An Economic Analysis of Government Expenditure in Education Sector in Odisha

A Dissertation Submitted to Central University of Haryana for the Partial Fulfilment of the Award of the Degree of

Master of Philosophy

in

Economics

Supervisor

Dr. Ranjan Aneja

Assistant Professor

Department of Economics

Submitted by

Abinash Singh

Roll No: 8037

M.Phil. Economics

DEPARTMENT OF ECONOMICS

SCHOOL OF ARTS, HUMANITIES AND SOCIAL SCIENCES

CENTRAL UNIVERSITY OF HARYANA

MAHENDRAGARH – 123031

HARYANA

(2017)

DECLARATION

I hereby declare that the work presented in this dissertation entitled, "**An Economic Analysis of Government Expenditure in Education Sector in Odisha"** in partial fulfilment for the award of Degree of **"Master of Philosophy**" in **Economics** and submitted to Department of Economics, Central University of Haryana is a record of my own investigations carried under the guidance of **Dr. Ranjan Aneja**, Assistant Professor, Department of Economics, Central University of Haryana, Mahendergarh. The material presented in this Dissertation is not submitted anywhere before for the award of any other degree.

Date: **Name:** Abinash Singh

Place: Mahendergarh, Haryana **Enrolment No:** 8037

ACKNOWLEDGEMENT

I deem it my proud privilege to have undertaken this investigation under the inspiring guidance and expert supervisions of my supervisor, **Dr. Ranjan Aneja (Assistant Professor)**, Department of Economics, Central University of Haryana. He has reinforced me throughout my dissertation with his fortitude and knowledge. His ability to probe beneath text is a genuine gift and his sagacity have strengthened this study extremely. I will always be thankful for his wisdom, awareness and deep concern for me. I am warmly indebted for his valuable advice and friendly help. His far-flung discussions around my work and interesting explorations in operations have been very obliging for this study. It's been honor to work with him.

I am appreciative to **Dr. Ajeet Kumar Sahoo (Assistant Professor)** Department of Economics, Central University of Haryana, for his kind support, insights and prayers which have sustained me during these periods.

My Friends' encouragement and support have upheld me, during the process of completing this thesis. I would like to thank Mr. Amit Sharma, Research Scholar, MNIT Jaipur and Mr. Sameer Kumar Jena, Research Scholar, IIPS Mumbai for their continuous encouragement, help and precious suggestions.

Finally, my greatest devoirs to the Almighty for bestowing upon me the spirit to face the complexities of life and complete this thesis successfully.

(Abinash Singh)

CONTENTS

LIST OF TABLES

Table no. **Page no.**

LIST OF FIGURES

Figure no. **Page no.**

CHAPTER 1

INTRODUCTION

1.1 Introduction

The spotlight of the world economists, especially those pertaining to the developing nations, has been increasingly shifting towards embarking on a twin policy of accomplishing growth of economy with human development. Economic growth alone, is not sufficient in itself to generate development because the concussion seldom percolates down to the lower strata sections of the society. Education and health are vital factors for economic growth and human development. Poverty reduction, child nutrition, school enrolment and infant mortality are deciding factors of human development. Education is an economically and socially rewarding investment. In many developing countries, education is provided principally by state funding. The spread of education therefore depends on financial resources. The development of a nation is primarily determined by the endowed natural resources and the attribute of the human resources, which depends on the level of knowledge, skills and attitudes of the citizens; these parameters are determined by the status of school education and higher education. For development of knowledge, the act of education is crucial.

The generalisation, that investment in human capital promotes economic growth is major issue since the time of Adam Smith (Kiker,1968), who emphasised the priority of investing in human skills. Schultz (1961) and Denison (1962) argued that education directly contributes to the growth of national income by enhancing the skills and productive capabilities of the labour force. These works led them to find that a considerable proportion of the rate of growth of output in the United States was due to investment in education. Hence, policy-makers in India, after independence, have placed importance on the provision of basic social services like education, health and nutrition to all sections of society, mainly the poor. Given the large base of poor in India, this policy induced substantial increase in social expenditure.

1.1.1 Role of Education in Economic Development

'Education is the manifestation of the perfection already in man' – Swami Vivekananda. He conceived the aspect of education as a facilitating one, which helps to build the latent talents, already present in the individual. Quality education and knowledge are considered as an intrinsic part of human development.

The relationship between human beings and education is very close. Man, has achieved success in almost every field and made his life comfortable, but this development or achievement has been gained only because of his knowledge and skills, which is accomplished through education. Therefore, education is regarded as one of the most powerful instruments for emancipation and empowerment of human beings (Misra 2001).

Education is the single most important means to attain sustainable development. Any attempt to strengthen economies, scale down poverty and enhance the quality of life of people, can yield results with increased attribution to education. Learning equips people with the skills they need to participate absolutely in the economy and society.

It is obvious that good schooling and advanced knowledge will always yield positive returns. Therefore, educational programs must acquire considerable priority in any under developed country like India where supremacy of non-economic factors play a role.

Empirical evidences claim that education has positive influence on the income of the individuals. While there is widespread interest in education as a means of furthering economic development, there has been remarkable findings about various channels through which education promotes economic development. Education may influence economic development through changing the attributes relevant to economic development or it may influence economic development in its capacity as a relevant economic input. In the former case, education may change the attitude to work, consumption preferences, savings propensities, innovativeness attitude towards family and various social attitudes relevant from the economic

point of view. In the latter case, that is as an input, education is considered to be a process of skill formation and in this aspect, it is treated at par with the process of capital formation. It is obvious from these studies that the correlation between educational development and economic development is very well established.

1.1.2 Arbitration of State in Education

The role of state in education has been identified from the earliest times. There had always been state patronage for education in ancient India. State aid was given to the educational institutions. It has now been recognised that every child up to a certain age has a right to receive education and it is the duty of the state to make adequate provision for it. Even Adam Smith, the apostle of national liberty and laissez-faire, was in favour of state-controlled elementary education. John Stuart Mill, belonging to the classical tradition, also advocated that the state should provide for both elementary and higher education and the elementary education should be made compulsory. Because the functioning of market mechanism helps to provide goods and services to satisfy the demands of the consumers. But all the needs of the consumers cannot be satisfied through the market. The inherent and inbuilt limitations of market mechanism as a guiding principle for economic decision making have called for government's intervention in various fields even in the advanced market economies.

Even in the history of economic thought state involvement in education in one form or the other has been favoured for social and economic improvement (Vaizey, 1962). After reviewing earlier views on education, John Vaizey concluded that “there is a long and honourable tradition from Adam Smith to Alfred Marshall which assigns to publicly supported education a vital role not only in promoting social peace and harmony, and self-improvement, but in the process of Wealth creation itself'.

The mobilisation of human resources and its development is the process by which knowledge, skills, and capacities of all the people are increased. The expenditure incurred on the development of human resources is seen as a form of investment in human beings and is known in the field of economics of education as investment in human capital" (Schultz, 1961).

The state intervention in the development of education takes many forms and varies widely across countries. In communist countries, the state owns all the educational institutions and possesses complete control over the supply of educational services. In some countries state intervention is limited to selected areas of education (such as the conduct of examination) and all other aspects are in the hands of private sector. But the most common form of intervention in the development of education is through the public financing of educational system.

1.1.3 Significance of Public Expenditure on Education

Public expenditure on education for economic development in general and for the provision of education to the society education system in particular, has come to assume a crucial role in modem times.

There is a general apprehension about the public educational expenditure as a tool of public policy. But the importance assigned to education in the overall development, has posed the problem such as: How much a nation should spend on education? What are the methods of financing education? Who has to share the burden of costs of education? What is the result of raising resources for education from different sources -taxes, fees etc.? How the resources should be distributed at different levels, etc.? Because the government has to meet the competing ends with limited resources. These are all issues of crucial importance and the understanding of which will help to serve the policy ends better. As such, instruments of educational policy are limited in number, and financing is one among the few available for influencing the policy objectives (Noah and Sherman, 1979). The public financing of education

can influence the quantity and quality of education and also its distribution at different levels. But it depends on how effectively the government makes use of its and ultimately how it affects the development objectives themselves.

Education being a merit good, is financed by the government as well as by the receivers of education in most of the countries. The degree of state involvement in financing education varies among the countries depending on their political, economic and social systems. In general, there are two ways of financing education: direct intervention by the state through its institutions and through grants to educational institutions and loans and other financial assistance to the receivers of education (Prest,1965).

Education is one of the important services provided with the help of the government and it has grown rapidly both in terms of public expenditure and the number of persons educated. The education expenditure has grown both in absolute terms and in relation to the GNP in both the developed and the developing countries with different political and economic systems.

1.1.4 Distributional Aspect of Public Expenditure on Education

Most of the Public finance operations, including expenditure on education are justified mainly on the grounds of either 'efficiency' or 'equity' or both. The conventional allocative efficiency argument for government support of education is that significant externalities are produced as the individuals seek to enhance their educational levels. It means that the market system supplied education to the extent that it satisfies private demand and produces less than optimal quantity of education and consequently society as a whole suffers. Further, it is assured that the measurement of these benefits and identification of the beneficiaries are very difficult, no particular group can be asked to pay for these benefits. Hence the only way out is to finance them collectively so that private and social rates of return could become equal.

The most often stated equity justification is that since many families cannot stand to pay the costs of their children's education, the government should provide financial assistance so as to guarantee equal participation from all sections of society. Without subsidies for education, it is argued, access to education may spread unequally among the people. The strength of this argument assumes significance when it is recognised that"... education influences the future level of earnings, so that to distribute it in accordance with the purchasing power is to perpetuate inequalities of income" (Woodhall,1975). Hence, the most crucial and obvious way of equalising educational opportunity is, to remove financial barriers that may prevent children of poor families from entering and completing any course of education.

The goal of equalising opportunities in economic and social life through education has gained importance at a time when the contribution of education to economic growth has become a subject of much controversy. In recent years, the 'equity' criterion has dominated over the 'efficiency' criterion in the educational planning of developing countries (Smith, J.A, 1974). Hence, distributional considerations based on equity have come to play a dominant role in the financing and supply of education services in the developing countries like India.

In recent years' policy-makers and researchers have focussed on the crucial issue of financing of education. Accordingly, various arguments have been put forwarded in favour of and against the public intervention in general and expenditure on education in particular. Those in favour of public expenditure argue that if a service like education is provided by the government at low or no cost, its consumption is likely to spread more evenly among different sections and regions of a country than if it is given to the market mechanism. It is believed that public financing permits education to act as an equalising agency by providing a parallel access to all and consequently allowing all individuals to rise up the social ladder irrespective of their socio-economic background.

1.2 Development of Education Sector in India

Development of Education sector in India has achieved new level vitally since independence of the nation. India is a developing country and it has been expanding is every field. Development of educational field in India brought about a transformation and the approach of education got modified. Literacy rate has raised from around 3% in 1880 to 65% in 2001. As per the 2011 Census, the Literacy Rate is recorded to be around 74%. All levels of education in India, from primary to higher, portray a challenge. India now have range of prestigious educational institutions such as AIIMS, IITs, NITs, IISc, and IIMs. The higher education system of India is positioned third largest in the world, after China and the United States. Development of education in India regards that no cost and mandatory education must be provided to all children up to the age of 14. Moreover, the 86th Amendment of the Indian constitution makes education a fundamental right for all children between 6-14 years.

1.3 Development of Education Sector in Odisha

Education is not only one of the most essential factors of economic growth through manpower development but also the means to comprehensive development of societies. It helps to enhance skills and technology and thus has a vital impact on production and productivity.

Indian States are under constitutional obligation to dispense no cost and mandayory education to all children up to the age of 14. The Government of Odisha has set down a number of goals for the education sector like Universalisation of Elementary Education (UEE) in the State by 2010, universal literacy, development of secondary and higher secondary education, skill development through vocational education in higher secondary schools & modernisation of technical education. There has been an enduring advancement in the literacy rates of the State since last decades, which is a result of growth of educational infrastructure, both qualitative and quantitative.

The literacy rate in Odisha during 1951 was 15.8% against the national average of 18.3%, which increased to 63.08% in 2001 against the all India average of 64.80%, and in 2011 it was 73.45% against the national average of 74.04%. While the male literacy rate of 63.1% in the State in 1991 increased to 75.35% in 2001 and 82.40% in 2011, the female literacy rate increased from 34.7% to 50.51% and then to 64.36% over the same period.

In 2011, among the districts, Khurda has the highest literacy of 87.51%, whereas Nabrangpur has the lowest with 48.20% followed by Malkangiri(49.49%), Koraput(49.87%), Rayagada(50.88%), Gajapati(54.29%), and Nuapada(58.20%). The literacy rate among the scheduled castes and scheduled tribes in the state is lower than the overall literacy rate of the state. The literacy rate among scheduled caste is 69% and among scheduled tribes is 52.24% in the state in 2011.

The Government of Odisha is pledged to the Universalisation of Elementary Education in the State with the ambition of fulfilling the constitutional obligation with the assistance of Central Government. Keeping in view the need for Universalisation of Elementary Education, there has been augmentation at Primary and Upper Primary School stage of education, in the Government sector, especially in rural areas as well as backward areas.

In Odisha, there are 35928 Primary and 20427 Upper Primary schools to cater education at elementary level. More 491 Primary and 490 Upper Primary schools opened under SSA to cater schooling in unserved areas. There are 6193 Govt. and aided Secondary Schools, 849 Recognized High Schools and 151 permitted High Schools in the Odisha. The tribal and Rural Welfare department has opened special type of schools for the benefit of the tribal children in the tribal areas. But after so much of effort the return from education of students in the rural areas are not found effective, which may be a possible factor responsible for the under development and slow progress of the state.

1.4 Rationale of the Study

The development of any country depends upon its economic growth which is determined by upon human capital formation. There said to be a dynamic and inevitable linkage between economic growth and human development. And education is the most vital factor that helps in human capital formation. Therefore, keeping in mind the essence of education as one of the foundational level of development this study has been designed to analyse the construction of this foundational level through government expenditure.

The state Odisha is lagging behind in most of the human development indicators while compared with India. And progress in all these indicators would be possible if the basic necessity of health and education is addressed properly. Odisha is having huge rural population of 83.3 % and ST/SC population alone constitute near about 40 % of the population. The literacy rate of tribal population according to 2011 census is only 53.1% which is very low.

In spite of such increment in Gross state domestic product and expenditure in education since last decade, many infrastructural facilities like percentage of school with electricity, computer facilities, playground facilities etc are showing poor performance while compared with India. And it is also believed that government aided schools are losing their enrolments to the private aided schools as the data from previous decade shows enrolment in government school is experiencing a decreasing growth rate while the private schools are experiencing an increasing growth rate.

Public expenditure on education in Odisha is experiencing a highly fluctuating rate and declining trend. The notion behind choosing this study is the backwardness of Odisha and its slow progress which is somewhere being caused by the negligence in education sector. With solution to problem like; how effectively expenditure on education is affecting the economy of Odisha and how expenditure on education can be raised to improve infrastructure related to

education in Odisha, this study aims at providing an optimal framework which will not only enhance the educational development but will also enrich the economy in future.

The study has been taken up to spotlight the problems and prospects of efficient funding for education in Odisha. The study would help to examine the trends in growth of elementary education in an exclusive manner, as it forms the foundation of our nation's future. This study would enable planners, administrators, academicians, school managements, parents and entrepreneurial experts to get an insight and know about the various issues and the scope for improvement. It also enables us to get a feedback from students and parents about the present education scenario. The management authorities of schools have also contributed their findings and ideas which are very useful in the present study. More over this study will enable people and government to understand the importance of expenses on education which has a long-term association with the economy.

1.5 Objectives of the Study

1) To examine the trend of public expenditure at elementary level of education in Odisha.
2) To examine infrastructure facilities related to education available in Odisha.
3) To assess the relationship between economic growth and education expenditure in Odisha

1.6 Terminology

1.6.1 Educational Expenditure

Public spending on education includes direct expenditure on educational institutions as well as educational-related public subsidies given to households and administered by educational institutions. The indicator is shown as a share of GDP and of total public spending. Education

expenditure covers expenditure on universities, schools and other private and public institutions delivering educational services.

1.6.2 Gross State Domestic Product (GSDP)

Gross state domestic product is the monetary value of all final goods and services produced within a country's territory in a specific time period. GSDP includes all public and private consumption, government outlays, investments, private inventories, paid-in construction costs. Put simply, GSDP is a wide measurement of a state's overall economic activity.

1.6.3 Gross District Domestic Product (GDDP)

Gross District Domestic Product is defined as a measure, in monetary terms, of the volume of all goods and services produced within the territory of the District during a specific period of time, accounted without duplication.

1.6.4 Educational Infrastructure

The conditions of the schools directly impact the performance of the students. The fact is that a school with good infrastructure, with renewed spaces, makes it possible for children and youths that live in remote areas to study and, in addition, tends to improve the interest and attentiveness of students and teachers in learning. In the category of educational infrastructure, we can simply include some essential infrastructure like; no. of school, no. of class rooms, drinking water facilities, toilet facilities, electricity, computer facility, playground, boundary etc.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

The concerned literature with the research work is presented below to spotlight the work done on the subject in India and abroad i.e. empirical and theoretical studies related to educational expenditure, public expenditure and economic growth, which proved useful to delineate the various issues and methodologies adopted.

2.2 Theoretical Studies

Wagner (1893) introduced his hypothesis with connecting to the public expenditure. His idea is also known as 'Wagner's Growth of Public Expenditure'. He published his book titled "Law of the Increase of State Activities". In his hypothesis, he analyses the relationship between growth of an economy and public expenditure. According to Wagner, there is a fundamental cause and effect relationship between economic growth with respect to the growth in public expenditure.

Peacock and Wiseman (1961) hypothesis in public expenditure is based on their empirical study conducted in United Kingdom, during the period 1890 to 1955. The hypothesis talks about the relationship between growth of an economy and public expenditure. But there is wide difference between these two theories. Here, Peacock and Wiseman says that, public expenditure will increase with respect to the growth of an economy. But the growing trend will not as like in the Adolf Wagner's theory. Further, it will be in a step like manner.

Lucas (1988) assumes that investment in education leads to the production of human capital which is the important determinant in the growth process. Uzawa developed an endogenous growth model based on investment in human capital which was used by Lucas. He makes a distinction between the internal effects of human capital where the individual worker undergoing training becomes more productive, and external effects which spill over and increases the productivity of capital and of other workers in the economy. It is the investment

in human capital rather than physical capital that has spill over effects that increases the level of technology.

2.3 Empirical studies

Quan and Beck (1987) approaches the complication of economic growth by investigating changes in the level of wages, employment, and state per capita income because of educational expenditure in North east and Sunbelt region. Variables taken in the study are; personal income, population, total state and local taxes, per capita expenditure for local school and higher education. The study uses a pooling time series and cross section data foe estimation purpose and uses a general log- linear model for regression analysis taking the annual data for each state for fiscal year 1964 to 1983. The findings of the study tell that, effect of educational expenditure on the level of wages and employment differ in the north east and sun belt, education expenditure have positive and significant effects on the level of wage and employment in the northeast while the reverse is true in sunbelt and there is positive relationship between wages and employment suggesting a migration to the sunbelt.

Butt and Sheikh (1988) analysed the gap between demand for and supply of higher education in Pakistan by estimating the degree and trend of gap. To estimate the extent and trend gap, data on number of application (demand side) and the number of candidate actually admitted (supply side) for five years (1982-87) has been collected for five different departments of University of Punjab. The major findings of the study show demand for higher education is inversely related to its direct private cost, demand for higher education increases to the extent higher education is subsidized, and demand for education is an indicator of social status.

Jorgenson and Fraumeni (1992) measured the impact of investment in education on U.S. economic growth. The study uses data on output, input and productivity of sources of economic growth, educational as well as non-educational sector for a period from 1948 to 1986. The

major findings of the study conclude that, the appropriate value of investment in education is given by its impact on the individual's lifetime labour income, the relevant concept of labour income must not be limited to market activities alone since many of the benefits of education accrue in the form of enhanced value for non- market activities.

Monteils (2002) undertake the critical reading of the theoretical contribution of new growth theories and to present an empirical testing of Lucas model for France in 19th and 20th century. Data collected for several years ranging from 1834 to 1996 for different variables like; duration of training as explanatory variables and human capital stock (literacy of men & women, diplomas, conscript literacy, level of schooling, wages) as explained variable. The study uses correlation analysis, DW test and logistic regression to analyse the data. The result is surprising and so in contradiction with the hypothesis of the new growth theories. Human capital returns are decreasing and thus knowledge produced by education cannot be the engine of self-maintained economic growth.

Czynski and Zeira (2003) examined the factors influencing the extent & composition of expenditure on education in Israel and analysed the relation between various demographic, economic & political explanatory variables. The study is based on Secondary data from for a period of 1962-98 and different variables like; Population size, age distribution, distribution of student population in to ethnic group, per capita GDP, relative price of education, distribution of income across the population, return on education, overall budgetary pressure are used to analyse the data. The study adopts the methodology with Correlation, regression analysis and cointegration test to test and analyse the data. Major findings of the study show Per capita GDP positively affects educational expenditure, distribution of income doesn't affect public spending on education & distribution of income does affect private spending on education, spending on education was not correlated with the party in government.

Musila and Belasi (2004) investigated the relationship between government education expenditure per worker & economic growth in Uganda. The study uses Secondary time series data for the period 1965-1999 for variable like Logarithm of Real GDP, gross fixed capital information, govt education expenditure per worker of employment and uses Cointegration test and error correction model to analyse the data. The findings of the study depict that, capital and labour input are some of the key variable that seems to affect the long run growth performance of the country, the average education expenditure per worker is positively correlated with economic growth.

Hussain et al. (2004) analysed the priority accorded to education by the federal as well as provincial governments. A comparative analysis of performance of public sector education in four provinces of Pakistan has been carried out in the study to examine the disparities in budget allocation to education in the provinces. Secondary cross-sectional data for the year 2001-02 has been taken for different budget allocation variables like educational budget as a percentage of total budget. Representation index and Gini coefficient are used in order to show the degree of representation of groups and to measure the disparities in the allocation of resource to the educational sector. The findings of the study conclude that, no disparities between districts on allocation of funds to the educational sector and there exists a positive correlation between the districts literacy rates and fund allocation.

Chakrabati and Jogelkar (2006) examined the patterns and changes in the allocation of government funds for higher education over the period 1980-81 to 1999-2001. Data for two decades were collected from 15 major states of India. Different variables related to economy, demography and policy has been interpreted and analysed. The study also incorporates a basic panel fixed model and a generalised least square estimates. The result of the study shows state with higher per capita income was found to spend more on education, income elasticity at each

level of education is found to be less than one, grants from centre induces a positive significant impact of public expenditure on education both at aggregate level and individual level.

Al-Yousi et al. (2008) examined the nature and direction of the relationship between educational expenditure as a proxy of human capital and economic growth. The study uses Secondary time series data for a period 1977- 2004 and Real per capita GDP, ration of government educational expenditure to GDP as variables. The study incorporates Unit root test, Cointegration test, Ganger causality test with an error correction framework in the analysis of data. The findings of the study conclude that, the causality between Educational expenditure and economic growth is a bidirectional one, results are country specific and vary with the proxies.

Dey and Endow (2008) analysed the major trends in public financing of education in India, including expenditure by the central govts, state govts, other local bodies and NGO sector in India for seven major states. It uses Secondary data on: Govt. expenditure on education by different department and schemes, expenditure by state and centre on education, per capita NSDP, infrastructural facilities, foreign aids etc. And the methodology includes Discussion on source of finance and problem of estimation, trend and composition of aggregate expenditure on education, mechanism of flow of fund and analysis of centre state relation in education finance. The findings of the study are: CSS which are partly funded by external aid have been a critical part of the centre to state transfer, For the less developed states recent changes in education expenditure have improved access, but retention and learning achievements remain low.

Omwami and Keller (2010) examined the unit cost of primary education in sub-Saharan Africa countries in order to establish the need to realise universal access. The study is based on secondary data collected from UNESCO and UNDP data base and variables used are total

primary school enrolment, public school enrolment, gross and net enrolment rates, no. of children out of school, GDP and GDP per capita. This study incorporates the unit cost analysis and also employed a reverse computation procedure in order to arrive at the unit dollar cost and total primary education budget projection for each country. The findings of the study show, governments of sub-Saharan region spend less in US dollars per unit cost on primary education than do developed countries.

Soren (2010) highlighted the dropout rate of primary education and explored the situation of dropout of primary education in Odisha. Qualitative Case Study Article was conducted. 20 Schedule Tribe student from two blocks of Mayurbhanj district has been taken for the case study. The major reason influencing school dropout were found to be: household work, lack of parental guidance in studies, socio-economic condition of the family, punishment by the teachers etc. are the main source of drop out children at primary school level.

Conard (2011) empirically examined education's level specific contribution to economic growth in select Caribbean countries. The study uses Secondary time series data for the period 1970-2004 collected on Public funds per pupil at basic and advance stage, annual public expenditure per pupil at basic and advance stage, human capital output at basic and advance stage, and depreciation of human capital. This study is an adoption of two sector economy approach introduced by Lucas (1998). The findings of the study show Human capital accumulation has level specific effect on output in manufacturing & service sector in Barbados, Guyana, Jamaica, and Trinidad & Tobago, Human capital formation remains on an upward trend in these countries.

Ray et al. (2011) evaluated the association between economic growth and expenditure in India. The study uses Secondary data which has been collected over a period of 1962 to 2010. Real GDP is used as a proxy of economic growth with expenditure on education. For the analysis

and data testing the study uses Unit root test, Cointegration test and Error correction model. The findings of the study show Economic growth & educational expenditure are cointegrated indicating the existence of long run equilibrium relationship, the Ganger Causality test results confirms that there doesn't exist any causality in short-run between economic growth and education & vice versa.

Mukharjee (2012) analysed the expenditure in the department of school education and literacy and the department of higher education under MHRD, and provided a comprehensive assessment of role of 11th FYP on education sector. Comparative analysis of expenditure in different years under 11th FYP and scheme wise distribution of expenditure has been analysed. The study suggests increasing privatisation of education and implication for financing, and public private partnership for educational sector which will enhance the educational quality.

Tewary et al. (2014) analysed and estimated the per student expenditure on children enrolled in the government school and per student private expenditure on children on private school. The study uses Secondary for the year 2011-12 and variable such as private & and government expenditure on students, total enrolment in government & private schools, GDP deflator & inflation. In this study, the public expenditure on education, per student expenditure both at government and private level has been estimated. The findings of the study indicate: Richer states spent less on educational expenditure as a % of their GDP but more in terms absolute amount compared to the poorer states. Preliminary analysis indicates a strong relationship between per student expenditure and learning level.

Halder (2016) investigated the scenario of location of schools, habitation wise distribution of schools, Infrastructure of schools and attainment of students in schools. Secondary data are collected from different sources and school mapping exercise was carried out through GPS Survey. Different component of physical infrastructure parameters has been reduced to a

comprehensive Index of physical Infrastructure and Ranking method has been used to create a composite index of physical infrastructure with the help of SPSS. Bivariate analysis like spearmen's ranking correlation have been used to show the relation between educational attainment and the aggregative index of physical infrastructure. The findings of the study show that type of road plays an important role in schooling facility, Spatial distribution of school is found to be very close, Schools of under privileged children are under equipped. The study found attainment of children in schools is very much related to quality of schools.

2.4 Research Gap

There are studies available in which the quality of education is assessed in Odisha which are normally based on primary data but, there has been no study conducted to examine the effect of educational expenditure on economic growth and there has been no significant work found on infrastructural development related to education.

Thus, various researchers have used different methods to analyse educational expenditure and its effect on economic growth, most of the study have anticipated the causality analysis in their respective studies, in which the effect of expenditure on economy growth has been examined. Further the result of most of the study reveals the long-term association between educational expenditure and economic growth.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

The design of any research work requires considerable attention to the research methods and the proposed data analysis techniques. This chapter of the study discusses in detail the research methodology and methods that has been adopted for this study. The method that has been adopted in this research was so carefully designed as to go well with the area of inquiry. The researcher discusses the theoretical frame work related to public expenditure, source of data, construction of variable and methods to analyse the data with appropriate model.

3.2 Methodology

The main objective of this study is to investigate the dynamic relationship between expenditure on educational and economic growth in Odisha using the annual data over a time period from 1990-91 to 2014-15. The two important variables of this study are government expenditure on education and economic growth. The GSDP (Gross State Domestic Product) is used as the proxy for economic growth in Odisha and the study takes economic growth by using the constant value of GSDP (Gross State Domestic Product) measured in Indian rupee.

This study aims to examine the association in long run and the causal relationship between the respective variable; Educational expenditure and Economic growth. The methodology adopted in this study is the cointegration and Vector Auto Regressive technique. The whole estimation procedure consists of three steps: unit root test, cointegration test, Granger Causality test in a VAR model framework, and the VECM model estimation.

3.2.1 Research Hypothesis

- H0: there exists no long run relationship between GDP and EDU in Odisha.

  H1: there exists long run relationship between GDP and EDU in Odisha.

3.2.2 Data Variable and Data Sources

The two main variables considered in this study are economic growth, which is represented by real GSDP (Gross State Domestic Product) of Odisha and EDU (Total expenditure on education) of Government.

Information on both Elementary Educational expenditure and State domestic product has been collected over a period of 15 years i.e. from 1990-91 to 2014-15 for Odisha.

Beside this information on expenditure on elementary education and Gross District Domestic Product(GDDP) of all 30 districts has been collected over a time period of 14 year i.e. from 2002-03 to 2015-16. And information on different educational infrastructure is also collected for a time period from 2005-06 to 2015-16.

All required data for the time period are obtained from the respective sources like educational expenditure is collected from *Handbook of Statistics on state govt. finance, published by Reserve Bank of India* and *Odisha Primary Education Programme Authority(OPEPA).* GSDP is taken from *Odisha Economic Survey 2014-15 published by Directorate of Economic and Statistics, Bhubaneswar*. Infrastructure related data and other educational parameter are being collected from *District Information System for Education (DISE).*

3.2.3 Econometric Model Specification

The growth model for the study takes the form**: GSDP=f (EDU)** ……(1)

Where GSDP is Gross State Domestic Product and EDU is expenditure on education respectively. GSDP is used as explained and expenditure on education EDU as the only explanatory variable.

The association between growth (measured in GSDP) and expenditure on education (EDU) in Odisha can be evaluate using the following model in linear form:

ln GSDP t = α + β ln EDUt + ε t …… (1.1)

Where,

α and β > 0

GSDP t and EDU t show the Gross State Domestic Product and educational expenditure of government at a particular time. while εt stands for the "noise" or error term; α and β represent the slope and coefficient of regression. β indicates how a unit change in the independent variable (educational expenditure) can affects the dependent variable (gross district domestic product). To cater other things that may influence GSDP the error εt is incorporated in the equation.

3.2.4 Unit Root Test

In time series data, a number of statistical issues can control the estimation of parameters. The situation of spurious regression can also be found between two unrelated variables i.e. high R square in Ordinary Least Squares (OLS) estimation because of the non-stationarity of series.

A series is said to be stationary if the joint probability of the same doesn't change over the time i.e. mean and variance remain constant over time or mean and variance are time-invariant. simply implies that the mean [(E(Yt)] and the variance [Var(Yt)] of Y remain constant over time for all t. In other word,

F(Yt) = F(Yt + k)

Where, F is joint probability

Y is say, for an example GDP here

t is the time period

and k is the change in time period.

To test the stationary of series, the most often used test is Augmented Dickey Fuller (ADF) Test. The following equation in this study checks for the unit root of time series data used in the model:

$$\Delta y = \beta_1 + \beta_1 t + \delta y_{t-1} + \sum \alpha \Delta y_{t-1} + \varepsilon_t \quad \text{..... (2)}$$

Where,

εt is white noise error term in the model of stationarity test, with null hypothesis that variable has unit root.

The null hypothesis and alternative hypothesis for the existence of unit root in variable yt is Ho: $\delta = 0$ versus H1: $\delta < 0$. Rejection of the null hypothesis denotes stationarity in the variables.

Once the stationarity of series is assured, the further process before applying Johansen's (1988) co-integration test is to identify the maximum number of lags that can be used in estimation process.

3.2.5 Testing for Co-integration (Johansen approach)

The motive behind Cointegration test is, knowing the order of integration is crucial for building up any econometric model and to draw inferences. And to check for some theories which suggest that certain variables should be cointegrated showing long-run relationship. This test may be regarded as a long run equilibrium relationship among the variables.

The purpose is to determine in a bivariate framework whether or not expenditure on education (EDU) and (GSDP) variables have association in long-run. Engle and Granger (1987) introduced the concept of cointegration, where economic variables might reach a long-run equilibrium that reflects a stable relationship among them.

The approach which is used in this study to test for cointegration is called the Johansen cointegration approach. The Johansen approach can determine the number of cointegrated vectors for any given number of non-stationary variables of the same order.

3.2.6 The Granger Causality Test

Testing of causality among variables is one of the most crucial and yet one of the difficult issue in economics. The basic idea of Granger causality test can be; if the prediction of one-time series is improved by incorporating the knowledge of second time series then, the later said to have a causal influence on the first. Historically, Granger (1969) and Sim (1972) were the ones who formalized the application of causality in economics.

The null hypothesis (H0) is what we test in this case, that the X variable does not Granger cause variable Y and variable Y does not Granger cause variable X.

In summary, one variable (Xt) is said to granger cause another variable (Yt) if the lagged values of Xt can predict Yt and vice-versa.

The Granger method involves the estimation of the following equations:

If causation runs from EDU to GSDP,

$$ln\ GSDP_t = \Sigma\ \alpha_i\ lnGSDP\ t_{-i} + \beta_j\ lnEDU_{t-j} + \lambda_1 t + u_{1t} \quad \text{..... (3)}$$

If causation runs from GSDP to EDU, it takes the form:

$$ln\ EDUEXP_t = \Sigma\ \gamma_i\ lnEDUt_{-i} + \delta_j\ lnGSDP\ _{t-j} + \lambda_2 t + u_{2t} \quad \text{.....(3.1)}$$

3.2.7 VECM and Short-Term Causality Test

Error correction mechanism was first introduced by Sargan (1984), later adopted, and modified by Engle and Granger (1987). The foremost advantage of VECM is that it has noble interpretation with long-term and short-term equations. Error correction mechanism examines

the short-run behaviour of an economic variable with its long-run behaviour. A vector error correction model is a restricted VAR that has cointegration restrictions built in to the specification. So, it is designed for use with non-stationarity series that are known to be cointegrated. The VEC specification restricts the long-run behaviour of the endogenous variables to converge to their cointegrating relationship. The cointegration term is known as the error correction term which shows the speed of divergence or convergence towards the equilibrium in long-run and the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. In case if there exist no cointegration between variables, only short run causality would be tested with the help of VAR model.

CHAPTER 4

RECENT TREND AND PATTERN OF PUBLIC EXPENDITURE ON EDUCATION IN ODISHA

4.1 Introduction

Odisha, a state on the eastern coast of India, is divided into 30 administrative geographical units called districts. A district of an Indian state is an administrative geographical unit, headed by a District Collector (DC) or Deputy Commissioner in some states (DC).

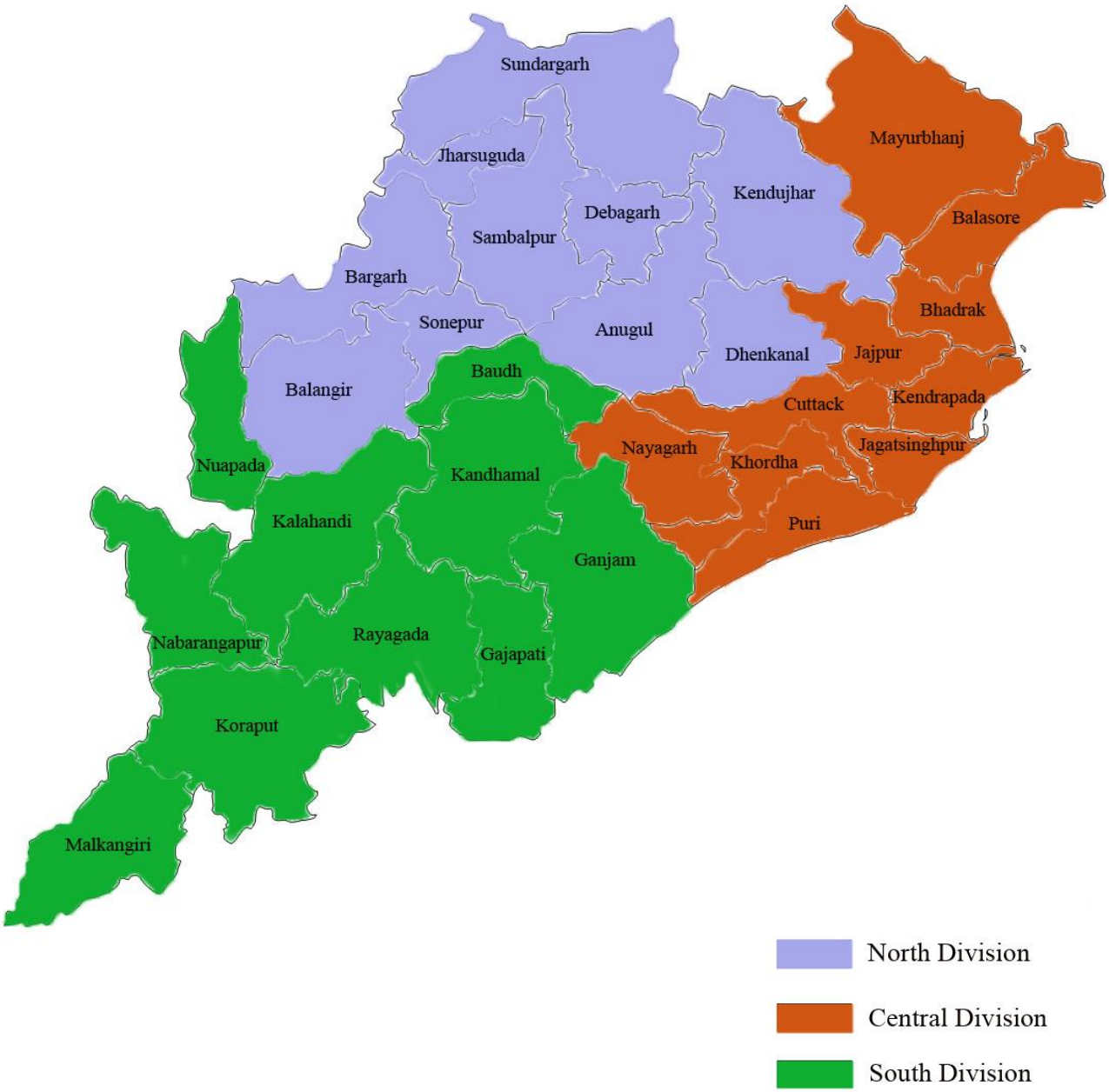
There are 30 districts in Odisha— Angul, Balangir, Balasore, Bargarh, Bhadrak, Boudh, Cuttack, Debagarh, Dhenkanal, Gajapati, Ganjam, Jagatsinghpur, Jajpur, Jharsuguda, Kandhamal, Kalahandi, Kendrapara, Keonjhar, Khordha, Koraput, Malkangiri, Mayurbhanj, Nabarangpur, Nayagarh, Nuapada, Puri, Rayagada, Sambalpur, Subarnapur, Sundargarh.

These 30 districts have been placed under three different divisions for smoothening the governance. The divisions are North, South and Central with their headquarters at Sambalpur, Berhampur and Cuttack respectively. Each division consists of 10 districts. Its administrative head is the Revenue Divisional Commissioner (RDC) and the Police Head is Inspector General of Police (IGP).

Table No. 4.1 Division Wise List of Districts

North Division	**Central Division**	**South Division**
Anugul	Balasore	Baudh
Balangir	Bhadrak	Gajapati
Bargarh	Cuttack	Ganjam
Debagarh	Jagatsinghapur	Kalahandi
Dhenkanal	Jajapur	Kandhamal
Jharsuguda	Kendrapara	Koraput
Kendujhar	Khordha	Malkangiri
Sambalpur	Mayurbhanj	Nabarangapur
Sonepur	Nayagarh	Nuapada
Sundargarh	Puri	Rayagada

Figure No. 4.1 Map of Odisha with RDC Divisions



In this chapter, the trend of educational expenditure has been analysed using district level data on expenditure and Gross District Domestic Product for a period of 14 years i.e., from 2002-03 to 2015-16. In order to have a comparative and representative analysis of all 30 districts, total expenditure for education and Combined Gross District Domestic Product has been taken for three divisions; North, Central and South respectively.

The study uses tabulation, graphical representation and calculation of growth rate to analyse the trend for each division and the study also compares the expenditure level and income of each division with other, which alternatively provides information about the districts in each division.

4.1.1 North Division

Table No. 4.2 Educational Expenditure and GDDP In North Division (In Lakhs)

Year	Exp	GR(Exp)	Comb. GDDP	GR(Comb.GDDP)
2002-03	618.19		1532058	
2003-04	4838.63	682.70	1819129	18.73
2004-05	8785.27	81.56	2895925	59.19
2005-06	11962.95	36.17	3063931	5.80
2006-07	19822.34	65.69	3512682	14.64
2007-08	24062.53	21.39	3978539	13.26
2008-09	23670.48	-1.62	4325243	8.71
2009-10	30467.36	28.71	4418238	2.15
2010-11	23963.81	-21.34	4697308	6.31
2011-12	28331.77	18.22	4841300	3.06
2012-13	30958.59	9.27	5442704	12.42
2013-14	41073.18	32.67	5702741	4.77
2014-15	34288.32	-16.51	5968493	4.66
2015-16	42783.16	24.77	6272885	5.09

Source: Directorate of economics and statistics & OPEPA, Bhubaneswar, Odisha.

Figure No. 4.2 North Division Growth Rates

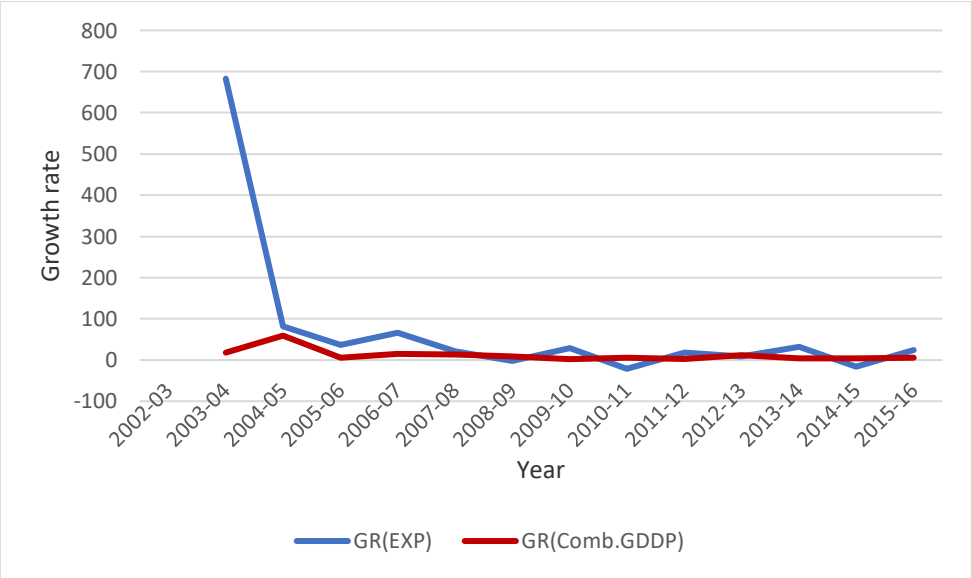


Table No. 4.2 and Figure No. 4.2 depicts the total combined expenditure on education and the combined Gross District Domestic Product with their growth rates for North division of Odisha which comprises of 10 districts viz; Anugul, Balangir, Bargarh, Debagarh, Dhenkanal, Jharsuguda, Kendujhar, Sambalpur, Sonepur, Sundargarh respectively.

The growth rate of expenditure on education was experienced at the peak for the year 2003-04 and then maintained a positive growth rate except for the years 2008-09, 2010-11, 2014-15 which experience negative growth rates. While at the same time the combined district domestic product for north division shows a positive trend all over the period.

The combined expenditure for the year 2002-03 was Rs.618.19 lakhs which has been increased to 42783.16 in 2015-16.

4.1.2 Central Division

Table No. 4.3 Educational Expenditure and GDDP In Central Division (In Lakhs)

Year	Exp	GR(EXP)	Comb. GDDP	GR(Comb.GDDP)
2002-03	1385.4		1856079	

2003-04	5958.41	330.08	2101832	13.24
2004-05	9494.46	59.34	3086174	46.83
2005-06	14719.18	55.02	3251431	5.35
2006-07	23779.84	61.55	3634138	11.77
2007-08	27914.11	17.38	3992614	9.86
2008-09	29906.22	7.13	4291441	7.48
2009-10	38892.7	30.04	4502571	4.91
2010-11	29528.01	-24.07	4941034	9.73
2011-12	41965.44	42.12	5252184	6.29
2012-13	57185.55	36.26	5542303	5.52
2013-14	69352.2	21.27	5843293	5.43
2014-15	42097.11	-39.29	6153026	5.3
2015-16	50116.03	19.04	6477788	5.27
Source: Directorate of economics and statistics & OPEPA, Bhubaneswar, Odisha.				

Figure No. 4.3 Central Division Growth Rates

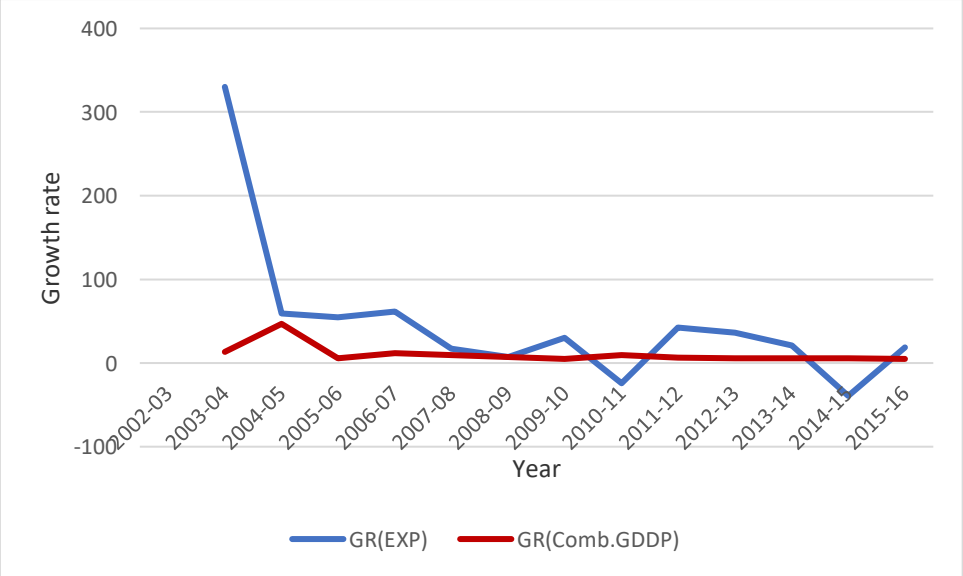


Table No. 4.3 and Figure No. 4.3 depicts the total combined expenditure on education and the combined Gross District Domestic Product with their growth rates for Central division of Odisha which comprises of 10 districts viz; Balasore, Bhadrak, Cuttack, Jagatsinghapur, Jajapur, Kendrapara, Khordha, Mayurbhanj, Nayagarh, Puri respectively.

The growth rate of expenditure on education was experienced at the peak for the year 2003-04 and then maintained a positive growth rate except for the years 2010-11, 2014-15 which experience negative growth rates. While at the same time the combined district domestic product for central division shows a positive trend all over the period.

The combined expenditure for the year 2002-03 was Rs.1385.4 lakhs which has been increased to Rs. 50116.03 in 2015-16. Which is more than the north division.

4.1.3 South Division

Table No. 4.4 Educational Expenditure and GDDP In South Division (In Lakhs)

Year	Exp	GR(EXP)	Comb. GDDP	GR(Comb.GDDP)
2002-03	522.57		1075960	
2003-04	4962.93	849.71	1219381	13.32
2004-05	8651.73	74.32	1790845	46.86
2005-06	11029.28	27.48	1899110	6.04
2006-07	21682.57	96.59	2123263	11.80
2007-08	26571.87	22.54	2313409	8.95
2008-09	27621.28	3.94	2464494	6.53
2009-10	39035.1	41.32	2664307	8.10
2010-11	39886.21	2.18	2874765	7.89
2011-12	35588.77	-10.77	2917816	1.49

2012-13	35517.21	-0.20	3234400	10.85
2013-14	58288.8	64.11	3360609	3.90
2014-15	43994.82	-24.52	3602333	7.19
2015-16	61189.69	39.08	3794856	5.34
Source: Directorate of economics and statistics & OPEPA, Bhubaneswar, Odisha.				

Figure No. 4.4 South Division Growth Rate

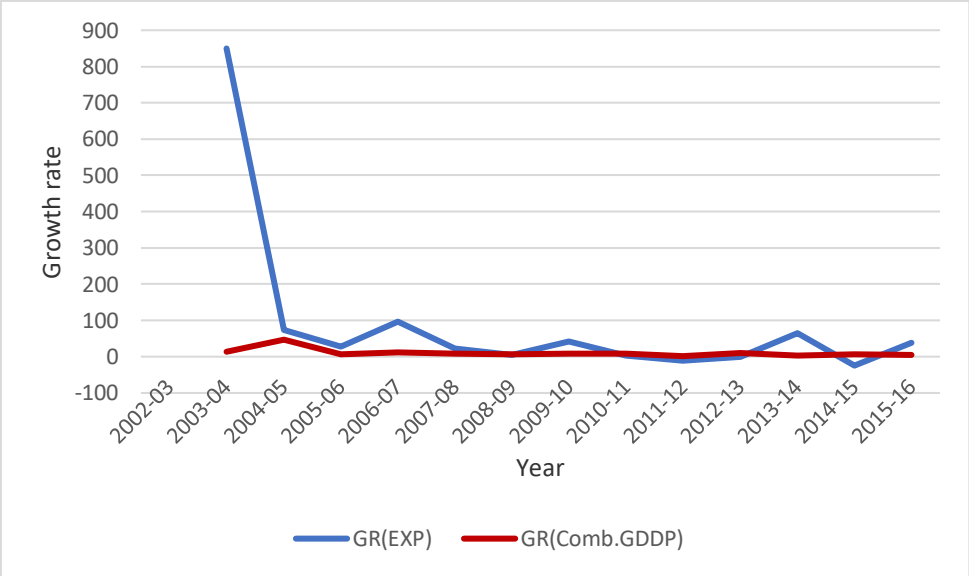


Table No. 4.4 and Figure No. 4.4 depicts the total combined expenditure on education and the combined Gross District Domestic Product with their growth rates for South division of Odisha which comprises of 10 districts viz; Baudh, Gajapati, Ganjam, Kalahandi, Kandhamal, Koraput, Malkangiri, Nabarangapur, Nuapada, Rayagada respectively.

The growth rate of expenditure on education was experienced at the peak for the year 2003-04 and then maintained a positive growth rate except for the years 211-12, 2012-13, 2014-15 which experience negative growth rates. While at the same time the combined district domestic product for central division shows a positive trend all over the period.

The combined expenditure for the year 2002-03 was Rs. 522.57 lakhs which was less than other two divisions but it has been increased to Rs. 61189.69 in 2015-16. Which is more than the other divisions.

The growth rate was high for all the three divisions in 2003-04, because of the initial investment through SSA.

4.2 Combined Expenditure and Gross District Domestic Product of All Three Divisions

Table No. 4.5 Educational Expenditure of All Divisions (In Lakhs)

Year	North div Exp	Central div Exp	South div Exp
2002-03	618.19	1385.4	522.57
2003-04	4838.63	5958.41	4962.93
2004-05	8785.27	9494.46	8651.73
2005-06	11962.95	14719.18	11029.28
2006-07	19822.34	23779.84	21682.57
2007-08	24062.53	27914.11	26571.87
2008-09	23670.48	29906.22	27621.28
2009-10	30467.36	38892.7	39035.1
2010-11	23963.81	29528.01	39886.21
2011-12	28331.77	41965.44	35588.77
2012-13	30958.59	57185.55	35517.21
2013-14	41073.18	69352.2	58288.8
2014-15	34288.32	42097.11	43994.82
2015-16	42783.16	50116.03	61189.69

Source: Directorate of economics and statistics & OPEPA, Bhubaneswar, Odisha.

Figure No. 4.5 Combined Educational Expenditure of all Divisions

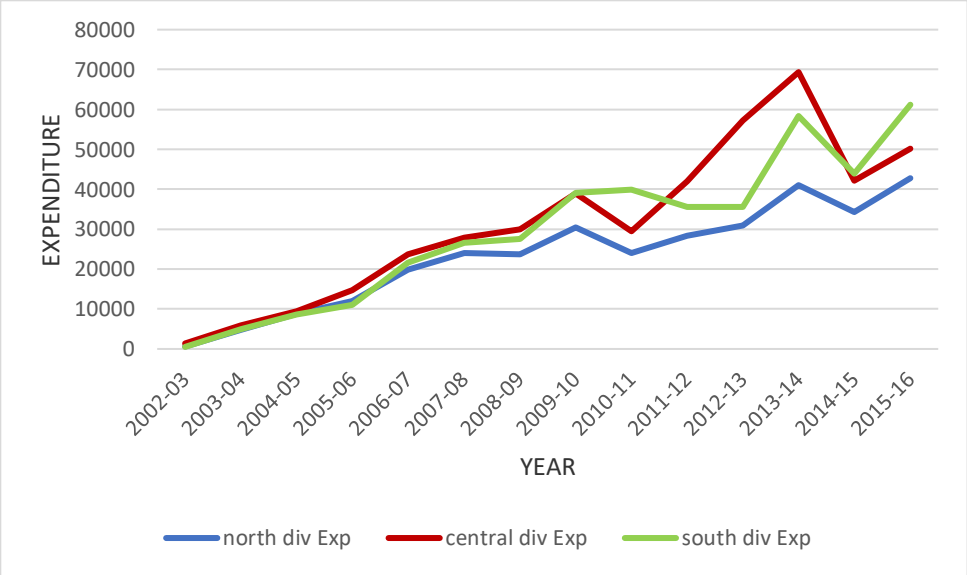


Table No. 4.5 and Figure No. 4.5 depicts the total combined educational expenditure for all the three divisions namely North, Central, and South Division respectively from 2002-03 to 2015-16. The line for all the three divisions show that the total expenditure for all divisions are increasing steadily. Starting from 2002-03 the highest expenditure was incurred on central division i.e. Rs. 1385.4 lakhs followed by north division; Rs. 618.19 lakhs and south division; Rs. 522.57 lakhs. In 2015-16 the expenditure for the south division was increased and is the highest among all the division i.e. Rs. 61189.69 lakhs against the central and north division i.e. Rs. 50116.03 and 42783.16 lakhs respectively because of the composition of sooth division i.e. most of the districts in south division belongs to backward and poor region mainly comprises of tribal and rural area. So the attention for the educational development have been drawn to these areas by sanctioning more funds which will help in educational and economic upliftment of these areas as it is proved that there exist a long-run relation between educational expenditure and economic growth.

Table No. 4.6 Combined GDDP of all Divisions (In Lakhs)

Year	North division	Central division	South division
2002-03	1532058	1856079	1075960
2003-04	1819129	2101832	1219381
2004-05	2895925	3086174	1790845
2005-06	3063931	3251431	1899110
2006-07	3512682	3634138	2123263
2007-08	3978539	3992614	2313409
2008-09	4325243	4291441	2464494
2009-10	4418238	4502571	2664307
2010-11	4697308	4941034	2874765
2011-12	4841300	5252184	2917816
2012-13	5442704	5542303	3234400
2013-14	5702741	5843293	3360609
2014-15	5968493	6153026	3602333
2015-16	6272885	6477788	3794856

Source: Directorate of economics and statistics & OPEPA, Bhubaneswar, Odisha.

Figure No. 4.6 Combined GDDP of all Divisions

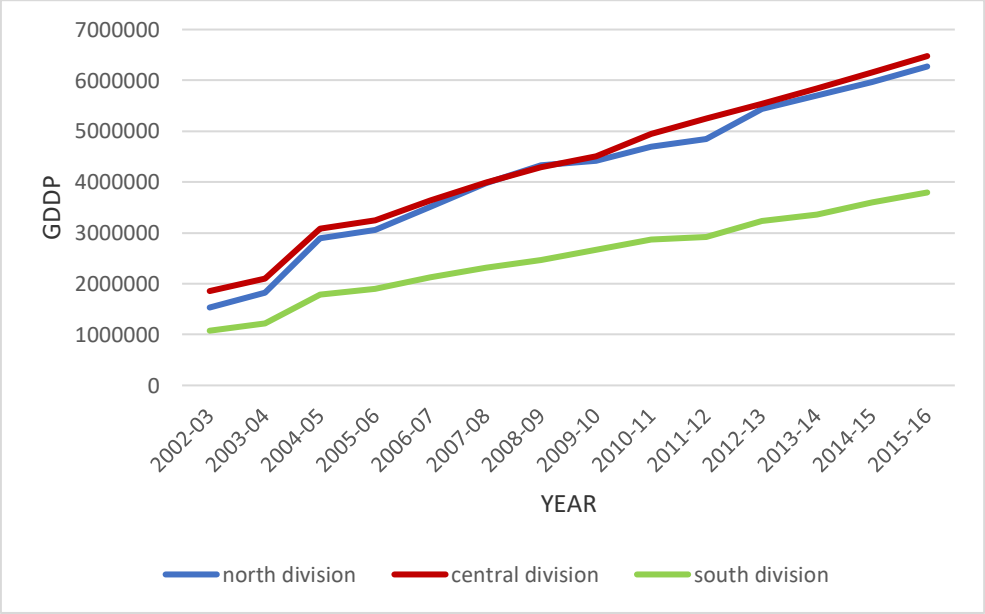


Table No. 4.6 and Figure No. 4.6 depicts the combined GDDP for all the three divisions namely North, Central, and South Division respectively from 2002-03 to 2015-16. The line for all the three divisions show that the combined GDDP for all divisions are increasing steadily. Starting from 2002-03 the highest income was recorded for on central division i.e. Rs. 1856079 lakhs followed by north division; Rs. 1532058 lakhs and south division; Rs. 1075960 lakhs. In 2015-16 the income for the south division remains low at Rs. 3794856 lakhs as compared to the other division because of its backwardness and poverty concentrated districts. While the central and north division competed with each other at a good growing trend from 2001-02 onwards i.e. North division recorded Rs. 6272885 lakhs and for central it was Rs. 6477788 lakhs respectively. The economic growth according to the GDDP values are for North and Central division are good and far ahead than the South division in which economy is growing but not as faster as other divisions.

4.3 Division wise Literacy rate

Table No. 4.7 District Wise Literacy Rate of North Division (In Percentage)			
Districts	**2001 census**	**2011 census**	**Change**
Anugul	68.79	77.53	8.74
Balangir	55.71	64.72	9.01
Bargarh	63.99	74.62	10.63
Debagarh	60.36	72.57	12.21
Dhenkanal	60.42	78.76	18.34
Jharsuguda	70.65	78.86	8.21
Kendujhar	59.24	68.24	9
Sambalpur	67.25	76.22	8.97
Sonepur	62.84	74.42	11.58
Sundargarh	64.86	73.34	8.48
Source: Directorate of economics and statistics Bhubaneswar, Odisha.			

Figure No. 4.7 Literacy Rate of North Division

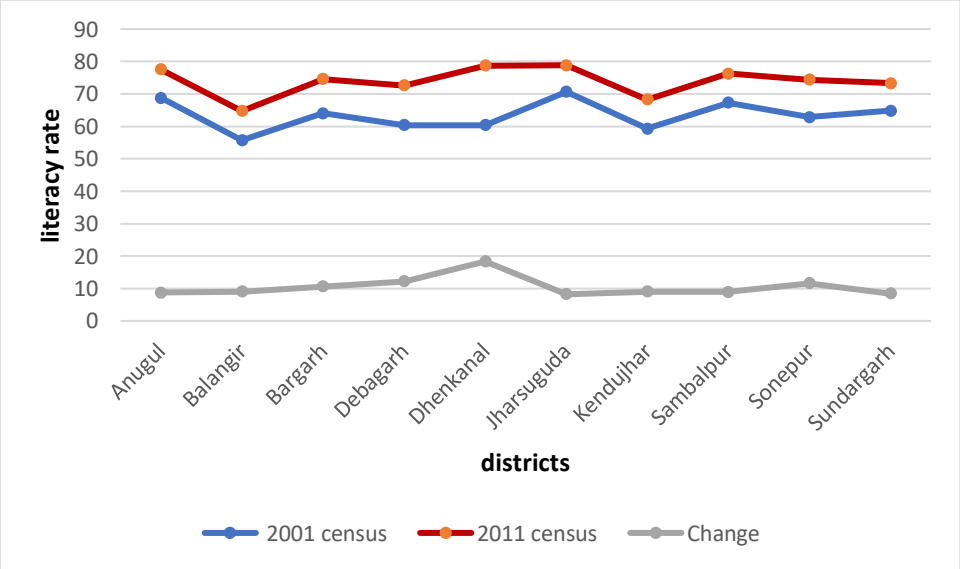


Table No. 4.7 and Figure No. 4.7 depicts the Literacy rate of all districts coming under north division both at 2001 and 2011 census and the recorded change. The highest literacy rate in 2011 was in Jharsuguda district (78.86%) followed by Dhenkanal(78.76%), Anugul(77.53%) and the lowest was in Balangir (64.72) followed by kendujhar(68.24%). Approximately on an average literacy rate increased around 10% for all 10 districts while dhenkanal recorded a highest change of 18.34% from 2001 to 2011.

Table No. 4.8 District Wise Literacy Rate of Central Division (In Percentage)

Districts	**2001 census**	**2011 census**	**Change**
Balasore	70.56	79.79	9.23
Bhadrak	73.86	82.78	8.92
Cuttack	76.66	85.5	8.84
Jagatsinghapur	79.08	86.59	7.51
Jajapur	71.44	80.13	8.69
Kendrapara	74.14	85.15	11.01
Khordha	79.59	86.88	7.29
Mayurbhanj	47.37	63.17	15.8
Nayagarh	70.52	80.42	9.9
Puri	77.96	84.67	6.71

Source: Directorate of economics and statistics Bhubaneswar, Odisha.

Figure No. 4.8 Literacy Rate of Central Division

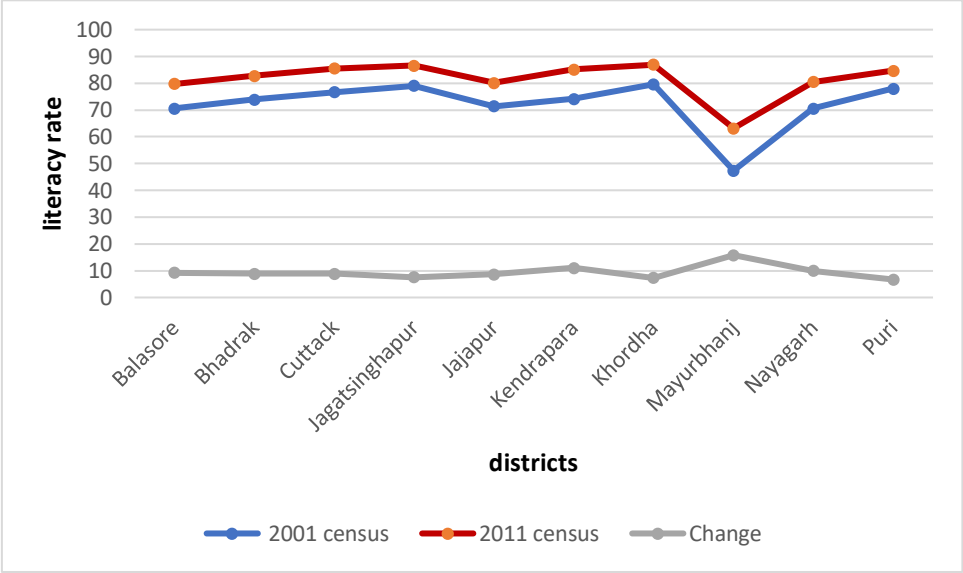


Table No. 4.8 and Figure No. 4.8 shows the Literacy rate of all districts coming under Central division both at 2001 and 2011 census and the recorded change. The highest literacy rate in 2011 was in Khorda district (86.88%) followed by Jagatsinghpur(86.59%), Cuttack(85.5%) and the lowest was in Mayurbhanj (64.72). Approximately on an average literacy rate increased around 10% for all 10 districts while Mayurbhanj recorded a highest change of 15.8% from 2001 to 2011. But after significance change in literacy rate of Mayurbhanj, it is one among all the 10 districts in central division having lowest literacy rate, highest tribal and rural population.

Table No. 4.9 District Wise Literacy Rate of South Division (In Percentage)

Districts	2001 census	2011 census	Change
Baudh	57.73	71.61	13.88
Gajapati	41.26	53.49	12.23
Ganjam	60.77	71.09	10.32
Kalahandi	45.94	59.22	13.28

Kandhamal	52.48	64.13	11.65
Koraput	35.72	49.21	13.49
Malkangiri	30.53	48.54	18.01
Nabarangapur	43.93	46.43	2.5
Nuapada	42	57.35	15.35
Rayagada	36.15	49.76	13.61
Source: Directorate of economics and statistics Bhubaneswar, Odisha.			

Figure No. 4.9 Literacy Rate of South Division

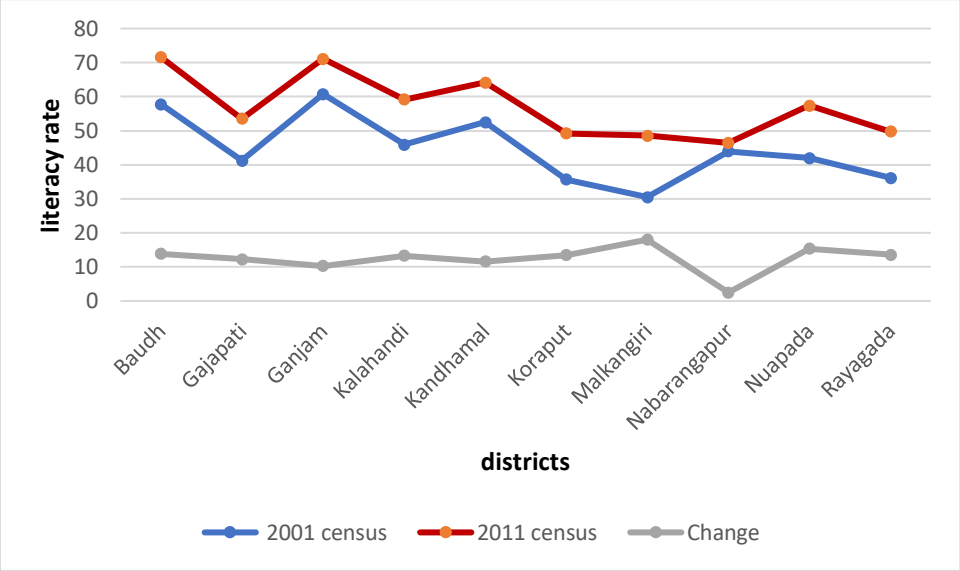


Table No. 4.9 and Figure No. 4.9 depicts the Literacy rate of all districts coming under South division both at 2001 and 2011 census and the recorded change. The highest literacy rate in 2011 was in Baudh (71.61%) followed by Ganjam (71.09%) and the lowest was in Nabarangapur (46.43%) followed by Malkangiri(48.54%) and Koraput (49.21%). Approximately the growth of literacy rate increased for all 10 districts and are more than the North and South division. Malkangiri recorded a highest change of 18.01% from 2001 to 2011 and Nabrangpur recorded the lowest i.e. 2.5%.

4.4 Conclusion

In spite of such contradistinctive composition of all three divisions in which 30 districts of Odisha has been divided based on geographical location i.e. North, Central and South, the data shows significant public financing on education.

The central division is comprised of mostly developed districts while North and South division are comprising of moderately developed and backward districts respectively. The South division separately identified because of its known backward region, tribal population and low economic growth as shown in the Figure 4.5. And this backwardness drew the attention of government which has been shown in Figure 4.4 i.e. the public expenditure for districts in south division has been increased which is more than the other two divisions. Some districts of north division and Mayurbhanj district of Central division also need special attention in order to make a move out from backwardness and illiteracy.

Only expending more will not rise the education level and economy growth, all that government need to do is to introduce necessary schemes, proper allocation fund, efficient management etc by which these deprived areas can overcome from illiteracy which is the main cause of all economic and social illness.

CHAPTER 5

EDUCATIONAL INFRASTRUCTURE FACILITIES IN ODISHA

5.1 Introduction

Infrastructure is an important tool for facilitating quality education in Elementary education system. Realizing the importance of infrastructure, both the central and the state government have undertaken several schemes to improve physical infrastructure of government schools. Sarva Shiksha Abhiyan (SSA) is one of the flagship programs of Government of India, which has been implemented in all the 30 districts of Odisha since 2001 in order to achieve universal elementary education. SSA has been implemented in Odisha with objective to provide elementary education of proper quality with focus on education for life.

Availability of physical Infrastructures are very crucial for providing satisfactory quality in elementary education. These physical infrastructures include provision of building, toilets, drinking water facility, electricity, computers, etc. In order to access the physical infrastructural development, it is important to take into account all the above stated infrastructure indicators separately. However, there is no particular indicator which will represent the infrastructure development of any school.

In order to investigate the available infrastructure related to Odisha, this chapter includes analysis and comparison of different physical infrastructure available state and nation wide; Total Government school, Total Private school, schools with drinking water, schools with playground facility, schools having electricity, schools with computer, schools with boundary wall, schools with common, boys and girls toilet etc for a period of 10 years from 2005-06 to 2015-16, with the help of Tabulation and graphical representation.

5.1.1 Total Number of Government and Private School in Odisha

Table No. 5.1 Total Government School

Year	Odisha	GR(Odisha)	India	GR(India)
2007-08	53667		1002915	
2008-09	55713	3.81	1035178	3.21
2009-10	53041	-4.79	1048046	1.24
2010-11	57179	7.80	1064604	1.57
2011-12	58023	1.47	1078407	1.29
2012-13	58355	0.57	1086720	0.77
2013-14	58412	0.09	1093969	0.66
2014-15	58573	0.27	1080757	-1.20
2015-16	58476	-0.16	1076994	-0.34

Source: District Information System for Education

Figure No. 5.1 Number of Total Government School

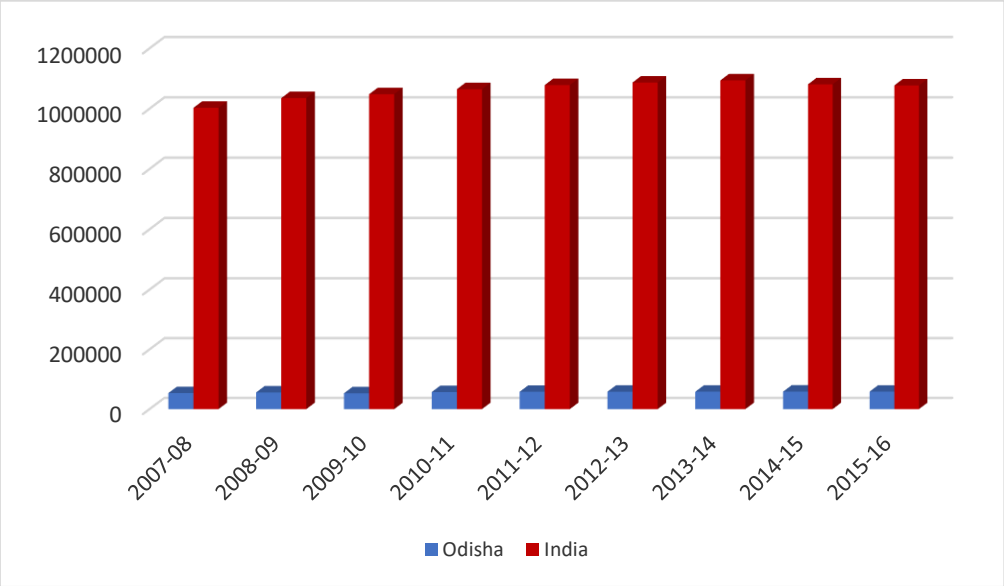


Figure No. 5.2 Growth Rate of Government School

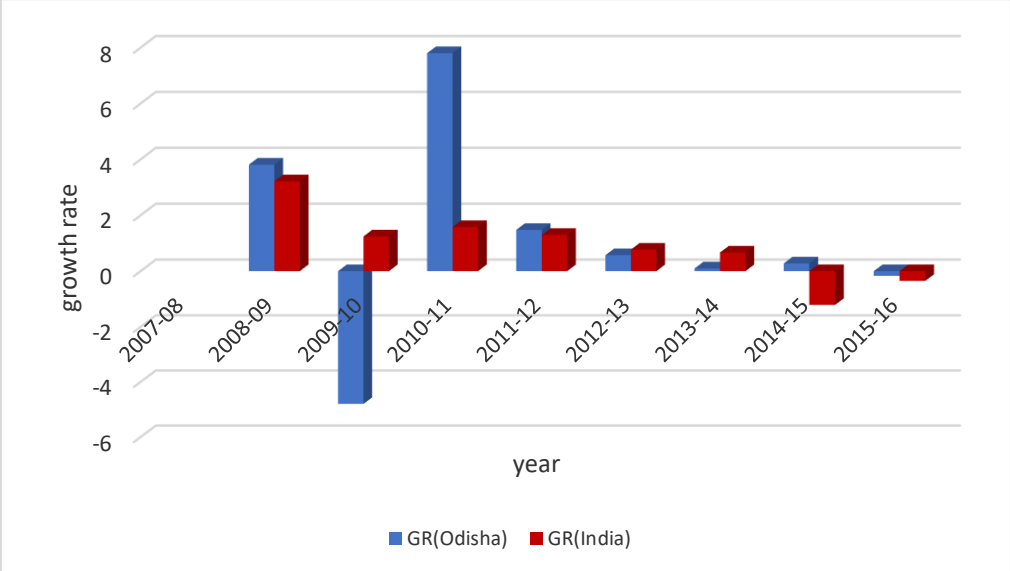


Table No. 5.1, Figure No. 5.1 and Figure No. 5.2 represents the total number of government school and the growth rate of government school both at state and national level. Number of government school in Odisha are increasing as represented in the table i.e. in 2007-08 the number of government school was 53667 which has been increased to 58476 in 2015-16. If we compare the growth rate of having government schools in Odisha with India then, Odisha is

performing well as the growth rate of number of government schools in Odisha is higher than the national growth rate.

Table No 5.2 Total Private School

Year	Odisha	GR(Odisha)	India	GR(India)
2007-08	5768		243895	
2008-09	6447	11.77	249920	2.47
2009-10	3732	-42.11	254178	1.70
2010-11	7060	89.17	264607	4.10
2011-12	7202	2.01	299357	13.13
2012-13	7418	2.99	307978	2.87
2013-14	7611	2.60	319990	3.90
2014-15	7995	5.04	328845	2.76
2015-16	8537	6.77	334468	1.70

Source: District Information System for Education

Figure No. 5.3 Number of Total Private School

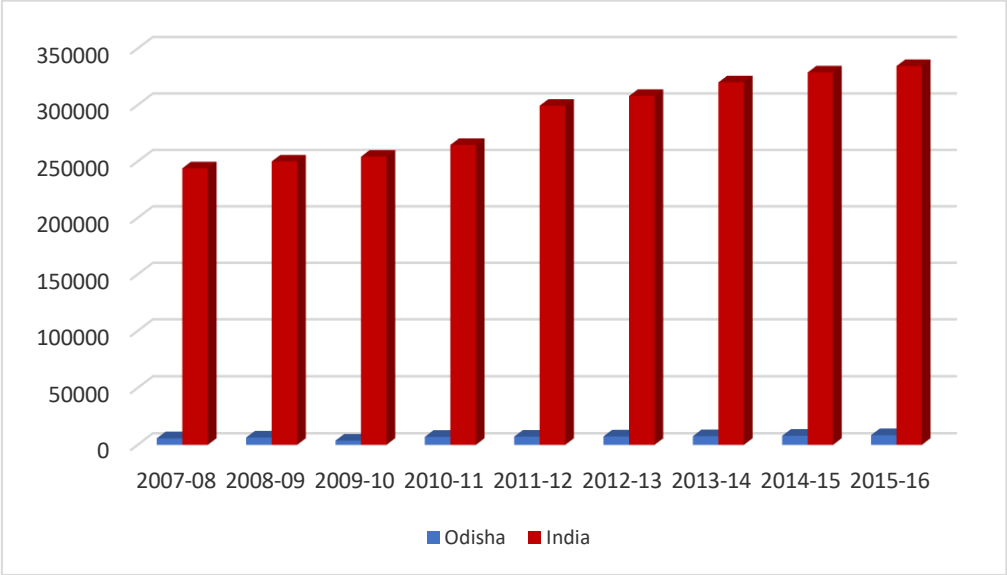


Figure No. 5.4 Growth Rate of Private School

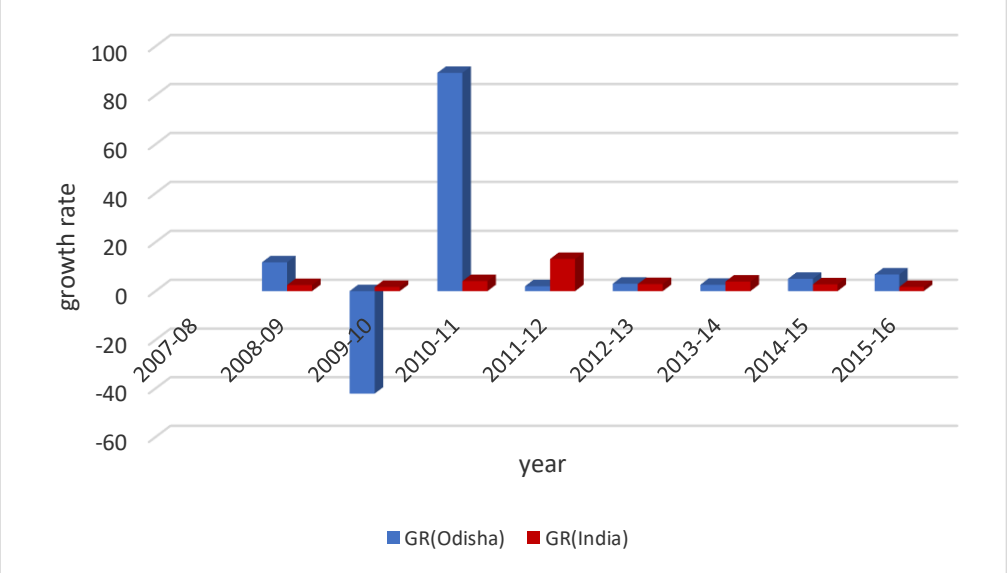


Table No. 5.2, Figure No. 5.3 and Figure No. 5.4 represents the total number of private school and the growth rate of private school both at state and national level. Number of private school in Odisha are increasing steadily as represented in the table i.e. in 2007-08 the number of private school was 5768 which has been increased to 8537 in 2015-16. If we compare the growth rate of private schools in Odisha with India, growth rate of number of private schools in Odisha is higher than the national growth rate. In 2009-10 the growth rate was negative but

in the next year i.e. 2010-11 the growth rate was almost 90%. Increased from 3732 private schools in 2009-10 to 7060 in 2010-11 and 8537 in 2015-16. The growth rate of private schools in Odisha was 6.77% as against the nationwide growth rate 1.70% in 2015-16.

The number of private school is no doubt less than the number of government school, but the rate at which the number of private school growing is faster than the rate of growth of number of government schools which shows the privatisation of education sector in Odisha.

5.1.2 Percentage of Schools with Drinking Water Facility in Odisha

Table No. 5.3 Percentage of Schools with Drinking Water

Year	Odisha	GR(Odisha)	India	GR(India)
2007-08	85.6	0	86.8	0
2008-09	83.3	-2.3	87.8	1
2009-10	89.1	5.8	92.6	4.8
2010-11	88.7	-0.4	92.7	0.1
2011-12	94.4	5.7	94.5	1.8
2012-13	94.8	0.4	94.9	0.4
2013-14	96.8	2	95.3	0.4
2014-15	98	1.2	96.1	0.8
2015-16	99.5	1.5	96.8	0.7

Source: District Information System for Education

Figure No. 5.5 Percentage Schools with Drinking Water

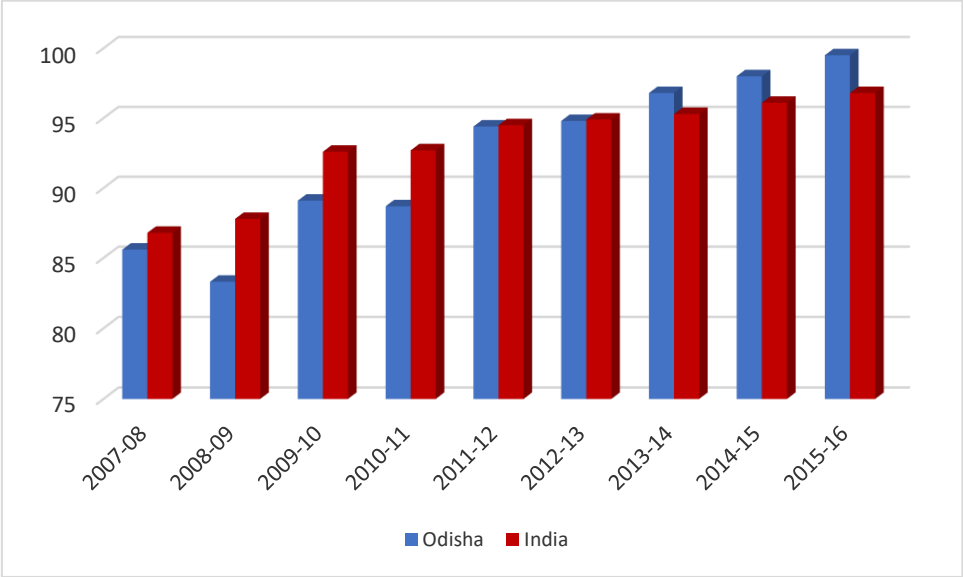


Figure No. 5.6 Growth Rate of Schools with Drinking Water

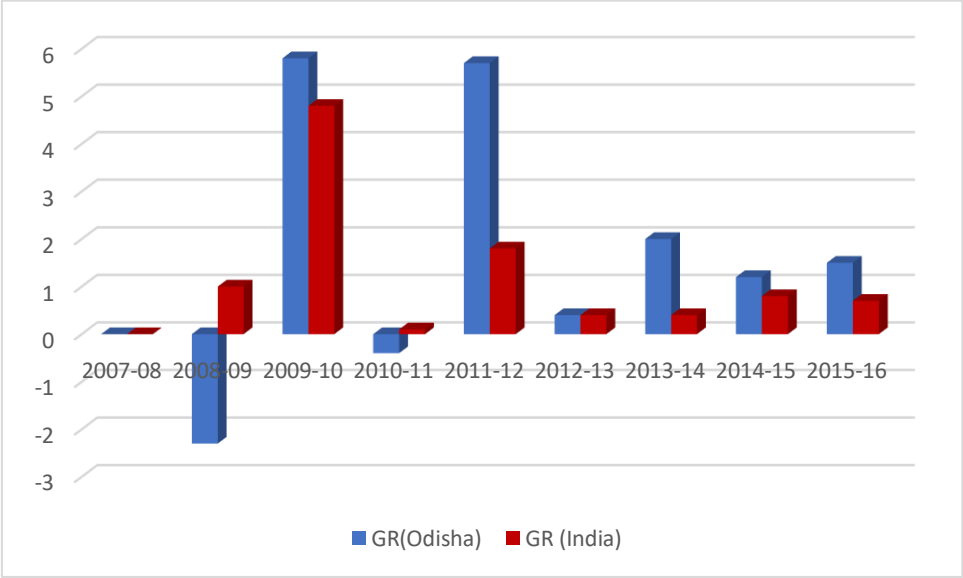


Table No. 5.3, Figure No. 5.5 and Figure No. 5.6 represents the percentage of schools with drinking water facility and the growth rate of schools with drinking water facility both at state and national level. Percentage of schools with drinking water facility in Odisha are increasing steadily as represented in the table i.e. in 2007-08 the Percentage of schools with drinking water facility was 85.6% for Odisha as against India's i.e. 86.8% which has been increased to 99.5% for Odisha and 96.8% for India in 2015-16. If we compare the growth rate of percentage of

schools with drinking water facility in Odisha with India, growth rate in Odisha is higher than the national growth rate. For Odisha, the growth rate of Schools with drinking water facility is 1.5% as against the national growth rate 0.7% in 2015-16.

5.1.3 Percentage of Schools with Playground Facility in Odisha

Table No. 5.4 Percentage of School with Playground Facility

Year	Odisha	GR(Odisha)	India	GR(India)
2009-10	23.7	0	54.8	0
2010-11	29.3	5.6	55	0.2
2011-12	29.7	0.4	56.1	1.1
2012-13	29.7	0	56.6	0.5
2013-14	29.7	0	58.1	1.5
2014-15	29.6	-0.1	59.8	1.7
2015-16	30.3	0.7	60.6	0.8

Source: District Information System for Education

Figure No. 5.7 Percentage of School with Playground Facility

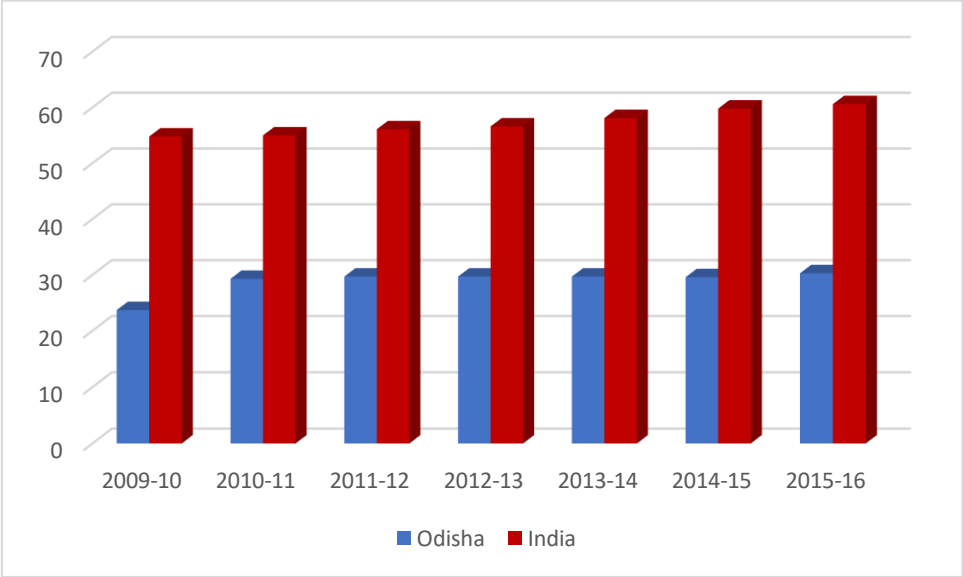


Figure No. 5.8 Growth Rate of School with Playground Facility

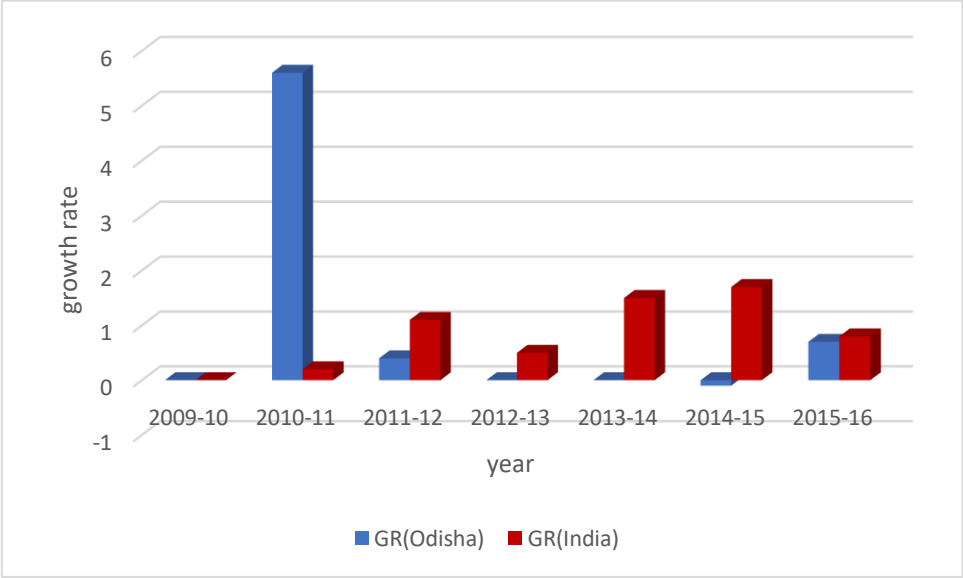


Table No. 5.4, Figure No. 5.7 and Figure No. 5.8 represents the percentage of schools with playground facility and the growth rate of schools with playground facility both at state and national level. Percentage of schools with playground facility in Odisha is rising but not up to the mark as represented in the table i.e. in 2007-08. The Percentage of schools with playground facility is only 23.7% for Odisha as against India i.e. 53.8% for the year 209-10 which has been increased to 30.3% for Odisha and 60.6% for India in 2015-16 which is exactly the double of

Odisha. If we compare the growth rate of percentage of schools with playground facility in Odisha with India, growth rate in Odisha is very low than the national growth rate. For Odisha, the growth rate of Schools with playground facility is 0.7% as against the national growth rate 0.8% in 2015-16. Talking about Odisha, half of the taken year are showing zero or negative growth rate while for India the growth rate is positive and increasing.

5.1.4 Percentage of Schools with Boy's and Girl's Toilet in Odisha

Table No. 5.5 Percentage of Schools with Boys' Toilet

Year	Odisha	GR(Odisha)	India	GR(India)
2009-10	14.7	0	31	0
2010-11	17.5	2.8	42.6	11.6
2011-12	76.7	59.2	81.1	38.5
2012-13	21.1	-55.6	67.1	-14
2013-14	95.3	74.2	94.5	27.4
2014-15	95.3	0	95.4	0.9
2015-16	93.8	-1.5	97.1	1.7

Source: District Information System for Education

Figure No. 5.9 Percentage of Schools with Boys' Toilet

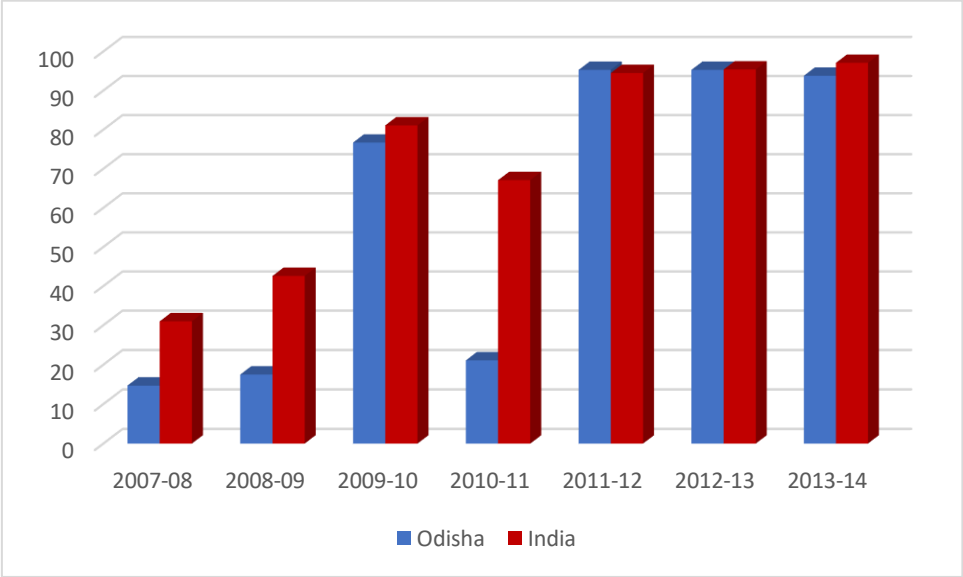


Figure No. 5.10 Growth Rate of Schools with Boys' Toilet

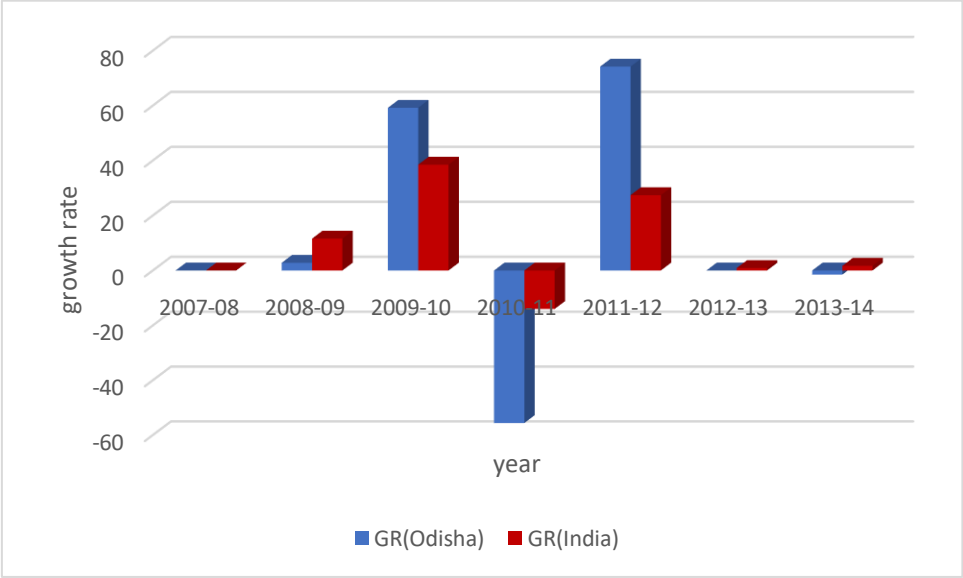


Table No. 5.5, Figure No. 5.9 and Figure No. 5.10 represents the percentage of schools with boys' toilet facility and the growth rate of schools with boys' toilet facility both at state and national level. Percentage of schools with boys' toilet facility in Odisha as well as India has increased rapidly as represented in the table i.e. in 2009-10 the Percentage of schools with boys' toilet facility was only 14.7% for Odisha as against India's i.e. 31% which has been increased to 93.8% for Odisha and 97.1% for India in 2015-16. Growth rate of percentage of

schools with boys' toilet facility in Odisha and India, is increasing and achieved a good growth after 2013.

Table No. 5.6 Percentage of Schools with Girls' Toilet

Year	Odisha	GR(Odisha)	India	GR(India)
2007-08	28	0	50.6	0
2008-09	34	6	53.6	3
2009-10	37.9	3.9	58.8	5.2
2010-11	38.2	0.3	60.3	1.5
2011-12	41.1	2.9	72.2	11.9
2012-13	68.5	27.4	88.3	16.1
2013-14	68.9	0.4	84.6	-3.7
2014-15	76.8	7.9	87.1	2.5
2015-16	97.1	20.3	97.6	10.5

Source: District Information System for Education

Figure No. 5.11 Percentage of Schools with Girls' Toilet

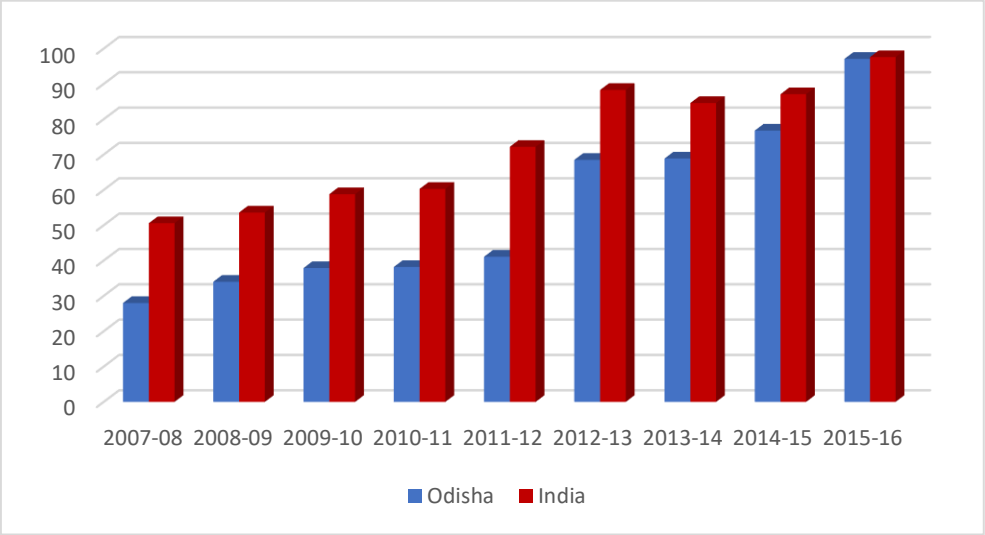


Figure No. 5.12 Growth Rate of Schools with Girls' Toilet

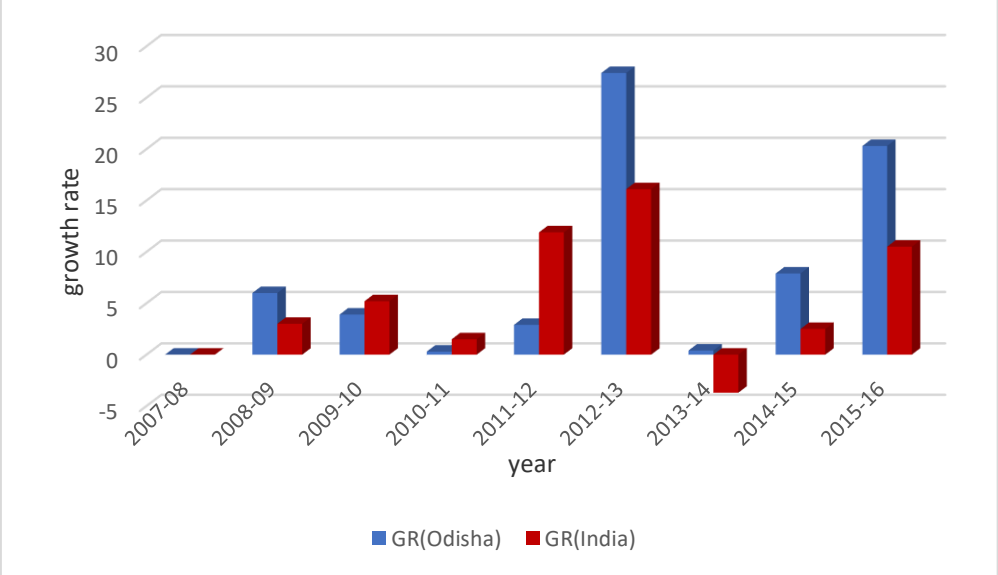


Table No. 5.6, Figure No. 5.11 and Figure No. 5.12 represents the percentage of schools with girls' toilet facility and the growth rate of schools with girls' toilet facility both at state and national level. Percentage of schools with girls' toilet facility in Odisha as well as India has increased rapidly as represented in the table i.e. in 2009-10 the Percentage of schools with girls' toilet facility was only 28% for Odisha as against India's i.e. 50.6% which has been increased to 97.1% for Odisha and 97.6% for India in 2015-16. Growth rate of percentage of schools with

boys' toilet facility in Odisha is increasing and achieved a good growth after till date in comparison with national level.

5.1.5 Percentage of Schools with Electricity Facility in Odisha

Table No. 5.7 Percentage Schools having Electricity

Year	Odisha	GR(Odisha)	India	GR(India)
2008-09	18.6	0	35.6	0
2009-10	15.8	-2.8	39	3.4
2010-11	20.4	4.6	43.1	4.1
2011-12	21.8	1.4	47.1	4
2012-13	23.9	2.1	49.9	2.8
2013-14	26	2.1	51.7	1.8
2014-15	29.6	3.6	58.9	7.2
2015-16	32.1	2.5	61.7	2.8

Source: District Information System for Education

Figure No. 5.13 Percentage of Schools having Electricity

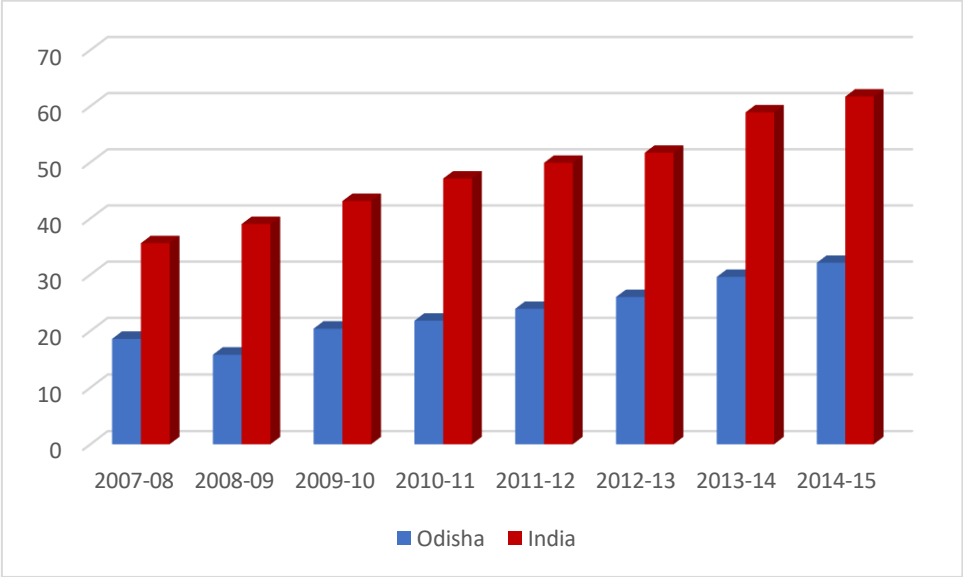


Figure 5.14 Growth rate of Schools having Electricity

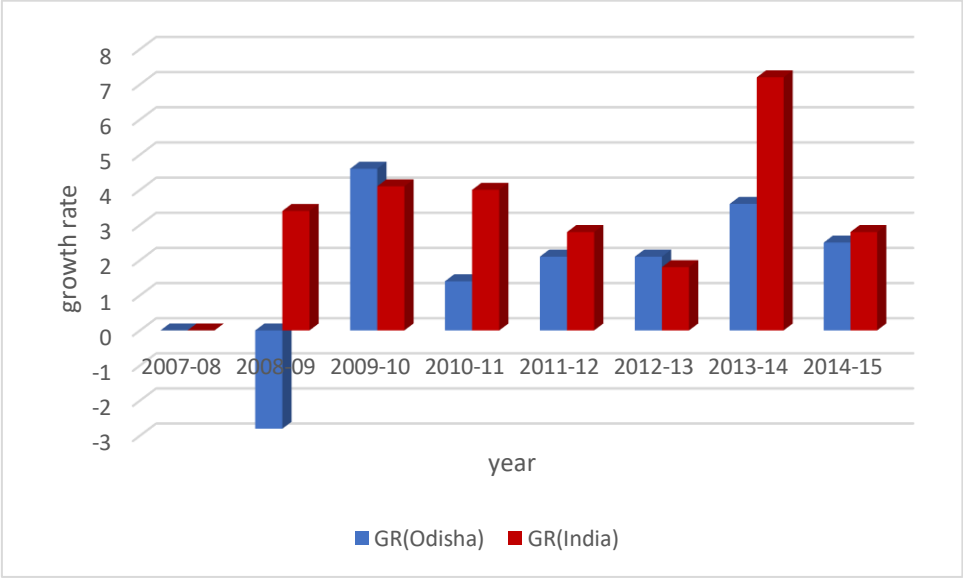


Table No. 5.7, Figure No. 5.13 and Figure No. 5.14 represents the percentage of schools with electricity facility and the growth rate of schools with electricity facility both at state and national level. Percentage of schools with electricity facility in Odisha is rising but not up to the mark as represented in the table i.e. in 2007-08. The Percentage of schools with electricity facility was only 18.6% for Odisha as against India i.e. 35.6% for the year 2008-09 which has been increased to 32.1% for Odisha and 61.7% for India in 2015-16 which is nearly the

double of Odisha. If we compare the growth rate of percentage of schools with electricity facility in Odisha with India, growth rate in Odisha is very low than the national growth rate. For Odisha, the growth rate of Schools with electricity facility is 2.5% as against the national growth rate 2.8% in 2015-16.

5.1.6 Percentage of Schools with Computer Facility in Odisha

Table No. 5.8 Percentage of Schools with Computer

Year	Odisha	GR(Odisha)	India	GR(India)
2007-08	8	0	14.3	0
2008-09	7.5	-0.5	14.1	-0.2
2009-10	7.3	-0.2	16.7	2.6
2010-11	8.5	1.2	18.7	2
2011-12	9	0.5	20.5	1.8
2012-13	9.2	0.2	22.1	1.6
2013-14	10.6	1.4	23.3	1.2
2014-15	13.6	3	25.2	1.9
2015-16	14.4	0.8	26	0.8

Source: District Information System for Education

Figure No. 5.15 Percentage of Schools with Computer

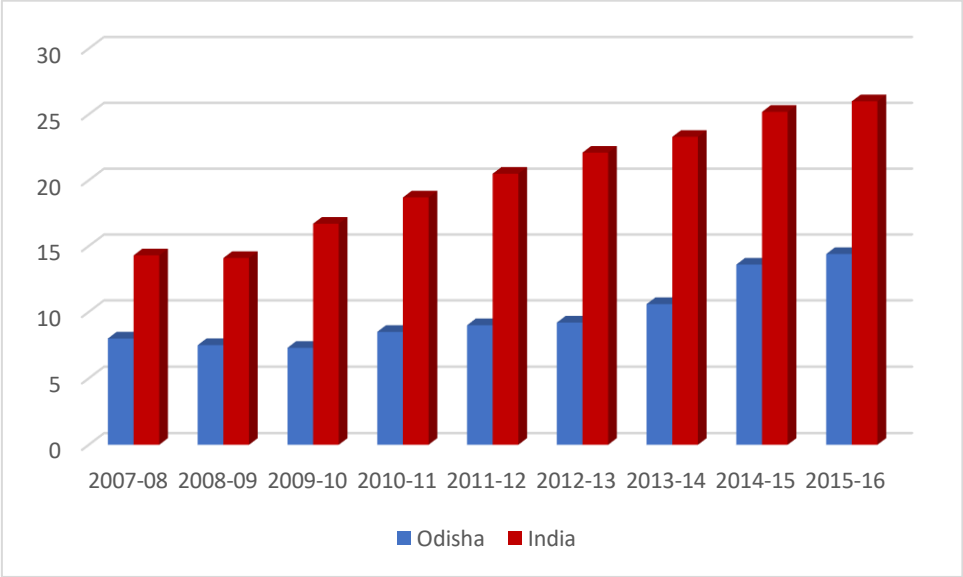


Figure No. 5.16 Growth Rate of Schools with Computer

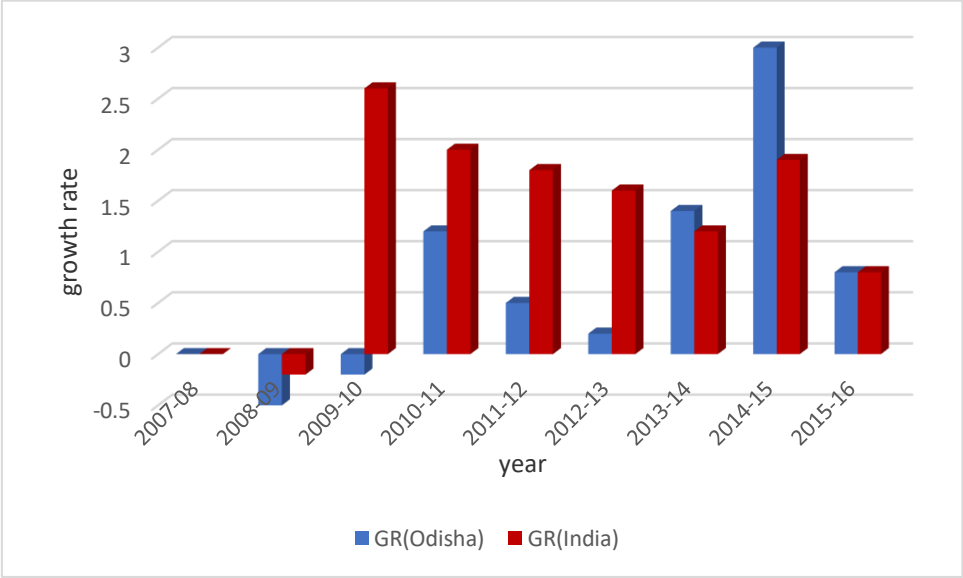


Table No. 5.8, Figure No. 5.15 and Figure No. 5.16 represents the percentage of schools with computer facility and the growth rate of schools with computer facility both at state and national level. This is one of the important factor of educational development we need to concern about when we talk about Digitalisation of India. Percentage of schools with computer facility is rising but neither in India or Odisha it is up to the mark as represented in the table. The Percentage of schools with computer facility was only 8% for Odisha as against India i.e.

14.3% for the year 2007-08 which has been increased to 14.4% for Odisha and 26% for India in 2015-16 which is very less. If we compare the growth rate of percentage of schools with computer facility in Odisha with India, growth rate in Odisha is very low than the national growth rate.

5.1.7 Percentage of Schools with Boundary Wall Facility in Odisha

Table No. 5.9 Percentage of Schools with Boundary wall

Year	Odisha	GR(Odisha)	India	GR(India)
2007-08	59.6	0	50.2	0
2008-09	59.1	-0.5	51	0.8
2009-10	57.6	-1.5	51.5	0.5
2010-11	58.8	1.2	55.4	3.9
2011-12	62.4	3.6	58.2	2.8
2012-13	64.9	2.5	59.5	1.3
2013-14	65.8	0.9	61.9	2.4
2014-15	67.5	1.7	64.5	2.6
2015-16	68.2	0.7	64.9	0.4

Source: District Information System for Education

Figure No. 5.17 Percentage of Schools with Boundary wall

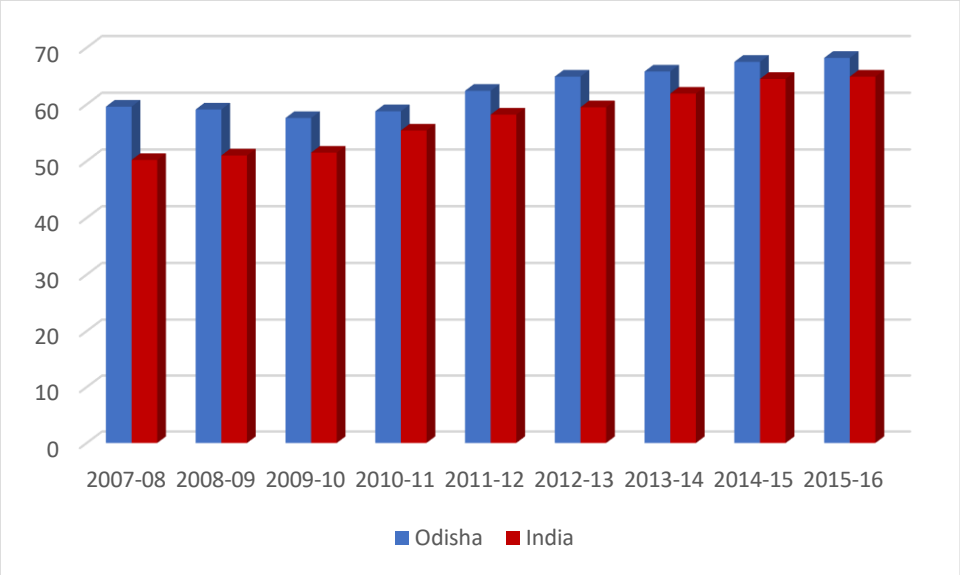


Figure No. 5.18 Growth Rate of Schools with Boundary wall

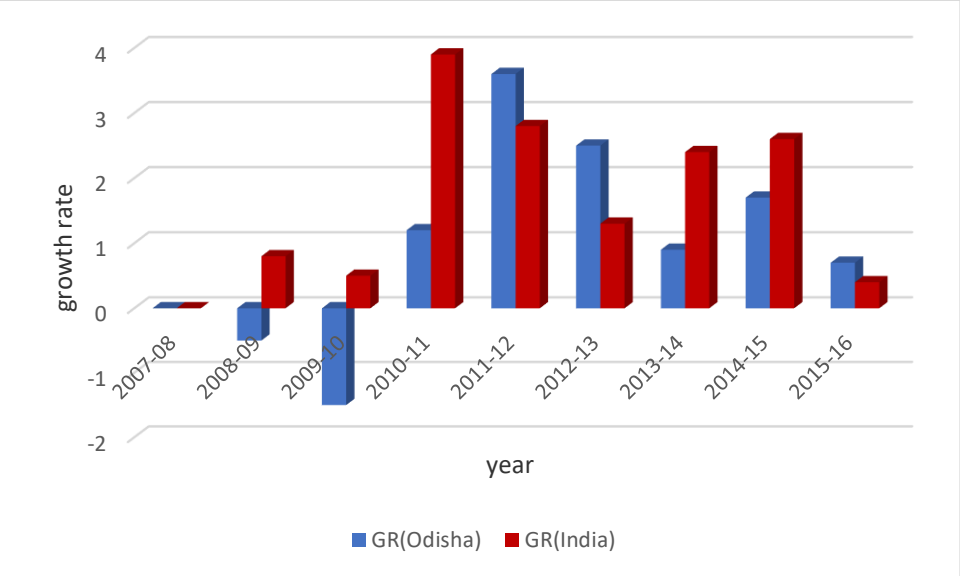


Table No. 5.9, Figure No. 5.17 and Figure No. 5.18 represents the percentage of schools with boundary wall facility and the growth rate of schools with boundary wall facility both at state and national level. Percentage of schools with boundary wall facility is rising in Odisha more steadily in comparison with India as represented in the table. The Percentage of schools with

boundary wall facility was 59.6% for Odisha as against India i.e. 50.2% for the year 2007-08 which has been increased to 68.2% for Odisha and 64.9% for India in 2015-16 which shows the better performance of Odisha if we compare with India. If we compare the growth rate of percentage of schools with boundary wall facility in Odisha with India, growth rate in Odisha was negative initially but captured a steady pace after 2011 which is more or less equivalent to the national growth rate.

5.2 Rank of Odisha Among Other States at Different Infrastructural Parameters

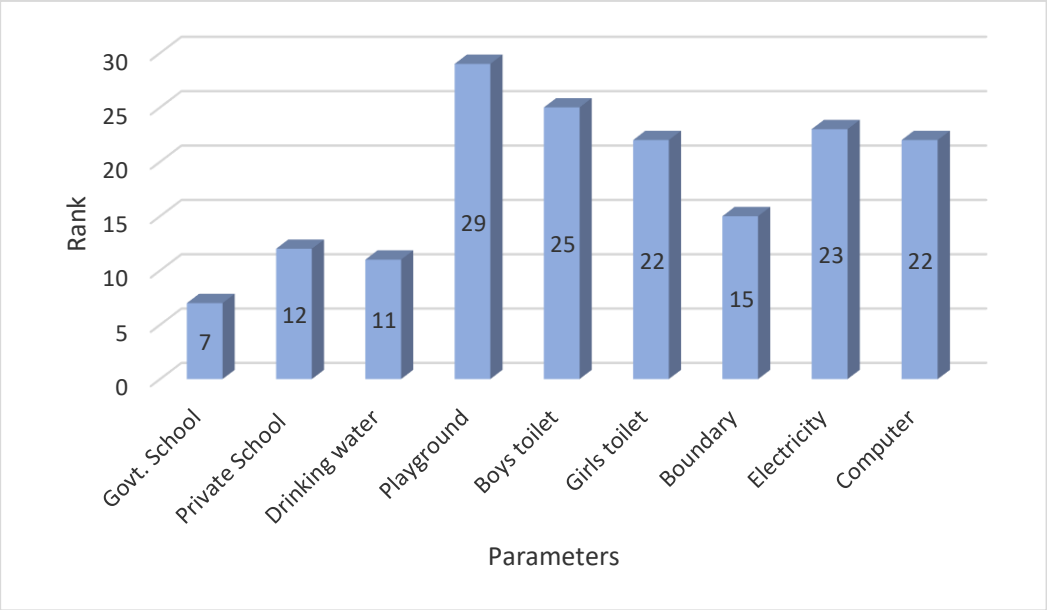
To trace the progress in different infrastructural development related to education in Odisha the rank order for those parameters has been calculated for the latest period and the earlier period. Which shows the place of Odisha among all 29 states of India.

Table No. 5.10 Rank of Odisha in Different Infrastructural Development, 2015-16

Parameters	**Rank** (2007-08)	**Rank** (2015-16)
Total no. of Govt. School	9	7
Total no. of Private School	13	12
Drinking water facility	15	11
Girls toilet facility	18	22
Boundary facility	10	15
Computer facility	21	22

Parameters	**Rank** (2009-10)	**Rank** (2015-16)
Playground facility	27	29
Boys toilet facility	22	25
Electricity	20	23
Source: Calculated by Author		

Figure No. 5.19 Rank of Odisha at different Infrastructural Parameter (2015-16)



The rank of Odisha has been calculated for different parameters as shown in the Table No. 5.10. There is significant improvement in three parameters of infrastructure if we compare the rank of Odisha in 2015-16 with the earliest period namely; Total no. of Govt. School, Total no.

of Private School and Drinking water facility. Remaining parameters showing decreasing rank. States like Goa, Gujarat, Tamilnadu, kerala and so on are performing good in all most all the parameters. The declining rank of Odisha in many infrastructural developments are mainly because of inefficient public expenditure. So, the government needs to be more concern about this issue as those infrastructure developments are the important factors of educational development.

5.3 Conclusion

The analysis of different infrastructural parameter related to education like; total no. govt school, total no. of private school, percentage of school with drinking water facility, percentage of school with playground facility, percentage of school with boys' toilet facility, percentage of school with girls' toilet facility, percentage of school with electricity facility, percentage of school with computer facility, and percentage of school with boundary wall facility concludes that, Odisha is performing well at infrastructural parameters like; drinking water facility, boys' and girls' toilet facility and boundary wall facility. There is a significant development in these four parameters as recorded from the data. But if we talk about playground, electricity and computer facility the state is still lagging far behind if we compare with India and other states. As electricity is the crucial factor for operating computers, the low availability of electricity is obstructing the path of digitalisation. Talking about the number of government and private school, the data shows government schools are losing their enrolment to private schools as the growth rate of private school is more both in case of Odisha and India. So, it is really a matter of concern for the state as well as the central government to look after the government schools, how the enrolment and quality of education can be enhanced, and how students can be facilitated with the availability of electricity, computer and internet which will help with rigorous development in knowledge creation. And these small steps in the sector of education can lead to big achievement in future which will surely beneficial to our nation.

CHAPTER 6

CAUSALITY BETWEEN EXPENDITURE ON EDUCATION AND ECONOMIC GROWTH

6.1 Introduction

This chapter is an attempt which deals with different models adopted in the study in order to examine the causal relationship between educational expenditure and economic growth. The study starts with unit root/ stationarity test to check whether the series taken are stationary or not. And then after conforming the stationarity it moves to Cointegration test and a Vector Auto Regressive (VAR) model to check the association among variables.

6.2 Unit root test

The study anticipates a VAR model in which it is desirable that the variables may be non-stationary at level but, after first or second difference they should become stationary. This study uses Augmented Dickey Fuller (ADF) test to examine whether the series got unit root or not. The variables are taken in the natural log form and tested at level, at first difference and at second difference. And in each stage variables are tested for three criteria: only intercept, intercept with trend, no trend no intercept.

Hypothesis for ADF test are:

H0: variable got unit root or not stationary

H1: variable is stationary

With the following assumption, the null hypothesis i.e. variable got unit root is rejected

i) Absolute value of test statistics should be more than critical value at 5% level of significance.
ii) P- Value should be significant at 5% level.

6.2.1 Unit root at level

In order to check and make the variable as stationary it is the first step to examine whether the variables at level got unit root or not.

Table No. 6.1 ADF test at level

Variable	GSDP			EDU		
ADF model	Intercept	Intercept with trend	No trend and intercept	Intercept	Intercept with trend	No trend and intercept
Test statistics	0.428	-1.782	5.788	0.271	-1.374	5.946
p-value	0.673	0.089	0.000	0.789	0.184	0.000
5% critical value	-3.000	-3.600	-1.950	-3.000	-3.600	-1.950

Source: *Calculated by Author using STATA 13*

Table No. 6.1 shows the result of ADF test at level. Analysing GSDP, the test statistics at three different models; intercept, intercept with trend, no trend and intercept are; 0.428, -1.782 & 5.788 respectively which are less than the 5% critical value (except no trend & intercept).

Analysing EDU, the test statistics at three different models; intercept, intercept with trend, no trend and intercept are; 0.271, -1.374, & 5.946 respectively which are less than the 5% critical value (except no trend & intercept).

The results indicate that the null hypothesis cannot be rejected which means variables got unit root or are non-stationary at level.

6.2.2 Unit root at first difference

In the first step, the variables got unit root or are non-stationary. So, to make them stationary this is the second step i.e. unit root at first difference.

Table No. 6.2 ADF test at first difference						
Variable	GSDP			EDU		
ADF model	Intercept	Intercept with trend	No trend and intercept	Intercept	Intercept with trend	No trend and intercept
Test statistics	-5.554	-5.730	-2.783	-3.144	-3.123	-1.688
p-value	0.000	0.000	0.011	0.005	0.005	0.105
5% critical value	-3.000	-3.600	-1.950	-3.000	-3.600	-1.950

Source: *Calculated by Author using STATA 13*

Table No. 6.2 shows the result of ADF test at first difference. Analysing GSDP, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -5.544, -5.730 and -2.783 respectively which are more than the 5% critical value.

Analysing EDU, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -3.144, -3.123, and -1.688 respectively which are less than the 5% critical value (except intercept)

The results indicate that the null hypothesis cannot be rejected which means variables still got unit root or are non-stationary at first difference.

6.2.3 Unit root at second difference

In the second step, the variables still got unit root or are non-stationary. So, to make them stationary this is the third step i.e. unit root at second difference.

Table No. 6.3 ADF test at second difference						
Variable	GSDP			EDU		
ADF model	Intercept	Intercept with trend	No trend and intercept	Intercept	Intercept with trend	No trend and intercept
Test statistics	-10.564	-10.326	-10.836	-5.227	-5.141	-5.349

p-value	0.000	0.000	0.000	0.000	0.000	0.000
5% critical value	-3.000	-3.600	-1.950	-3.000	-3.600	-1.950

Source: *Calculated by Author using STATA 13*

Table No. 6.3 shows the result of ADF test at second difference. Analysing GSDP, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -10.564, -10.326 and -10.836 respectively which are more than the 5% critical value.

Analysing EDU, the test statistics at three different models; intercept, intercept with trend, no trend & intercept are; -5.227, -5.141 and -5.349 respectively which are more than the 5% critical value.

The p-value for all the model of GSDP as well as EDU are less than 5 % level, which shows the significance of the model.

The results indicate that the null hypothesis is rejected which means variables still got no unit root or are stationary at second difference which is desirable for further test of VAR or VECM.

6.3 Lag order selection test

Table No. 6.4 Lag order selection test

Lag	p-value	LL	LR	FPE	AIC	HQIC	SBIC
0		-438.956		1.2e+23	58.7942	58.7932	58.8886
1	0.000	-396.963	83.987	7.5e+20	53.7284	53.7254	54.0116
2	0.387	-394.893	4.141	1.0e+21	53.9857	53.9806	54.4577
3	0.053	-390.219	9.3467	1.0e+21	53.8959	53.8889	54.5567
4	0.009	-383.414	13.61	8.7e+20	53.5219	53.5129	54.3716
5	0.001	-374.33	18.17	6.9e+20	52.8439	52.8329	53.8824
6	0.000	-356.693	35.274	3.0e+20*	51.0257	51.0126	52.253
7	0.000	487.98	1689.3		-61.064*	-61.079*	-59.6479*

8		447.336	-81.287		-55.6448	-55.6599	-54.2287
9	0.000	483.609	72.546*		-60.4812	-60.4963	-59.0651
10		482.997	-1.2247		-60.3996	-60.4146	-58.9835

Source: *Calculated by Author using STATA 13*

This test is one of the vital test in this study as it decides the maximum lag to be taken in our model.

In Table No. 6.4 FPE (Final Prediction Error) criteria is suggesting to take lag 6 and LR suggesting 9 while all other three criteria; AIC (Akaike Information Criterion), HQIC (Hanan-Quinn Information Criterion), SBIC (Schwarz Information Criterion) are suggesting to take maximum lag of 7 which are denoted with star (*) in the above table. So, the maximum lags to be used for this study is seven.

6.4 Johansen Co-integration test

The mission is to determine in a bivariate framework whether or not expenditure on education (EDUEXP) and (GSDP) variables have association in long-run and the pre-condition is the variables are having unit roots at level and no unit root at first or second difference. The variables are taken with their natural log with the following hypothesis.

Hypothesis for Johansen Co-integration test is:

H0: There is no co-integration among variables

H1: There is cointegration among variables

Table No. 6.5 Johansen Co-integration test

	Trace statistics			**Max eigen value statistics**		
Maximum rank	Eigen value	Trace statsistics	5% critical value	Eigen value	max statsistics	5% critical value
0	-	38.8023	15.41	-	37.1484	14.07

1	0.87303	1.6539*	3.76	0.87303	1.6539*	3.76
2	0.08779	-	-	0.8779	-	-

Source: *Calculated by Author using STATA 13*

In Table No. 6.5 The trace statistics and maximum eigen value statistics suggest that null hypothesis can be rejected i.e. GSDP and EDU are cointegrated and have no long-run association.

The value of trace statistics 38.8023 and max statistics 37.1484 are more than the 5% critical value at maximum rank zero and 1.6539 for both trace statistics and max statistics which is less than 5% critical value at maximum rank 1. So, the model suggests that null hypothesis can be rejected meaning variables are cointegrated with each other i.e. GSDP and EDU have long run association.

6.5. Granger Causality test

The granger causality test helps in determine the directional causality i.e. whether the one variable with lags jointly can cause the other variable or not. This test will also help in determine one of the two hypotheses of the study i.e. whether there is bi-directional causality between variables or not.

Hypothesis for Granger Causality test are:

H0: all the GSDP lagged variable does not cause EDU

H0: all the EDU lagged variable does not cause GSDP

Table No. 6.6 Granger Causality test					
Null	**Equation**	**excluded**	**Chi 2**	**P-value**	**Decision**
EDU does not Granger cause GSDP	lnGSDP	EDU	15.754	0.008	Reject
		ALL	15.754	0.008	
GSDP does not Granger cause EDU	lnEDU	GSDP	32.763	0.000	Reject
		ALL	32.763	0.000	

Source: *Calculated by Author using STATA 13*

As shown in the above Table No. 6.6 the null hypothesis is rejected as the p-values are less than the 5% level. The results suggest that there is bi-directional causality between GSDP and EDU. i.e. causality runs from EDU to GSDP as well as from GSDP to EDU.

6.6 Vector Error Correction Model (VECM)

We have already seen our two variable GSDP and EDU are cointegrated so it is clear that there is long run association between variable. Therefore, to check short run causality and the speed of convergence or divergence towards equilibrium the study tests the Vector Error Correction Model.

Table No. 6.7 VECM estimation for GSDP AND EDU				
Variables		**Statistics**		
	Independent variable	**Coefficient**	**Standard error**	**p-value**
Dependent variable = GSDP	Ce 1 L1	**-.0573964**	.243739	0.814
	EDU L1	-.0130109	.115066	0.910
	EDU L2	-.0586639	.1369286	0.668
	EDU L3	-.1874557	.1198328	0.118
	EDU L4	-.1583167	.117433	0.178

	Independent variable	Coefficient	Standard error	p-value
Dependent variable = EDU	Ce 1 L1	**.9746606**	.4440117	0.028
	GSDP L1	.4440117	.6987905	0.195
	GSDP L2	-.9371199	.6346489	0.140
	GSDP L3	-1.167209	.6203342	0.060
	GSDP L4	.562933	.6064213	0.353

Source: *Calculated by Author using STATA 13*

Table No. 6.7 shows coefficient of error correction term, standard error, and p-value of variables at different lag. As shown above the p-values for all the variables are more than 5% level which shows the insignificancy off model. And the negative sign of error correction term of GSDP as independent variable shows there exist a long run causality and at a speed of 5.73 % it is going to be converge towards equilibrium in future. And the positive error correction term confirms there is no long-run causality running from GSDP to EDU.

6.6.1 Post estimation- Testing of linear hypothesis (short-run causality)

This test examines whether there is any short run causality running from variables by testing the linear hypothesis i.e. coefficient with all lags in specific equation are zero.

H0: There is no short-run causality running from EDU (with all lags) to GSDP

CHI^2	6.77
P-value	0.1486

Null hypothesis cannot be rejected as p value is more than 5% value.

Hence the test confirms that only long run causality is running from EDU to GSDP and no short run causality is running in the same direction.

H0: There is no short-run causality running from GSDP (with all lags) to EDU

CHI^2	11.30
P-value	0.0234

Null hypothesis is rejected as p value is less than 5% level.

Hence, the test confirms that only short-run causality is running from GSDP to EDU and no long-run causality is running in the same direction.

6.7 Diagnostic checking of VECM

6.7.1 LM test for autocorrelation

Table No. 6.8 LM test for autocorrelation

Lag	Chi 2	P-value
1	0.2708	0.99162
2	3.6234	0.45936
3	5.8498	0.21065
4	9.2765	0.05455
5	3.9691	0.41020

Source: *Calculated by Author using STATA 13*

H0: there is no auto correlation at lag order

In Table No. 6.8 P-values for all the lag order are more than 5% level, means we cannot reject the null hypothesis. Hence it is concluded that there is no autocorrelation.

6.7.2 Jarque bera Test for Normality

Table No. 6.9 Jarque- Bera test

Equation	Chi 2	P-value
lnGSDP	0.283	0.86804
lnEDU	0.104	0.94940

ALL	0.387	0.98354

Source: *Calculated by Author using STATA 13*

HO: residuals are normally distributed

In Table No. 6.9 P-values for all the models are more than 5% level. So, null hypothesis cannot be rejected. Hence it is concluded that the model as a whole, residuals are normally distributed.

6.6 Testing of Hypothesis:

- H0: there exists no long run relationship between GDP and EDU in Odisha.

H0 is rejected as Johansen Cointegration Model proved that variables cointegrated, which means there is long run relation between GSDP and EDU.

CHAPTER 7

CONCLUSION, MAJOR FINDINGS AND POLICY IMPLICATION

7.1 Conclusion

The study was an attempt to evaluate the relationship between government expenditure on education and economic growth in Odisha using annual data over the period 25 years i.e. 1990-91 to 2014-15. In order to assess the relation between these two variables, unit root test has been conducted to check the stationarity, Johansen cointegration test has been conducted to check long run association and a VAR model is build based on the ADF and cointegration test for assessing the causal relationship. Moreover, growth rates of different infrastructural parameters, rank of infrastructural development, expenditure on education and district domestic income has been calculated which shows the inefficiency of public expenditure on education sector. The result shows that expenditure on education sector can give fruitful result to the economy by boosting the economic growth. And to make the economy more dynamic and more competitive government must invest in infrastructure related to education as it creates the quality of education and this investment will alternatively help in promoting economic growth in long-term. The major findings of study include the following:

7.2 Major Findings

7.2.1 Educational Infrastructure and Trend of Educational Expenditure In Odisha

- Use of new technologies and scientific knowledge in the delivery of education services and promotion of scientific and technological interventions is likely to have significant impact not only on the quality of education services but also on its accessibility to the rural poor, in particular the disadvantaged sections. Access to quality basic education is imperative not only to reduce social and regional disparities, but also to achieve balanced growth and development. States, which have given high priority to investment in education, have shown greater economic progress in recent years.

- This study investigates the infrastructure development related to education in Odisha over a time period of 2007-08 to 2015-16 and found that; different infrastructure facilities like; drinking water facility, girls' & boys' toilet, and boundary wall facility are showing significant performance i.e. a major number of schools are well equipped with these facilities. The attainment of children in school is very much related to quality of the schools (Jhuma Haldar, 2016) While the state is lagging behind on the ground of other facilities like; playground, electricity and computer facility. Moreover, while comparing the rank of Odisha with other states of India the study found that except drinking water facility and number of govt & private schools, in all other parameters Odisha's rank is declining. And these are some important parameters of to be looked over by the government which can resulted as significant social and economic development in the state.
- The study also examined the trend of educational expenditure as well as economic growth of three different division comprises of ten district each namely; North, Central and South over a period 2002-03 to 2015-16. State with higher per capita income found to spend more income on education (Chakrabarti and Jogelkar, 2006) where as the study found that the government is raising the fund on education for backward districts (most of them are coming under south division) but the result from this raised fund is not significant as many part of these districts still do not have primary or necessary facilities related education and are genuinely deprived from other facilities as well. So, only expending more will not rise the education level and economy growth, unless and until there is no proper allocation of fund and management committee to look after the fund and reported progress.

7.2.2 Causal Relationship Between Education Expenditure and Economic Growth

- The unit root test confirms that both variables GSDP and EDUEXP are non-stationary at level as well as at first difference but, found to be stationary at second difference. Which allowed the study to run further tests and model like; Johansen Cointegration test, Granger Causality test & Vector Error Correction Model.
- The Johansen cointegration test confirms that economic growth and expenditure on education have long run association as they are cointegrated, indicating the existence of long-run association between GSDP and EDUEXP.
- The causality between Educational expenditure and economic growth is a bidirectional one (Yousif Khalifa Al- Yousi, 2008). The Granger Causality test in a VAR framework confirms that both variables are causing each other and the relation is bi-directional i.e. causality can run from economic growth to educational expenditure and vice versa.
- Running of Vector Error Correction Model (VECM) confirms that there is no short run causality running from educational expenditure to GSDP rather there exist long term causality. Czynski and Zeira (2003) in their study found GDP positively affects educational expenditure and the result also shows the short-term causality is running from GSDP to educational expenditure.

7.3 Policy Implications

- Allocation of fund for educational development should be maximised at rural or backward areas, especially for south and north division of Odisha. so that the gap of availing quality of education in developed and under developed districts of Odisha can be minimized.
- The demand for education is strongly influenced by the economic variables such as income, property etc. Hence, availing the higher education by the low-income groups

has become difficult nowadays. In order to achieve equity in higher education, the higher education may be subsidised so as to enable the lower income groups to avail higher education at least to some extent.

- Kothari Committee Stipulates that states shall spend at least 6% of their SDP on Education, which have to be followed strictly. Moreover, it would be more appropriate if, for different levels of education (primary, secondary etc), per-student expenditure is fixed differently for each state with respect to their state income. Because of the major drawback that states with low GSDP (like Bihar and Orissa) may considered as more spending states without spending much amount actually.
- While determining the target groups of educational facilities and assistance, income of the household may be considered as the rational criteria rather than social classification. If income is considered as a criterion, we can establish equity in education at least to some extent.
- In order to keep pace with the Global knowledge explosion and technological advancement the share of education expenditure in GDP and the share of expenditure on Research and Development in GDP should be increased to the Global averages in the various levels of education.
- The poorer section of the society left to receive education at government institutions where infrastructure is poor in most of the cases. It results in less competitive skill among the students coming out government institutions. Hence, it is the need of the hour to strengthen the infrastructure in government institutions. It will help the poorer section of the society to receive better education.
- Finally, it can be suggested that concerted effort of proper management of funds and quality assurance in education should be given utmost priority in order to increase human capital, productivity and to make Odisha growth enhancing.

7.4 Limitation of the study

All most all studies are faced with various limitations and the study is no exception to the phenomenon. And the study would have been more efficient in the absence of these limitations. Following are the limitations of the study:

i) For the analysis of causal relation between educational expenditure and economic growth, data on absolute values of educational expenditure as a whole for Odisha is collected instead of collecting data for different level of education like; primary, secondary and higher education and analysing those with economic growth because of unavailability of state level data.

ii) Due to unavailability of data on secondary and higher education, only elementary education has been taken for analysing trend and assessing infrastructure. If the data would available for secondary and higher education then the result will be more effective.

BIBLIOGRAPHY

Mamoon, D., & Murshed. (2009). Want economic growth with good quality institutions? Spend on education. *Education Economics*, vol.17, issue 4, pp 445-468.

Barro. (2001). Human Capital and Growth. *American Economic Review*, vol.91 (2): pp12-17.

Busemeyer, & Marius. (2007). Determinants of Public Education Spending in 21 OECD Democracies. *Journal of European Public Policy*, Vol. 14, No. 4, pp 582-610.

Butt, A. R., & Sheikh, M. A. (1988). An Analysis of gap between demand for and supply of higher education in pakistan. *Pakistan Economic and and Social Review,, 26, No. 1*, 41-55.

Chakrabati Anindita, J. R. (2006). Determinants of expenditure on education- An empirical analysis using state level data. *Economic and Political Weekly*, vol. 41, No. 15(Apr. 15-21, 2006), pp. 1465-1472.

Chandra. (2010). Does Government Expenditure on Education Promote Economic Growth? An Econometric Analysis. *Jamia Millia Islamia*, Paper No. 25480.

Chandrasekhar, S., Mukhopadhyay, & Abhiroop. (2006). Primary Education as a Fundamental Right:Cost Implications. *Economic and Political Weekly*, 3797-3804.

Chowdhury, S., & Bose, P. (2004, July-August). Expenditure on Education in India: A Short Note. *Social Scientist, 32*, 85-89.

Conard, D. (2011). The level specific effect of education in economic growth: Evidence from four caribean countries. *The journal of developing areas, 45*, 279-290.

Czynski, M. S., & Zeira, J. (2003). What determines educational expenditure in Israel. *Israel Economic Review*, 11-33.

De, A., & Endow, T. (2008). *Public expenditure in India: Recent trends & outcomes.* India: Research Consortium on Educational Outcomes and Poverty, WP no. 18.

Dorgee, A., Kapoor, A., & Tewary, V. (2014). *How much does India spend per student on elementary education ?* India : Accountability Institute, Centre for policy research, paisa report series.

Fiszbein, & Psacharopoulos. (1993). A Cost Benefit Analysis of Educational Investment in Venezuela: 1989 Update. *Economics of Education Review*, vol. 12(4): pp293-98.

Gylfason, T., & Zoega, G. (2003). Education, Social Equality and Economic Growth: A View of the Landscape. *CESifo Economic Studies, vol.49 (4)* , 557-579.

Halder, J. (2016). Geographical Access and Quality of primary schools- A Study of south 24 parganas district of West Bengal. . *Working Paper, Institute for Social and Economic Change* .

Hanuschek, A, E., & Dennis D, K. (2000). Schooling, Labor Force Quality and the Growth of the Nations. *American Economic Review*, 1184-1208.

Husssein Fazal. (2004). An Anlysis of public expenditure on education in Pkistan. *The Pkistan Development Review*, Vol.42, NO. 4, PP. 771-780.

Jogrension, D., & Fraumeni, B. (1992). Investment in education and U.S. economic growth. *The Scandinavian Journal of Economics, 94*, s51-s70.

Johansen. (1988). Statistical Analysis of Cointegrating Vectors. *Journal of Economic Dynamics and Control, vol.12*, 231-54.

Keller Edmond. (2010). Public findings and budgetray challenges to providing universal access to primary education in Sub-Saharan countries. *International Review of Education*, Vol. 56, No. 1, pp. 5-31.

Khalifa, Y. (2008). Education expenditure and economic growth: some empirical evidence from the GCC countries. *The journal of developing areas, 42, No. 1*, 69-80.

Kochar, A. (2001). *Emerging Challenges for Indian Education Policy.* Stanford: Centre for Research on Economic Development and Policy Reform Stanford University.

Kolhatkar, M. (1988). Education Expenditure in India in Relation to National Income (1980-88): Trends and Implications. *Journal of Education and Social Change*, Vol.2, No.2, pp.104-127.

Lavy, & Victor. (2001). *Investment in Education: How Much and How.* Ninth Annual Caesarea Economic Conference (Hebrew).

Lenka, J., & Malliek, M. (2007). Growth of Primary Education in Orissa: Quality and Quantity. *Southern Economist*, Vol.46, No.1,(2007), pp. 27-30.

Monteils , M. (2002). Education and Economic growth: Endogenius growth theory test, The french case. *Historical Social Research, 27, No. 4*, 93-107.

Mukharjee , A., & Sikdar, S. (2012). *Public Expenditure in India by the Union Government and Roadmap for the future.* India Infrastructure Report.

Musila, J. W., & Belasi, W. (2004). The impact of education expenditure on economic growth in Uganda: Evidence from time series data. *The Journal of developing areas, 38, No. 1*, 123-133.

Prakash Ved. (2007). The Trends in the growth and financing of higher education in India. *Economic and Political Weekly*, vol. 42, No. 31, pp. 3249-3258.

Quan, N., & Beck , J. (1987). Public education expenditure an dstate economic growth: north east and sun belt region. *Southern Economic Journal, 54, No. 2*, 361-376.

Ray, S., Pal, M. K., & Ray, I. A. (2011). Assesing causal relaionship between education and economic growth in India. *Vidyasgar University Journal of Economics*, Vol XVI.

Roy, A., Kamaiah, b., & Rao, M. (2000). Educational Expenditure of Large States in India. *Economic and Political Weekly*, Vol.35,No.17 22-28.

Soren, D. (2010). Relevance of Education and dropout among Tribal students in Mayurbhanj district of Odisha. *Scholarly Research Journal for Interdisciplinary Studies*.

Yogish. (2006). Education and Economic Development. *Indian Journal of Social Development, vol.6* , 255-270.

APPENDICES

Appendix 1 GSDP & Expenditure on Education of Odisha with their Natural Log

year	GSDP (In Lakhs)	ln GSDP	Edu (In Lakhs)	ln Edu
1991	3883162	15.17216033	45174	10.71827698
1992	4263824	15.26567697	54848	10.912321
1993	4188390	15.24782697	62009	11.03503481
1994	4496557	15.31882255	68815	11.13917702
1995	4728488	15.36911605	81524	11.30865273
1996	4923531	15.40953651	94255	11.45375915
1997	4684672	15.35980646	106610	11.57693259
1998	5311965	15.48547238	120839	11.70221436
1999	5462975	15.51350407	147969	11.90475807
2000	5932446	15.59594716	193037	12.17063716
2001	5830376	15.57859205	174158	12.06771821
2002	6110766	15.62556269	173334	12.06297565
2003	6105838	15.62475592	188279	12.14568018
2004	6889860	15.74556132	188183	12.14517017
2005	7772943	15.86615942	199540	12.20377
2006	8214472	15.92140803	231158	12.35085674
2007	9270083	16.04230289	247435	12.4189032
2008	10284562	16.14615449	326022	12.69472014
2009	11081178	16.22075855	499887	13.12213735
2010	11585113	16.26523147	591721	13.29079052
2011	12513105	16.34228705	677526	13.42620321
2012	13011301	16.38132885	698044	13.45603742
2013	13501017	16.41827557	726307	13.49572807
2014	13746828	16.43631866	870385	13.67669092
2015	14857608	16.51402262	1153598	13.95839631
Source: Handbook of Statistics on State Govt. Finance, RBI & Odisha Economic Survey 2014-15				

Appendix 2 District Wise Expenditure on Elementary Education, Odisha

		District wise Expenditure on elementary Education, Odisha												(Rs in Lakh)
DISTRICTS	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Anugul	157.5	552.39	687.84	1363.43	2161.93	2130.89	1975.4	3187.03	1790.09	2126.35	2476.51	5303.71	2487.26	6598.89
Balasore	101.38	522.82	1188.88	1661.98	4099.49	3388.34	3339.37	4643.85	4477.8	6989.09	5359.45	9773.61	7225.56	7202.83
Bargarh	15.27	660.08	910.86	1281.58	1950.44	1976.5	2215.12	3413.21	2278.18	3788.09	3243.54	4550.2	3730.69	4077.44
Bhadrak	147.08	524.19	740.54	1749.26	2058.75	1748.87	2838.7	4055.21	2463.31	620.32	2310.32	11615.3	2753.45	2161.78
Balangir	7.7	725.42	1090.72	1863.35	2832.47	3934.56	4694.53	4136.27	625.09	5978.59	4873.01	5096.82	5288.13	5379.08
Baudh	9.95	185.49	277.55	386.64	899.32	554.35	839.96	1503	2444.33	1336.48	2374.21	2104.34	1991.4	1997.43
Cuttack	201.42	695.88	973.08	1834.78	2481.14	2660.16	2808.5	4472.51	3035.66	6078.12	6738.92	4768.12	2833.25	5485.65
Debagarh	41.33	211.04	341.7	735.57	840.51	1230.61	830.28	1175.06	1143.26	556.01	469.98	2117.49	1459.63	1264.26
Dhenkanal	25.15	526.36	854.17	958.08	1331.41	1604.49	1990.55	2716.55	1901.83	3991.75	4045.97	2204.07	3564.36	5050.7
Gajapati		465.77	736.83	1008.05	1757.55	2501.44	2576.31	2942.7	3458.21	2185.72	2692.8	2504.68	3343.1	5637.6
Ganjam	350.1	1143.21	1859.11	2641.65	5298.18	8504.8	5730.92	7519.73	5148.61	5453.04	7113.49	16561.58	12859.02	13302.96
Jagatsinghapur	151.13	363.04	746.47	902.37	1641.06	1554.06	1819.1	2522.64	1610.14	3609.74	2162.26	4149.09	1766.01	2723.96
Jajapur	170.82	720.25	887.25	1496.12	2609.77	2505.77	2569.58	3360.03	1967.64	4098.92	4011.62	9096.37	2622.03	6934.68
Jharsuguda	67.66	393.99	713.46	566.76	978.32	695.49	931.93	1396.26	1940.93	1806.11	1252.02	1556.81	1722.37	1825.66
Kalahandi	28.14	876.51	1254.59	1676.06	3437.11	3450.65	3872.87	4065.92	3439.5	5823.11	4561.72	6777.03	4708.52	6221.18
Kandhamal	19.51	337.16	1053.99	1116.87	1842.93	2354.71	2099.74	4545.02	2629.94	5185.94	3894.8	6595.43	2598.64	5318.22
Kendrapara	162.48	475.95	849.85	1344.33	1663.9	1899.79	2547.2	3270.85	2940.39	2534.19	4886.75	5566.97	3082.07	1837.66
Kendujhar	17.83	677.75	1000.28	1318.16	2343.18	3673.57	2710.5	4177.64	5653.82	3286.47	4147.6	7849.42	4556.38	8459.84
Khordha	144.1	658.01	958.97	1209.62	1863.97	2150.22	2661.13	3026.49	2732.64	5557.12	4026.7	5278.99	3623.98	3896.61
Koraput	17.72	676.63	861.56	986.93	2132.85	2184.4	3211.71	5368.42	7375.47	6752.23	2879.49	9144.05	5684.06	4425.59
Malkangiri	8.13	285.65	490.56	631.49	1157.58	567.17	1884.87	3007.68	3476.66	3642.6	3167.74	2571.18	2629.64	3380.3
Mayurbhanj	85.96	746.4	1285.65	2019.16	3508.95	7776.42	6791.32	8024.84	6867.74	6736.16	17460.28	11133.56	9101.73	11752.17
Nabarangapur	13.58	393.74	602.07	833	1930.99	2038.33	2438.41	3100.94	4351.84	1469.45	1029.48	6943.81	2810.85	9354.22
Nayagarh	102.77	634.68	770.68	984.62	1741.21	1697.54	1786.18	1659.53	737.24	3121.18	3648.47	4244.42	2388.82	3419.72
Nuapada	60.61	137.45	455.2	409.23	838.18	1204.27	1628.96	2552.79	1504.83	2626.2	3755.05	2706.98	1616.83	4928.79
Puri	118.26	617.19	1093.09	1516.94	2111.6	2532.94	2745.14	3856.75	2695.45	2620.6	6580.78	3725.77	6700.21	4700.97
Rayagada	14.83	461.32	1060.27	1339.36	2387.88	3211.75	3337.53	4428.9	6056.82	1114	4048.43	2379.72	5752.76	6623.4
Sambalpur	8.29	506.73	942.66	1072.23	2120.6	1931.21	2137.54	2895.58	2944.17	1489.13	3534.19	2424.94	3473.22	3011.21
Sonepur	53.88	218.67	280.87	527.53	873.42	1361.61	994.07	1891.79	2209.99	833.2	1045.8	2239.79	2318.85	1111.5
Sundargarh	223.58	366.2	1962.71	2276.26	4390.06	5523.6	5190.56	5477.97	3476.45	4476.07	5869.97	7729.93	5687.43	6004.58
ODISHA	2526.16	15759.97	26958.45	37711.38	65284.76	78548.5	81198.01	108395.16	93378.02	105886.05	123661.35	168714.19	120380.24	154086.9
Source: OPEPA, BHUBANESWAR														

		District wise Gross District Domestic Product, Odisha												(Rs in Lakh)
DISTRICTS	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Anugul	292433	348738	569079	586193	668483	763067	829799	817531	828472	920338	971939	1004689	1036314	1078517
Baleshwar	207756	230105	325117	340467	389833	440705	477544	507811	564490	592583	644020	683815	724143	767318
Bargarh	132555	155771	204507	216561	240774	271669	290612	296602	332667	349810	372379	392470	412158	434666
Bhadrak	113619	131818	185546	192401	210580	229860	251508	276651	291069	308677	331283	351452	371096	390104
Balangir	133980	161239	243039	258153	290084	321550	340807	363666	424311	386649	467989	498351	529771	562878
Baudh	38251	44816	64251	68528	75188	80621	86046	93206	103098	87665	113823	120891	127609	134482
Cuttack	335414	372988	575675	586345	656783	730306	779092	819742	886720	947293	999437	1051023	1103260	1160537
Debagarh	29398	34094	47760	51438	55625	58392	62545	67592	66332	80211	78226	78255	81411	84324
Dhenkanal	112883	134110	200510	215733	234458	260656	278459	296836	317912	347747	358602	378600	397640	418197
Gajapati	57465	63186	93448	95615	105026	112429	120413	126089	135439	146647	149829	156916	164342	171771
Ganjam	322402	366942	550109	580635	660894	714679	753448	815724	887774	954389	994660	1047981	1107022	1167553
Jagatsinghapur	148732	157377	248082	256831	295363	335181	373589	373370	404486	423913	468224	491991	515654	541813
Jajapur	178005	207847	335018	355005	412284	444102	463593	472419	514704	560803	573490	595036	622230	652493
Jharsuguda	123619	139476	218995	238629	269946	299371	331458	348568	405149	254238	454810	486282	518275	550256
Kalahandi	127469	152191	205229	219675	237126	260389	285922	300286	339323	346020	376263	400534	423782	446941
Kandhamal	90771	96794	175579	187111	211073	232077	252257	301893	320821	241539	371053	399521	428248	455470
Kendrapara	106921	120297	177602	188519	199514	217152	228237	243592	270318	279922	294215	311025	327052	343867
Kendujhar	212206	265001	483935	516465	591685	664273	713219	724678	724322	786520	850460	880288	911170	949579
Khordha	337499	386422	546715	598556	685087	744196	815937	850861	940675	988828	1065303	1125540	1190605	1255261
Koraput	158371	179236	248925	267367	304707	332198	352423	373668	407846	432694	458854	428750	508950	536468
Malkangiri	47697	53029	80860	82701	88976	95362	98951	104352	105485	111568	116805	120737	124733	129211
Mayurbhanj	197855	230774	337809	354463	392502	432161	457374	481937	535819	592956	594175	626725	659932	695651
Nabarangapur	84373	94100	134789	140041	152354	163911	172670	186545	198880	199463	220181	231413	242891	254587
Nayagarh	71417	83693	114244	122448	132753	139720	145225	156983	171597	176345	186135	195635	205883	215990
Nuapada	53115	60735	82921	89206	98010	111402	116003	122451	130743	137497	147994	155418	162459	171062
Puri	158861	180511	240366	256396	259439	279231	299342	319205	361156	380864	386021	411051	433171	454754
Rayagada	96046	108352	154734	168231	189909	210341	226361	240093	245356	260334	284938	298448	312297	327311
Sambalpur	145039	163577	250728	272144	302776	340393	370840	377339	403214	446243	461837	484821	506967	531883
Sonepur	45591	51121	75891	81443	91035	95012	102281	114779	126203	126071	139952	148895	158701	167542
Sundargarh	304354	366002	601481	627172	767816	904156	1005223	1010647	1068726	1143473	1286510	1350090	1416086	1495043
ODISHA	**4464096**	**5140342**	**7772944**	**8214472**	**9270083**	**10284562**	**11081178**	**11585116**	**12513107**	**13011301**	**14219407**	**14906643**	**15723852**	**16545529**
Source: Directorate of economics and statistics, Odisha														

Appendix 4 ADF test for GSDP at level including intercept only

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. dfuller lnGSDP, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        24

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             0.428            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9825

------------------------------------------------------------------------------
    D.lnGSDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lnGSDP |
         L1. |   .0102677   .0239986     0.43   0.673    -.0395024    .0600377
             |
       _cons |  -.1059557   .3784592    -0.28   0.782    -.8908321    .6789207
------------------------------------------------------------------------------

.
```

Appendix 5 ADF test for GSDP at level including intercept and trend

```
. dfuller lnGSDP, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        24

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -1.782            -4.380            -3.600           -3.240
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.7134

------------------------------------------------------------------------------
D.lnGSDP        |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lnGSDP |
         L1. |  -.2285733   .1282645    -1.78   0.089    -.4953139    .0381674
      _trend |   .0144264   .0076251     1.89   0.072    -.0014308    .0302836
       _cons |   3.478968   1.928338     1.80   0.086    -.5312318    7.489167
------------------------------------------------------------------------------

.
```

Appendix 6 ADF test for GSDP at level including no trend and no intercept

```
Dickey-Fuller test for unit root                    Number of obs   =        24

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             5.788            -2.660            -1.950           -1.600
------------------------------------------------------------------------------

------------------------------------------------------------------------------
    D.lnGSDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      lnGSDP |
         L1. |   .0035512   .0006136     5.79   0.000     .0022819    .0048204
------------------------------------------------------------------------------
```

Appendix 7 ADF test for GSDP at first difference including only intercept

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. dfuller dlnGSDP, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        23

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -5.554            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
   D.dlnGSDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     dlnGSDP |
         L1. |  -1.180357   .2125149    -5.55   0.000    -1.622306   -.7384079
             |
       _cons |   .0641889   .0154084     4.17   0.000     .0321454    .0962324
------------------------------------------------------------------------------
```

.....

Appendix 8 ADF test for GSDP at first difference including trend and intercept

```
. dfuller dlnGSDP, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        23

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -5.730            -4.380            -3.600           -3.240
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.dlnGSDP       |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     dlnGSDP |
         L1. |  -1.214378   .2119266    -5.73   0.000    -1.656449   -.7723071
      _trend |   .0018433   .0015108     1.22   0.237    -.0013081    .0049947
       _cons |   .0439389   .0225269     1.95   0.065    -.0030515    .0909293
------------------------------------------------------------------------------
```

.....

Appendix 9 ADF test for GSDP at first difference including no trend and no intercept

```
. dfuller dlnGSDP, noconstant regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        23

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -2.783            -2.660            -1.950           -1.600
------------------------------------------------------------------------------

------------------------------------------------------------------------------
   D.dlnGSDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     dlnGSDP |
         L1. |  -.5092401   .1830006    -2.78   0.011      -.88876   -.1297202
------------------------------------------------------------------------------
```

Appendix 10 ADF test for GSDP at second difference including only intercept

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. dfuller d2lnGSDP, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        22

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)           -10.564            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
  D.d2lnGSDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    d2lnGSDP |
         L1. |  -1.656527   .1568127   -10.56   0.000    -1.983633   -1.329422
             |
       _cons |   .0020911   .0114297     0.18   0.857    -.0217509    .0259331
------------------------------------------------------------------------------

.
```

Appendix 11 ADF test for GSDP at second difference including trend and intercept

```
Dickey-Fuller test for unit root                    Number of obs   =        22

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)           -10.326            -4.380            -3.600           -3.240
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
D.d2lnGSDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----------+----------------------------------------------------------------
  d2lnGSDP |
       L1. |  -1.656428   .1604108   -10.33   0.000    -1.992171   -1.320684
    _trend |  -.0006185   .0018409    -0.34   0.741    -.0044715    .0032345
     _cons |   .0092044    .024185     0.38   0.708    -.0414155    .0598243
------------------------------------------------------------------------------
```

Appendix 12 ADF test for GSDP at second difference including no trend and intercept

```
. dfuller d2lnGSDP, noconstant regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        22

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)           -10.836            -2.660            -1.950           -1.600
------------------------------------------------------------------------------

------------------------------------------------------------------------------
  D.d2lnGSDP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
    d2lnGSDP |
         L1. |  -1.657878   .1529918   -10.84   0.000    -1.976041   -1.339714
------------------------------------------------------------------------------
```

Appendix 13 ADF test for EDU at level including only intercept

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. dfuller lnedu, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        24

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             0.271            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.9760

------------------------------------------------------------------------------
     D.lnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lnedu |
         L1. |    .007323   .0270092     0.27   0.789    -.0486906    .0633365
             |
       _cons |   .0457624   .3299689     0.14   0.891    -.6385513    .7300761
------------------------------------------------------------------------------
```

.....

Appendix 14 ADF test for EDU at level including trend and intercept

```
. dfuller lnedu, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        24

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -1.374            -4.380            -3.600           -3.240
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.8684

------------------------------------------------------------------------------
D.lnedu         |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
----------------+----------------------------------------------------------------
          lnedu |
            L1. |  -.1990679   .1449044    -1.37   0.184     -.500413    .1022772
         _trend |   .0260733   .0180003     1.45   0.162    -.0113604     .063507
          _cons |   2.235056   1.545354     1.45   0.163    -.9786849    5.448796
------------------------------------------------------------------------------
```

.....

Appendix 15 ADF test for EDU at level including no trend and intercept

```
. dfuller lnedu, noconstant regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        24

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)             5.946            -2.660            -1.950           -1.600
------------------------------------------------------------------------------

------------------------------------------------------------------------------
     D.lnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       lnedu |
         L1. |   .0110595   .0018601     5.95   0.000     .0072117    .0149074
------------------------------------------------------------------------------
```

Appendix 16 ADF test for EDU at first difference including only intercept

```
. dfuller dlnedu, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        23

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.144           -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0235

------------------------------------------------------------------------------
    D.dlnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dlnedu |
         L1. |  -.6740867   .2143937    -3.14   0.005    -1.119943   -.2282307
             |
       _cons |   .0905169   .0358701     2.52   0.020     .015921    .1651128
------------------------------------------------------------------------------
```

.....

Appendix 17 ADF test for EDU at first difference including trend and intercept

```
. dfuller dlnedu, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        23

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -3.123           -4.380            -3.600           -3.240
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.1010

------------------------------------------------------------------------------
    D.dlnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dlnedu |
         L1. |  -.6766724   .2167077    -3.12   0.005    -1.128717   -.224628
      _trend |   .0026138   .0034955     0.75   0.463    -.0046777    .0099052
       _cons |   .0594844   .0551051     1.08   0.293    -.0554629    .1744316
------------------------------------------------------------------------------
```

.....

Appendix 18 ADF test for EDU at first difference including no trend and intercept

```
. dfuller dlnedu, noconstant regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        23

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic         Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -1.688           -2.660            -1.950           -1.600
------------------------------------------------------------------------------

------------------------------------------------------------------------------
    D.dlnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
      dlnedu |
         L1. |  -.2581568   .1529179    -1.69   0.105     -.575289    .0589755
------------------------------------------------------------------------------
```

Appendix 19 ADF test for EDU at second difference including only intercept

```
. dfuller d2lnedu, regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        22

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -5.227            -3.750            -3.000           -2.630
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

------------------------------------------------------------------------------
   D.d2lnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     d2lnedu |
         L1. |  -1.160013   .2219421    -5.23   0.000    -1.622976   -.6970498
             |
       _cons |   .0071317   .0285471     0.25   0.805    -.0524165       .06668
------------------------------------------------------------------------------
```

.....

Appendix 20 ADF test for EDU at second difference including trend and intercept

```
. dfuller d2lnedu, trend regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        22

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -5.141            -4.380            -3.600           -3.240
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0001

------------------------------------------------------------------------------
D.d2lnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     d2lnedu |
         L1. |   -1.16771   .2271553    -5.14   0.000    -1.643151   -.6922682
       _trend |   .0020687   .0046053     0.45   0.658    -.0075703    .0117077
       _cons |  -.0166631   .0604546    -0.28   0.786     -.143196    .1098697
------------------------------------------------------------------------------
```

.....

Appendix 21 ADF test for EDU at second difference including no trend and intercept

```
. dfuller d2lnedu, noconstant regress lags(0)

Dickey-Fuller test for unit root                    Number of obs   =        22

                                 ------------ Interpolated Dickey-Fuller ------------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(t)            -5.349            -2.660            -1.950           -1.600
------------------------------------------------------------------------------

------------------------------------------------------------------------------
   D.d2lnedu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
     d2lnedu |
         L1. |  -1.160269   .2169287    -5.35   0.000    -1.611397   -.7091413
------------------------------------------------------------------------------
```

Appendix 22 Lag Selection Test

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. varsoc GSDP edu, maxlag(10)

   Selection-order criteria
   Sample:  2001 - 2015                              Number of obs      =        15
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-438.956				1.2e+23	58.7942	58.7932	58.8886
1	-396.963	83.987	4	0.000	7.5e+20	53.7284	53.7254	54.0116
2	-394.893	4.141	4	0.387	1.0e+21	53.9857	53.9806	54.4577
3	-390.219	9.3467	4	0.053	1.0e+21	53.8959	53.8889	54.5567
4	-383.414	13.61	4	0.009	8.7e+20	53.5219	53.5129	54.3716
5	-374.33	18.17	4	0.001	6.9e+20	52.8439	52.8329	53.8824
6	-356.693	35.274	4	0.000	3.0e+20*	51.0257	51.0126	52.253
7	487.98	1689.3	4	0.000	.	-61.064*	-61.079*	-59.6479*
8	447.336	-81.287	4	.	.	-55.6448	-55.6599	-54.2287
9	483.609	72.546*	4	0.000	.	-60.4812	-60.4963	-59.0651
10	482.997	-1.2247	4	.	.	-60.3996	-60.4146	-58.9835

```
   Endogenous:  GSDP edu
    Exogenous:  _cons
```

Appendix 23 Johansen Co-integration Test

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. vecrank lnGSDP lnedu, trend(constant) lags(7) max

                     Johansen tests for cointegration
Trend: constant                                          Number of obs =       18
Sample:  1998 - 2015                                           Lags =        7
```

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	26	71.081908	.	38.8023	15.41
1	29	89.656124	0.87303	1.6539*	3.76
2	30	90.483071	0.08779		

maximum rank	parms	LL	eigenvalue	max statistic	5% critical value
0	26	71.081908	.	37.1484	14.07
1	29	89.656124	0.87303	1.6539	3.76
2	30	90.483071	0.08779		

Appendix 24 Granger Causality Test

```
. vargranger

   Granger causality Wald tests
```

Equation	Excluded	chi2	df	Prob > chi2
lnGSDP	lnedu	15.754	5	0.008
lnGSDP	ALL	15.754	5	0.008
lnedu	lnGSDP	32.763	5	0.000
lnedu	ALL	32.763	5	0.000

Appendix 25 Vector Error Correction Model

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. vec lnGSDP lnedu, trend(constant) lags(5)

Vector error-correction model

Sample:  1996 - 2015                                    No. of obs      =         20
                                                        AIC             = -4.686114
Log likelihood =  67.86114                              HQIC            = -4.482017
Det(Sigma_ml)  =  3.87e-06                              SBIC            = -3.640595

Equation             Parms      RMSE      R-sq       chi2      P>chi2
------------------------------------------------------------------------------
D_lnGSDP                10      .047177   0.7982    39.56453   0.0000
D_lnedu                 10      .085941   0.8829    75.42077   0.0000
------------------------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
D_lnGSDP     |
        _ce1 |
         L1. |  -.0573964    .243739    -0.24   0.814    -.5351161    .4203233
             |
      lnGSDP |
         LD. |  -.1343464   .3835992    -0.35   0.726     -.886187    .6174942
        L2D. |   .1042442   .3483888     0.30   0.765    -.5785854    .7870738
        L3D. |   .0722395   .3405308     0.21   0.832    -.5951886    .7396676
        L4D. |   .5342407   .3328934     1.60   0.109    -.1182183      1.1867
             |
       lnedu |
         LD. |  -.0130109    .115066    -0.11   0.910     -.238536    .2125143
        L2D. |  -.0586639   .1369286    -0.43   0.668     -.327039    .2097112
        L3D. |  -.1874557   .1198328    -1.56   0.118    -.4223237    .0474123
        L4D. |  -.1583167    .117433    -1.35   0.178    -.3884811    .0718477
             |
       _cons |   .0920748   .0417097     2.21   0.027     .0103253    .1738243
-------------+----------------------------------------------------------------
D_lnedu      |
        _ce1 |
         L1. |   .9746606   .4440117     2.20   0.028     .1044137    1.844907
             |
      lnGSDP |
         LD. |  -.9048891   .6987905    -1.29   0.195    -2.274493    .4647151
        L2D. |  -.9371199   .6346489    -1.48   0.140    -2.181009    .3067691
        L3D. |  -1.167209   .6203342    -1.88   0.060    -2.383041    .0486238
        L4D. |    .562933   .6064213     0.93   0.353     -.625631    1.751497
             |
       lnedu |
         LD. |   .6493664    .209612     3.10   0.002     .2385344    1.060198
        L2D. |  -.1925694   .2494384    -0.77   0.440    -.6814598     .296321
        L3D. |    .182729   .2182957     0.84   0.403    -.2451226    .6105806
        L4D. |  -.4771842   .2139239    -2.23   0.026    -.8964674    -.057901
             |
       _cons |   .0054222   .0759812     0.07   0.943    -.1434983    .1543427
------------------------------------------------------------------------------

Cointegrating equations

Equation             Parms      chi2      P>chi2
------------------------------------------------------------------------------
_ce1                     1    170.4678    0.0000
------------------------------------------------------------------------------

Identification:  beta is exactly identified

                  Johansen normalization restriction imposed

------------------------------------------------------------------------------
        beta |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
_ce1         |
      lnGSDP |          1          .        .       .            .           .
       lnedu |   -.450902   .0345351   -13.06   0.000    -.5185896   -.3832144
       _cons |  -10.00727          .        .       .            .           .
------------------------------------------------------------------------------
```

Appendix 26 LM Test for Residual Autocorrelation

```
. tsset year, yearly
        time variable:  year, 1991 to 2015
                delta:  1 year

. veclmar, mlag(5)
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	0.2708	4	0.99162
2	3.6234	4	0.45936
3	5.8498	4	0.21065
4	9.2765	4	0.05455
5	3.9691	4	0.41020

H0: no autocorrelation at lag order

……

Appendix 27 Jarque bera Test of Normality Test

```
. vecnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_lnGSDP	0.283	2	0.86804
D_lnedu	0.104	2	0.94940
ALL	0.387	4	0.98354