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BUILDING HUMAN CAPITAL FOR SUSTAINABLE ECONOMIC GROWTH

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ABSTRACT

The role of human capital in fostering economic growth cannot be undermined in the economic literature. Also the Sustainable Development Goals formulated by the United Nations have further strengthened the importance of making progress in the indicators of human capital measured in terms of education and health outcomes. The present paper makes an attempt to assess the role of investment in education and health and their outcomes, along with other variables in contributing to economic growth of countries. The study covers panel dataset of 110 countries for the period 2010-2017. The fixed effect model examines the impact of different indicators of education, health, and trade openness, capital formation, fiscal balance, inflation and population on economic growth for the period under study. Implications are drawn on the basis of the results of panel data analysis, which confirms the important role of building human capital in terms of investment in education and health to achieve sustainable levels of economic growth.

Keywords: *Human Capital, Education, Health, Economic Growth, GDP, Life Expectancy.*
JEL Codes: I15, I26, O4

Introduction

Sustainable Economic Growth remains an urgent global need. Building human capital to foster economic growth has been well recognized in literature. Various studies have shown that human capital affects growth at the aggregate level.[Flabbi, Luca and Gatti Roberta (2018), Goldin Claudia (2014), Hanushek, Eric A (2013), Bala subramaniam R (2018).]The Sustainable Development Goals formulated by the United Nations and its wide spread acceptance by countries around the globe have further strengthened the importance of making progress in the indicators of human capital measured in terms of education and health outcomes. In most of the countries, the public sector plays an important role in providing the health and education services to build human capital. The impact of public spending on health and education along with maintaining sustainable fiscal deficit and good governance help in achieving sustainable development goals. [Emmanuele Baldacci, et al. (2004)].Positive externalities or market failures do justify the involvement of public sector in providing quality education and good health, however, this does not show that higher spending on education and health as such is the most effective or the only policy intervention to meet the goals of sustainable development.

An attempt has been made in the present paper to assess the importance of health and education outcomes and other policy interventions on human capital, economic growth and other social indicators. The present study covers panel data for 110 countries for the period 2010-17.The data has been collected from world bank database "World Development Indicators". The model examines the impact of education and health indicators on the economic growth for the period under study. Fixed Effects model has been used to study the relationship between real per capita GDP growth as the dependent variable and education capital, health capital and other control variables as the explanatory variables. The study also highlights the association of education capital with health capital.

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Literature Review

A large number of studies have shown that one of the most important factors of economic growth is human capital. [Elena Pelinescu (2014), Jacob Mincer (1981), Jan Cadil, et. al. (2014), Angel De La, et. al (2011), Luca Flabbi, et. al (2018)].While some studies have focused on the impact of spending on education on growth [Robert Janson (2010), George Pscacharopordos, et. al (2018), Noam Angrist et. al (2018), Eric A Hanushek (2018).]Other studies have highlighted the importance of healthcare services in building human capital and enhancing productivity and growth.[David and Weil (2005), Robert J Barro (1996), David Bloom et. al (2013), Guy et. al(1996), Deaton Angus (2004)]

Just as the accumulation of personal human capital produces individual economic growth, the national aggregates do the same. At the national level, human capital can be viewed as a factor of production, which coordinates with physical capital. Its contribution to growth is greater, the larger the volume of physical capital and vice versa. The aggregate production function shows that the growth of human capital is a condition, as well as consequence of economic growth. While physical capital can be acquired or built quite rapidly, the development of significant level of human capital of a nation is a lengthy process which involves significant social and cultural changes. The World Bank defines Human Capital as " The potential of individuals in terms of their skills, health, knowledge and resilience to be productive ,flexible and innovative. It is the long term investment which a country can make for its people's future prosperity and quality of life." Due to changing nature of technology and, therefore, changing nature of work, investments in human capital have become more and more important. Despite substantial progress, significant gaps in human capital investments are leaving the world poorly prepared for what lies ahead. Children in many countries are struggling to learn in school. Tremendous progress has been achieved in bringing children to school but for about 50% children in the world, including India, schooling has not turned into learning. Millions of children around the globe cannot read and write, inspite of having attended school. (World Bank)

According to World Bank estimates, one fourth of the children worldwide are stunted (impaired growth and development which children experience from poor nutrition, repeated infection and inadequate psychosocial stimulation), leaving them vulnerable to poor cognitive development and hampering their ability to learn. Half of the world population is not covered by essential health services.80% of poor people in low income countries lack a social safety net. Even though human capital is important for sustainable growth and poverty reduction, countries have not been making the desired levels of investments in human capital. It is understandable that building roads and bridges can generate quick economic as well as political gains, the benefits of investing in people can take a long term to materialize. Investing in human capital of young children will not deliver economic returns until children grow up and join the workforce. Due to underinvestment in human capital, countries can miss out on opportunities to create a virtuous cycle between physical and human capital and growth and poverty reduction.

The Human Development Index, launched by the World Bank in 2018, captures the amount of human capital a child born today could expect to attain by the age of 18. HDI has three components, Survival, Expected Years of Learning Adjusted School and Health. Survival reflects the fact children born today need to survive until the process of accumulation of human capital through formal education begins. Survival is measured using under 5 mortality rate. Expected Years of Learning Adjusted School provides information on the quantity of education a child can expect to obtain by the age of 18, combined with measure of quality i.e. how much children learn in school, based on countries' relative performance on international student achievement tests. Health component uses two indicators for a country's overall health environment (1) the rate of stunting of children under 5. (2) the adult survival rate i.e. The proportion of 15 year olds who will survive until age 60.

Based on empirical studies, the health and education components of the index are combined to reflect their contribution to worker productivity. The index ranges between 0 and 1.A country in which a child born today can expect to achieve both full health (no stunting and 100% adult survival) and full education potential(14 years of high quality school by the age of 18) will score 1 on the index. A score of 0.7 means the productivity of a child born today as a future worker is 30% below ,what could have been achieved with complete education and full health. So will be GDP per capita. The empirical studies show that human capital is important and accounts for 10-30% of country income differences. Physical capital accounts for 20% of country income differences. The residual total factor productivity accounts for 50-70% of country income differences.[Chang Tai Hsieh and Peter J Klenow(2010)]

Investing in human capital is similar to investing in physical capital. Investment in human capital can be made with the expectation of economic returns just as one can invest in the factor of production physical capital. Since human capital includes education, training, medical care and other additions to knowledge and health, any policy affecting these areas affects human capital and ultimately growth. The empirical literature has measured different aspects of human capital, mainly focusing on education and years of schooling as the prime constituent of general human capital, and on the job training as the prime constituent of specific human capital.

Of late, there has been a recognition of the importance of health and also of the early childhood investments in affecting general human capital. General human capital can move across different employers .Specific human capital cannot move across all potential employers. Both the individual worker and the economy as a whole have an incentive to acquire general human capital, whereas only the firm desirous of having specific production process has an incentive to invest in specific human capital.

Human capital investments are of inter-temporal nature i.e. The current decisions affect the future options. There are uncertainties about the increase in productivity due to inefficiencies or market failures. Human capital investment affects subsequent accumulation of human capital also. Early investments may not be productive if they are not followed by later investments. Intergeneration transmission of human capital and the importance of family backgrounds also affects human capital investments.

Education Outcomes and Economic Growth

Education is critical for economic growth and poverty reduction. Quality education systems produce the efficient workers and expand knowledge. Good education enables students to learn skills and enhance labour productivity. A host of other benefits also add up to increased child well being, improved health status, efficiency of consumer choices and building social capital. In a simplified version of human capital model, the rate of return to schooling equals the lifelong earnings of a person to the net present value of the costs of education. The costs incurred by the individual are the foregone earnings during the period of study plus the school fee and incidental expenses. An investment will be economically viable if the rate of return is positive and is higher than the alternative rate of return.

Various studies have used the secondary school enrollment rate as a proxy for investment in human capital. They have attributed about 50% of income differences to human capital differences in a sample of 98 non oil countries.[Klenow and Rodriguez- Clare(1977)]. Years of schooling attainment has also been used as proxy for investment in education. The studies show that wages vary with years of schooling within countries. Score on international achievement test can also be the proxy for education capital of a country [World Bank].

Health Outcomes and Economic Growth

Generally the people in poor countries are less healthy than their counterparts in rich countries. The pertinent question- How much of this gap in income between rich and poor countries is accounted for by this difference in health? The effect of good health can be seen through various channels. One is that healthier people are better workers. They can work harder and longer and think more clearly. Also, improvement in health raises the incentive to acquire schooling, since investments in schooling can be amortized over a longer working life. Healthier students have lower absenteeism and higher cognitive functioning and receive better education for a given level of schooling. Improvement in mortality may also lead people to save for retirement, thereby raising the level of investment and physical capital per worker. Physical capital per worker may also rise because the increase in labour input from healthier workers increases capital's marginal product.

To measure the income differences among countries, the key health outcome is how health affects the ability to produce output. There are number of health outcomes or health indicators which can be observed at the national level. Comparisons of health among countries can be made by considering either inputs to health or health indicators. Various studies examine the effects of varying health inputs on health outcomes and wages. [Behrman(2003)] and [Alderman et.al.(2006)] have examined the long run effects of childhood nutrition. Their findings suggest that better childhood nutrition leads to improvements in schooling completion, IQ, height and wages. [Behrman(2003)] and [Resenzweig (2004]) have shown that good weight at birth leads to better health and raises the output per worker by 3-4%. [Bloom et.al.(2004)] have shown that one year increase in life expectancy raises output by 4%.

Various empirical studies show that health has an economically important effect in determining income differences among countries, but this is not the major source of cross-country income variation. According to [David N.Weil(2005)], health is less important than education and physical capital as a factor of income differences among countries. Residual productivity is the most important determinant of income differences among countries, although productivity no longer ranks as being more important than all other factors taken together.

Research Methodology

The present study aims to check the relationship between economic growth and building human capital using panel data analysis on the basis of panel data of 169 countries. Panel data allows us to control for variables which we cannot observe or measure. It accounts for individual heterogeneity also. Fixed effect model is used when we want to analyze the impact of variables which vary over time. FE model explores the relationship between dependent and explanatory variables within an entity. Each entity has its own characteristics which may or may not influence the explanatory variables. While using FE we assume that something within the entity may impact the explanatory or dependent variables and we need to control for this. This is the rationale behind the assumption of the correlation between the entity's error term and explanatory variables. FE model removes the effect of those time-invariant characteristics, so that we can assess the net effect of explanatory variables on the dependent variable. Another important assumption of the FE model is that those time invariant characteristics are unique to the entity and should not be correlated with other individual characteristics. Each entity is different, therefore, the entity's error term and constant , which captures individual characteristics should not be correlated with others. If error terms are correlated, then FE is not suitable, since inferences may not be correct and we need to model that relationship, probably using random effects. This is the rationale for the Hausman Test

$$Y_{it} = a_i + b_1 X_{it} + u_{it}$$

where:

a_i =(i=1,2,3,.....n) is the unknown intercept for each entity(n entity –specific intercepts)

Y_{it}=is the dependent variable where i=entity and t=time

X_{it}=independent variable

b_1=coefficient for independent variable

u_{it}=error term

In the panel data, for a given country, if X varies across time by one unit, Y increases or decreases by b units. Fixed Effects model will not work well with data for which, within cluster variation is minimal or for slow changing variables over time. The rationale behind the random effects model is that, unlike fixed effects model, the variation across entities is assumed to be random and uncorrelated with the independent variables included in the model. If we have reason to believe that differences across entities have some influence on the dependent variable, then we should use random effects. An advantage of random effects is that we can include time invariant variables. In the FE model these variables are absorbed by the intercept. To decide between fixed or random effects, we can run a Hausman Test, where the null hypothesis is that the preferred model is random effects and the alternative is the fixed effects. It basically tests whether the unique errors (u_i) are correlated with the explanatory variable. The null hypothesis is that unique errors are not correlated with the explanatory variables. If test rejects the null hypothesis, FE is accepted.

Robustness check examines how certain core regression co-efficient estimates behave when the regression specification is modified by adding or removing regressors. If the coefficients are robust, this is the evidence of structural validity of the model. Robustness Check vouches for the robustness of the model

The Regression Equation:

$$GROWTH_{it}=a_{1i}+n_{1it}+b_{i1.}\log(GDP_{it-1})+b_{i2.}(POP)_{it}+b_{i3}.(GFCF_{it})+b_{i4}.EDU_{i,t-1}+b_{15}.HEALTH_{it-1}+E^{n}_{m=8}\, b_{lm}(CONTROL^{m}_{it})+u_{it}$$

where:

$GROWTH_{it}$ – Real GDP per capita growth

a_i - country specific effect

n_t – period specific effect

$log(GDP_{it-1})$ –lagged logarithm of per capita income to control for the expected reduction in growth rate when per capita income rises.

$GFCF_{k\ it}$ – the investment ratio, measured in terms of gross capital formation as a percentage of GDP. As an increase in the investment ratio captures an increase in the stock of physical capital, its coefficient is expected to be positive.

EDU_{it} – stock of education capital, proxied by the composite primary and secondary enrolment rate.

$HEALTH_{it}$ – the stock of health capital proxied by the log of under 5 child mortality rate.

POP_{it} – the rate of growth of population

$CONTROL^{m}_{it}$ – consists of control variables:

OPENit- trade openness[(exports + imports) as a % of GDP]

FISCALit- fiscal balance

INFit- inflation

u_{it} – error term

Data Analysis

The Human Capital Index 2018 shows that India has the score of 0.44 on the scale of 0 to 1. A score of 0.44 means the productivity of a child born today as a future worker is 56% below ,what could have been achieved with complete education and full health. A country in which a child born today can expect to achieve both full health (no stunting and 100% adult survival) and full education potential(14 years of high quality school by the age of 18) will score 1 on the index. Singapore has the index of 0.88, USA and Japan have the score of 0.84, Australia 0.8, UK 0.79 and China 0.67.

To find the relationship between the dependent variable $GROWTH_{it}$ – Real GDP per capita growth and explanatory variables $log(GDP_{it-1})$, $GFCF_{k\ it,}$ EDU_{it} , $HEALTH_{it}$, POP_{it} and control variables: OPENit, FISCALit, INFit, stationarity of the data series was checked using Harris Tzavalis test. This test is most appropriate where N is large and t is small as in our case. It was found that all variables were stationary at level except $GFCF_{k\ it,}$ OPENit, POP_{it} and INFit, which were found to stationary at level 1. Therefore, their first differenced series was used in the regression analysis.

Assumptions of regression were tested. Normality was tested using Doornik-Hansen test. The chi square and p value of the Doornik-Hansen test were chi2(2) = 4.108 and Prob>chi2 = 0.1282. Results showed that the assumption is met.White's test for homoskedasticity was applied to check the second assumption. The results were chi2(54) = 537.63 and Prob > chi2 = 0.0000. Therefore, the null hypothesis cannot be accepted. So, the inference is that there is heteroskedasticity in the data. The assumption of autocorrelation was checked using Wooldridge test for autocorrelation. Results were obtained as F (1, 109) = 0.101 and Prob > F = 0.7512. It showed that data conforms to the assumption of no autocorrelation.

Variance Inflating Factor (VIF) and Tolerance (TOL) were used to detect problem of multicollinearity. The low VIF and high TOL showed that there is very low to medium multicollinearity in the data which was desirable.

Random Effects Model and Fixed Effects Model were applied on the data. Hausman test was run on the data to choose between the models.

chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)

= 44.22

Prob>chi2 = 0.0000

From the results, the null hypothesis is rejected which implies that between Fixed Effects Model and Random Effects Model, Fixed Effects Model fits the data better.

The data violates the assumption of autocorrelation and homoskedasticity. Hence, it should be corrected in the model. Thus, a robust model is applied. The results are presented in Table 4.

The regression results show that both EDU_{it} – stock of education capital, proxied by the composite primary and secondary enrolment rate and $HEALTH_{it}$ – the stock of health capital proxied by the log of under 5 child mortality rate are significant explanatory variables. GDP per capita is positively correlated with both education and health capital. This shows that higher income levels and greater human capital reinforce each other and contribute to a virtuous circle of growth and higher human capital. Therefore, we can assert that education capital and health capital positively contribute to output growth. The results also show that education and health have strong inter linkages. Health capital contributes to the accumulation of education capital and education is also associated with health capital. Income levels matter for social indicators.

Conclusion and Policy Implications

The present study has a number of implications for poverty reduction strategies and meeting the sustainable development goals. Given the importance of different policy interventions, efforts to meet the sustainable development goals will have to be wide-ranging and include strengthening the macro-economic environment and governance. The investment in education and health services will have salutary effect on growth, but it is not sufficient. More robust expansion in economic activity through accelerating rate of gross fixed capital formation and curtailing fiscal deficit are needed to achieve the sustainable development. Additional research will be useful to address the key policy interventions to achieve rapid economic growth.

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Table 1: The Human Capital Index and Components 2018

Economy	Probability of of Survival to Age 5	Expected Years of School	Harmonised Learning Outcomes	Learning Adjusted Years of School	Adult Survival Rate	Fraction of Children not stunted	Human Capital Index
Australia	1	13.8	524	11.6	0.95	0.98	0.8
China	0.99	13.2	456	9.7	0.92	0.92	0.67
Japan	1	13.6	563	12.3	0.94	0.93	0.84
India	0.96	10.2	355	5.8	0.83	0.62	0.44
Singapore	1	13.9	581	12.9	0.95		0.88
UK	1	13.9	517	11.5	0.94		0.79
USA	0.99	13.3	523	11.1	0.9	0.98	0.84

Table 2: Education Indicators

States_Uts	Adjusted Net Enrolment Ratio at Elementary (Class 1-8) and Secondary (Class 9-10) school (%)	Correct responses on Learning Outcomes in Language, Mathematics and EVS for Class 5 students (%)	Correct responses on Learning Outcomes in Language, Mathematics, Science and Social Science for Class 8 students (%)	Children in the age group of 6-13 who are out of school (%)	Average Annual Drop-out rate at secondary level (%)	School teachers professionally qualified (%)	Elementary and secondary schools with Pupil Teacher Ratio less than/equal to 30 (%)
Target	100	67.89	57.17	0.28	10	100	100
India	75.83	54.69	44.58	2.97	17.06	81.15	70.43
A & N Islands	77.48	52	39	2.12	9.87	98.86	99.51
Andhra Pradesh	63.49	65	51.25	0.91	15.71	98.1	85.99
Arunachal Pradesh	79.02	41.67	36.75	2.92	17.11	51.07	88.87
Assam	80.65	61.67	51	2.88	27.06	40.14	75.33
Bihar	77.04	55.67	47.75	4.95	25.9	53.97	21.75
Chandigarh	78.73	67	53	0.44		98.88	82
Chhattisgarh	77.04	51.67	45.25	3.75	21.26	73.47	82.89
D & N Haveli	76.79	62	52	1.49	16.77	92.84	88.16
Daman and Diu	67.05	46.67	38.5	1.28	32.27	92.47	79.17
Delhi	92.94	48.33	39.25	3.15	11.81	100	46.43
Goa	90.45	49	42.25		11.15	97.2	90.29
Gujarat	74.97	58	54.25	1.94	25.04	99.95	70.47
Haryana	74.91	51	44.5	1.05	15.89	95.33	75.02
Himachal Pradesh	92.87	55.33	45	0.21	6.07	95.75	96.19
Jammu and Kashmir	57.22	54.33	38	2.04	17.28	56.39	96.07
Jharkhand	67.98	60.33	54.75	2.02	24	71.04	50.01
Karnataka	85.53	68.67	54.5	1.49	26.18	95.85	76.05
Kerala	91.75	65.67	50.25	0.82	12.32	97.78	91.41
Lakshadweep	81.94	47.33	36	3.67	6.76	96.51	100
Madhya Pradesh	69.74	53.33	45.5	3.78	24.77	77.25	71.03
Maharashtra	80.92	56.33	46.25	0.81	12.87	99.02	75.32
Manipur	88.2	58.67	44.75	1.72	14.38	43.27	93.15
Meghalaya	68.39	45.33	39.25	2.9	20.52	30.47	86.87
Mizoram	79.6	48.67	36.75	0.6	21.88	60.4	94.23

Nagaland	56.24	49.67	37.75	0.9	18.23	32.92	95.91
Odisha	82.24	54	45.5	6.1	29.56	81.07	80.7
Puducherry	79.52	51.33	34.25	0.18	12.19	99.88	95.17
Punjab	78.56	48	39.25	2.28	8.86	91.38	86.01
Rajasthan	72.48	68	62.25	5.02	13.48	94.01	74.35
Sikkim	45.47	45.67	39.25	0.58	15.89	48.4	99.03
Tamil Nadu	92.86	53	40.25	0.66	8.1	97.58	82.89
Telangana	82.53	55.67	42		15.53	97.64	77.81
Tripura	94.72	55	42.75	0.79	28.42	40.12	95.08
Uttar Pradesh	68.7	50.67	44.25	3.9	10.22	77.51	55.96
Uttarakhand	77.19	61.33	48.5	5.07	10.4	87.11	87.94
West Bengal	72.28	52.67	43.25	2.45	17.8	52.53	74.64

Table 3: Health Indicators

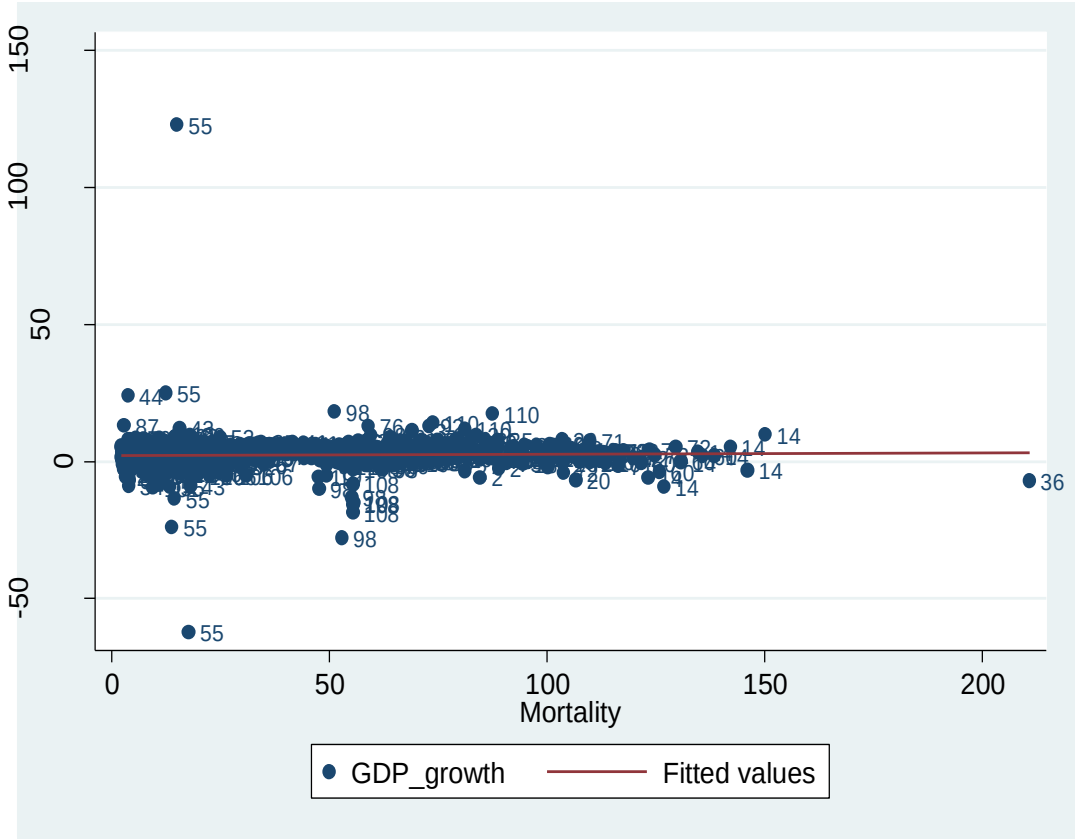
States_Uts	Maternal Mortality Ratio	Under-five mortality rate per 1,000 live births	Children aged 12-23 months fully immunized (BCG, Measles and three doses of Pentavalent vaccine) (%)	Annual notification of Tuberculosis cases per 1 lakh population	Number of governmental physicians, nurses and midwives per 1,00,000 population
Target	70	11	100	0	549.96
India	130	50	62	138.33	220.96
A & N Islands		13	73.2	76	16.43
Andhra Pradesh	74	41	65.3	161	405.49
Arunachal Pradesh		33	38.2	203	126.81
Assam	237	57	47.1	119	146.38
Bihar	165	58	61.7	82	19.74
Chandigarh			79.5	523	10.45
Chhattisgarh	173	64	76.4	145	83.98
D & N Haveli		42	43.2	225	30.28
Daman and Diu		34	66.3	151	21.85
Delhi		47	66.4	360	343.82
Goa		13	88.4	128	42.32
Gujarat	91	43	50.4	224	228.86
Haryana	101	41	62.2	145	204.98
Himachal Pradesh		38	69.5	226	434.2
Jammu and Kashmir		38	75.1	74	29.8
Jharkhand	165	54	61.9	118	28.04
Karnataka	108	32	62.6	123	452.93
Kerala	46	7	82.1	67	762.13
Lakshadweep		23	86.9	70	41.86
Madhya Pradesh	173	65	53.6	167	208.53
Maharashtra	61	29	56.3	159	148.41
Manipur		26	65.9	94	344.39
Meghalaya		40	61.5	116	191.63
Mizoram		46	50.5	186	434.82
Nagaland		37	35.7	148	19.12
Odisha	180	49	78.6	159	316.42
Puducherry		16	91.3	114	51.97
Punjab	122	33	89.1	153	357.76
Rajasthan	199	51	54.8	139	426.24
Sikkim		32	83	197	37.24
Tamil Nadu	66	27	69.7	119	426.04
Telangana	81	32	68.1	107	
Tripura		33	54.5	44	143.15
Uttar Pradesh	201	78	51.1	140	53.37
Uttarakhand	201	47	57.7	151	43.51
West Bengal	101	32	84.4	100	141.49

Table 4: Panel Data Analysis-Growth Equation

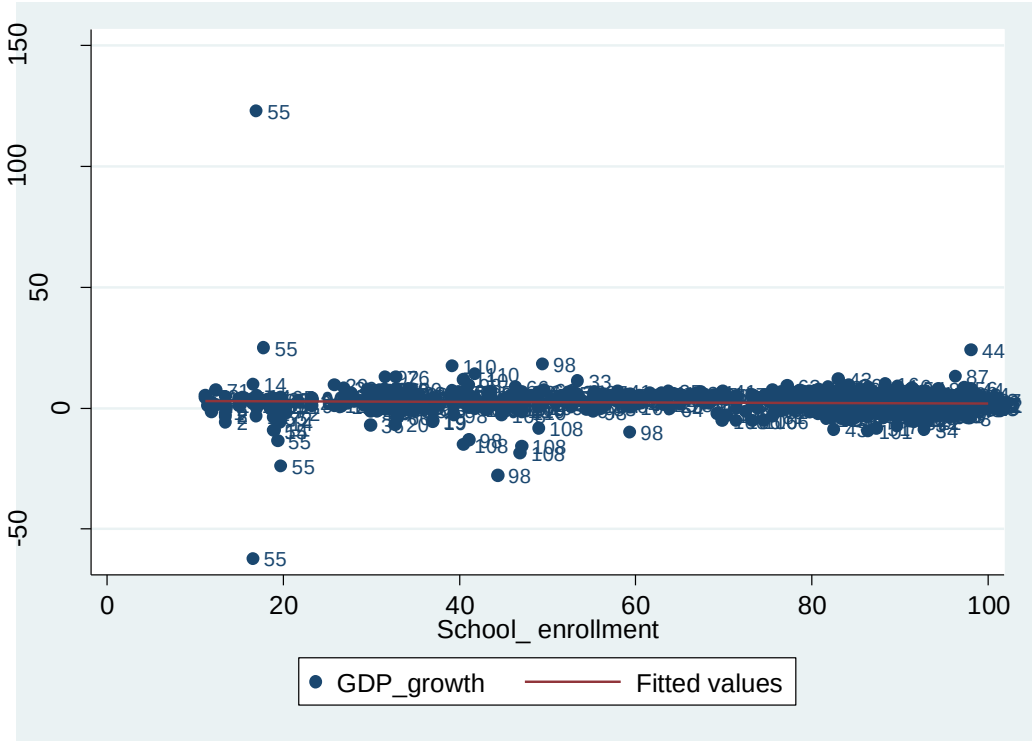
	I	II
Dependent Variable	**Real Per Capita GDP Growth**	
Model	Fixed Effects(Robust)	Random Effects(Robust)
EDUit	0.489**	0.030**
	[0.034]	[0.036]
HEALTHit	0.075***	0.040**
	[0.013]	[0.033]
log(GDPit-1)	10.679	,-1.785***
	[0.410]	[0.009]

GFCFit	0.112	-0.135***
	[0.254]	[0.010]
POPit	-0.322	,0.944**
	[0.749]	[0.0541]
OPENit	0.001	0.0125
	[0.990]	[0.901]
TERMSit	-0.031	-0.0044
	[0.485]	[0.385]
FISCALit	0.334***	0.196***
	[0.000]	[0.000]
INFit	-0.093	,-0.0762
	[0.298]	[0.219]
Constant	-39.688	13.144
	[0.363]	[0.000]
Observations	769	769
R-Sq within	0.2502	0.2272
R-Sq between	0.2552	0.2342
R-sq overall	0.116	0.1842
Country Fixed Effects	Yes	No
Year Fixed Effects	Yes	No
prob>F	0.000	
rho	0.668	
corr(u_i,x)		0
prob>chi2		0
P values in parenthesis. ***p<0.01, significant at 1 %.		
**p< 0.05, significant at 5%.*p<0.1, significant at 10%.		

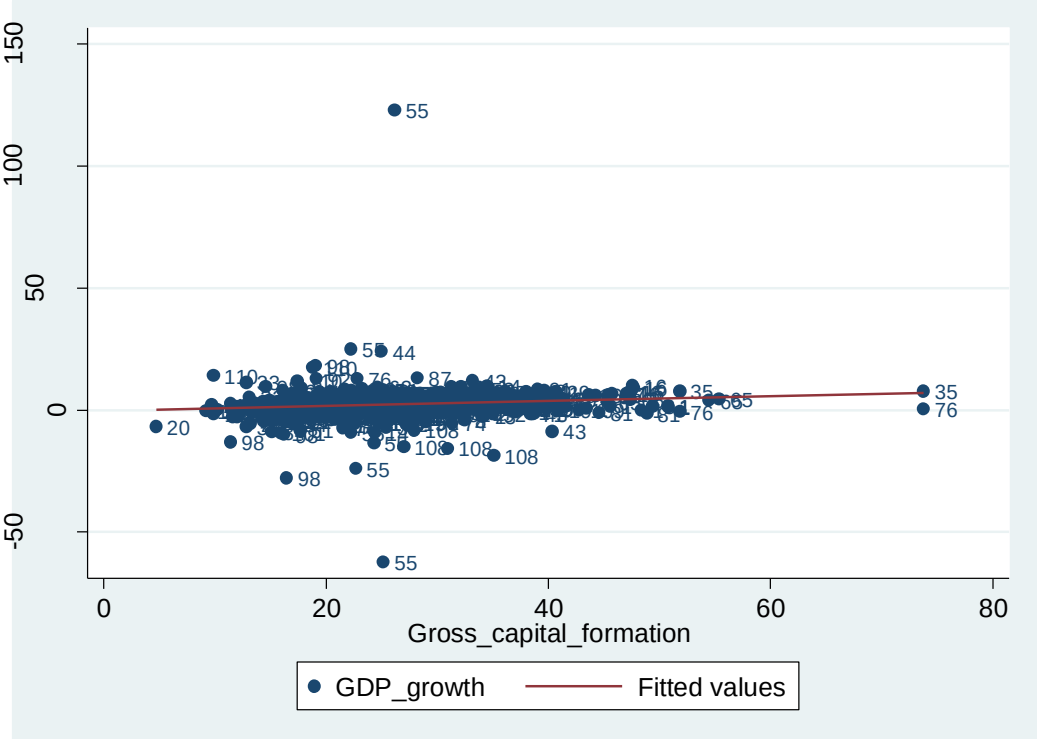
Graph 1



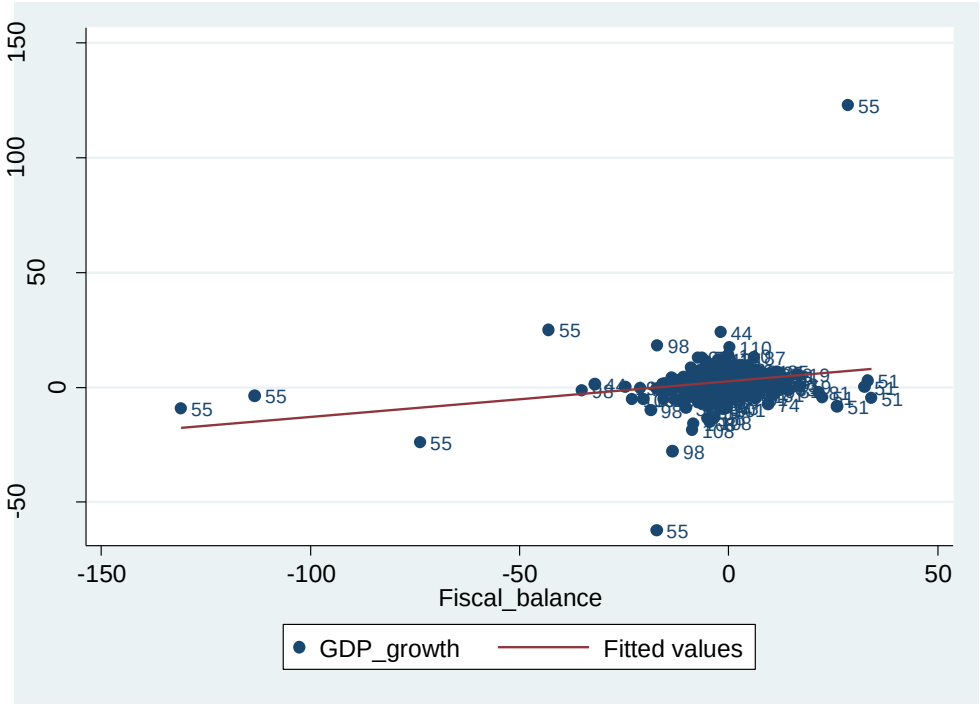
Graph 2



Graph 3



Graph 4



Graph 5