INVESTMENT IN HUMAN CAPITAL FORMATION AND ECONOMIC GROWTH: A STUDY ON THE ECONOMY OF ASSAM

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Abstract :

Investment in physical and human capital is indispensable for economic growth, as it augments the productive capacity of an economy more rigorously. Investment in human capital via nutrition, health care, quality education, job skills, digital knowledge, and better infrastructural facilities are the keys to removing extreme poverty and achieving a more equitable society. As per the World Development Report, 2019, no country can achieve sustained and inclusive economic growth without investing feasibly in human capital. Hence, this study considered several components of human capital formation as education, health, and other physical infrastructure covering transport, communication, power and IT for the economy of Assam and also considered GDP as representative of economic growth. Further, examines the link between investment in human capital and the economic growth of Assam, based on the secondary data of investment in those components and GDP from 1990-91 to 2021-22 with the aid of co-integration and suggests a significant long-term relationship between investment in human capital formation and economic growth in Assam. The VECM (Vector Error Correction Model) further reveals that although both variables change towards a long-run relationship, real investment in human capital does so more rapidly than the state GDP of Assam.

Keywords : Investment, Human Capital, Economic Growth, Long-term relation.

1.0 Introduction :

Human capital investment is a crucial aspect of a knowledge-oriented modern market-based economy in the present era. Even the developing countries can never deny this fact. To achieve a steady growth rate, human capital is a must and its nourishment has implications all over the economy. Human capital is briefly defined as knowledge, skill, ability, intelligence, experience, and physical and mental health that can be fostered by investing in human beings. Hence,

investment in human capital can lead to the development of the most creative and productive human resources via quality education and better healthcare with supporting infrastructure. Human capital formation and its impact on economic growth have a significant place in the field of economics. The neo-classical growth model by Solow (1956), the new growth theory of Lucas (1988) and Romer (1990) and the works of Knowles and Owen (1995) are some prominent studies in this regard, all of them studies suggest that the physical capital and the human capital investments augment the long term economic growth and human capital based on invention and innovations brings upon economic growth via technological advancements.

1.1 Theoretical Background :

Human Capital Theory was put forward by Schultz in 1961, and initiated by the branch of Labour Economics. Later, it was developed by Becker in 1964. Theodore Schultz introduced the human capital theory of economic growth by considering three specific aspects-- countries without sound human capital are unable to manage their physical capital, economic growth can be achieved if physical and human capital can grow together and last but not least human capital is the most intrinsic form of capital that propels growth. Hence, a clear connection lies between the development of human capital and economic growth.

1.2 Literature Review:

Over the past several decades, a wide range of explorations have been found on the contribution of human capital in the growth process of both developed and developing economies.
T.W Schultz (1961) viewed education as an investment in human capital rather than a consumption good. Subsequently, Blaug et.al (1969) , and Tilak (1987) show that investment in education yields a higher rate of return than investment in physical capital. Chaudhri (1979) finds that primary schooling positively affects productivity, particularly during rapid technological change. Romer (1986) and Lucas (1988) have proffered the new growth theories where sustained long-run growth of per capita income is explored by the likelihood of investment in human capital. Barro and Sala-i-Martin (1995) found that the average schooling years of a person have a significant positive effect on the economic output. In India, Mathur (1993) has shown that a positive association exists between stocks of human capital and economic development and that the association becomes stronger at higher levels of education.

Tilak (2002) explains household expenditure on education with the help of the term household incomes and other household characteristics such as the educational level of the head of the household, occupation, caste, and religion. Nour (2010) in her study, made use of comparative and descriptive methods to study the impact of human capital on science and technology (S&T) in Sudan. Another study by Zhang and Zhuang (2011) examined the effect of the composition of human capital on economic growth in China.

1.3 Objective and Research Question:

The objective of this study is to study the long-term relationship between govt. investment in human capital formation and economic growth of Assam. On the basis of the following objective, the research question can be stated as- Does investment in human capital formation contribute to the economic growth of Assam?

1.4 Methodology :

This study is based on secondary data for the time period 1990 to 2022 from various sources like World Bank Accounts data, Statistical Handbooks, publications of govt. of Assam and India and various websites. To find long-term relation between investment in the components of human capital formation and its effect on the growth of the GDP of Assam, certain sectors are considered as components of human capital formation based on the Human Capital Index, mentioned in the Human Capital Report, (2013). They are- education, health, transport, power, information technology.

A co-integration analysis is applied between total investment in human capital formation and the state GDP of Assam from the time period 1990 to 2022. Before that deflator is used for both the data set and converted to real value. By using the deflator, the nominal values are adjusted to real values. These steps are essential for obtaining an accurate long-term analysis. The real investment values provide a clearer picture of the actual investment over time, accounting for the effects of inflation.

1.5 Empirical Analysis :

To study the long-term relationship between investment in human capital formation and the economic growth of Assam, the study followed a structured methodology involving deflation of nominal investment values, and co-integration analysis. In the first place, on the basis of nominal investment in different components(i.e education, health, transport, power, IT) of human capital

formation , total or gross investment is calculated, later with the help of deflators real values of investment in human capital formation is computed and shown in the table:1.1.

Table : 1.1 , Total real investment in human capital formation components in Assam.

Year	Total_investment in education, health, transport,power,IT (in lakh)	Deflator	Real_Investment
1990-91	78284.85	0.6	130474.8
1991-92	122538.9	0.62	197643.4
1992-93	134784.2	0.65	207360.3
1993-94	131892.4	0.67	196854.4
1994-95	152040.3	0.7	217200.4
1995-96	177040.3	0.72	245889.3
1996-97	203523.6	0.75	271364.8
1997-98	220067	0.78	282137.2
1998-99	315313.2	0.8	394141.5
1999-00	331496.2	0.83	399393
2000-01	509653.3	0.85	599592.1
2001-02	414254.6	0.87	476154.7
2002-03	319500.7	0.9	355000.7
2003-03	510229.5	0.92	554597.3
2004-05	835004.6	0.95	878952.2
2005-06	761486.7	0.97	785037.8
2006-07	751320	1	751320
2007-08	830731.2	1.03	806535.2
2008-09	930361.1	1.05	886058.2
2009-10	1180375	1.08	1092940
2010-11	1363609	1.1	1239645
2011-12	1400819	1.13	1239663
201213	1996704	1.15	1736265
2013-14	2162484	1.18	1832614
2014-15	2713383	1.2	2261153
2015-16	2999666	1.23	2438753
2016-17	3712589	1.25	2970071
2017-18	4103479	1.28	3205843
2018-19	4051460	1.3	3116508
2019-20	3657947	1.33	2750336
2020-21	3333340	1.35	2469141
2021-22	2888000	1.38	2092754

Source : Statistical Hanbook, Assam, Govt. Budget of different financial years, World Bank Accounts data.

Similarly, on the basis of nominal GDP of Assam, real GDP is calculated with the help of same deflators, that can be depicted in Table 1.1.

Table 1.2: GSDP and Real Value by Deflating

The Table 1. 2 with Real GSDP values calculated using the provided deflator values:

Year	GSDP at Constant Price in Assam (in Cr)	Deflator	Real Value of GSDP(By Deflating)
1990-91	3769	0.6	6281.67
1991-92	3942	0.62	6358.06
1992-93	3997	0.65	6157.23
93-94	4161	0.67	6217.91
94-95	5116	0.7	7314.29
95-96	4416	0.72	6133.33
96-97	4563	0.75	6084.00
97-98	4613	0.78	5912.82
98-99	4654	0.8	5817.50
99-2000	34833	0.83	41967.47
2000-01	35715	0.85	42017.65
2001-02	36642	0.87	42186.21
2002-03	39233	0.9	43592.22
2003-04	41959	0.92	45608.70
2004-05	43150	0.95	45421.05
2005-06	45282	0.97	46630.93
2006-07	47502	1.0	47502.00
2007-08	50222	1.03	48759.22
2008-09	53319	1.05	50875.24
2009-10	56702	1.08	52594.44
2010-11	74860	1.1	68054.55
2011-12	143175	1.13	126681.42
2012-13	147342	1.15	128121.74
2013-14	154525	1.18	130944.92
2014-15	166709	1.2	138924.17
2015-16	179595	1.23	145199.19
2016-17	195496	1.25	156396.80
2017-18	211940	1.28	165578.13
2018-19	234048	1.3	180036.92
2019-20	324000	1.33	243609.02
2020-21	433925	1.35	321425.93
2021-22	412612	1.38	299414.49

Source : Statistical Hanbook, Assam, World Bank Accounts data

Now, the real investment in human capital formation and real GDP of Assam is shown in a tabular form from the year 1990 to 2022.

Table 1.3 : Total govt. investment (Real) and GSDP in real terms

Year	Total Real investment in human capital formation in Assam (using deflator)	Real value of GSDP in Assam (using deflator)
1990-91	130474.8	62.81667
1991-92	197643.4	63.58065
1992-93	207360.3	61.49231
1993-94	196854.4	62.10448
1994-95	217200.4	73.08571
1995-96	245889.3	61.33333
1996-97	271364.8	60.84
1997-98	282137.2	59.14103
1998-99	394141.5	58.175
1999-2000	399393	419.6747
2000-01	599592.1	420.1765
2001-02	476154.7	421.1724
2002-03	355000.7	435.9222
2003-04	554597.3	456.0761
2004-05	878952.2	454.2105
2005-06	785037.8	466.8247
2006-07	751320	475.02
2007-08	806535.2	487.5922
2008-09	886058.2	507.8
2009-10	1092940	525.0185
2010-11	1239645	680.5455
2011-12	1239663	1267.035

2012-13	1736265	1281.235
2013-14	1832614	1309.534
2014-15	2261153	1389.242
2015-16	2438753	1460.122
2016-17	2970071	1563.968
2017-18	3205843	1655.781
2018-19	3116508	1800.369
2019-20	2750336	2436.09
2020-21	2469141	321425.93
2021-22	2092754	299414.49

Source : From table- 1.1 and table -1.2

Now, the data on the variables of real investment in human capital formation and real GDP is plotted and visualised with the following figure.

The graph shows the real values of investment in HCF and State GDP over time
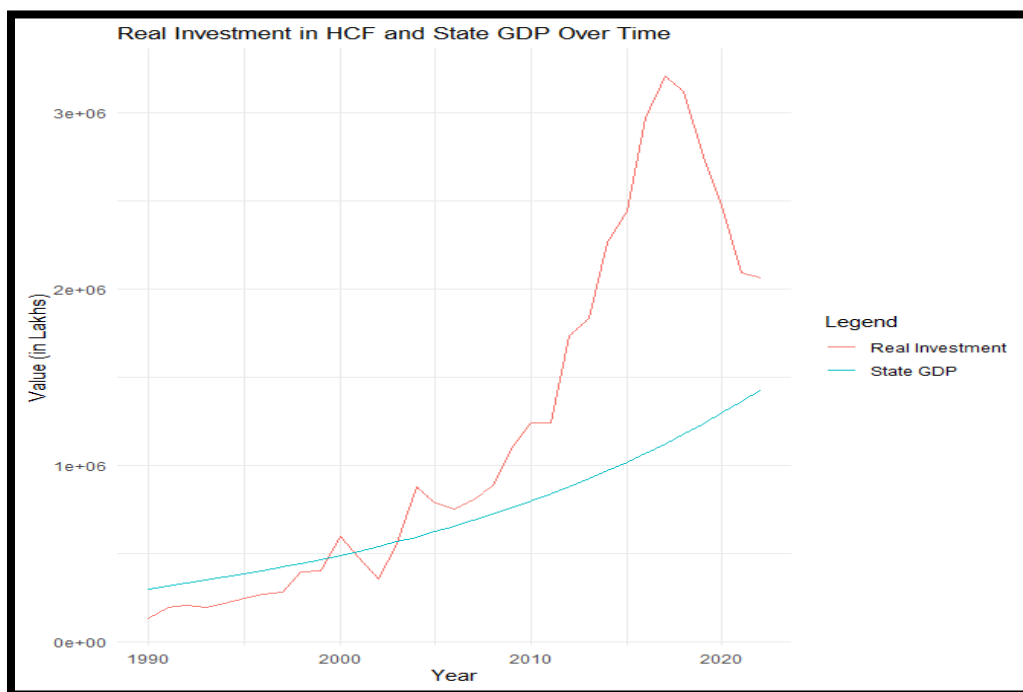

Figure :1, Graph for the real investment and real GDP over time.

The real investment is calculated by dividing the total investment by the deflator for each year to adjust for inflation. This gives a more accurate representation of the investment in real terms. Further, the total investment in various sectors shows an overall increase over the years, representing a rising focus on human capital formation in Assam depicting a steady increase in investment. The highest real investment recorded is in the year 2014, with a real investment value of 2,261,152.5. It also suggests the nature of the real investment and real GSDP in Assam by its government. The trend suggests that the investment made by the government increased exponentially over the year.

Data represents the trends and fluctuations in investments across diverse sectors, which can be analysed additionally , to understand the impact of these investments on the state's GDP and economic growth.

Test Result (in detail) :

The following table suggests various implications of the relationship between human capital investment and state GDP over time, which can be summarized below.

Table 1.5 Johansen Procedure Result :

Metric	Result
Test Type	Trace Statistic (without linear trend and constant in cointegration)
Eigenvalues (λ)	0.4342, 0.0937, 0.0000
Test Statistics and Critical Values	
$r \leq 1 r \leq 1 r \leq 1$	
- Test Statistic	3.05
- Critical Values (10%, 5%, 1%)	7.52, 9.24, 12.97
Conclusion ($r \leq 1$)	Do not reject null hypothesis (at most 1 cointegrating vector)
$r=0 r = 0 r=0$	
- Test Statistic	20.70
- Critical Values (10%, 5%, 1%)	17.85, 19.96, 24.60
Conclusion ($r = 0$)	Reject null hypothesis (at least 1 cointegrating vector)
Cointegration Relations (Eigenvectors)	
- Real_Investment.l2	1.00

- State_GDP.l2	-1126.87
- Constant	469713.77
Loading Matrix (Weights W)	
- Real_Investment.d	-0.1513477
- State_GDP.d	-0.0000258
Practical Implications	There is a strong long-term equilibrium relationship between Real Investment and State GDP. Real Investment adjusts more quickly to deviations from this equilibrium compared to State GDP.

The Johansen test suggests that there exists a co-integration between real investment and real State GDP, indicating a long-term equilibrium relationship between those variables. For maintaining such balance it is shown that when real Investment changes, real state GDP also changes. This is due to its coefficient, which implies that whenever there is a deviation from equilibrium both real investment and real State GDP will adjust their level towards it. Johansen's approach bears out that there is one co integrating vector between real investment and real State GDP. The immediate implication could be that if real investment goes up, signifies that the state GDP will also rise. The change in real investment is accompanied by an equal move in state GDP leading to maintaining long-term stability when equilibrium changes. An approach by Johansen indicates co-integration between real investment and the state GDP that has existed in the long term.

Later, the Johansen co-integration test and subsequent Vector Error Correction Model (VECM) analysis have provided several important results regarding the long-term relationship between investments in human capital formation (including education, health, transport, power, IT) and economic growth (represented by State GDP) in Assam.

Johansen Co-integration Test Results:--

Eigenvalues: 0.434, 0.094, 2.18e-17.

Test statistics and critical values:

r=0 (no co-integration): Test statistic = 20.70, which is greater than the 5% critical value (19.96). This indicates rejecting the null hypothesis of no co-integration.

For

$r \leq 1$

r≤1 (at most one co-integration relationship): Test statistic = 3.05, which is less than the 5% critical value (9.24). This indicates failing to reject the null hypothesis of at most one co-integrating relationship.

The test suggests there is one co-integrating relationship among the variables at the 5% significance level. This means that there is a long-term equilibrium relationship between investment in human capital formation and economic growth in Assam.

Co-integration Relations (Eigenvectors)

The eigenvector corresponding to the co-integrating relationship (normalized to the first column) is:

(1, -1126.87, 469713.77)'

This suggests the long term relation can be shown as –

(Real Investment)$_{t-2}$= 1126.87* State GDP$_{t-2}$ + 469713.77

This suggests a significant relationship between past values of investment and economic growth.

Loading Matrix (Weights)

The weights specify that how deviations from the long-term equilibrium affect short-term adjustments in the parameters.

Specifically:

The estimated coefficients for the error correction term (ect1) in the VECM are:

(-0.151, -0.0000258)'

This suggests that deviations from the long-term equilibrium are corrected at different rates for Real Investment and State GDP. Specifically:

For Real Investment: The rate of adjustment back to equilibrium is about 15.1% per period.

For Real State GDP: The adjustment speed is almost negligible, indicating that State GDP adjusts very slowly to deviations from the long-term equilibrium.

The negative coefficients of the error correction terms indicate that both real Investment and State GDP (real) move towards the long-term equilibrium after a jolt.

The stronger adjustment for Real Investment suggests that investment in human capital is more responsive to deviations from the equilibrium compared to State GDP (real).

1.6 Conclusion :

The joint study reveals a significant long-term relationship between investment in human capital formation and economic growth in Assam and indicates that investment in human capital formation has been contributing to the economic growth of Assam. The VECM further shows that although both variables change towards this long-run relationship, real investment in human capital does so more rapidly than state GDP. This implies that investments in education, health and infrastructural components like transport, power, and information technology have an immediate response to correct imbalances, while the impact on economic growth unfolds slowly in Assam.

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