment of a state.

Extractions of minerals also plays a pivotal role in the development of a minerals rich state like Odisha. Mining has its own economic benefit in mining industries as well as benefits to other linking industries in infrastructure, manufacturing and construction which contribute significantly to state exchequer and hence regarded as prime driver of economic growth but at the same time its negative externalities fall on agriculture and agricultural productivity affecting human development adversely. The mineral revenue of the state has touched the pick to Rs 5797.79 crore in 2015-16 and stood at Rs 4925.66 crore in 2017-18 which was Rs 378.36 crore in 2001-02 (Odisha Economic Survey, 2017-18).

The level of employment and output are two major indicators of development of a state where the large mineral sector in Odisha adds value only 10.21 percent of the total value of minerals produced in India in 2004-05 which was 5.42 per cent in 1999-2000. It has increased to 11.42, 10.6, 11.89, 20.52, 20.32, 24.05, 12.5, 14.16 and 13.88 per cent in all India level during 2008-09, 2009-10, 2010-11, 2011-12, 2012-13, 2013-14, 2014-15, 2015-16 and

2016-17 respectively with the top at 24.05 percent in 2013-14. In 2016-17, the percent of value of Odisha in India has led the position among the major mineral producing states in India. A dismal figure was shown in the level of employment to skilled and unskilled persons in mining sector with negative growth of employment in some years. However, the employment figure of mining was reached to 49,086 during 2015-16 which was 47,370 in 2014-15. However, though the above facts and figures shows mining has an impacts on state' output and employment and the above literature also stated contentious views on impacts of mining, yet there is dearth of systematic research study in this regards. Therefore, present study aims to discuss how state's output and employment are affected with rich mineral deposits and such vast mining activities. Precisely the paper examine the growth performance of industrial output and employment of the mining led industries over a period of time. Based on the objective, it is hypothesized that - Mining led industrialization has statistically significant effectson the output and employment in Odisha.

Data Sources and Methodology

The study is based on secondary data. The variables that are explored in this study are output, employment and revenue, which are mostly time series in nature and collected from CSO, NSSO, Directorate of Economics and Statistics, Directorate of Mines, OMC and other published reports of the central and state government as well as different websites. Given the objective of the paper, functional methods like double log method was applied to calculate elasticity of mining employment due to mining output. For double-log model, the following equation has been specified:

$$\ln Y(t) = \alpha + \beta \cdot \ln X(t) + u_t \dots \dots \dots (1)$$

Where, 'X' variable is represented as mining output and 'Y' as mining employment and ln implies natural log i.e. log to the base e. β refers to elasticity co-efficient.

$$\beta = \frac{\partial \ln Y}{\partial \ln X} = \frac{\Delta \ln Y}{\Delta \ln X} = \frac{\Delta Y/Y}{\Delta X/X} = \frac{\Delta Y}{\Delta X} \times \frac{X}{Y} = E \dots (2)$$

Since $\Delta \ln Y / \Delta \ln X$ is an approximation of $\partial \ln Y / \partial \ln X$ and a change in the log of a number is a relative change i.e.

$$\Delta \ln Y = \frac{\Delta y}{Y} \text{ and } \Delta \ln X = \frac{\Delta x}{X}$$

The statistical technique like t-test was applied to examine the statistical validity of relationship among different variables. For the test of stationarity of variables, Augmented Dickey Fuller (ADF) test was used to check the unit root for the two variables and Vector Auto Regression (VAR) under Unrestricted VAR was used to study the impact of variables on them. In the VAR model, we have taken mining and quarrying as mining and total NSDP as NSDP for easy run of model in E-views software. Second differential of Mining and first differential of NSDP are taken as endogenous variables or dependent variables and differential lag 1 and 2 of mining and NSDP are taken as independent variables where Mining (M) affects NSDP (N) and vice-versa. To explain how a VAR is estimated with constant k lag values (2), the following equations can be estimated:

$$M_t = \alpha + \sum_{j=1}^k \beta_j M_{t-j} + \sum_{j=1}^k \gamma_j N_{t-j} + u_{1t} \dots (1)$$

$$N_t = \alpha^1 + \sum_{j=1}^k \theta_j M_{t-j} + \sum_{j=1}^k \gamma_j^1 N_{t-j} + u_{2t} \dots (2)$$

The data analysis was made by using software E-Views.

Role of Mining in State Output & Employment

Role of Mining in State Output

The national economy has exhibited a modest growth rate with an average of 6.84 percent during 2012-13 to 2016-17 whereas state economy has shown positive growth with an average of 6.66 percent. The state economy has surpassed the all India growth rate of 7.1 percent with 7.94 percent GSDP growth rate in 2016-17. This impressive anticipated growth rate can be achieved by the state due to the structural shift with service sector and industry sector overhauling agricultural sector which is the major driver of economy. The share of broad agricultural sector has sharply declined to 19.91 percent of GSDP in 2016-17 which was around 55 percent in 1950-51. On the other hand, the combined share of industries and service sector has reversed from 45 percent to 80.09 percent during the same period. With 20 per cent share of GSDP, agricultural sector is prime driver of economy because of its employability, inclusiveness and sustainability. But the GSDP of mineral sector being an investment hub for mines has shown sturdy growth rate of 17.15 per cent in 2015-16. Therefore, the state economy is now witnessing

structural transformation from an agricultural based economy to service and industries driven economy (Odisha Economic Survey, 2016-17). Table – 1 reflects the composition of NSDP by broad categories at 2004-05 constant prices. Figure – 1 is the reflection of table – 1 where the growth trends of all the sectors are presented. Highest priority on agriculture during first five year plan shows positive trend preliminarily but with rapid industrialisation objective in second five year plan the primary sector has sharply declined during that period. During third plan period with balanced development aim, the agriculture sector somehow shows positive growth but gradually decreased with the positive growth of secondary, tertiary and service sector. Secondary sector has reflected upward trend slowly with the implementation

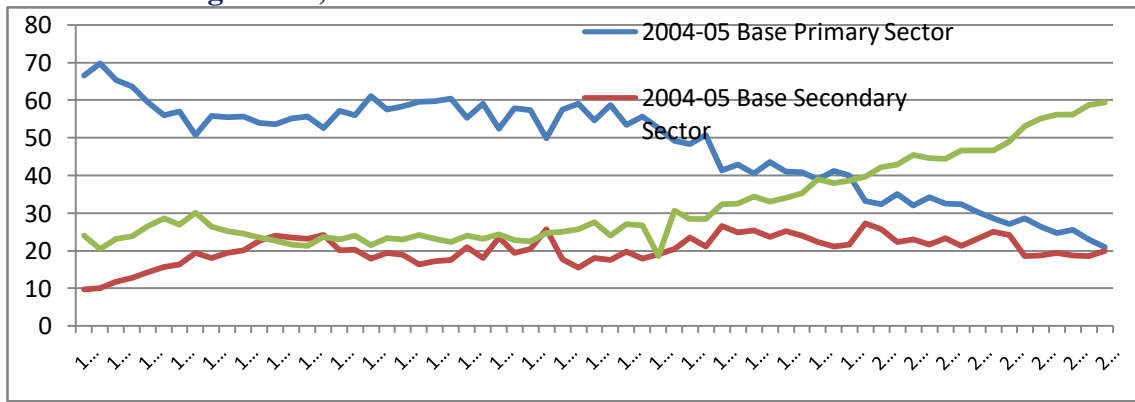
of five year plan in the country. During 1980-81, the industrial sector has experienced poor performance and hence downward trend in figure – 1. Further in 1996-97, there is secondary sector has experienced declined trend due to tightening of money-credit policies in 1995-96 which created substantial domestic and international environments for sharp deceleration in exports and hence slackening of industry. Due to influence of global crisis in 2008-09 there was decline in investment and savings which resulted secondary sector further declining in 2009-10 but the sharp recovery was shown in next two years. Therefore, the trend is positive but slow for secondary sector. Tertiary and service sector depicts steady growth up to 1985-86 but after 1987-88 there is sharp rise of the sector.

Table - 1, Composition of NSDP (Percent) of Odisha from 1950-51 to 2014-15 (at (2004-05) Constant Prices)

Year	Primary	Secondary	Tertiary & service	Year	Primary	Secondary	Tertiary & service
1950-51	66.39	9.65	23.96	1983-84	58.62	17.44	23.94
1951-52	69.67	9.94	20.39	1984-85	53.32	19.71	26.97
1952-53	65.27	11.67	23.05	1985-86	55.6	17.76	26.65
1953-54	63.52	12.71	23.77	1986-87	52.52	18.95	18.53
1954-55	59.23	14.29	26.48	1987-88	49.03	20.3	30.67
1955-56	55.81	15.57	28.63	1988-89	48.23	23.37	28.39
1956-57	56.96	16.21	26.83	1989-90	50.59	20.97	28.44
1957-58	50.58	19.25	30.17	1990-91	41.25	26.37	32.38
1958-59	55.76	17.92	26.32	1991-92	42.83	24.76	32.41
1959-60	55.44	19.35	25.21	1992-93	40.4	25.27	34.33
1960-61	55.47	20.02	24.51	1993-94	43.4	23.61	32.99
1961-62	53.92	22.54	23.53	1994-95	40.89	25.05	34.06
1962-63	53.46	23.87	22.66	1995-96	40.83	23.93	35.24
1963-64	55.05	23.35	21.6	1996-97	38.83	22.18	38.98
1964-65	55.6	23.14	21.26	1997-98	41.17	21	37.84
1965-66	52.45	24	23.56	1998-99	39.82	21.57	38.61
1966-67	57.05	20.06	22.88	1999-00	33.17	27.13	39.7
1967-68	55.83	20.24	23.94	2000-01	32.27	25.52	42.22
1968-69	60.93	17.74	21.34	2001-02	34.96	22.27	42.77
1969-70	57.49	19.3	23.21	2002-03	31.82	22.83	45.35
1970-71	58.24	18.77	22.99	2003-04	34.08	21.45	44.48
1971-72	59.5	16.32	24.18	2004-05	32.37	23.31	44.32
1972-73	59.69	17.2	23.11	2005-06	32.16	21.27	46.58
1973-74	60.3	17.41	22.28	2006-07	30.28	23.12	46.6
1974-75	55.18	20.79	24.03	2007-08	28.49	24.89	46.61
1975-76	58.96	17.96	23.09	2008-09	27.03	24.05	48.91
1976-77	52.37	23.38	24.26	2009-10	28.55	18.45	52.99
1977-78	57.83	19.33	22.84	2010-11	26.35	18.61	55.03
1978-79	57.22	20.27	22.51	2011-12	24.58	19.32	56.1
1979-80	49.78	25.6	24.62	2012-13	25.37	18.58	56.06
1980-81	57.43	17.57	25	2013-14	22.84	18.53	58.63
1981-82	58.89	15.47	25.63	2014-15	20.84	19.83	59.34
1982-83	54.53	17.93	27.55				

Source: Economic Survey, 2014-15

Figure – 1, Trends of Different Sectors in NSDP of Odisha



The share of the mining sector to state GSDP has increased to 33.44% in 2014-15 from 33.08% in 2013-14 (Odisha Economic Survey, 2015-16). Table – 2 depicts the percentage share of mining and quarrying in total NSDP of the state. Share of mining and quarrying has been gradually increased up to 2009-10 and reached the pick percentage of 9.72 in the same

year and after that it has declined and its share became 8.05 percent of total NSDP in 2014-15. Figure – 2 is the reflection of percentage share of mining in total Net State Domestic Product where the share was less than one per centum during the beginning of the plan period. In 2014-15, this share has increased to 8.05 per cent with a growing trend.

Figure – 2, Share of Mining in Total NSDP of the State

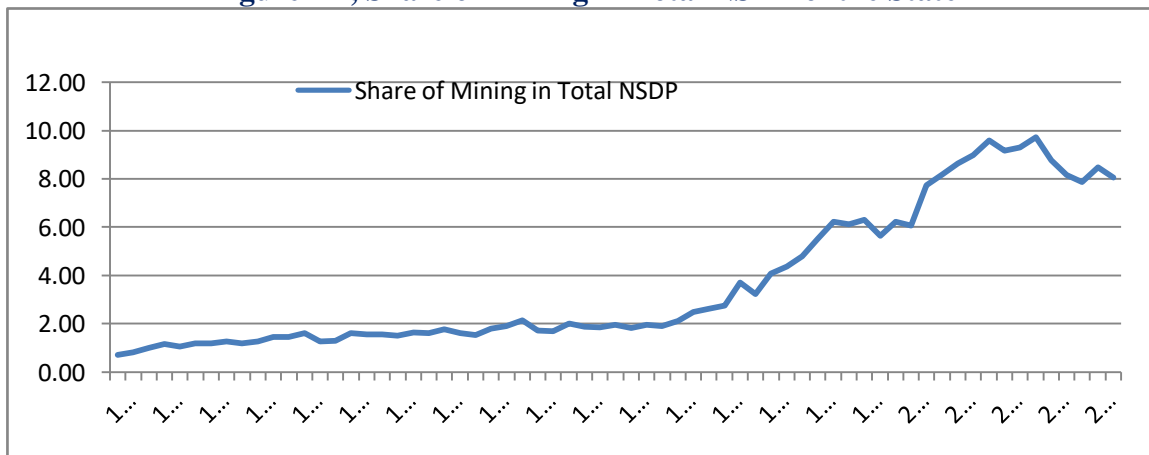


Figure – 2 can be studied in two phases. During the first phase, there is almost slow and steady positive growth of mining share in total NSDP since 1986-87. But the share has sharply increased during the second phase with the impact of trade liberalization, privatization and globalization of New Economic Policy 1991. A kink was visible in the second phase during 1997-98 where mining share to total NSDP falls down due to tight money & credit policies in

1995-96. After 1999-2000, the share has further raised its momentum and reached the pick in 2009-10 with 9.72 per cent mining share to total NSDP. The effect of Global crisis has led down the mining share to 8.15 per cent in 2011-12 and 7.86 per cent in 2012-13. In 2013-14, there is the recovery period where the share of mining is somehow improved and shows positive growth.

Table - 2, Share of Mining & Quarrying in Total NSDP of Odisha during 1950-51 to 2014-15 (figures are in Per cent based on 2004-05 base year)

	Mining & Quarrying (In Rs Lakh)	Total NSDP (In Rs Lakh)	Share of Mining in Total NSDP	Year	Mining & Quarrying (In Rs Lakh)	Total NSDP (In Rs Lakh)	Share of Mining in Total NSDP
1950-51	6507	918011	0.71	1983-84	52913	2923841	1.81
1951-52	8417	1018265	0.83	1984-85	53594	2756019	1.94
1952-53	10543	1042238	1.01	1985-86	58876	3108950	1.89
1953-54	12604	1099323	1.15	1986-87	66441	3145510	2.11
1954-55	11536	1101762	1.05	1987-88	75263	3039966	2.48
1955-56	13511	1150948	1.17	1988-89	94979	3611833	2.63
1956-57	13845	1167163	1.19	1989-90	107269	3899431	2.75
1957-58	13155	1029180	1.28	1990-91	121831	3282841	3.71
1958-59	13969	1175848	1.19	1991-92	116479	3625339	3.21
1959-60	15609	1242442	1.26	1992-93	144643	3539943	4.09
1960-61	18890	1307121	1.45	1993-94	166426	3816406	4.36
1961-62	20363	1400285	1.45	1994-95	191499	4009160	4.78
1962-63	25014	1553608	1.61	1995-96	229312	4164616	5.51
1963-64	20907	1668622	1.25	1996-97	243634	3913538	6.23
1964-65	22937	1791686	1.28	1997-98	273232	4464813	6.12
1965-66	26277	1632540	1.61	1998-99	289483	4592379	6.3
1966-67	26854	1720356	1.56	1999-00	302271	5372881	5.63
1967-68	26994	1722661	1.57	2000-01	324897	5223400	6.22
1968-69	29249	1929814	1.52	2001-02	329758	5448028	6.05
1969-70	31645	1920915	1.65	2002-03	420585	5432171	7.74
1970-71	32498	2004548	1.62	2003-04	497396	6078415	8.18
1971-72	32157	1828190	1.76	2004-05	586186	6798702	8.62
1972-73	32578	2012623	1.62	2005-06	637080	7100497	8.97
1973-74	32633	2149287	1.52	2006-07	764315	7984484	9.57
1974-75	33657	1878328	1.79	2007-08	794420	8669191	9.16
1975-76	41486	2188443	1.9	2008-09	865484	9320665	9.29
1976-77	44276	2080461	2.13	2009-10	912994	9395723	9.72
1977-78	41427	2420995	1.71	2010-11	874785	9987972	8.76
1978-79	43704	2587769	1.69	2011-12	844773	10362763	8.15
1979-80	44697	2238573	2	2012-13	845723	10766375	7.86
1980-81	47686	2554198	1.87	2013-14	916947	10808072	8.48
1981-82	47631	2569037	1.85	2014-15	938068	11656558	8.05
1982-83	47153	2429381	1.94				

The long run relation between share of mining and quarrying with total NSDP can be studied with the time series data covers period from 1950-51 to 2014-15. So the first step is to test stationarity of the variables because non stationary series will produce spurious regression estimate where the resulting outcomes have no practical relevance (Gujarati, 2003). Augmented Dickey Fuller (ADF) test is used to check the unit root for the two variables in E-Views and the outcomes are presented in table-3.

ADF test depicts that both the variables have unit roots and are non-stationary at levels but mining shows stationary at second difference whereas NSDP shows stationary at first

difference where probability value is less than 5 per cent. Therefore, both the variables are integrated in the order I (2). But as per properties of integrated series, both the variables are non-stationary at levels and stationary at different orders. If both the variables are stationary at same order then Granger Causality test under Vector Error Correction Method can be used to examine the impact of each variable on them. Due to stationarity of different orders, here, Vector Auto Regression (VAR) under Unrestricted VAR is used to study the impact of variables on them. The VAR lag order selection has got prime importance before the run of the VAR model and it is presented in table 4. From the

table, it is examined that lag 2 is satisfied by both Final Prediction Error (FPE) criterion and Hannan-Quinn information (HQ) criterion for

which lag 2 is selected for running the VAR model in the present chapter

Table – 3, ADF Unit Root Test of MINING and QUARRYING and Total NSDP

Null Hypothesis: MINING has a unit root	Exogenous: Constant, Linear Trend	Lag Length: 8 (Automatic - based on SIC, maxlag=10)	Null Hypothesis: D(MINING) has a unit root Exogenous: Constant, Linear Trend	Lag Length: 9 (Automatic - based on SIC, maxlag =10)	Null Hypothesis: D(MINING,2) has a unit root Exogenous: Constant, Linear Trend	Lag Length: 8 (Automatic - based on SIC, maxlag =10)
	t - Statistic (level)	Prob.	t - Statistic (1st difference)	Prob.	t - Statistic (2nd difference)	Prob.
Augmented Dickey-Fuller test statistic	4.737062	1.0000	-0.868005	0.9521	-7.241717	0.0000
Null Hypothesis: NSDP has a unit root	Exogenous: Constant, Linear Trend	Lag Length: 1 (Automatic - based on SIC, maxlag=10)	Null Hypothesis: D(NSDP) has a unit root Exogenous: Constant, Linear Trend	Lag Length: 0 (Automatic - based on SIC, maxlag =10)	NA	NA
	t - Statistic (level)	Prob.	t - Statistic (1st difference)	Prob.	NA	NA
Augmented Dickey-Fuller test statistic	1.920570	1.0000	-10.11227	0.0000	NA	NA

Source: Economic Survey (2014-15)

Table – 4, VAR Lag Order Selection Criterion

VAR Lag Order Selection Criteria						
Endogenous variables: DMI_QU2 NSDP_O						
Exogenous variables: C						
Date: 08/17/19 Time: 12:20						
Sample: 1 65						
Included observations: 58						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1621.397	NA	7.02e+21	55.97919	56.05024	56.00687
1	-1477.909	272.1324	5.72e+19	51.16926	51.38241*	51.25229
2	-1471.704	11.33930	5.31e+19*	51.09325	51.44849	51.23162*
3	-1468.769	5.162294	5.51e+19	51.12995	51.62730	51.32368
4	-1465.877	4.885879	5.75e+19	51.16817	51.80762	51.41725
5	-1459.683	10.03842*	5.35e+19	51.09252*	51.87407	51.39695
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Economic Survey (2014-15)

In the VAR model, we take mining and quarrying as mining and total NSDP as NSDP for easy run of model in E-views software. Second differential of Mining and first

differential of NSDP are taken as endogenous variables or dependent variables and differential lag 1 and 2 of mining and NSDP are taken as independent variables where Mining

(M) affects NSDP (N) and vice-versa. To explain how a VAR is estimated with constant k lag values (2), the following equations can be estimated:

$$M_t = \alpha + \sum_{j=1}^k \beta_j M_{t-j} + \sum_{j=1}^k \gamma_j N_{t-j} + u_{1t} \dots(1)$$

$$N_t = \alpha^1 + \sum_{j=1}^k \theta_j M_{t-j} + \sum_{j=1}^k \gamma_j N_{t-j} + u_{2t} \dots(2)$$

The VAR estimates are represented in Table – 5.

In table – 5, the t-statistics shows negative significant result in lag 1 of mining but it is negative insignificant in lag 2 which implies mining is dependent on previous years’ mining

but not dependent on previous two years’ mining. Similarly the negative insignificant result of t-statistics for both lags of NSDP indicates that mining has no dependency on previous years’ NSDP. In case of NSDP, t-statistics gives significant result in lag 2 whereas insignificant in lag 1. This implies NSDP is not dependent on previous years’ NSDP or mining but it depends on previous two years’ NSDP as well as mining i.e. in the long run NSDP is dependent on mining. Neither the R-square nor the Adjusted R-square is high.

Table – 5, The VAR Estimates - Standard errors in () & t-statistics in []

	DMINING2	DNSDP
DMINING2(-1)	-0.508668	1.419230
	(0.13308)	(1.52406)
	[-3.82225]	[0.93122]
DMINING2(-2)	-0.078512	3.228436
	(0.14177)	(1.62361)
	[-0.55378]	[1.98843]
DNSDP(-1)	-0.004088	0.014263
	(0.01116)	(0.12782)
	[-0.36624]	[0.11158]
DNSDP(-2)	-0.013033	0.369457
	(0.01106)	(0.12665)
	[-1.17850]	[2.91726]
C	3624.528	110188.1
	(4103.43)	(46993.0)
	[0.88329]	[2.34478]
R-Squared	0.234166	0.175872
Adj. R-Squared	0.179463	0.117006
Akaike AIC	23.18019	28.05654
Schwarz SC	23.35322	28.22957

Source: Economic Survey (2014-15).

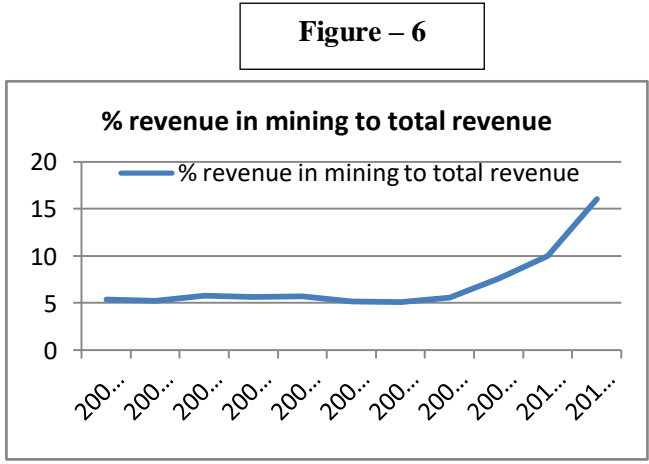
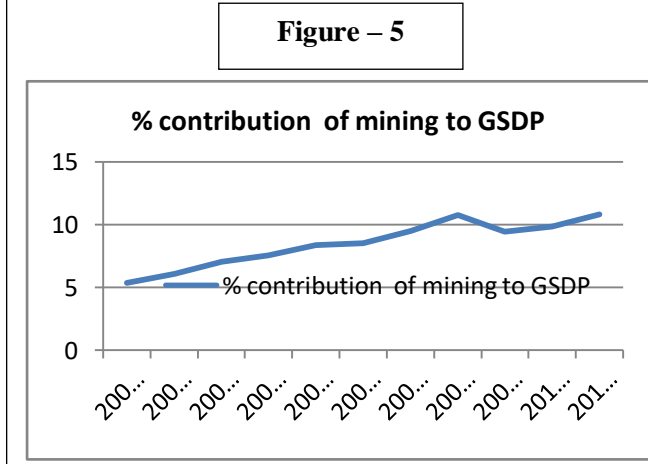
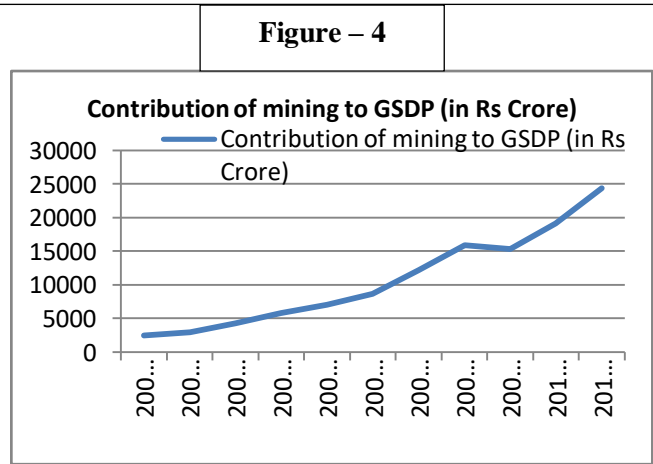
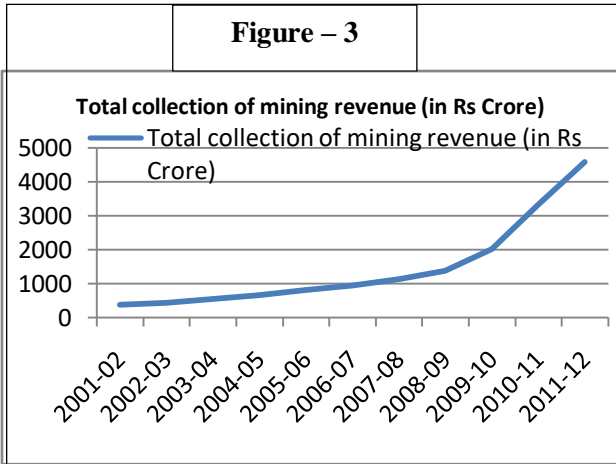
Table – 6, Percentage Growth of Contribution and Revenue of Mining

Year	Total Collection of Mining Revenue (in Rs Crore)	Contribution of Mining to GSDP (in Rs Crore)	% Contribution of Mining to GSDP	% Revenue in Mining to total Revenue
2001-02	378.36	2503.44	5.35	5.37
2002-03	443.54	3012.73	6.06	5.26
2003-04	550.76	4300.5	7.05	5.83
2004-05	670.51	5861.86	7.54	5.66
2005-06	805.00	7126.78	8.37	5.72
2006-07	936.56	8662.77	8.51	5.19
2007-08	1126.09	12247.54	9.47	5.13
2008-09	1380.59	15937.37	10.73	5.61
2009-10	2020.72	15395.02	9.4	7.65
2010-11	3330.47	19154.18	9.82	10.01
2011-12	4586.65	24431.35	10.8	16.08

Source: Panda, 2014

Table – 6 depicts that the total collection of mining revenue and its share to GSDP and its percentage share in total revenue of the state. The figure of mining revenue which was Rs 17.90 lakh in 1955-56, Rs 172.20 lakh in 1965-66, Rs 451.13 lakh in 1975-76, Rs 975.37 lakh in 1985-86 that has been increased to Rs

241.26 crore in 1995-95, Rs 378.36 crore in 2001-02, Rs 4586.65 crore in 2011-12, Rs 5679.35 crore in 2012-13, Rs 5519.58 crore in 2013-14, Rs 5310.09 crore in 2014-15, Rs 5797.79 crore in 2015-16, Rs 4925.66 crore in 2016-17 and Rs 6176.91 crore in 2017-18. The positive growth trend is shown in figure -3.



The contribution of mining to State Gross Domestic Product has also been raised from Rs 2503.44 crore in 2001-02 to Rs 24431.35 crore in 2011-12 with increasing trend which was shown in figure – 4. High growth rate is also seen in figure – 5 which describes raising trend of the percentage contribution of mining to

Gross State Domestic Product. Figure – 6 has depicted that the percentage of revenue to total revenue of the state has stagnant at a rate of 5 per cent from 2001-02 to 2008-09 but after that it has raised and touched the peak at 16.08 per cent in 2011-12.

Table – 7, Total Revenue Collected from Minor Minerals in Odisha

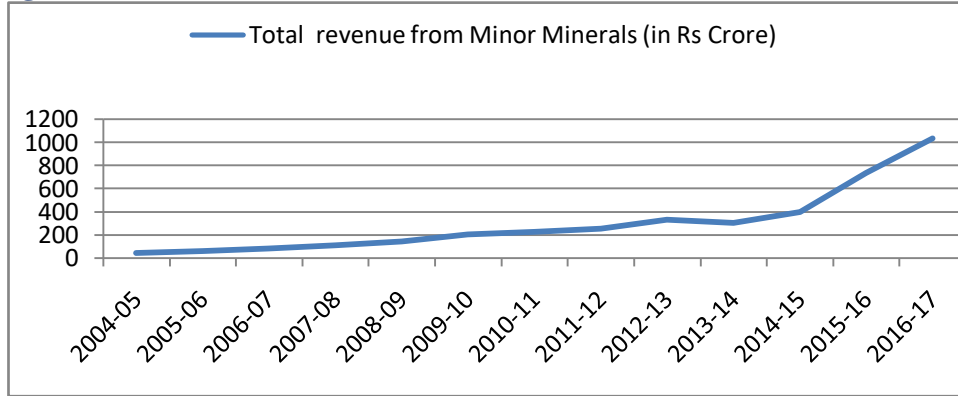
Year	Total revenue from Minor Minerals (in Rs Crore)	Year	Total revenue from Minor Minerals (in Rs Crore)
2004-05	44.55	2011-12	255.69
2005-06	58.59	2012-13	329.79
2006-07	85.31	2013-14	304.35
2007-08	111.86	2014-15	400.58
2008-09	142.59	2015-16	735.30
2009-10	202.65	2016-17	1034.77
2010-11	226.56		

Source: Economic Survey (2017-18)

In case of minor minerals, the similar condition is observed. The figure for revenue collection from minor minerals which was double digit (Rs 44.55 crore) in 2004-05, that has increased to three digit (Rs 304.35 crore) figure in 2013-14. The rising trend is visible in figure – 7 where revenue from the minor minerals of the state has increased steadily up to 2006-07 but

since 2007-08, it has risen significantly with an increasing trend showing slightly fluctuations during the period of Global Economic Recession and touches the pick at Rs 1034.77 in 2017-18. The Table has reflected the increasing contribution of minor mineral revenue in the State revenue indicating the positive symbol towards the economic growth of the State.

Figure – 7, Total Revenue from Minor Minerals in Odisha (in Rs. Crore)



Role of Mining on State Employment:

Employment generation capacity is an important economic indicator for development of a state. Table – 8 shows fluctuating figures in the number of employment provided by the mining sector in the state over the years (2004-05 to 2016-17). There is negative growth of employment in 2006-07, 2008-09, 2009-10, 2011-12 and 2013-14 where in 2013-14, the negative growth is maximum (-20.28 percent) but a sudden rise to 23.17 per cent in 2012-13. Figure – 8 shows the number of employment in the sector where the total number of employment in mining was increased from

49837 in 2004-05 to 49086 in 2015-16 and stood at 52405 in 2016-17 where the year 2012-13 has shown the highest number of employment (59417) in this sector. Figure – 9 depicts the zigzag picture of annual growth of employment in mining sector which reflects that employment in this sector is not growing. During the period of Global Economic Recession, the employment in this sector is more harassing that the reduction of 12047 number of employment from total employment in the previous year depicting negative growth of mining employment to (-) 20.28.

Figure -8, Trend of Employment in the mining sector in Odisha

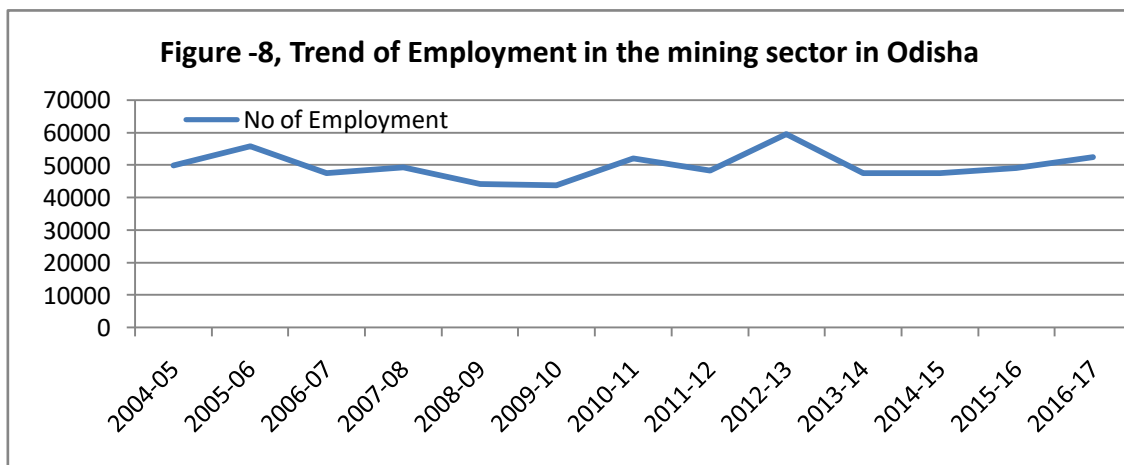
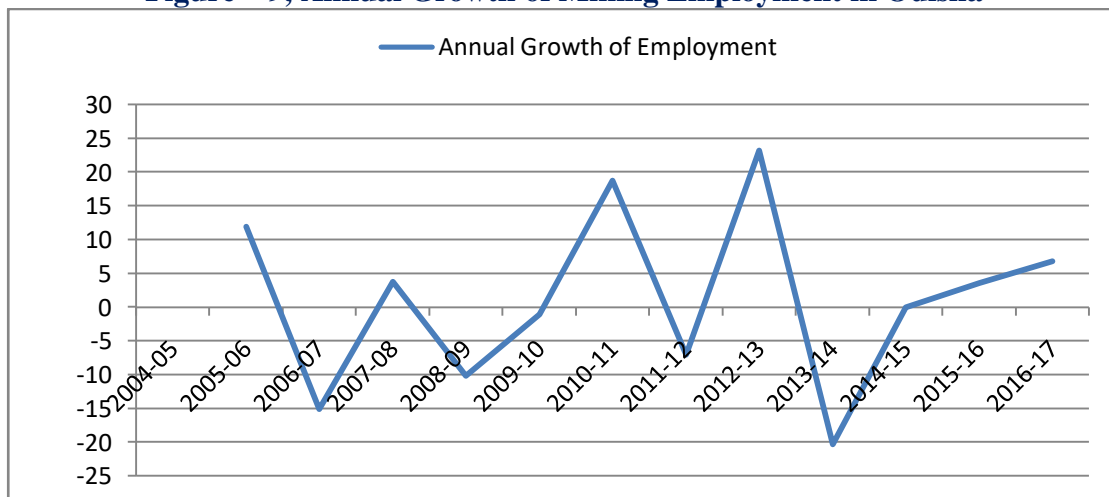


Table – 8, Number of Mining Employment in Odisha

Year	No of Employment	Annual Growth of Employment
2004-05	49837	
2005-06	55764	11.89
2006-07	47376	-15.04
2007-08	49176	3.80
2008-09	44167	-10.19
2009-10	43705	-1.05
2010-11	51877	18.70
2011-12	48239	-7.01
2012-13	59417	23.17
2013-14	47370	-20.28
2014-15	47370	0.00
2015-16	49086	3.62
2016-17	52405	6.76

Source: Economic Survey (2017-18)

Figure – 9, Annual Growth of Mining Employment in Odisha



To test the relationship between mining employment and mining output, double-log model is applied where the following equation can be solved (Gujarati, 2003):

The double-log model is presented in table 9, where the calculation is done using Microsoft

Excel spreadsheet and t-statistics shows insignificant result. This means the proportionate change in mining employment due to proportionate change in mining output is not significant.

Table – 9, Double-log Model of Mining Employment and Mining Output

Regression Statistics					
Multiple R	0.043715				
R Square	0.001911				
Adjusted R Square	-0.088824				
Standard Error	4556.92790				
Observations	13				
ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>

Regression	1	437339.991	437340	0.02	0.8872384			
		2		1061	3			
Residual	11	228421510.	2076559					
		9	2					
Total	12	228858850.						
		9						
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	50695.488	7137.237	7.103	0.00	34986.535	66404.441	34986.535	66404.441
X Variable 1	-0.537	3.697	-0.145	0.88	-8.674	7.601	-8.674	7.601

Source: Economic Survey (2017-18)

Conclusion

The objective of the paper is to understand the role of mining led industrialisation on state's employment and output. It was observed that contribution of mining and quarrying in GSDP and NSDP is statistically significant. However, the employment generating capacity of this sector is not significant. Further, the

proportionate change in mining employment due to proportionate change in mining output is also not significant. Though the mining sector has significant contribution to state's exchequer, but mining led displacement is a major current issue which required state's concern.

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