The Effects of Education on Poverty Reduction in India: Striving Towards Sustainable Development

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ABSTRACT

Education is crucial for the development of a nation. Education is a multidimensional process; it helps to enhance skills and human capabilities, promote human rights, reduce inequalities and crime, and enhance economic growth. The United Nations (UN) recognized the need to promote education and alleviate poverty. The UN set two significant Sustainable Development Goals (SDGs), i.e., SDG 1 and SDG 4, to reduce poverty at all levels and to ensure inclusive and equitable education, respectively. These SDGs were introduced in 2015; the world has already passed seven years. But, still, in developing countries (like India), a large portion of the population continues to live in poverty. In this context, it is important to investigate the effects of education on poverty reduction in India. Here, time series data on poverty reduction and education for India are gathered from various secondary sources such as articles, databases (mainly from the World Bank database), journals, websites, etc. relating to the time period from 1991 to 2020 to ascertain whether education has effects on the reduction of poverty or not. Here, the Johansen cointegration test, VECM, and Wald tests are applied to ascertain whether education has any long- and short-run effects on the reduction of poverty or not. This study found that education has long-term effects on poverty reduction in India.

Keywords: Poverty; Education; Sustainable Development; VECM

JEL Codes: C32, I25, I32, Q01

Introduction

Adopting the Millennium Development Goals (MDGs) was one of the UN's best efforts to address numerous issues. MDG 1 dealt with hunger and poverty. Even though the world made significant progress in achieving MDG 1, it was still unsatisfied. The UN then introduced the SDGs (a set of 17 distinct goals) in 2015. Among these 17 goals, one of the most important is SDG 1. SDG 1 emphasizes ending poverty at all levels. Though globally, the number of individuals who live below the international poverty line has decreased by more than 50%, a large portion of individuals continue to live in extreme poverty. In the case of India, it has witnessed unprecedented economic growth in the last few years and established itself as an emerging economy in the world. Even though the per capita income of India increased, a significant number of people still live in poverty. Poverty is the condition where a person cannot afford the necessities for a minimum standard of living because they do not have enough money. People in this circumstance are unable to meet

their basic necessities, such as having access to clean water, owning a home, eating well, receiving medical care, etc. Problems with poverty can be divided into two categories: personal and societal. At the individual level, people living in poverty don't have enough money to buy the things they need to live well. They have daily challenges obtaining food, clothing, shelter, medicines, and education. A person's physical and mental health might suffer from poverty. At a societal level, poverty hampers economic development and causes other issues, such as crime, unemployment, etc. (Krueger & Maleckova, 2003) whereas education means the knowledge that people learn and experience in their homes, schools, colleges, universities, and communities. The foundation for a person's and a society's progress is education. Education helps people develop their thought processes. It enables individuals to live the life they want by presenting a wide range of opportunities, like good employment. It basically gives people financial stability and self-confidence. Education promotes technological advancements and assists in community development. Education is essential for the proper growth of any country. Education boosts economic growth, eradicates poverty, and improves efficiency (Awan *et al.*, 2011). Human capabilities can be enhanced through proper skills and knowledge. Education provides knowledge and skills that enable people to get high-salaried jobs. It indicates education helps to enhance a person's income. Good income helps them fulfill their needs (Janjua & Kamal, 2011). In this context, it is important to understand whether education has the potential to reduce poverty in India or not.

Literature Review

Bourne and Attzs (2005) made an attempt to find out the association between poverty and economic progress in the Caribbean. They found that economic growth is one of the key factors that influence a nation's ability to create and enhance employment, income, and access to resources. The outcome of this study demonstrated that a higher level of economic growth in a country attracts a higher amount of investment, enhances productivity, and increases expenditures on health and education. According to the study of Khan *et al.* (2008), poverty can be decreased by increasing human capital investment and enhancing the quality of human resources. They used the multivariate co-integration method in their study. They found that improvements in human resources have the capacity to reduce poverty. Kim and Lee (2014) investigated the relationship between non-formal education programs and poverty. Researchers found that one of the key elements influencing poverty is a low level of literacy and life skills. The results of this study demonstrated that education at the primary school level is insufficient to reduce poverty. Afzal *et al.* (2012) tried to investigate whether education and physical capital affect economic progress or not. This study concluded that education, physical capital, and economic growth are positively related to each other. That means education and physical capital positively affect economic progress. This outcome aligns with Adawo's (2011) study results. Janjua and Kamal (2011) examined how income and education contribute to reducing poverty. This study found that income growth is moderately helpful in reducing poverty. Education played a crucial role in eliminating poverty. According to the study of

Tilak (2007), secondary and higher education play an important role in human development and economic growth. This study found that secondary and higher education boost individual earnings and support economic growth. Chaudhary *et al.* (2009) investigated the association between higher education and economic growth from 1972–1973 to 2005–2006 in Pakistan. They found that a long-term association exists between real GDP, physical capital, the labor force, and education. Islam *et al.* (2007) assessed the linkages between educational and economic growth in Bangladesh. They applied a multivariate regression method in their study. It is concluded that economic growth and education have a long run association as well as bidirectional causation between the two variables. Brempong *et al.* (2006) investigated the impact of higher education on economic progress in Africa. In this study, they applied the Augmented Neoclassical Growth model for estimation. They found that higher education has a positive and significant impact on economic development in Africa. This result is consistent with the study by Hassan and Ahmed (2006). Hassan and Ahmed (2006) considered sub-Saharan African nations and used the Mankiw, Romer, and Weil-augmented Solow models in their study. They found that primary and secondary school enrollment ratios have a positive effect on economic growth.

Research Gap

A comprehensive review of the literature revealed that the majority of previous studies tried to identify the impact of education on poverty before the introduction of the SDGs. In the SDGs, two important goals, SDG 1 and SDG 4, are set to end poverty at all levels and enhance the quality of education, respectively. Though the world has already passed seven years since the introduction of the SDGs, in developing countries (like India), a large portion of the population continues to live in poverty. Since the government has been working to reduce poverty and improve education, it is crucial to understand how education affects poverty reduction in India.

Research Questions

Following are the research questions:

- Does education have any long-term effect on poverty reduction in India?

- Does education have any short-term effect on poverty reduction in India?

Methodology

Justification of Selecting Variables

Justification of selecting variables is discussed in Table 1.

Table 1: Description of Variables Used in This Study

Name of the Variables & its Representation	Description	Author/(s) used these variables in their studies
Household Final Consumption Expenditure (HFCE)	It consists of expenditure made by household on goods or services that are utilized for meeting needs or wants. It is used as a proxy variable for poverty.	Havinga, Kamanou and Vu, (2009) Bhalla, Bhasin and Virmani (2022)
Gross Enrolment Ratio (GER)	It indicates students who are enrolled in specific level of education, regardless of age. It is used as a proxy variable for education.	Owoeye, (2014); Dey and Mishra (2018).
Government Educational Expenditure (EDUEX)	Direct government expenditures on academic institutions as well as public subsidies provided to households for educational purposes are both included in the governmentexpenditure on education. It is also used as a proxy variable for education.	Sylwester (2000); Choudhary (2016); Chen *et al.* (2023)

Source: Researchers' own presentation

Data Source and Period of Study

The annual time series data relating to gross enrolment ratio (GER), government educational expenditure (EDUEX), and household final consumption expenditure (HFCE) covering the period from 1991 to 2020 are used in this study. Data are extracted from the World Bank database, i.e., World Development Indicators (WDI).

Model Specification

The following functional regression equation is constructed to examine the effects of education on poverty reduction in India by considering the aforementioned variables.

$$Y = b_0 + b_1 X_1 + b_2 X_2 + ... + b_n X_n + e$$

Where, Y= the dependent variable;

X_1 = independent variable 1

X_2 = independent variable 2

n= number of observations

b0, b1, b2 .... bn = Model parameters

ε = Random disturbance term

In the model, 'Natural Log of Household Final Consumption Expenditure' is considered the dependent variable, and 'Gross Enrolment Ratio' and 'Government Educational Expenditure (% on GDP)' are used as the independent variables to examine the effects of education on poverty reduction in India. The following general model is developed to meet the above-mentioned research objectives:

$$LN\_HFCE = b0 + b1\ EDN\_GER + b2\ EDU\_EX + \varepsilon$$

Where,

LN_HFCE = Natural Log of Household Final Consumption Expenditure

EDN_GER = Gross Enrolment Ratio

EDU_EX = Government Educational Expenditure (% GDP)

In this study, to examine the presence of unit roots in the data sets, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods are first applied. Then lag length is selected using Akaike information criteria (AIC), Schwarz information criteria (SC), and Hannan-Quinn information criteria (HQ). Then, a cointegration test is run to estimate the long run effect of education on poverty reduction. Here, the Johansen methodology of cointegration is applied. Then, the Vector Error Correction Model (VECM) is also applied. In order to confirm whether education has any short-term effects on poverty reduction or not, the Wald test is used. Finally, to check the stability of the model, CUSUMQ is used.

Econometric Tools Used

Unit Root Tests

Time series modeling is not possible if the data series are non-stationary in nature (Farooq & Islam, 2021; Temiz Dinç & Akdoğan, 2019). Because of this, the unit root test is used to confirm whether the data series is stationary or not. Two popular unit root tests invented by Dickey, D. A., & Fuller, W. A. (1979) and Phillips, P. C., & Perron, P. (1988) are utilized in this study.

Lag Order Selection using VAR

A VAR model is used to determine the optimum lag length (Farooq & Islam, 2021; Temiz Dinç & Akdoğan, 2019). Here, the optimal lag length is determined using the AIC, SC, and HQ criteria. This lag selection is crucial because the cointegration test is very sensitive to the lag length of the VAR.

Estimated Long Run Coefficients

Long-term correlation between various time series is known as co-integration. To check this, in this study, the Johansen cointegration test is conducted to estimate the long run effects of education on poverty reduction (Paul and Sana, 2018; Temiz Dinç & Akdoğan, 2019).

Vector Error Correction Model (VECM)

If the cointegration test's outcomes confirm that there is cointegration between data sets, the VECM model is generally used. The long-term equilibrium relationship between the data sets and the existence or absence of error correction over time is examined using the VECM model (Asari *et al.*, 2011; Temiz Dinç & Akdoğan, 2019).

Wald Test

The Wald test is carried out to determine the short-run relationship between data sets. If the Wald test probability value exceeds 0.05, it indicates a short-run relationship between the data sets (Farooq & Islam, 2021; Abid *et al.*, 2016).

Stability Test

The Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ) is used to confirm the stability of the model. If plots of CUSUMSQ are inside the boundaries, there is no indication of any substantial structural instability (Burakov, D., 2017; Bahmani-Oskooee & Ng, 2002).

Results and Discussion

The results of the different analyses are discussed in this section.

Unit Root Test

For the purpose of examining the presence of unit roots in the data sets, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) methods are applied. The results of the same are exhibited in the following tables: Table 2 and Table 3.

Table 2: Outcomes of Unit Root Test Using Augmented Dickey-Fuller (ADF) Method

Variables	At Level		At First Difference		Integrating Order
	Stat.	Probability.	Stat.	Probability.	
LN_HFCE	-1.4682	0.5313	-5.7541	0.0001	I (1)
EDN_GER	-0.4922	0.8790	-3.7591	0.0085	I (1)
EDU_EX	-1.9730	0.2963	-3.3176	0.0236	I (1)

Source: Researchers' own calculation

Table 3: Outcomes of Unit Root Test Using Phillips-Perron (PP) Method

Variables	At Level		At First Difference		Integrating Order
	Stat	Probability	Stat	Probability	
LN_HFCE	-2.7867	0.0726	-6.7740	0.0000	I (1)
EDN_GER	-0.5520	0.8665	-3.7223	0.0092	I (1)
EDU_EX	-1.9625	0.3007	-3.3006	0.0245	I (1)

Source: Researchers' own calculation

The existence of unit roots is checked by using the Augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test (Paul and Sana, 2018; Nazima, 2011). Table 2 and Table 3 show the presence of a unit root at level (at the 5% significance level), which denotes series that are non-stationar. The non-stationarity problem is resolved after taking the first difference, and in all cases, the p value is less than 0.05. Now, the Johansen cointegration method is applied to examine the long-run association between variables (Paul and Sana, 2018). Then, the appropriate lag length is decided using different lag length criteria selection methods. It was found that there would be two lags for all variables.

Table 4: Results of Lag Order Selection Criteria using VAR

Lag	Akaike Information Criteria (AIC)	Schwarz Information Criteria (SC)	Hannan- Quinn Information Criteria (HQ)
0	7.690576	7.834558	7.733389
1	-0.301584	0.274343	-0.130331
2	-0.982614*	0.025259*	-0.682921*
3	-0.836171	0.603647	-0.408038

Source: Researchers' own calculation

**represents lag order selected by the criterion*

According to the AIC, SC, and HQ information criteria, the optimum lag length should be 2 (Table 4).

Findings

Null Hypothesis H0 1: There is no integration between the variables.

Alternative Hypothesis: There is at least one cointegrating variable.

Model:

D(LN_HFCE) = C(1) (LN_HFCE(-1)+0.412878992245*EDU_EX(-1) - 0.106838544534*EDN_GER(-1) - 26.2393171272) + C(2)*D(LN_HFCE(-1)) + C(3)*D(LN_HFCE(-2))*

*+ C(4)*D(EDU_EX(-1)) + C(5)*D(EDU_EX(-2)) + C(6)*D(EDN_GER(-1)) + C(7)*D(EDN_GER(-2))+ C(8)*

This equation is used in the Error Correction Model. Here, the natural log of household final consumption expenditure (LN_HFCE) is used as the dependable variable. C (1) indicates the coefficient of the integrating equation.

Null Hypothesis H0 2: This null hypothesis states that there is no long term causality among HFCE, EDU_EX, and EDN_GER.

Alternative Hypothesis: There is long-term causality.

Table 5: Results of Johansen Test of Co-integration

HFCE = f (EDU_EX, EDN_GER)							
No. of Co-integration Equations	Eigen value	Trace Stat.	0.05 Critical Value at 5%	Probability-Value**	Maximum-Eigen Value	0.05 Critical Value at 5%	Probability- Value**
None *	0.585991	35.71341	29.79707	0.0093	23.81041	21.13162	0.0205
At most 1	0.316622	11.90300	15.49471	0.1616	10.27908	14.26460	0.1942

Source: Researchers' own calculation

At the 0.05 level of significance, the trace test and the Max-eigen value test indicate one co-integrating equation.

* represents rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

From table 5, it is observed that the Max. Eigen value and Trace test (the estimated test statistics) are higher than the critical value at the 5% significance level. This indicates that there is one cointegration equation. The null hypothesis is rejected because the probability is less than 0.05. It means cointegration exists between the variables.

Table 6: Outcomes of Vector Error Correction Estimates

Dependent Variable	Coefficient	Standard Error	t-Stat.	Probability Value
C(1)	-0.151419	0.046139	-3.281837	0.0039

Source: Researchers' own calculation

The above table shows that the co-efficient [C (1)] has a negative sign and is significant at the 1% significance level as the probability value is less than 0.01. This result indicates error correction over the long term. This also demonstrates the long-run effects of education on poverty reduction.

D(LN_HFCE) = C(1)*(LN_HFCE(-1) + 0.412878992245*EDU_EX(-1) - 0.106838544534*EDN_GER(-1) - 26.2393171272) + C(2)*D(LN_HFCE(-1)) + C(3)*D(LN_HFCE(-2))
+ C(4)*D(EDU_EX(-1)) + C(5)*D(EDU_EX(-2)) + C(6)*D(EDN_GER(-1)) + C(7)*D(EDN_GER(-2))
+ C(8)

Table 7: Estimation of Equation

	Coefficient	Standard Error	t-Stat.	Probability Value
C(1)	-0.151419	0.046139	-3.281837	0.0039
C(2)	-0.873580	0.281771	-3.100315	0.0059
C(3)	0.362277	0.192956	1.877507	0.0759
C(4)	0.005714	0.032000	0.178571	0.8602
C(5)	0.016829	0.031615	0.532323	0.6007
C(6)	-0.005292	0.005774	-0.916562	0.3709
C(7)	0.002036	0.007262	0.280433	0.7822
C(8)	0.179753	0.038908	4.619927	0.0002
R-squared	0.735950	Mean dependent var		0.121313
Adjusted R-squared	0.638669	S.D. dependent var		0.050366
S.E. of regression	0.030275	Akaike information criterion		-3.915762
Sum squared residual	0.017415	Schwarz information criterion		-3.531810
Log likelihood	60.86279	Hannan-Quinn information criterion		-3.801593
F-stat.	7.565166	Durbin-Watson statistics		2.324399
Probability (F-statistic)	0.000206			

Source: Researchers' own calculation

The above table shows that the probability value of the co-efficient [C (1)] is 0.0039, which is less than 0.05 and 0.01. This indicates the null hypothesis is rejected both at the 1% and 5% levels of significance. The coefficient [C (1)] has a negative sign in Table 7, which denotes long-term equilibrium. The adjusted R-squared is 0.638669, which indicates independent variables have a strong influence on the dependent variable. Over all models, it is significant because Prob. (F-statistic) is less than 0.05.

Table 8: Outcomes of Wald Test

Test Stat.	Value	Prob.
F-stat.	0.284621	0.8843
Chi-square	1.138485	0.8881

Source: Researchers' own calculation

To check whether EDU_EX and EDN_GER have any impact on LN_HFCE or not in the short run (SR), the Wald test is conducted (Abid *et al.,* 2016; Paul and Sana, 2018).

Null Hypothesis H0 3: This null hypothesis states that lag 1 & 2 of EDU_EX and EDN_GER cannot jointly affect LN_HFCE. The Chi square statistic's probability is less than 0.05. This indicates the null hypothesis is rejected. However, the null hypothesis is accepted here, since the probability of the Chi square statistic is greater than 0.05,

indicating that the lags 1 and 2 of the EDU_EX and EDN_GER do not jointly affect the LN_HFCE in the short run (table 8). So, in the short run, education doesn't have any immediate effect on poverty reduction.
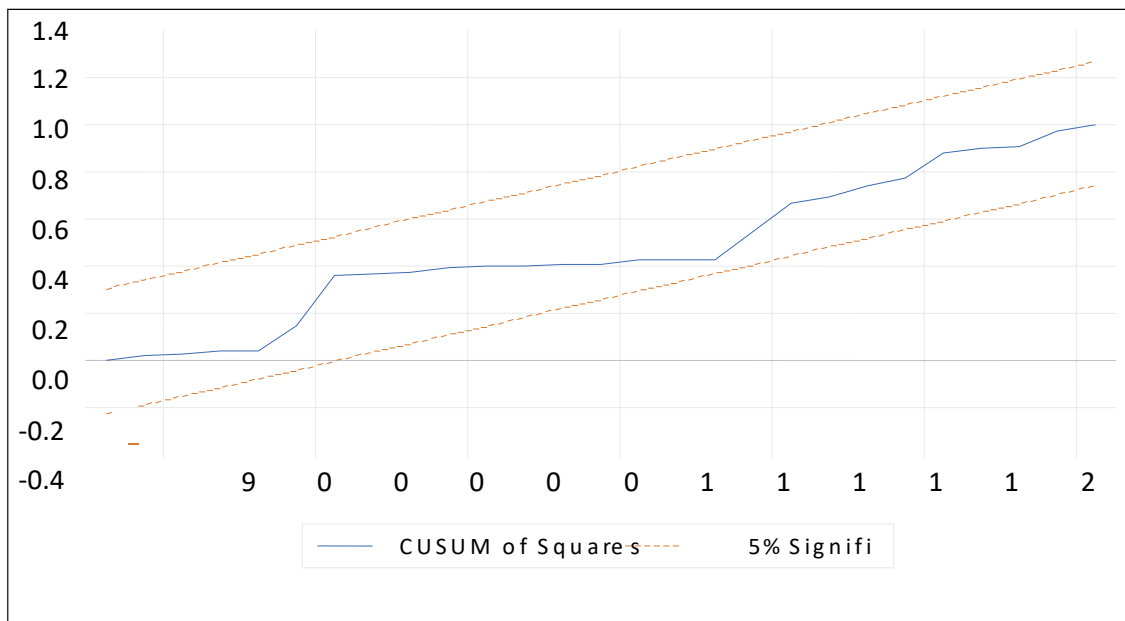
Stability Tests

Figure 1: Plot of Cumulative Sum of Squares of Recursive Residuals

The above figure shows that plots of CUSUMSQ are inside the boundaries; this indicates a long-run relationship exists between the variables, and it also shows that the model is stable.

Conclusion

The key to economic development is investing in the educational sector. Education assists in the reduction of poverty and promotes socio-economic development. This study attempts to examine the effects of education on poverty reduction in India. With the help of the Johansen method, cointegration among series is investigated. The cointegration result demonstrated that there is a long-term association between education and poverty. This shows that education has a long-term, positive, and significant effect on reducing poverty. Therefore, poverty can be reduced by promoting education. The targets of SDG 1 (zero poverty) can be achieved by educating people (SDG 4). Enrollment in educational institutions rises if government spending on education rises. If enrollment in educational institutions rises, more students find employment after finishing their degrees, which contributes to rising household final consumption expenditure. In the long run, this higher household final consumption expenditure helps to raise living standards and reduce poverty, but there is no short-run effect. Government expenditure on education and the enrolment ratio won't have any immediate effect on reducing poverty, and it will take time to observe a noticeable result. It takes a few years after a student enrolls in school before they

are placed. Once they get a job, their income will rise, their expenses will rise, and poverty will gradually decline. These contribute to achieving SDG 1, i.e., eradicating poverty.

Limitations of the Study

This study did not take into account all of the factors like employment, economic growth, etc. The other pertinent factors could not be taken care of due to time constraints. To obtain more robust results, a number of other factors could have been considered. Further research can be done in this area.

Acknowledgment

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