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RELEVANCE OF PRESTON CURVE IN SAARC COUNTRIES

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Abstract: The Preston Curve has served as the foundation of global health policy for a very long, with significant attention given to its implication that income has a causal effect on life expectancy. Our research sets to evaluate this relationship with the modern data of SAARC Countries by incorporating econometric recommendations.

Index Terms – Preston curve, life expectancy, GDP per capita

1 Introduction

Economic factors have been known to affect mortality for a very long time, but evennow, this vast area is not revealed completely. There are various factors, economic and non-economic, that affect the mortality rate, a few of them are food supply, national income, etc. But as per our topic, we are concerned with the effect of GDP per capita on life expectancy. According to the birth year, present age, and other demographic characteristics, including sex, an organism's life expectancy is calculated statistically as the length of time on average that it is predicted to survive. The most popular metric is Life expectancy at birth (LEB). Gross Domestic Product (GDP) is a measure of a country's overall output and is divided by the population to create GDP per capita. Because it illustrates the relative performance of each country, it is particularly helpful when comparing one nation to another. We will go over some of the factors that led us to choose national income as our key variable. The foremost study of the relationship between life expectancy and national income was done by Samuel H. Preston in 1975. He said lifeexpectancy increases at an increasing rate with an increase in GDP per capita, mainly in poor countries.

In this paper, we are concerned with the relevance of the Preston curve in the SAARC countries.

2 Data and Sources of Data

This paper considers the data on life expectancy and of per capita income of25 years from 1990-2015 in SAARC countries. The data set is more or less balanced, as only two countries, Afghanistan and Maldives are missing data for 12 years. To alleviate concerns aboutthe missing data, we used interpolation to extract missing data of countries, as we can't apply regression on panel data if some of data is missing.

We use statistics from the World Bank for the two primary variables—life expectancy and GDP per capita. The data obtained is relevant to other sources. The effectof missing data has been nullified by using interpolation.

3 Theoretical framework

As per the theoretical basis and empirical evidence, there is a strong correlation between healthcare and economic growth, as compared to other socio-economic factors. There are variousreasons for using national income rather than any other variable for checking the correlation withmortality rate-

1. It is the best indicator of living standard in any country and also national income includes the expenditures on all the products that influence mortality, with varyingweights.
2. It is the most important indicator of economic development. Per capita income is widelyused in the derivation of policy measures in various growth models. Example- Leibenstein and Nelson claimed that a "big push" in economic development was required in order to move the economy past the threshold at which rising incomes tend to lead to a drop in mortality.

Hagen and Demeny, on the other hand, refute the big push theory and claim that it hasn't responded to income-related issues as much as public health ones.

Nevertheless, the relationship between national wealth and mortality is indirect. Higher incomes imply and encourage greater real consumption of health-related goods and services such as food, housing, healthcare, public health, education, recreation, etc.

The foremost study of the association between life expectancy and a country's real per capita income was done by Samuel H. Preston in 1975. He plotted the data for 1900, 1930, and 1960 America and formed a curve, which is named as Preston curve. Thus, the Preston curve is an empirical cross-sectional non-linear relationship between the expected lifespan and the country's income level. According to Preston, poor countries have a significant rise in life expectancy as they develop, although this effect lessens but still has a favorable impact on affluent nations.

After Preston, various studies have been done over different economies or nations for differentperiods. In this paper, we are going to check the relevance of this association betweenlife expectancy and per capita income, over the association of 8 countries, SAARC.

SAARC refers to the South Asian Association for Regional Cooperation. It is the geopolitical union of South Asian countries and a regional inter-governmental organization. Pakistan, Bangladesh, Bhutan, India, Nepal, Afghanistan, Maldives, and Sri Lanka are among its member states. All of these member countries are of developing nature and as per Preston, in poor countries, and as per present era, we correctly say, in developing countries, increase in GDP per capita, increases the life expectancy. So, we will check the hold pf the Preston curve in thisdeveloping association, SAARC.

Using data from SAARC countries, the purpose of this work is to give a systematic long- term analysis of the link between income levels and life expectancy.

But extensive investigation of Preston curve introduces various critiques of it and relate the idea with other development factors, and thus the relevance of Preston curve varies for different countries. Preston argued in 1975 that advances in modern medicine are the primary factors explaining the dramatic increase in life expectancy and that affluence only has a small indirect impact through dietary choices.

Preston himself expressed skepticism about this connection in 2007, noting that the GDP per capita may occasionally account for no more than 16% of the variation in life expectancy.

Furthermore, **Filmer and Pritchett (1999)** demonstrate that countries with extreme poverty can have good health conditions. Similarly,

The reliability of the Preston curve, according to **Spence and Lewis (2009)**, "may not hold among countries over time" due to the lack of a large dataset to evaluate the Preston curve.

The Preston curve's critics discuss exogenous variables as the causes of changes in life expectancy, such as new drugs, medical procedures, or post-war initiatives. The rapid diffusion of knowledge and technology closes the life expectancy gap. Thus, the former concept of 'higher income buys a longer life' has been challengedon various grounds.

As per the Preston curve, there are many schools of thought -

- Some economists believe that there is a positive correlation between income levels and life expectancy, and they observe this correlation in a wide range of nations.
- Even disparities over comparatively longer time periods may not be related, according to some economists.
- Some economists observe twin peaks that persist in life expectancy distributions around the world even when high HIV countries are excluded from the sample, indicating that different data generation procedures may be used for various sorts of nations.

Few studies indicate that when all nations are considered together, the percentage ofgovernment spending on healthcare was the strongest predictor for the health of a nation.

If we thoroughly study the association between GDP per capita and life expectancy, wefind that this relationship is two folded-

- Increase in GDP of a country, increases the life expectancy by the effect of goodinfrastructure, better facilities, proper food supply, sanitation, etc.
- Increase in life expectancy improves economic growth by a healthier populationexperience, which increases the productivity of labor resources.

4 Research methodology

Our primary empirical method uses panel data analysis to regress life expectancy in years on a linear term of per capita GDP in order to acknowledge the original Preston curve concept. Our current objective is to calculate the percentage of difference in life expectancy that may be accounted for by SAARC countries' per capita GDP. We specifically estimate,

$LE_{it} = 58.791 + .0017 (GDP/cap)_{it}$

This equation says that, a unit change in GDP per capita changes life expectancy by .0017 units.If GDP per capita is zero, life expectancy is 58.791.

Overall value of $R^2 = 0.6171$, means that 61% of variation IN LE is explained by PCI.

LEI	Coef.	Std error	z	p> |z|	95% confidence interval	
PCI	.0017286	.0000994	17.39	0.000	0.0015338	0.0019235
Constant	58.79093	1.246754	47.16	0.000	56.34733	61.23452
Sigma_ u	3.3732411					
Sigma_ e	2.4869247					
Rho	0.64786194 (fraction of variance due to u_i)					

IV. Conclusion

The above statistics shows that the results are significant, i.e., there is positive association between life expectancy and per capita income. For proving this result, the panel data analysis was very helpful as we used the pooled data of life expectancy and per capita income for 25 years and of 8 countries. High value of R^2 shows that the model is fit. The above result shows the hold of Preston curve even in SAARC countries and hence the results ofPreston were valid even for SAARC countries.

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APPENDIX

Life Expectancy of SAARC Countries

	AFG	BGL	BHU	IND	SRI LNKA	MAL	NEP	PAK
1990	49.86105	58.41756	52.46232	57.94373	69.67949	61.41851	54.19473	60.11122
1991	50.64098	59.05027	53.25193	58.43822	69.7802	62.25822	55.05863	60.39622
1992	51.36293	59.71785	54.04051	58.94507	69.79641	63.09329	55.92449	60.67622
1993	52.02188	60.4188	54.8261	59.45293	69.71673	63.91946	56.78529	60.95017
1994	52.61434	61.14554	55.60917	59.95483	69.56598	64.73776	57.6331	61.21954
1995	53.13939	61.88739	56.39973	60.44437	69.41861	65.56049	58.46441	61.48529
1996	53.60205	62.62956	57.20576	60.91561	69.37273	66.40371	59.27729	61.74795
1997	54.01783	63.35788	58.03524	61.36956	69.50466	67.27805	60.07168	62.00856
1998	54.40273	64.05915	58.88868	61.80722	69.85066	68.18383	60.84761	62.26761
1999	54.76727	64.72383	59.76207	62.22707	70.40185	69.11461	61.6001	62.52315
2000	55.12588	65.34798	60.65039	62.63063	71.10639	70.05971	62.32663	62.77317
2001	55.48754	65.93017	61.54663	63.01985	71.87783	71.00559	63.0222	63.01371
2002	55.8572	66.47817	62.43583	63.3992	72.61015	71.9292	63.6868	63.24076
2003	56.23529	67.00015	63.303	63.77454	73.22232	72.80734	64.32044	63.45834
2004	56.62632	67.4972	64.13617	64.1478	73.68029	73.61759	64.92259	63.66746
2005	57.02724	67.97185	64.91844	64.52388	73.97356	74.33234	65.49429	63.87763
2006	57.43256	68.42563	65.6379	64.9081	74.12454	74.92685	66.03607	64.09939
2007	57.83383	68.85998	66.2931	65.30044	74.19412	75.39971	66.55193	64.33873
2008	58.22502	69.27785	66.88502	65.69944	74.23873	75.75954	67.04537	64.59815
2009	58.60368	69.68378	67.41666	66.10263	74.28029	76.01866	67.51839	64.8761
2010	58.97083	70.08029	67.89241	66.50615	74.33924	76.20049	67.97149	65.16256
2011	59.32795	70.47195	68.3232	66.90417	74.42456	76.33751	68.40663	65.447
2012	59.67961	70.86027	68.7229	67.28988	74.53124	76.46234	68.82332	65.71688
2013	60.02827	71.24524	69.10293	67.66041	74.65383	76.60261	69.222	65.96368
2014	60.37446	71.6259	69.47124	68.0138	74.7948	76.77283	69.60468	66.18337

GDP per capita in SAARC Countries

	AFG	BGD	BTN	IND	SLK	MLD	NPL	PAK
1990	294.55	834.05	1507.86	1146.03	2369.19	2413.58	774.59	1975.82
1991	344.63	871.08	1554.10	1172.56	2526.92	2708.05	829.41	2086.24
1992	394.72	918.45	1683.41	1240.00	2664.67	3002.52	859.55	2237.91
1993	444.81	963.30	1789.00	1303.90	2882.75	3296.99	889.26	2272.16
1994	494.90	1000.28	1945.53	1393.00	3077.03	3591.46	957.04	2347.14
1995	544.98	1050.65	2136.99	1500.68	3284.27	3885.93	985.78	2452.75
1996	595.07	1094.57	2281.50	1612.53	3445.39	4180.40	1032.56	2554.03
1997	645.16	1138.93	2405.16	1674.87	3705.83	4474.87	1078.98	2559.98
1998	695.25	1185.99	2514.28	1764.88	3900.34	4769.34	1100.43	2590.08
1999	745.34	1235.15	2681.77	1915.39	4106.48	5063.81	1144.13	2662.54
2000	795.42	1304.44	2850.82	1998.49	4422.56	5358.28	1220.46	2775.63
2001	845.51	1375.76	3064.83	2105.84	4419.80	5652.75	1286.47	2833.04
2002	895.60	1424.31	3344.16	2182.24	4630.59	5947.22	1287.73	2907.76
2003	945.69	1495.53	3564.72	2361.33	4965.73	6788.43	1345.91	3046.54
2004	940.48	1591.40	3770.09	2576.54	5339.80	7690.62	1428.76	3293.51
2005	1039.41	1724.43	4060.20	2860.89	5811.51	7088.65	1507.57	3586.42
2006	1095.66	1871.00	4365.94	3172.71	6400.82	8443.88	1588.27	3845.53
2007	1245.06	2031.78	5172.73	3484.76	6964.99	9112.53	1668.74	4054.64
2008	1283.04	2171.63	5418.20	3637.76	7467.59	10092.71	1787.41	4118.69
2009	1525.52	2273.16	5717.17	3920.16	7732.06	9681.45	1863.68	4179.73
2010	1629.17	2401.72	6354.39	4315.44	8390.41	10301.71	1956.47	4209.70
2011	1712.59	2579.34	6882.69	4634.95	9213.78	11126.95	2042.14	4322.53
2012	1934.29	2764.78	7251.43	4921.84	10164.36	11373.46	2153.74	4460.92
2013	1941.61	2942.37	7417.44	5267.04	10598.80	11853.99	2251.50	4633.00
2014	1942.48	3138.24	7875.80	5679.59	11210.30	12534.71	2399.77	4833.66