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Role of Globalization and Financial Development on the Population's Health Status in the South Asian Countries: A Panel Quantile Regression Investigation

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Abstract:
Using the annual data from 1983 to 2016, the study attempted to explore the role of globalization and financial development on life expectancy in South Asian countries, at the presence of economic growth and pollution. The study employed the panel quantile regression (median) technique that could provide reliable results in the presence of heteroskedasticity and cross-section dependence in residuals, while pooled OLS, fixed effect and random effect models were not. Estimated results confirm that the model is correctly specified, and there is no asymmetry in quantiles. This study has found a significant positive impact for economic growth, globalization, and financial development, and a significant negative impact for environmental pollution on life expectancy in the study countries. So, policymakers have to promote globalization and financial development to improve the population's health status, besides controlling environmental pollution.

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Keywords: Life expectancy, globalization, financial development, environmental pollution, panel quantile regression.

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Introduction

The world, where we live, comes to close together day by day by exchanging labor, capital, and technology. This integration process is widely known as globalization. Financial development (FD) implies the financial sector development and is typically expressed by the domestic credit to the public sector as a percentage of GDP. Globalization and financial development together have incremental impacts on the population's health status of a country. These two variables play a significant role in poverty reduction through economic growth all over the world. When people overcome their poverty situation, they can spend more on health care and nutrient foods. As a result, the health status of a country improves gradually. Globalization and financial development enhance the affordability of the people and also the availability of foods, which in turn improves the health status of a country. Globalization and financial development also improved health status by improving the level of education, especially female education. An educated female can take better care of their children (Rayhan et al. 2018) that helps to improve the immune system of the people at an early age. As more females are educated, more females are participating in the labor force (Shami et al. 2019) so that the female labor force participation rate is increasing. As a result, average family incomes are increasing, economic growth is accelerating and in turn, health status is improving. Moreover, educated people are more aware of health and health care, and they know more about medicine use and side-effects. Therefore, globalization and financial sector development are improving health status by improving the level of education too.

Globalization and financial development also improves health status by developing infrastructure. More hospitals and pharmaceutical companies are established, more advanced equipment are added, and new technologies in health care are transferred. So, by summing up, it can be concluded that globalization and financial development have a positive role in population health status improvement.

Life expectancy (LE) at birth is a widely used indicator to represent the population's health status of a country (Rayhan et al. 2019). This study aims to mark out the role of globalization and financial development on life expectancy in South Asian countries. Summary statistics of LE, real GDP per population, globalization, and FD of the South Asian countries (5 South Asian countries- India, Bangladesh, Nepal, Sri-Lanka, and Pakistan are included in this study) are tabulated in Table 1. The average LE at birth is 64.34 years in these five countries from 1983 to 2016, while in Bangladesh it is 64.06 years, in India 62.12 years, in Sri-Lanka 72.10 years, in Nepal 60.87 years, and Pakistan 62.55 years. Average LE is highest in Sri-Lanka and lowest in Nepal among these south Asian countries. The average per capita real GDP is $958.773 (at 2010 constant dollars) in these countries from 1983 to 2016, while in Bangladesh it is $584.99, in India $926.1744, in Sri-Lanka $1964.08, in Nepal $467.55, and in Pakistan, it is $851.09. The per capita real GDP is highest in Sri-Lanka and lowest in Nepal. From these statistics, it is clear that high LE in Sri-Lanka is consistent with high real GDP per capita of its and low LE in Nepal is consistent with low real GDP per capita of its. These provide evidence of the strong association between economic growth and increasing LE.

Now the degree of globalization (according to KOF globalization index) is on average 43.098 percent in these South Asian countries from 1983 to 2016, while in Bangladesh it is 38.518 percent, in India 46.311 percent, in Sri-Lanka 50.108 percent, in Nepal 34.699 percent, and Pakistan 45.856 percent. The degree of globalization is highest in Sri-Lanka and lowest in Nepal, which is consistent with high life expectancy in Sri-Lanka and low life expectancy in

Nepal. Therefore, these findings suggest that LE is positively associated with globalization. Finally, the domestic credit to the private sector (percentage of GDP) is, on average, 46.032 percent in these countries from 1983 to 2016, while in Bangladesh it is 36.941 percent, in India 57.284 percent, in Sri-Lanka 43.796 percent, in Nepal 43.440 percent, and in Pakistan, it is 48.697 percent. The association between FD and high LE is not visualized with these statics so that we have to rely on the results of the advanced statistical analysis to find out whether FD improves LE in the south Asian countries or not.

Table 1. Country-wise summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Life expectancy	170	64.34	6.1316	48.852	76.482
Real GDP per capita	170	958.773	685.1973	285.7947	3769.159
Globalization	170	43.09807	10.94211	17.64227	62.24332
Financial Development	170	46.03172	14.48126	18.90179	85.9673
Bangladesh					
Life expectancy	34	64.05921	5.662097	54.225	71.785
Real GDP per capita	34	584.9686	200.0003	378.0919	1062.04
Globalization	34	38.51767	9.388166	24.0311	52.2352
Financial Development	34	36.94127	15.99762	18.90179	61.443
India					
Life expectancy	34	62.12241	4.297903	55.074	68.897
Real GDP per capita	34	926.1744	407.8201	464.177	1875.732
Globalization	34	46.31102	12.13741	30.8884	62.2433
Financial Development	34	57.28406	11.62917	42.32703	77.91685
Sri-Lanka					
Life expectancy	34	72.10306	2.930907	68.975	76.482
Real GDP per capita	34	1964.088	845.8619	1003.186	3769.159
Globalization	34	50.1067	8.838058	38.33807	60.90004
Financial Development	34	43.79613	9.717379	24.95602	71.32419
Nepal					
Life expectancy	34	60.86632	6.594908	48.852	69.848
Real GDP per capita	34	467.5468	128.0239	285.7947	731.9993
Globalization	34	34.69901	8.864595	17.64227	48.76146
Financial Development	34	43.44033	18.04722	23.76629	85.96732
Pakistan					
Life expectancy	34	62.549	2.636135	57.882	66.77
Real GDP per capita	34	851.0868	138.8828	613.7212	1117.518
Globalization	34	45.85596	7.591814	34.11946	55.34643
Financial Development	34	48.69678	5.261506	37.21553	57.78607

Source: Software output

Literature Review

Some recent and important literatures that discussed the impact of economic growth, FD, globalization, and environmental pollution on LE are discussed here. Analyzing the annual data of Bangladesh from 1972-2013 and by employing the ARDL bounds test Alam et al. (2020) find a positive impact of globalization and FD on LE in Bangladesh. Their study also finds a bi-directional causality between FD and LE. By using the quarterly data of India from the first quarter of 1990 to the fourth quarter of 2013, Alam et al. (2016) also found that economic growth and FD positively affect LE. Bergh & Nilsson (2010) studied 92 countries from 1970 to 2015 and found that economic globalization is responsible for increasing LE. By using the city level data of China from 1991 to 2012 and by using the first difference model

Ebenstein et al. (2015) found a positive impact of economic growth on life expectancy. Gilligan & Skrepnek (2015) studied the annual data of 21 Mediterranean countries from 1995 to 2010. They used a multi-level mixed-effects linear model for their estimation and found that in the industrialized countries, GDP is a positive predictor of life expectancy. Shahbaz et al. (2019) studied 16 sub-Saharan African countries from 1970 to 2012 and found that economic growth, globalization, and financial development leads to increasing life expectancy in these countries except Gabon and Togo. While studied the data of Pakistan, Wang et al. (2020) revealed that economic growth leads to improving life expectancy. Study of Rayhan et al. (2019) estimate the production function of health for the South Asian countries and revealed the role of economic growth on LE. Besides, Bul & Moracha (2020) studied the Sub-Saharan countries of Africa and concluded that economic growth had association with health outcomes.

Some recent studies included air pollution into the model of life expectancy and found that air pollution is responsible for losing life expectancy. For example, the study of Hill et al. (2019) for 49 states of the USA, the study of Kolasa-Więcek & Suszanowicz (2019) for 20 European countries, the study of Wang et al. (2020) for Pakistan, and the study of Wu et al. (2020) for urban Chinese population found that air pollution is detrimental for life expectancy, and causes loose of expected life. Moreover, study of Sheraj (2017) discussed how environmental pollution hampered the life in Bangladesh and China. Study of Metu & Khan (2019) found uncovered negative influence of indoor air pollution on Bangladeshi people.

To our best knowledge, none of the previous studies tried to explore the role of financial development and globalization on population's health status at the presence of economic growth and environmental pollutions in the South Asia countries by employing the panel quantile regression (median) technique. This study takes an attempt to fill this research gap.

Methodology

As globalization and financial development are associated with economic growth, we also include economic growth as a predictor of life expectancy in our model. Moreover, as some recent studies found a statistically significant impact of air pollution (which is the byproduct of economic growth) on life expectancy, we also include air pollution into our model. This study includes carbon dioxide emissions as a proxy of air pollution while many empirical works used it to represent environmental pollution (Rayhan & Islam, 2015; Rayhan et al., 2018; Rayhan & Islam, 2018). Variables, their notations, definitions, and sources of data are presented in Table 2. Therefore, our model becomes,

$$LE = f(prgdp, glo, fd, ep).$$

Table 2. Variables and Sources of Data

Variable	Definitions	Notations	Source of Data
Life expectancy	Measured at birth	le	WDI, 2020
Economic growth	Measured at real GDP per capita at constant 2010 dollars	prgdp	WDI, 2020
Globalization	Globalization index	glo	KOF Globalization index, 2020
Financial development	Domestic credit to private sector as percentage of GDP	fd	WDI, 2020
Environmental pollution	CO2 emissions (kg of oil per capita)	ep	WDI, 2020

Log transformation of le, prgdp, glo, fd, and ep are used in this study to estimate the elasticities. This study employs the Panel Quantile Regression (Median) to get the elasticies. Statistical software STATA15 and Eviews11 are used in this study.

Result Analyses and Descriptions

Descriptive statistics of lnle, lnprgdp, lnglo, lnfd, and lnep are tabulated in Table 3. The probability of the Jarque-Bera (JB) statistics for these variables are 0.115937, 0.004131, 0.016830, 0.007162, and 0.003106, respectively. The JB results suggest that lnprgdp, lnglo, lnfd, and lnep are not distributed normally at 5 percent level of significance.

Table 3. Descriptive statistics of LNLE, LNPRGDP, LNGLO, LNFD and LNEP

Mean	LNLE	LNPRGDP	LNGLO	LNFD	LNEP
Median	4.159572	6.681263	3.728866	3.775157	-0.992043
Maximum	4.168097	6.626916	3.752657	3.830571	-0.707916
Minimum	4.337056	8.234608	4.131051	4.453967	0.597618
Std. Dev.	3.888795	5.655274	2.870298	2.939257	-3.481964
Skewness	0.096882	0.577923	0.270532	0.341690	0.940151
Kurtosis	-0.367517	0.621652	-0.534450	-0.584154	-0.587899
	2.739016	2.936149	2.896329	2.827950	2.502086
Jarque-Bera	4.309408	10.97834	8.169176	9.878025	11.54882
Probability	0.115937	0.004131	0.016830	0.007162	0.003106
Sum	707.1273	1135.815	633.9071	641.7766	-168.6472
Sum Sq. Dev.	1.586245	56.44509	12.36869	19.73113	149.3763
Observations	170	170	170	170	170

Source: Software output

As lnprgdp, lnglo, lnfd, and lnep are not normally distributed, we conduct the pooled OLS regression (while lnle is the dependent variable and lnprgdp, lnglo, lnfd and lnep are the explanatory variables) and check the normality test results for combined effect. The results of the pooled OLS are tabulated in Table 4, and the results of the JB normality test are illustrated in Figure 1. The p-value of the JB test in this case is 0.076, which reveals that the residuals are normally distributed at 5% level, but not normally distributed at 10% level of significance.

Table 4. Results of Pooled OLS Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRGDP	0.133107	0.025828	5.153510	0.0000
LNGLO	0.646129	0.062419	10.35144	0.0000
LNFD	0.174456	0.032808	5.317545	0.0000
LNEP	-0.200048	0.008052	-24.84305	0.0000

Source: Software output

Now the results of the heteroskedasticity test for both panel cross-section and panel period are tabulated in Table 5, where the likelihhod ratio is 75.67657 with 5 df and a p-value of 0.0000 for cross-section LR test, and the likelihood ration is 70.80258 with 5 df and a p-value of 0.0000 for panel period heteroskedasticity LR test. Both panel cross-section and period LR

test reject the null hypothesis of homoscedasticity and reveal that residuals are heteroskedastic across panel and period.

Figure 1. Illustration of Normality test results

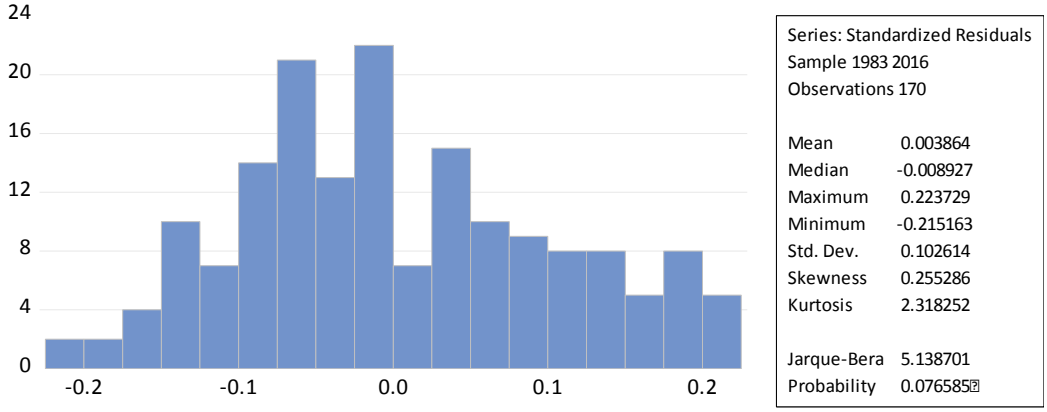


Table 5. Heteroskedasticity LR test for both Panel cross-section and Period

Panel Cross-section Heteroskedasticity LR Test			
	Value	df	Probability
Likelihood ratio	75.67657	5	0.0000
Panel Period Heteroskedasticity LR Test			
	Value	df	Probability
Likelihood ratio	70.80258	5	0.0000

Source: Software output

The results of the cross-section dependence (CD) test are presented in Table 6, where the p-value of Breusch-Pagan LM, Pesaran scaled LM, and Pesarn CD test are 0.0000, 0.0000, and 0.0000, respectively, suggesting the rejection of null hypothesis and conclude that CD exists in residuals.

Table 6. Results of various CD test

Null hypothesis: No cross-section correlation in residuals

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	202.3408	10	0.0000
Pesaran scaled LM	43.00872		0.0000
Pesaran CD	14.04876		0.0000

Source: Software output

As residuals are not normally distributed, heteroskedastic, and cross-sectionally correlated, estimation of fixed effect or random effect model will provide misleading results in this case. So, this study applies the panel quantile regression (median) to estimate the elasticities. Results of the panel quantile regression are presented in Table 7, from where it is observed that lnprgdp, lnglo, and lnfd have a positive significant impact and lnep has a negative significant impact on lnle in the south Asian countries. Results reveal that a one percent increase in median economic growth will increase median life expectancy by 0.0918 percent, a one percent increase in median globalization will increase median life expectancy by 0.2649

percent, and a one percent increase in median financial development will increase median life expectancy by 0.02774 percent, while a one percent reduction of median environmental pollution will improve median life expectancy by 0.07317 percent. The adjusted R-square is about 0.6747 indicates that about 67.47 percent of the variation of median life expectancy is expressed by these explanatory variables after taking into account the number of regressors.

Table 7. Results of Quantile Regression (Median)

Method: Quantile Regression (Median), Dependent Variable: LNLE

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNPRGDP	0.091844	0.007860	11.68513	0.0000
LNGLO	0.264910	0.025516	10.38204	0.0000
LNFD	0.027740	0.009244	3.000814	0.0031
LNEP	-0.073170	0.005755	-12.71322	0.0000
C	2.380608	0.065633	36.27149	0.0000

Pseudo R-squared	0.682444	Mean dependent var	4.159572
Adjusted R-squared	0.674746	S.D. dependent var	0.096882
S.E. of regression	0.038465	Objective	2.118978
Quantile dependent var	4.166665	Restr. Objective	6.672771
Sparsity	0.063974	Quasi-LR statistic	569.4585
Prob(Quasi-LR stat)	0.000000		

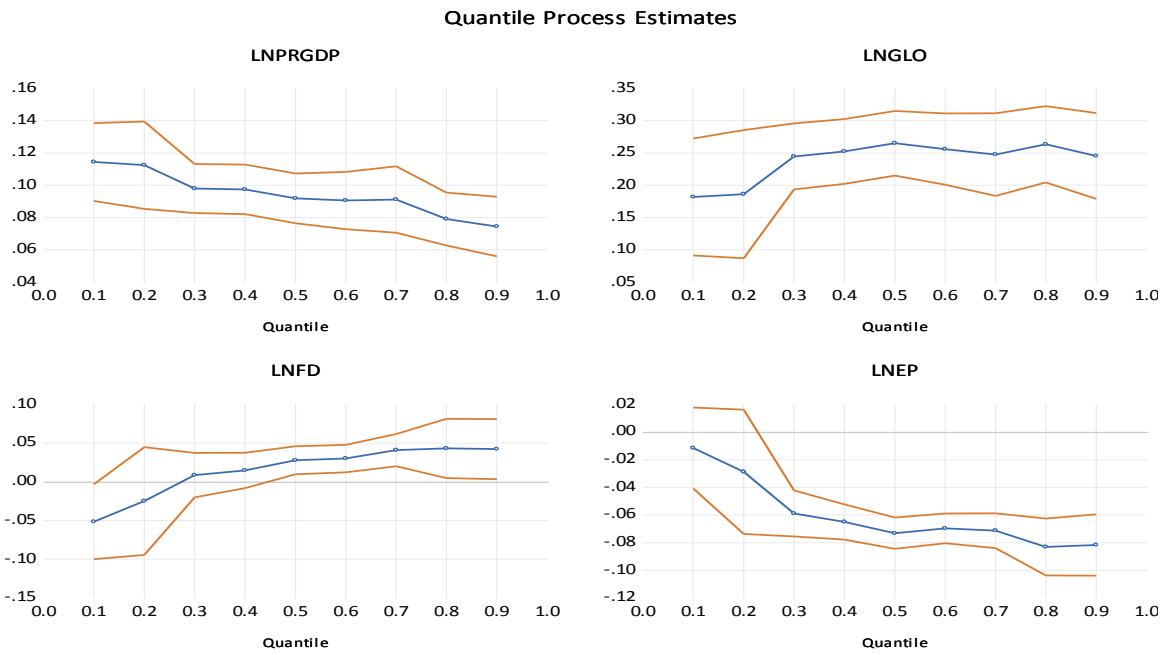
Source: Software output

Table 8. Result of Ramsey RESET Test

	Value	df	Probability
QLR L-statistic	1.012508	1	0.3143
QLR Lambda-statistic	1.010561	1	0.3148

Source: Software output

Figure 2. Plot of Quantile Process Estimates



Source: Software output

The results of the Ramsey RESET test are tabulated in Table 8, where the p-value of QLR L-statistic is 0.3143 and QLR Lambda-statistic is 0.3148, implying that the quantile regression (Median) model is correctly specified. Quantile process estimates are tabulated in Table 9, where the number of process quantiles is 10.

Table 9. Quantile Process Estimates

Estimated equation quantile tau = 0.5, Number of process quantiles: 10

	Quantile	Coefficient	Std. Error	t-Statistic	Prob.
LNPRGDP	0.100	0.114412	0.012307	9.296357	0.0000
	0.200	0.112428	0.013789	8.153672	0.0000
	0.300	0.097958	0.007747	12.64536	0.0000
	0.400	0.097442	0.007822	12.45756	0.0000
	0.500	0.091844	0.007860	11.68513	0.0000
	0.600	0.090539	0.009049	10.00540	0.0000
	0.700	0.091161	0.010474	8.703264	0.0000
	0.800	0.079082	0.008354	9.466735	0.0000
	0.900	0.074431	0.009413	7.906936	0.0000
LNGLO	0.100	0.181841	0.046152	3.940059	0.0001
	0.200	0.186154	0.050557	3.682055	0.0003
	0.300	0.244564	0.026089	9.374120	0.0000
	0.400	0.252287	0.025611	9.850618	0.0000
	0.500	0.264910	0.025516	10.38204	0.0000
	0.600	0.255923	0.028137	9.095460	0.0000
	0.700	0.247412	0.032657	7.575963	0.0000
	0.800	0.263403	0.030141	8.738882	0.0000
	0.900	0.245295	0.033840	7.248654	0.0000
LNFD	0.100	-0.051526	0.024687	-2.087205	0.0384
	0.200	-0.024968	0.035530	-0.702720	0.4832
	0.300	0.008539	0.014681	0.581610	0.5616
	0.400	0.014718	0.011617	1.266982	0.2069
	0.500	0.027740	0.009244	3.000814	0.0031
	0.600	0.029970	0.009071	3.304141	0.0012
	0.700	0.040912	0.010605	3.857796	0.0002
	0.800	0.043049	0.019523	2.205052	0.0288
	0.900	0.042163	0.019814	2.127963	0.0348
LNEP	0.100	-0.011599	0.014907	-0.778095	0.4376
	0.200	-0.028800	0.022955	-1.254640	0.2114
	0.300	-0.058870	0.008516	-6.913130	0.0000
	0.400	-0.065035	0.006479	-10.03840	0.0000
	0.500	-0.073170	0.005755	-12.71322	0.0000
	0.600	-0.069706	0.005472	-12.73876	0.0000
	0.700	-0.071380	0.006401	-11.15104	0.0000
	0.800	-0.083149	0.010502	-7.917334	0.0000
	0.900	-0.081731	0.011295	-7.236289	0.0000

Source: Software output

From the results, it is clear that the positive impact of economic growth on life expectancy is significant among all quantile, and the value of elasticity is declining. The impact of globalization on life expectancy is also significant and positive among all quantiles and the elasticity is increasing up to 50th, then decreasing from 50th to 70th quantile, increase again at 80th and decrease at 90th. Although the impact of financial development on life expectancy is positive among all quantile, it is insignificant at 20th to 40th quantile, then it is again

significant. The negative impact of environmental pollution on life expectancy is insignificant up to the 20th quantile, but remain significant later and it is negative among all quantiles. Figure 2 illustrates the plot of the quantile process, lnrgdp, lnglo, lnfd, and lnep are within the confidence bounds that provides the evidence of estimates stability. Table 10 contains the results of the slope equality test and Table 11 contains the results of the symmetric quantiles test.

Table 10. Quantile Slope Equality Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Wald Test	91.92628	32	0.0000

Source: Software output

The chi-square statistic of the Wald test of the slope equality test is 91.92628 and the respective p-value is 0.0000, which suggests the rejection of null-hypothesis. Therefore, we can say that the slope coefficients are not equal across the quantiles, they are different from each other. Now, the chi-square value of the Wald test of symmetric quantiles is 27.57854 and the respective p-value is 0.1198. Therefore, the null hypothesis cannot be rejected in this case and it can be concluded that there is symmetry, no asymmetry exists.

Table 11. Symmetric Quantiles Test

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Wald Test	27.57854	20	0.1198

Source: Software output

Conclusions

The study has made an attempt to explore the role of financial development and globalization on population's health status (expressed at life expectancy) in the South Asian countries at the presence of economic growth and pollutions. Data was covered from 1983 to 2016, and panel quantile regression (median) technique has been employed to obtain reliable estimates for heteroskedastic and non-normally distributed residuals. Estimated results confirmed that the model was specified accurately, and no asymmetry was found in quantiles. The result of the present study has found a significant positive impact for economic growth, globalization, and financial development, and a significant negative impact for environmental pollution on life expectancy in the study countries. So, policymakers have to promote economic growth, globalization, and financial development without polluting the environment to improve the population's health status. Environmental protection is very important to achieve the targets of sustainable development (Zafar et al. 2019). Inadequate environmental protection may attract foreign investments temporarily, but in the long-run it will deteriorate the population's health status. Therefore, for achieving the targets of SDG, fine tuning policy should be taken- promoting of economic growth, globalization and financialization with adequate environmental protection.

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