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Social Overhead Capital and Poverty Alleviation: Panel Data Analysis in the SAARC Countries

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ABSTRACT

The present study examines the impact of social overhead capital on reducing poverty in the SAARC countries. It is the poorest region in the world. However, it has the huge material resources that can be utilized to meet the challenges posed by poverty. The study incorporates the panel data for the year from 2000 to 2018 of eight countries of SAARC including Afghanistan, Bhutan, Bangladesh, India, Nepal, Sri-Lanka, Pakistan and Maldives. The study employs the fixed effect model to analyze the impact of infrastructure related variables on poverty. The results report that transportation, telecommunication sector and electricity access have negative impact on poverty. Moreover, gross domestic product, inflation rate are also contributing towards the reduction of poverty. Fertility rate is showing the positive association with the poverty.

1. Introduction

Poverty has always been the burning issue in the developing world which is often debated at the international level. SAARC countries have always highlighted this problem. It is an inter-governmental body. Its purpose is to improve the social growth and the well-being of its people. Social Overhead Capital includes all those services that are considered necessary for producing all the commodities of the country. Its major sectors includes transportation sector, telecommunication sector and energy generation facilities. These sectors includes a wide range of variables such as fixed telephone subscription, access to the electricity and roads and railway lines etc.

According to the World Bank report (2000), poverty is defined as the deprivation in the well-being of the masses. Three approaches are often considered valid in this regard. In the first approach of well-being, the poverty is measured in the monetary term or the power of the people to buy the goods and services. In the second method, it is evaluated by how many people have access to the particular goods, food, shelter, health facilities and the educational opportunities. Amartya Sen in (1987) presented the third measure of poverty which includes poor health, inadequate income, lack of capabilities, insecurity, low self-confidence, absence of the basic human rights, freedom of speech, and sense of powerlessness. Furthermore, poverty is also seen in other two ways. Absolute poverty means that people are not able to meet essential subsistence essentials such as food, clothing and shelter. In the relative poverty, a position of an individual is compared with respect to the average income or spending with the other half of the population.

The cost of basic needs approach is considered very suitable method to build up the poverty line. According to this method, a nutritional requirement for good health is picked such as 2100 calories per person per day. The estimation was that the food needs vary among individuals by climate change, individuals activities and seasonally. In the second step, food energy requirement is examined through diet that reflects by the habits of individuals. The second method of measuring poverty line is to find the consumption expenditures or income that enables the households to obtain enough food to meet energy requirements.

Telecommunication sector plays a very important role in the global economy. Today's economies of the world are highly dependent upon the quick information and the knowledge. Almost all the firms of the SAARC region use this means to get informed their people of their latest input prices and output prices. South Asian countries are striving to build the ICT infrastructure to its remote areas. India, Pakistan and Sri-Lanka are trying to increase the information and communication technology literacy and skills in education and training.

Transportation sector includes roads, railway lines, trucks, air and port infrastructure and shipping lines. In SAARC region, proper usage of this infrastructure is considered essential for the industrialization. Asian Development Bank has declared that roads, rails, aviation and inland water corridors have strengthen the intra-SAARC linkages. The theme of 14th SAARC summit was the connectivity. Its major concerns were trade, culture, poverty alleviation and physical infrastructure.

Energy sector is very important for the economic development of any country. It ensures the high quality of living. It is essential for the industrial purposes. In the year 2020, it is reported that all the people pf the Maldives have access to electricity and in Sri-Lanka it is 99.58%. It includes products such as coal and petroleum. Therefore, it is also helpful for the transportation.

Afghanistan is leading other regional countries in poverty. According to the National Risk and Vulnerability Assessment, it is reported that poverty rate has been 39% in 2020. In Nepal, it has been declined from 9% in 2018 to 7% in 2020. The remaining countries are also observing it due to the many factors. However, in Bhutan, It is at the lowest rate.

The study has tried to examine the role of social overhead capital to reduce the poverty in the SAARC region. The rest of the parts of this paper have been designed in the following manner. The first and the second section provides introduction and literature reviews of the past research on similar cases. Third section represents the data sources and methodology. The results of the econometric analysis have been incorporated in the fourth part of the study. The last section provides the concluding remarks.

2. Literature Review

To investigate the role of social overhead capital had been an issue of highly significance in the past literature. Many researchers have been conducted to see the relationship between infrastructure related variables and the economic growth. The present study has tried to eliminate the poverty in the eight countries of the SAARC region through SOC. Before proceeding towards the present research analysis, it is necessary to know the view points of the other studies and the econometric techniques that are used in them.

Faridi et al (2011) emphasized on the role of transportation and telecommunication sectors to stabilize the economy of Pakistan. The time series data was taken from 1972 to 2010 from the various economic

surveys and official websites of Pakistan governments. The study incorporated the autoregressive models. The study extended the Solow model according to the balanced growth and unbalanced growth theories. Skilled labor was essential for the increases output. Capital was the major source of the loanable funds. The results of the study proved that the motorways and highways could reduce the distances among people. Easy access to the market could attract the foreign buyers. The study suggested to initiate the training programs for the workers. Therefore, the awareness programs should be started to give information regarding telecommunication infrastructure among people.

Bashir et al (2013) explained the effectiveness of social overhead capital on the economic growth. Three components of the SOC were included in the study. Time series data were taken for the period from 1972 to 2010. Various sources were used for the collection of data such as Handbook of Statistics of Pakistan, Pakistan Economic Survey 2010-2011. The analysis utilized the ARDL model to investigate the short and long run relationships. The results showed that the telephone lines, highest enrollment rate, education expenditures and enrollment at university level were contributing positively to enhance the economic growth in the long run. However, the remaining variables such as railway lines, post offices and PIA revenue affected the output negatively. As a result, it is suggested to the government to develop the transportation infrastructure. It also forced to make policies regarding to increase the educational expenditures for the provision of cheaper learning opportunities.

Mohmand et al (2016) investigated the effects of transportation infrastructure on the economic growth and social welfare. Its effective reduced the cost of production and enhanced the economies of scale. The panel data was collected from 1982 to 2010 at the provincial level from the National Transport Research center and provincial statistical bureaus. The results of the Granger causality confirmed that there was not any long run relationship between the economic growth and investment infrastructure. However, a unilateral causality was present transportation and GDP. The study concluded that the improved accessibility to the roads was very significant for the access to the goods and services in the region.

Ahmad and Majeed (2019) explored the impact of renewable and non-renewable energy resources, trade openness and urbanization on the carbon dioxide emission. The nature of data was panel and it was obtained for the period from 1990 to 2014 for the SAARC countries. Panel unit root test sowed that all the variables were stationary at first difference. Further, panel co-integration test confirmed the long run relationship. The FMOLS results showed the negative association between the renewable energy resources and CO_2. On the contrary, non-renewable energy resources and trade openness were positively related. The study proved the evidence to make the policies to reduce the global warming. The analysis suggested to use the renewable energy to protect the environment.

Mahmood and Bashir (2019) examined the role of ICT infrastructure in the economic growth in the South Asian countries. Panel data was incorporated from 1990 to 2014 from the World Development Indicators, and Groningen growth and development. The study used the five different panel unit root tests. The results showed that the one percent increase in the ICT related assets would increase the GDP by eight percent. Similarly, one percent increase in the growth of non-ICT capital increased the GDP by twelve percent. The study concluded that ICT could improve the living standard at micro and macro level in the SAARC region that would boost the economic growth in the long run.

Chakraborty and Nandy (2011) found the impact of telecommunication sector investment in the developing countries. The study collected panel data from 1985 to 2007. The findings reported that granger causality ran from the per capita GDP to mainline tele-density. The conclusion was that tele-

communication sector could be proved strong for the developing countries. The investment in this sector is an important tool for development of less advanced countries.

Maparu and Mazumdar (2017) investigated the role of different sectors of transportation infrastructure to see its impact on economic growth and urbanization. Annual time series data were gathered from 1990 to 2011. The study included five variables such as national highway density, total road density including paved and unpaved roads, airways passengers, airways freight. The results showed that long run relationship was present among these variables. There existed a unidirectional long run relationship from GDP to all other variables excluding air passengers. There existed a short run bi-directional causality between railway lines and gross domestic product.

Meersman and Nazemzadeh (2017) explored the role of transport infrastructure in the Belgium economy. It was found that there was a high growth rate of passengers in Belgium. The study used the Granger causality and vector auto-regressive models. The analysis was divided into three models. In the first model, total transport network had a positive impact in short and long run. In model two, motorways and railways had significant impact in both short-term and long-term. Furthermore, investment rate and technology positively impacted the economy. The study concluded that open economy like Belgium could play its role in international trade and in generating the employment opportunities.

Saidi and Mongi (2018) found that there existed a causal relationship among education, information and communication technologies, economic growth. Panel data was utilized for the period from 1990 to 2015. Data were gathered from World Development Indicators. Unit root tests showed that the variables were non-stationary. Panel co-integration test revealed that all the variables were integrated. Vector auto-regressive models showed that short run causality ran from education to economic growth. The Granger Causality results confirmed that there was a two way causality from GDP to internet users, research and development and GDP. The analysis concluded that economic development was due to the ICT infrastructure in the developed countries over the periods.

Sardaoui et al (2019) dealt with the importance of energy growth and energy consumption in the MENA region. It also found the association between output and financial development in the MENA region. The analysis took the data for the empirical analysis for the period from 2000 to 2018. Fully modified ordinary least square test was used because the stationarity of all the variables was confirmed at level. The results revealed that financial policy and global energy had positive impact on the economy's real production. It was concluded that there was a need to implement the culture of rational use of energy consumption. It would diversify the energy supply and supply of clean and renewable energies.

3. Data sources, Methodological issues and Model Specification

Reliable data guarantee the reliable empirical results. This section provides data sources, methodology that has been used for the analysis along with model specification.

3(a). Data Sources

The nature of data of the present analysis is panel, because all the eight countries of SAARC region have been included in the study. Data sources for the balanced set of data from the year 2000 to 2018 are diverse. There consist World Development Indicator (WDI), the SAARC Secretariat Publications, World Bank (WB), International Roads Federation (IRF), and various issues of the economic surveys of the respective countries.

3(b). Methodology Issues

The study is based upon the balanced panel data. The fixed effect model is incorporated to estimate the desired results. First we construct the simple linear panel model having one explanatory variable. It will be known as the general form of the model. It is given below as:

$$Z_{it} = \alpha_i + SW_{it} + e_{it} \quad \ldots..1$$

Where, "Z" is a dependent variable and "W" is an independent variable. They are attached with subscripts "i" for i = 1,2,3,4, …., N cross section groups and "t" for t = 1,2,3,4, …., T time periods. The coefficient α and S do not possess any subscripts in this simple model. They will remain the same for all the years for all units. We can add subscript to the constant a for the sake of heterogeneity. Therefore, a will be the same for all the cross section.

In the following equation is derived:

$$Z_{it} = \alpha_i + SW_{it} + e_{it} \quad \ldots\ldots.2$$

This method is also known as the common constant method. On the practical grounds, the data is not always homogeneous. Therefore, it is considered a highly restrictive care and demands for the inclusion of fixed effect and random effect model.

i) **Fixed Effect Model**

The fixed effect model allows for the different constants for each cross section. Least-square dummy variable (LSDV) is another name of the fixed effect model. The following model is constructed to understand this estimation technique better.

$$Z_{it} = \alpha_i + S_1W_{1it} + S_2W_{2it} + \ldots\ldots S_kW_{kit} + e_{it} \quad \ldots\ldots 3$$

This equation is written in the matrix notation as:

$$Z = D\alpha + WS' + e \quad \ldots\ldots\ldots\ldots 4$$

Where,

$$Z = \begin{pmatrix} Z_1 \\ Z_2 \\ \vdots \\ Z_w \end{pmatrix}_{NT \times 1}, \quad D = \begin{pmatrix} i_T & 0 & 0 \\ 0 & i_T & 0 \\ \vdots & \vdots & \vdots \\ 0 & 0 & i_T \end{pmatrix}_{NT \times N}$$

$$W = \begin{pmatrix} W_{11} & W_{12} & W_{1k} \\ W_{21} & W_{22} & W_{2k} \\ \vdots & \vdots & \vdots \\ W_{N1} & W_{N2} & W_{Nk} \end{pmatrix}_{NT \times k} \quad \ldots\ldots\ldots 5$$

$$\alpha = \begin{pmatrix} \alpha_1 \\ \alpha_2 \\ \vdots \\ \alpha_N \end{pmatrix}_{N \times 1}, \quad S' = \begin{pmatrix} S_1 \\ S_2 \\ \vdots \\ S_R \end{pmatrix}_{k \times 1} \quad \ldots\ldots.6$$

In order to determine whether fixed effect method is better or common constant method, the F-test is applied. The null hypothesis is that all the constants have no heterogeneity. Therefore, the common constant method is appropriate.

$$H_0 : \alpha_1 = \alpha_2 \ldots\ldots. = \alpha_N \quad \ldots\ldots.7$$

The F-statistic is:

$$F = \frac{(R^2{}_{FE} - R^2{}_{cc})/_{N-1}}{(1 - R^2{}_{FE})/_{(NT-N-k)}} \sim F(N-1, NT-N-k) \quad \ldots\ldots\ldots 8$$

Where, $R^2{}_{FE}$ represents the coefficient of determination of the fixed effect model and $R^2{}_{cc}$ represents the coefficient of determination of the common constant model. If F-statistic is bigger than the F-critical then the alternative hypothesis is accepted.

The fixed effect model captures all those specific effect which remain the same over time such as geographical factors, size of the countries, and natural endowments etc. Moreover, it also solve the problem of estimating many parameters.

ii) The Random Effect Method

Another method for estimating the panel data is random effect method. This method includes the constants as random parameter and they are not fixed.

$$\alpha_i = \alpha + V_i \quad \ldots\ldots\ldots 9$$

Where, V_i is a zero mean standard random variable. The random effect model takes the following form:

$$Z_{it} = (\alpha + V_i) + S_1 W_{1it} + S_2 W_{2it} + S_3 W_{3it} + \ldots\ldots + S_k W_{kit} + e_{it} \quad \ldots\ldots 10$$

$$Z_{it} = \alpha + S_1 W_{1it} + S_2 W_{2it} + S_3 W_{3it} + \ldots\ldots + S_k W_{kit} + (V_i + e_{it}) \quad \ldots\ldots\ldots 11$$

Random effect model estimate the fewer parameters as compared to the fixed effect model. It is usually observed that when panel data based upon all the cross sectional data, fixed effect method is best. In case of the limited cross sectional variables, the random effect is more appropriate model.

iii) Hausman Test

The hausman test is applied to make a choice between the fixed effect model and the random effect model. Ahn and Moon in 2001 stated that two hypothesis are tested. The null hypothesis (H_0) is that the fixed effect are inconsistent. The alternative hypotheses (H_1) is that the fixed effect is consistent.

The following test statistic is used for the hausman test:

$$H = \left(\hat{\beta}^{FE} - \hat{\beta}^{RE}\right)' \left[Var\left(\hat{\beta}^{FE}\right) - Var\left(\hat{\beta}^{RE}\right)\right]^{-1} \left(\hat{\beta}^{FE} - \hat{\beta}^{RE}\right) \sim X^2(k)$$

If the statistical value is large, we accept the alternative hypotheses. On the contrary, the value of the hausman statistic is small, alternative hypothesis is rejected and null hypothesis accepted.

3 (c). Model Specification

Panel data methods are more appropriate than the time series analysis, because they include large number of degrees of freedom.

The specific form of the panel regression model for poverty is presented in the following way:

$$POVR = f(TRLN, TIUI, EREO, FCBB, SEDU, HLFR, PINF) \quad \ldots\ldots\ldots 12$$

The model includes seven explanatory variables. These include total railway lines (TRLN), Individual uses of internet (TIUI), Renewable energy output (EREO), commercial bank branches (FCBB),

Education expenditures (SEDU), Fertility rate (HLFR), and Inflation rate (PINE). This model takes the form of econometric model in the following way:

$$POVR_{it} = \alpha_0 + S_1 TRLN_{it} + S_2 TIUI_{it} + S_3 EREO_{it} + S_4 FCBB_{it} + S_5 SEDU_{it} + S_6 HLFR_{it} + S_7 PINF_{it} + e_{it} \quad \ldots\ldots\ldots\ldots .13$$

i) The Common Effect Model

This model holds the following equations:

$$POVR_{it} = \alpha_0 + S_{TRLN} TRLN_{it} + S_{TIUI} TIUI_{it} + S_{EREO} EREO_{it} + S_{FCBB} FCBB_{it} + S_{SEDU} SEDU_{it} + S_{HLFR} HLFR_{it} + S_{PINF} PINF_{it} + e_{\alpha it} \quad \ldots\ldots\ldots\ldots .14$$

In this regression model, α_0 represents the common intercept for eight countries of the SAARC region for the period from 2000 to 2018. It is observed that the slope coefficient also remain constant across all countries and through time.

ii) Fixed Effect Model

In case of fixed effect model, the following model is generated:

$$POVR_{it} = \alpha_0 + \alpha_i + \alpha_t + S_{TRLN} TRLN_{it} + S_{TIUI} TIUI_{it} + S_{EREO} EREO_{it} + S_{FCBB} FCBB_{it} + S_{SEDU} SEDU_{it} + S_{HLFR} HLFR_{it} + S_{PINF} PINF_{it} + e_{\alpha it} \quad \ldots\ldots\ldots\ldots .15$$

Where, α_0 shows the country specific effect, and α_t shows the time specific effects for each cross section.

iii) Random Effects Model

The random effects model is written in the following manner:

$$POVR_{it} = \alpha_0 + S_{TRLN} TRLN_{it} + S_{TIUI} TIUI_{it} + S_{EREO} EREO_{it} + S_{FCBB} FCBB_{it} + S_{SEDU} SEDU_{it} + S_{HLFR} HLFR_{it} + S_{PINF} PINF_{it} + \gamma_i + \alpha_t + e_{\alpha it} \quad \ldots\ldots\ldots .16$$

$$(\gamma_i + \alpha_t + e_{\alpha it}) = V_{\alpha it}$$

$$POVR_{it} = \alpha_0 + \alpha_i + \alpha_t + S_{TRLN} TRLN_{it} + S_{TIUI} TIUI_{it} + S_{EREO} EREO_{it} + S_{FCBB} FCBB_{it} + S_{SEDU} SEDU_{it} + S_{HLFR} HLFR_{it} + S_{PINF} PINF_{it} + V_{\alpha it} \quad \ldots\ldots\ldots\ldots .17$$

This model is also known as two way error component model.

Variables Description

Tables, Variables, and Proxy:

Variables	Proxy	Notation	Sources
Poverty	Head Count Ratio	POVR	WDI
Transportation Sector Infrastructure	Railway Lines	TRLN	IRF
Telecommunication Sector Infrastructure	Individual Users of Internet	TIUI	WDI
Energy Sector Infrastructure	Renewable Energy Output	EREO	WDI
Financial Sector Infrastructure	Commercial Banks Branches	FCBB	WDI
Social Sector Infrastructure	Education Expenditures	SEDU	WDI

Health Sector	Fertility Rate	HLFR	WDI
Inflation Rate	Consumer Price Index	PINF	WDI

4- Results and Discussion of Poverty model

This section represent the outcomes that have been obtained by econometric methods. An attempt has been made to describe all the possible empirical results of fixed and random effect model.

4 (a). Descriptive Statistic

Table 1

Descriptive Statistics

	Mean	**Median**	**Maximum**	**Minimum**
POVR	18.39875	12.25	64.1	0.300
TRLN	9569.95	602.555	68443.0	0.000
TIUI	11.8035	6.715	63.1857	0.00456
EREO	46.5027	33.519	101.00	0.000
FCBB	9.27171	8.89667	18.9888	0.000
SEDU	0.1463	0.1424	0.263	0.024
HLFR	3.13855	2.5595	7.485	1.870
PINF	0.05983	0.05835	0.264	-0.181

Source: Authors own's calculation

Table 1 consists of the results of mean, median, maximum, and minimum values of all the selected variables for poverty model. The average value, median, maximum, and minimum values of poverty rate (POVR) are 18.39, 12.25, 64.1, 0.300 respectively. The second row is of railway lines (TRLN). Its mean is 9569.95. Median value is 602.555. Its maximum value has been 68443.0. The minimum score is zero. It is due to the fact that Maldives lacks railway lines. The next variable is of individual users of internet (TIUI). Its mean is 11.8035. Its median is 6.715. Furthermore, the maximum and minimum values have been reported 63.1857 and 0.456 respectively. The mean of EREO is 46.5027. Its median value is calculated as 33.519. Its maximum value is 101.00 and minimum value is 0.00. In the next row, average of commercial banks branches (FCBB) is 9.27171. Its median is 8.89667. Its maximum value is 18.988. Its minimum value is zero. When the mean and median of education expenditures (SEDU) are calculated, they are 0.1463 and 0.1424 respectively. Its maximum score is 0.263. Its minimum score is 0.624. The mean value of fertility rate (HLFR) is 3.13856. Its median is calculated and it is 2.5595. Its maximum and minimum values are 7.485 and 1.870. Lastly, the mean score and median score of inflation (PINF) are 0.05983 and 0.5835. Its maximum score is 0.264. Its minimum score is -0.181.

Correlation Analysis

Table 2

Correlation Test

	POVR	**TRLN**	**TIUI**	**EREO**	**FCBB**	**SEDU**	**HLFR**	**PINF**
POVR	1.00							
TRLN	0.15	1.00						
TIUI	-0.476	-0.071	1.00					
EREO	0.226	-0.345	-0.137	1.00				
FCBB	-0.799	0.111	0.496	-0.132	1.00			
SEDU	0.173	-0.121	0.067	0.315	-0.166	1.00		
HLFR	0.82	-0.54	-0.10	0.02	0.09	0.08	1.00	
PINF	0.033	0.052	-0.228	0.029	-0.139	-0.224	-0.089	1.00

Source: Authors own's calculation

The main purpose of the correlation analysis is to check the problem of multicollinearity. The results report that there is not any multicollinearity among the chosen variables of the model. The association exists between the poverty (POVR) and railway lines (TRLN) by 0.15 percent. They are showing the negative association. The association between the telecommunication sector (TIUI) and poverty (POVR) is negative. They are associated with each other by the value -0.476. The degree of association between telecommunication sector infrastructure (TIUI) and railway lines (TRLN) is 0.071. Renewable energy output (EREO) and poverty (POVR) are negatively related with each other by the degree of -0.226. Moreover, the relationship between (TIUI) Individual Users of Internet and EREO (Renewable Energy Output) is -0.137. The financial sector which is represented by the total number of commercial bank branches (FCBB) and poverty (POVR) are showing negative association. The degree of association between them is -0.799. Similarly, the FCBB (Commercial Bank Branches) and EREO (Renewable Energy Output) are negatively associated by the degree of -0.132. However, the association between (FCBB) commercial bank branches and (TRLN) railway lines and with (TIUI) individual users of internet is positive. Their values are 0.111 and 0.496 respectively. There exists a negative relationship between (SEDU) education expenditures and (FCBB) total number of bank branches. The degree of relationship between them is -0.166. Moreover, the (SEDU) education expenditures and (TRLN) railway lines are showing that they are positively associated with each other by the degree of 0.121. The degree of association between (SEDU) education expenditures and (TIUI) individual users of internet is 0.67 percent. The value of association between SEDU (Education Expenditures) and EREO (Renewable Energy Output) is 0.315. HLFR (Fertility Rate) and POVR (Poverty rate) are positively related by the degree of 0.82. The degree of association between (HLFR) and (TRLN) is -0.54. (HLFR) fertility rate and (TIUI) individual users of internet are related by the degree of -0.10. The inflation rate (PINF) is showing negative relationship with individual users of internet (TIUI), commercial banks branches (FCBB), education expenditures (SEDU), and fertility rate (HLFR). The value of their degree of association is -0228, -0.139, 0.224, and 0.089 respectively.

Econometric Analysis

Table 3

Panel Unit Root Tests

Panel Unit Root Test				
Variable	**Levin, Lin and Chu**	**Pesaran and Shin W-stat**	**ADF - Fisher Chi-square**	**PP - Fisher Chi-square**
POVR	-8.100	-5.127	68.625	55.506
	0.000	0.000	0.000	0.000
TRLN	0.210	0.058	21.996	22.080
	0.583	0.523	0.004	0.004
TIUI	-14.691	-11.768	46.315	47.434
	0.000	0.000	0.000	0.000
EREO	-3.385	-3.239	43.649	52.368
	0.000	0.000	0.000	0.000
FCBB	-3.948	-1.216	30.372	10.622
	0.000	0.112	0.0162	0.832
SEDU	-3.196	-2.731	32.408	41.755
	0.000	0.003	0.008	0.000
HLFR	-3.408	-0.957	33.178	636.00
	0.000	0.169	0.007	0.000
PINF	-5.101	-3.942	43.014	41.763
	0.000	0.000	0.000	0.000

Source: Authors own's calculation

Table 3 is representing the results of the panel unit root test. The first column shows all the variables that are included in the analysis. These variables are poverty rate (POVR), railway lines in kilometers (TRLN), individual users of internet (TIUI), renewable energy output (EREO), total number of commercial bank branches (FCBB), total education expenditures (SEDU), fertility rate (HLFR), and inflation (PINF). The results of the Levin, Lin & Chu test are written in the second column of the table. The results confirms that all the variables are stationary at level. It is because of the fact that the values of these variables are highly significant and their probability is very low. The third column is of Pesaran and Shin W-Statistics. The results reveal that all the variables are stationary at level and the probability is very low. Therefore, the null hypothesis of the unit root is rejected. The fourth column

shows the results of ADF- Fisher Chi- Square test. It is observed that all the variables are stationary at level and alternative hypothesis is accepted. In the fifth column PP- Fisher Chi- Square also reports that the null hypothesis cannot be rejected. On the contrary, alternative hypothesis is accepted which confirms that all the values are highly significant.

Hausman Test

Table 4

Hausman Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	**160.859527**	**7**	**0**

Source: Authors own's calculation

Hausman test is very important test in order to determine the best model for the analysis. According to the results, the fixed effect model is more appropriate than the random effect model. When the Hausman Chi- Square statistic possess the high value and the probability value is less than five percent. It favors that the fixed effect model is the most appropriate model. On the contrary, if the value of Chi- Squared statistics is very low and the probability value is more than five percent. It favors that the random effect model is the best model. From the results of Hausman test, it is confirmed that the fixed effect model is more appropriate than the random effect model.

Results of fixed effect

Table 5

Fixed Effect Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	**52.82043**	**13.94245**	**3.788462**	**0.0002**
TRLN	**-0.002352**	**0.000885**	**-2.658505**	**0.0088**
TIUI	**-0.164126**	**0.048178**	**-3.406682**	**0.0009**
EREO	**-0.503867**	**0.13166**	**-3.827038**	**0.0002**
FCBB	**-1.104263**	**0.265117**	**-4.165185**	**0.0001**
SEDU	**49.70261**	**15.70073**	**3.165624**	**0.0019**
HLFR	**39.7485**	**12.01025**	**3.309547**	**0.0012**
PINF	**-33.92435**	**11.24379**	**-3.017164**	**0.003**

Source: Authors own's calculation

Table 5 shows the final outcome of the poverty model obtained for SAARC countries. Fixed effect method is used to estimate the equation. The results reveals the fact that the social overhead capital is very important in SAARC countries to reduce poverty. The coefficient value of the (TRLN) railway lines (in kilometers) is negative and statistically significant at one percent level. It shows that one

percent increase in (TRLN) railway lines will reduce the poverty by 0.2352 percent. Railway lines (in kilometers) is used as a proxy for the transportation sector. Telecommunication is shown by the individual users of internet (TIUI). It is used as a proxy for the telecommunication sector. The value of the coefficient of (TIUI) is negatively associated with the poverty (POVR). It shows that one percent increase in the individual users of internet (TIUI) will cause the poverty to decline by 0.1641 percent. The value of TIUI is highly significant at one percent level of significant. The findings of the third sector which is the energy sector infrastructure depicts that its coefficient value is also negative having very low probability score. The poverty reduces by 0.5038 percent due to the one percent increase in (EREO) renewable energy output. Furthermore, the financial sector is also very important that cannot be ignored while discussing the role of social overhead capital in the SAARC region. Commercial Bank Branches (FCBB) are taken as proxy for the financial sector infrastructure. The value of the coefficient of (FCBB) discloses that one percent increase in FCBB mitigates the poverty by 101.0426 percent. Social sector infrastructure is also included. Education expenditures (SEDU) are used as a proxy for this sector. The value of (SEDU) is positive and highly significant. It is revealing the fact that education is not declining the poverty. Fertility rate (HLFR) is positive and highly significant. Its coefficient value is 39.74. It means that one percent increase in the fertility rate will increase the poverty by 39.74 percent. Moreover, it is diagnosed that inflation is negatively related with the poverty. It coefficient value is statistically significant. It shows that one percent increase in the inflation will reduce poverty by 33.924 percent.

Random Effects Test

Table 6

Random Effect Test

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	**56.5099**	**2.857332**	**19.77716**	**0.000**
TRL	**0.000235**	**2.38E-05**	**9.889763**	**0.000**
TIUI	**-0.058289**	**0.040524**	**-1.438393**	**0.1525**
EREO	**0.130619**	**0.013613**	**9.595189**	**0.000**
FCBB	**-3.158061**	**0.118135**	**-26.73275**	**0.000**
SEDU	**12.50403**	**11.67284**	**1.071207**	**0.2859**
HLFR	**-32.9841**	**4.083382**	**-8.077641**	**0.000**
PINF	**-49.81352**	**10.17465**	**-4.895846**	**0.000**

Source: Authors own's calculation

In the random effect model, the variable railway lines in kilometers (TRLN) used as a proxy for the transportation has become positive. The coefficient values of the individual users of internet TIUI and commercial banks branches FCBB are negative. The coefficient of telecommunication sector shows that one percent increase in the TIUI reduce poverty by -0.5828 percent. The coefficient of commercial banks branches shows that one percent increase in FCBB declines poverty by 3.158 percent. Both of these values are highly significant at one percent level. The energy sector shows the positive relationship with poverty. Moreover, the education expenditures also show positive result. Inflation

is negatively related with poverty. It shows (PINF) that one percent increase in inflation will decline the poverty by 49.81 percent.

5- Conclusion

The current study evaluates the impact of social overhead capital in reducing the poverty in SAARC region. The panel data for the years from 2000 to 2018 are utilized for te analysis. Almost all the sectors of social overhead capital such as transportation sector, infrastructure, telecommunication, social sector infrastructure, financial and energy sector infrastructure were included in the present research. The study has incorporated the panel unit root tests which reveals that all the variables are stationary at level. Fixed effect method has been used to obtain the estimated values of the chosen variables. The present research confirm that there exists a strong negative impact of infrastructure related variables on poverty in SAARC countries.

Keeping in view all the discussions and empirical results, the study suggests the following policy implications.

1.It is suggested that the SAARC countries should concentrate on the improvement of the telecommunication sector. This sector can generate employment at huge scale. As a result, poverty can be reduced by this channel. There is a need to promote the e-culture in SAARC countries. This goal can be achieved through investment in producing the well trained ICT labor. This sector can prove a game changer.

2.This region face many obstacles of transportation. This problem can be resolved by improving the effectiveness of transportation system. It is suggested to build new roads, airports, and railways network. It will help the urban areas to build connection with the rural areas. Therefore, people will have more access to the industrial areas. It will help them to find employment for them.

3.It is suggested that the government should provide the modern health care facilities. Moreover, there is a need to explore renewable energy resources.

4.Poverty can be mitigated by given loans to the poor at micro and macro level. Therefore, the financial sector can play its role in the region.

5.Each country of SAARC region should give priority to the education system to accelerate the economic growth. Education increases the workers productivity. Therefore, the workers training programs can help to reduce the poverty.

6. Reference

Ahmad, W. and Majeed,M. T. (2019). The impact of renewable energy on carbon dioxide emissions: an empirical analysis of selected South Asian countries. *Ukrainian Journal of Ecology*, 9(4), 527-534.

Ahn, S.C. and Moon, H. R. (2001). Large-N and Large-T Properties of Panel Data Estimators and the Hausman Test, August 2001, USC CLEO Research Paper No. C01-20

Amin, A., Liu, Y., Yu, J., Chandio, A. A., Rasool, S. F., Luo, J. and Zaman, S. (2020). How does energy poverty affect economic development? A panel data analysis of South Asian countries. *Environmental Science and Pollution Research*, 27:31623–31635.

Arellano, M. and Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies*, 58, pp. 277-320

Asteriou, D. (2005). *Applied Econometrics: A modern approach using Eviews and Microfit*, Palgrave Macmilan.

Azam, A., Faridi, M. Z. and Tahir, S (2021). Unemployment Alleviation: Does Social Overhead Capital Matter? An Empirical Evidence from SAARC Countries. *Pakistan Social Sciences Review* 5(1), 887-903.

Baltagi, B.H. (1995). Econometric Analysis of Panel Data. New York, NY: John Wiley and Sons.

Bashir, F., Rehman, H. and Faridi, M. Z. (2013). Social Overhead Capital and Economic Output in Pakistan: An ARDL Bound Testing Approach. *FWU Journal of Social Sciences*, 7(2), 181-192.

Chakraborty, C. and Nandi, B. (2011). 'Mainline' telecommunications infrastructure, levels of development and economic growth: Evidence from a panel of developing countries. *Telecommunications Policy*, 35, 441-449.

Cuthbertson, K., Hall, S.G. and Taylor, M.P. (1992). *Applied Econometric Techniques*. New York: Simon and Schuster.

Faridi, M. Z., Chaudhry, M. O. and Ramzan, M. (2015). Role of Infrastructure in Poverty Alleviation: Evidence from Pakistan. *Pakistan Journal of Social Sciences (PJSS)*, 35(2), 533-542.

Faridi, M. Z., Malik, M. S. and Bashir, F. (2011). Transportation, Telecommunication and Economic Development in Pakistan. *Interdisciplinary Journal of Research in Business*, 1, 45-52.

Govt. of Pakistan (2000). 50 years of Pakistan in Statistics, Federal Bureau of Statistics, Statistical Division.

Govt. of Pakistan (2019-2020). Handbook of Statistics on Pakistan Economy 2010, State Bank of Pakistan.

Govt. of Pakistan (2020). Pakistan Economics Survey, Federal Bureau of Statistics, Statistical Division.

Greene, W. H., 2003. Econometrics Analysis. Prentice Education, Upper Saddle River. NJ.

Gujarati, D. N. and Porter, D. C. (2009). Basic Econometrics, 5th Edition.

Hassan, S. A., Zaman, K., Zaman, S. and Shabir, M. (2013). Measuring health expenditures and outcomes in SAARC region: Health is a luxury?. *International Journal of Methodology*.

Hausman, J. (1978). Specification Tests in Econometrics, *Econometrica*, 46, pp. 1251-71.

Javid, M. (2019). Public and Private Infrastructure Investment and Economic Growth in Pakistan: Aggregate and Disaggregate Analysis. *Sustainability (MDPI).*

Jhingan, M. L. (2009). The Economics of Development and Planning. 38th Revised and Enlarged Edition.

Kebede, E., Kagochi, J. and Jolly, C. M. (2010). Energy consumption and economic development in Sub-Sahara Africa. *Energy Economics*, 32, 532-537.

Khadaroo, J. and Seetanah, B. (2008). The role of transport infrastructure in international tourism development: A gravity model approach. *Tourism Management*, 29, 831-840.

Kumari, A. and Sharma, A. K. (2017). Physical & social infrastructure in India & its relationship with economic development. *World Development Perspectives*, 5, 30-33.

Lee, C. C. (2005). Energy consumption and GDP in developing countries: A cointegrated panel analysis. *Energy Economics*, 27, 415-427.

Mahmood, T. and Bashir, S. (2019). Measuring the Impact of Information and Communication Technology Capital (ICT-Capital) on Economic Growth: Evidence from SAARC Countries. *Pakistan Business Review*, 21(1).

Maparu, T. S. and Mazumder, T. N. (2017). Transport infrastructure, economic development and urbanization in India (1990–2011): Is there any causal relationship?. *Transportation Research*, 100, 319-336.

Meersman, H. and Nazemzadeh, M. (2017). The contribution of transport infrastructure to economic activity: The case of Belgium. *Case Studies on Transport Policy*, 5, 316-324.

Mohmand, Y. T., Wang, A. and Saeed, A. (2016). The impact of transportation infrastructure on economic growth: empirical evidence from Pakistan. *The International Journal of Transportation Research*, 9(2), 63-69.

Munir, S., Elahi, I. and Khan, I. H. (2018). Impact of Human Capital and Infrastructure on Economic Growth in Pakistan.*European Online Journal of Natural and Social Sciences*, 7(3).

Mutawkkil, A. A., Heshmati, A. and Hwang, J. (2009). Development of telecommunication and broadcasting infrastructure indices at the golobal level. *Telecommunications Policy*, 33, 176-199.

Ng, C. P., Law, T. H., Jakarni, F. M. and Kulanthayan, S. (2018). Related improvement in road mobility as compared to improvements in road accessibility and urban growth: A panel data analysis. *Transportation Research*,117, 292-301.

Pakistan Economic Survey, Ministry of Finance, Pakistan (various issues)

Planning Commission (2011). Framework for economic growth. Government of Pakistan, Islamabad

Pradhan, R. P. (2010). Energy Consumption-Growth Nexus in SAARC Countries: Using Cointegration and Error Correction Model. *Modern Applied Science*, 4(4).

Pradhan, R. P. Investigating the causal relationship between transportation infrastructure, financial penetration and economic growth in G-20 countries. *Research in Transportation Economics*.

Pradhan, R. P., Arvin, M. B. and Norman, N. R. (2015). The dynamics of information and communications technologies infrastructure, economic growth, and financial development: Evidence from Asian countries. *Technology in Society*, 42, 135-149.

Rehman, D. C. A., Ilyas, M., Alam, H. M., Akram, M. (2011). The Impact of Infrastructure on Foreign Direct Investment: The Case of Pakistan. *International Journal of Business and Management*, 6(5).

Sadraoui, T., Hamlaoui, H., Youness, Z. and Sadok, I. B. (2019). A Dynamic Panel Data Analysis for Relationshipbetween Energy Consumption, FinancialDevelopment and Economic Growth. *International Journal of Econometrics and Financial Management, 7(1), 20-26.*

Saidi, K. and Hammami, S. (2014). The impact of energy consumption and CO_2 emissions on economic growth: Fresh evidence from dynamic simultaneous-equations models. *Sustainable Cities and Society.*

Saidi, K. and Mongi, C. (2018).The Effect of Education, R&D and ICT on Economic Growth in High Income Countries. *Economics Bulletin*, 38, 810-825.

Shah, D. M. H. and Khan, F. (2019). Telecommunication and Infrastructure Development and FDI into Asian Developing Nations. *Journal of Business and Tourism*, 5(1).

Shoukat, A. and Ahmad, K. (2016). Impact of Physical Infrastructure on Economic Growth: Implications for Public Policy. *Governance and Management Review*, 1(1), 28-42.

Siyal, G. A., Ahmad, A., Aziz, A. and Zaman, K. (2013). The Long Run Effects Between Unemployment and Economic Growth in Selected SAARC Countries. *The Economic Research Guardian*, 3(2), 70-85.

Slesman, L., Baharumshah, A. Z. and Ra'ees, W. (2015). Institutional infrastructure and economic growth in member countries of the Organization of Islamic Cooperation (OIC). *Economic Modelling*, 51, 214-226.

United Nations (2010). The Millennium Development Goals Report 2010.

World Bank (2006). World Development Report: Equity and Development. Oxford University Press.

Zia, M. M. and Waqar, S. (2017). The Impact of CPEC & Related Road Infrastructure Projects on Employment. *Ministry of Planning Development and Reform*, Working Paper No. 11.