Das and Debanth *Future Business Journal* (2023) 9:5
https://doi.org/10.1186/s43093-022-00179-9

Future Business Journal

RESEARCH

Open Access

Impact of CO_2 emission on life expectancy in India: an autoregressive distributive lag (ARDL) bound test approach

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Abstract

As a developing country, one of the important objectives of India is to accelerate economic growth. This has a considerable impact on CO_2 emission. Life expectancy has a probable connection with CO_2 emission in two opposite ways. Given technological status, more CO_2 emission consequents upon more production of output and higher income level which is likely to affect the life expectancy of people in a positive way. Conversely, CO_2 emission is one of the important air pollutants that may reduce the span of human life. This paper aims to investigate the net impact of CO_2 on life expectancy in India. Furthermore, the study seeks to search whether India has surpassed the optimal limit of CO_2 emission in relation to life expectancy. Using World Bank time series data for the period 1991–2018 and applying ARDL cointegration technique, the study concludes the existence of a long-run and quadratic relationship between life expectancy and CO_2 emission. The study finds that India has already surpassed its optimal atmospheric concentration of CO_2 and thereby suggests adopting CO_2 reduction strategies.

Keywords Life expectancy, Emission, ARDL, Quadratic relationship

Introduction

Emission of CO_2 is considered a most potent factor in the deterioration of the environment [4, 46]. In pursuing higher economic growth, the world simultaneously has been swelling up the concentration level of CO_2 in the atmosphere which is a deep concern and certainly an issue beyond national boundaries [3, 21]. There are numerous research works on the relationship between climate change and health and economic welfare [24, 35, 43]. Life expectancy at birth is popularly used as an indicator of longevity of life as well as a summary indicator of the health of a population (Rabbi [34]). There is a possible linkage of life expectancy to both production and pollution. Production increases income, and that may have a positive impact on health at least in an underdeveloped economy [7, 27]. Conversely, pollution is more likely to increase morbidity and may reduce the span of life [22, 35]. If it is hypothesised that production means pollution then the question is whether CO_2 emission decreases human welfare or it increases the same.

Increasing concentration of CO_2 is not only responsible for global warming, rise in sea level, and other climate change effects but is also linked to the cause of morbidity and mortality due to air pollution [20]. Rasoulinezhad et al. [35] investigated the relationship between economic growth, fossil fuel consumption, mortality, and environmental pollution. The study used the generalised method of moments estimation technique and reached into conclusion that CO_2 is an important variable that has been causing mortality from diseases like cardiovascular disease (CVD), cancer, etc., in the Commonwealth of Independent States (CIS) regions from the period 1993–2008. Meanwhile, Murthy et al. [28], while investigating the relationship between CO_2, economic growth, and life

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expectancy in the D-8 countries for the study period 1992–2017, have observed a negative impact of CO_2 on life expectancy. However, a bunch of research findings, mostly in underdeveloped regions, observed a different set of findings. For example, Amuka et al. [2] made a study on the relationship between climate change and life expectancy for the period 1995–2013 in which CO_2 emission was used as a proxy of climate change. They have observed a positive significant relationship between CO_2 emission and life expectancy in Nigeria. In a separate study by Rjoube al. [36], CO_2 that has been observed positively affects life expectancy in Turkey.

From the existing literature on the nexus between carbon emission and life expectancy, it is not clear to draw a universal conclusion for all nations rather it is imperative to study the linkage with respect to country-specific situations separately. There are a scanty number of studies that investigate the impact of CO_2 emission on life expectancy in India. Avik [40] conducted a time series analysis of the linkage of carbon emissions on child and infant mortality in India. However, infant and child mortality cannot be treated as a sufficient indicator of overall health performance which in fact life expectancy can do [25].

Since CO_2 emission is associated with some economic welfare impacts, at least in terms of economic growth as found in some studies [1] and at the same time it has possible negative consequences on health, it should be wise to search for some optimal level of emission that optimises human welfare. However, most of the existing studies mainly dealt with the direction of the relationship and overlooked the question of what should be the threshold limit of emission in the given technological status. This is the gap in research and the present study made an attempt to examine the threshold limit of CO_2 emission for India in connection with life expectancy.

The rest of the paper has been structured as the impact of CO_2 emission on life expectancy being the second section and the third section of the paper contains data and method, while the result & discussion is in the fourth section. The final section is kept for conclusion and policy prescription.

Impact of CO_2 emission on life expectancy: a snapshot from literature

The impact of CO_2 emission on life expectancy possibly depends on two factors: income or wealth effect and health effect. Production means pollution. An increase in the volume of output is associated with an increase in the volume of CO_2 emission [37, 41]. The famous EKC[1] hypothesis states a positive relationship between growth and CO_2 till some threshold limit of CO_2 [17]. However, logically we can state the relationship between CO_2 and economic growth in a reverse way. A higher level of CO_2 may imply a higher level of output given the technological state. There is a possible cut in GDP growth while cutting CO_2 emissions. Giving permission for higher emissions also implies encouraging higher production. Meanwhile, Ghorashi and Rad [16] observed a bidirectional positive relationship between CO_2 emission and economic growth. With the given production technology, more emission of CO_2 means more expansion in gross production depending on the output elasticity of CO_2. This follows with the unchanged technological status reduction in emission of CO_2 would mean a reduction in the volume of output and income.

Conversely, the emission of CO_2 may affect the health of a community in several ways. There are numerous studies that have found a number of health-related issues such as respiratory symptoms, cancer, and obesity in association with the atmospheric concentration of CO_2 [18, 39]. Further CO_2 being a greenhouse gas increases the temperature. Temperature growth beyond a limit has several ill consequences on health (e.g. cardiovascular disease, hypertension, stroke, etc.) [6, 19, 38].

Fossil fuel consumption is one of the important sources of energy in India. The trend of fossil fuel consumption has been maintaining an increase in trend over the years. In 2006, India became one of the largest consumers of fossil fuels [8]. Excessive consumption of fossil fuels leads to an increase in the atmospheric concentration of CO_2.

There are many studies, which have found an increase in mean and maximum temperature over the decades in India. Das et al. [8] in a time series regression analysis found that over 82 per cent of the variation in temperature was explained by the variation in CO_2. With the increase in population and income, the demand for fossil fuels is further likely to grow up. In such a case, CO_2 concentration and consequently temperature is expected to be magnified.

Numerous studies were concerned with the health consequences of rising temperature in India (Sharma et al. [30]; [13] and others). Increased deaths from heat stroke, cardiovascular disease, deaths from various viral and infectious diseases, life loss due to floods, etc., are some of the consequences of increasing surface temperature and climate change [11]. Mazdiyasni [23] observed a significant increase in heat waves and the number of heat wave days in India along with the increase in frequency of heat-related deaths. Dutta et al. [13] also observed the mortality due to hit waves in certain parts of India. Dhara et al. [11] reported the cases of deaths due to floods in

[1] Environmental Kuznets Curve (EKC) hypothesis suggests that at the earlier stage of economic development, there is an inverse relationship between environmental quality and economic growth, but after attaining a certain level of economic development, the relationship between economic growth and environmental quality becomes direct. For details see Grossman and Krueger [17].

India, Nepal, and Bangladesh, as one of the consequences of climate change. Their study also reported the occurrence of various infectious diseases related to the warmer climate in the South Asian region.

Mathematically, life expectancy can be presented as a function of income and health. CO_2 is likely to affect income positively but it passes a negative effect on health. Thus, life expectancy depends on the relative strength of two opposite effects of CO_2 on health and wealth.

$$LE = f(\text{income}, \text{health}) \quad (1)$$

Keeping all other determinants of income aside, let us consider income as a function of the emission of CO2.

$$\text{Income} = \phi(CO_2) \quad (2a)$$

Assume a linear wealth function and zero CO_5 emission means zero production. Further, it is assumed that wealth is a continuous, linear first-order homogenous function, and a fall in labour productivity due to the health effect of CO_2 is totally compensable by an equivalent increase in machine productivity. We express the functional relationship between CO_5 and income as:

$$\text{income} = aCO_2;\ a > 0 \quad (2b)$$

Health of community is likely to increase with the increase in the level of income. Infant mortality, child mortality, undernutrition, and the magnitude of other health-related issues shrink with the expansion of income. Health also depends on environmental factors. Exposure to air and water pollutants is likely to deteriorate health outcome. In our simple model, we express health function as:

$$\text{Health} = f(CO_2,\ \text{income}) \quad (3)$$

Since our concentration is on the impact of CO_2 in the creation of benefit and cost, we introduce health degradation measure (HDEG) which we express as an inverse function of health (Health).

$$\text{HDEG} = \frac{1}{\text{Health}} \quad (4)$$

$$\text{HDEG} = g(CO_2, \text{income}) \quad (5)$$

Health degradation measure (HDEG) is expected to fall with the rise in the level of income. A rise in income enables people to spend money on health defensive and health constructive measures. We assume health degradation is measured as a linear function of the level of income. However, HDEG can be justified as a nonlinear function of CO_2 emission. There is a possibility of CO_2 blasting effect that beyond a threshold level CO_2 degrades the environment and health more intensively. Given income, the health degradation function can be expressed as:

$$\text{HDEG}_{\text{income}} = -\gamma_1 + \gamma_2 CO_2 + \gamma_3 CO_2^2;\ \gamma_2 > 0, \gamma_3 > 0 \quad (6)$$

The implication of negative intercept is that CO_2 concentration at a very low level may have life support effects.

By substituting HDEG for health in Eq. (1), life expectancy function in linear form can be written as:

$$LE = \alpha_1 W - \alpha_2 \text{HDEG} \quad (7)$$

Using Eqs. (2b) and Eq. (6), we rewrite Eq. (7) as:

$$LE = \alpha 1(aCO_2) - \alpha 2\left(-\gamma_1 + \gamma_2 CO_2 + \gamma_3 CO_2^2\right)$$

$$Or, LE = \alpha 1a\ CO_2 + \alpha 2\gamma_1 - \alpha 2\gamma_2 CO_2 - \alpha 2\gamma_3 CO_2^2)$$

$$\text{Or},\ LE = \beta 1 + \beta 2\ CO_2 - \beta 2\ CO_2^2 \quad (8)$$

where $\beta 1 = \alpha 2\gamma_1$, $\beta 2 = (\alpha 1a - \alpha 2\gamma_2)$; $\beta 3 = \alpha 2\gamma_3$

The optimal level of CO_2 emission can be obtained by the optimisation technique. Setting the first-order differentiation dLE ($CO_2/dCO_2 = 0$), we find:

$$\beta 2 - \beta 3\ CO_2 = 0$$

$$CO_2 = \frac{\beta 2}{\beta 3}$$

Graphically, the relationship between life expectancy and CO_2 emission is derived in the lower panel of Fig. 1. Life expectancy as a function of CO_2 emission gives an inverted 'U' curve. This reflects that there is an optimal level of emission till which there is a positive relationship between life expectancy and CO_2 emission, but beyond that optimal point, emission of CO_2 deteriorates life expectancy.

Therefore, theoretically we find a plausibility of a nonlinear relationship between CO_2 and life expectancy. Numerous studies empirically examined the nexus between CO_2 and life expectancy. However, there is no consensus among their findings. Some of the studies found a positive relationship between CO_2 emission and life expectancy, while others observe a negative linkage between CO_2 to life expectancy.

Erdogan et al. [15] examined the relation between CO_2 emission and health indicators in Turkey for the period 1971–2016. The study finds a negative impact of CO_2 emission on life expectancy. Nkalu and Edeme [29] adopted the generalised autoregressive conditional heteroskedasticity (GARCH) model and found that environmental hazards in terms of CO_2 emission

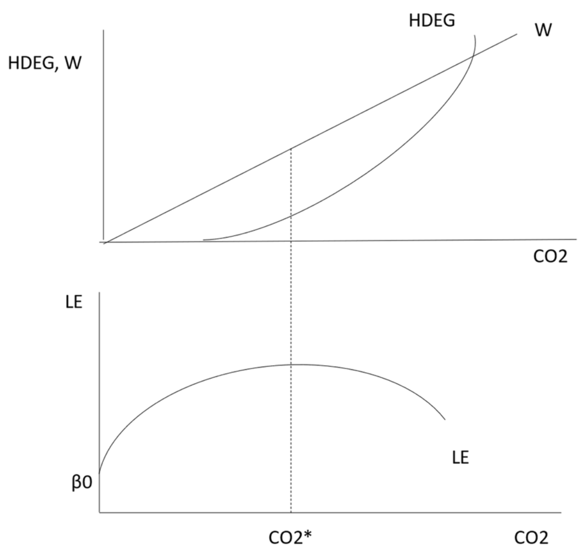

Fig. 1 Life expectancy and CO_2 relationship

reduce life expectancy significantly. Similarly, Jacobson [20], Rasoulinezhad et al. [35], and Murty et al. [28] observed a negative association between CO_2 emission and life expectancy.

However, there are a group of studies, which have found the opposite results. Matthew [26] examined the effect of carbon emission on agricultural output and life expectancy in West Africa for the period 2000–2018. The study found that a 1 per cent increase in carbon emission causes a 0.123 per cent increase in life expectancy. Similarly, there are numerous studies which have established a positive association between CO2 emission and life expectancy (Delavari et al., [9]; [2, 36] and others).

Thus, there is no unanimity among the findings of different studies across the world. Further, there is a dearth of literature which have studied this important linkage between CO_2 emission and life expectancy in India. On the basis of our theoretical argument, it can be said that the inverse relationship between CO_2 and LE may hold good for those nations where CO_2 exceeds the threshold limit, i.e. the case for which negative health effect exceeds the positive income effect. Conversely, the countries which exhibit a positive linkage between CO_2 and LE would mean they have not yet reached the threshold limit of CO_2 emission.

Data and method

Data

The study aims to explore the causal link from CO_2 emission to life expectancy in India for the period 1991–2018. The variables included in this study are CO_2 emission and life expectancy. The time series data are sourced from World Bank [45] Database. The trend of CO_2 emission in India measured in metric ton per capita for the period 1991–2018 and life expectancy at the birth rate in India for the period 1961 to 2015 are given in Figs. 2 and 3.

Figure 2 shows that per capita CO_2 concentration in India has been rising consistently. The overall growth of per capita CO_2 is observed to have deviated from the linear trend. Conversely, Fig. 3 reflects that life expectancy in India has maintained a linear trend. The consistent rise in life expectancy may be attributed to the economic development and development of medical science that has contributed to the declining mortality rate.

Method

The study hypothesised a quadratic functional relationship[2] between life expectancy (LE) and CO_2 emission. It is expected that there is a threshold limit of CO_2 beyond which CO_2 affects life expectancy negatively. In this section, however, an attempt has been made to construct the following regression model:

$$\mathrm{LE}_t = \beta 1 + \beta 2\mathrm{CO}_{2t} + \beta 3\mathrm{CO}_{2t}^2 + u_t \tag{8}$$

where LE stands for life expectancy at birth, and CO_2 represents per capita carbon dioxide emission.

However CO_2 being a transboundary pollutant, the global emission of CO_2 may also affect life expectancy. In order to capture the impact of global CO_2 emission on life expectancy rate in India, mean per capita global CO_2 concentration ($GLOBCO_2$) is incorporated in the regression model given in Eq. 9.

$$\mathrm{LE}_t = \beta 1 + \beta 2\mathrm{CO}_{2t} + \beta 3\mathrm{CO}_{2t}^2 + \beta 3\ \mathrm{GLOBCO}_2 + v_t \tag{9}$$

To explore the causal relationship from CO_2 to life expectancy, the paper at first verifies the stationary property of time series data using mostly practised unit root test techniques like augmented Dicky–Fuller test [12], Philips–Perron [33], and DF-GLS estimators [14]. DF-GLS test is efficient when the sample size is small. Secondly, cointegration test is conducted to verify the long-run relationship between LE and CO_2. Likelihood ratio test has been performed to test for redundancy of the variables. Thirdly, the stability of regression model has been tested by CUSUM and CUSUM square test.

Result and discussion

Unit root test

The result of the unit root test of time series data is reported in Table 1. The result of the unit root test reveals that LXP is stationary at the level, while CO_2 and

[2] It shows the equation of parabola and express the non-linear relationship between the variables. The graph of the Quadratic function is 'U' shaped curve.

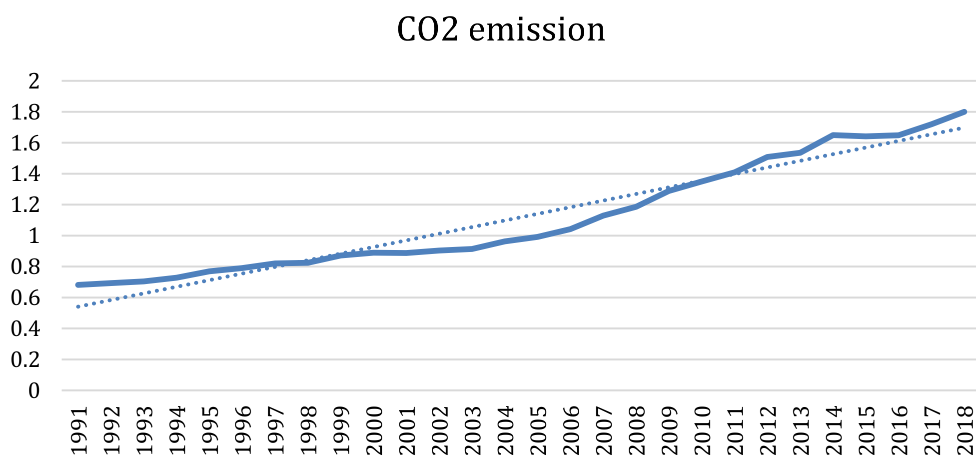

Fig. 2 Trend of CO_2 emission in India (1991–2018). *Source*: World Development Indicators

$GLOBCO^2$ are having unit root. However, after transforming the data series into first difference, it satisfies the stationary property of the time series variable of both CO_2 and $GLOBCO_2$. The result is consistent across ADF test, PP, and DF-GLS test.

Testing for cointegration

When the variables are integrated of different orders, it is advantageous to use OLS-based autoregressive distributed lag (ARDL) approach [10, 11] which was developed by Pesaran [31] and Pesaran et al. [32]. Moreover, ARDL test is more efficient when the data size is small. However, ARDL requires that the variable should be integrated of order zero, I(0), or integrated of order one, I(1). Since the variables in the study satisfy all these criteria, ARDL(p) approach has been considered. The ARDL framework of Eq. (8) and (9) is expressed as:

$$D(\mathrm{LXP_t}) = \alpha_0 + \sum_{i=1}^{p} \alpha_1 D(\mathrm{LXP}_{t-i}) + \sum_{i=0}^{p} \alpha_2 D\left(\mathrm{CO}_{2_{t-i}}\right) + \sum_{i=0}^{p} \alpha_3 CO_{2^2_{t-i}} + \phi_1 \mathrm{LXP}_{t-1} + \phi_2 \mathrm{CO}_{2_{t-1}} + \phi_3 \mathrm{CO}_{2^2_{t-1}} + \nu_t \quad (10)$$

$$D(\mathrm{LXP_t}) = \alpha_0 + \sum_{i=1}^{p} \alpha_1 D(\mathrm{LXP}_{t-i}) + \sum_{i=0}^{p} \alpha_2 D\left(\mathrm{CO}_{2_{t-i}}\right) + \sum_{i=0}^{p} \alpha_3 D\left(\mathrm{CO}_{2^2_{t-i}}\right) + \sum_{i=0}^{p} \alpha_4 D\left(\mathrm{GLOBCO}_{2_{t-i}}\right) + \phi_1 LXP_{t-1} + \phi_2 \mathrm{CO}_{2_{t-1}} + \phi_3 \mathrm{CO}_{2^2_{t-1}} + \varphi_4 \mathrm{GLOBCO}_{2_{t-1}} + \nu_t \quad (11)$$

Given the ARDL(p) model in Eq. (10–11), the leg length of the variables is selected on the basis AIC criterion which is more appropriate for a small sample size [10]. Besides regression diagnostic tests such as normality test (JB), and heteroskedasticity (Breusch–Pagan–Godfrey test), B-G test for serial correlation has been performed for robust estimators. In order to examine the long-run relationship between LE and CO_2, ARDL bound test has been conducted. In this connection, the null hypothesis is that coefficients of the long-run variables are jointly equal to zero against the alternative hypothesis that they are not zero [31]. The decision is based on the significance level of F statistic, developed by Wald. There are two critical values of F statistic: lower limit I(0) and upper limit. I(1). If the observed F exceeds upper critical limit I(1) then null hypothesis is rejected in favour of accepting the alternative hypothesis which assumes the existence of cointegration between variables. The result of ARDL bound test is reported in Table 2. The calculated F statistic for model is 162.09. The calculated value of F exceeds the critical upper limit of F. This leads to conclude that there is a cointegration between LXP and CO_2. Model II is the extension of model-I that includes $GLOBCO_2$ to incorporate the impact of global carbon emission on life expectancy in India. The result of ARDL bound test in Table 2 confirms that there is a cointegrating relationship among all the variables in the model.

Having established a cointegrating relationship between them, it is safe to report the result of long-run coefficients estimated based on ARDL approach which is given in Table 3. The paper hypothesised a quadratic relationship between LE and CO_2. The result of ARDL estimation reflects that CO_2 affects LE significantly. Moreover, the result confirms the existence of a nonlinear quadratic relationship among cointegrating variables.

Table 1 Unit root test

Test	LXP		CO_2		$GLOBCO_2$	
	At level	At 1st difference	At level	At 1st difference	At level	At 1st difference
Augmented Dickey–Fuller test (ADF)	− 7.65*	–	2.06	− 3.98*	− 0.35	− 3.723*
Philips–Perron test	− 3.77*	–	3.39	3.978*	− 0.46	− 3.68*
DF-GLS test	3.32**	–	2.3	− 5.29*	− 0.67	− 3.39*

* and ** indicate significance at 1% and 5%

LE improves with the increase in CO_2 concentration till a certain threshold limit after which LE starts falling with the increase in the level of atmospheric concentration of CO_2. Incorporation of the new variable $GLOBCO_2$ does not significantly affect our result. However, the result of model II shows that global carbon emission still has no detrimental impact on the life expectancy of India rather life expectancy improves with the increase in global carbon emission. This may be due to the income effect of CO_2 emission. This reflects that global carbon emission still has not surpassed the optimal limit from the point of view of the Indian economy. The strength of the negative impact of global CO_2 emission is still weaker than the positive income effect on the Indian economy.

Next, likelihood ratio test has been performed to verify redundancy of CO_2^2. Null hypothesis for this test is 'the coefficient of CO_2^2 equals to zero'. The decision whether CO_2^2 is a redundant variable is based on the significance level of 'F'. Since both F values are found statistically significant at 5 per cent, we reject the redundancy hypothesis. That is, there is a quadratic relationship between LE and CO_2. Finally, from the short-run ECM model, we have estimated the coefficient of error correction term (ECT_{t-1}). The coefficient of ECT_{t-1} should be negative and significant in general to reflect the long-run equilibrium relationship [44]. It reports the speed of adjustment to converge to long-run equilibrium. Table 3 shows that the coefficient of error correction term in both the models is negative and significant at 1 per cent level. This further confirms the existence of long-run equilibrium relation between LX and CO_2

Table 2 Bound test for the existence of a long-run relationship

Model	Dependent variable	Calculated F	1% critical values		Conclusion
			I(0)	I(1)	
Model-I	LXP	162.09* (K = 2)	6.34	7.52	Cointegration
Model-II	LXP	8.35* (K = 3)	5.17	6.36	Cointegration

* indicates significant at 1% and ** indicates significant at 5%

Critical values in the model are with intercept and trend

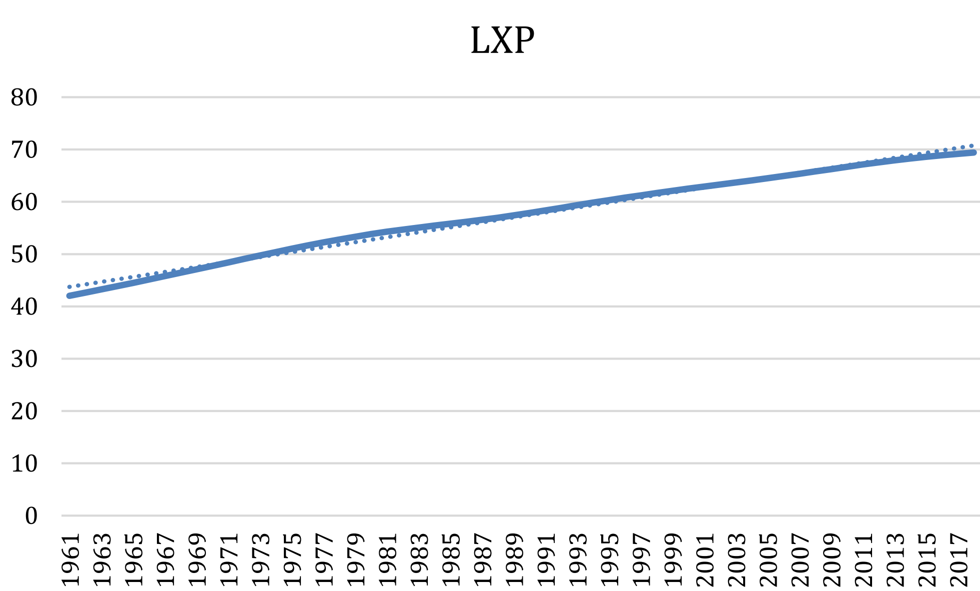

Fig. 3 Trend of life expectancy at birth (1961–2018). *Source*: World Development Indicators

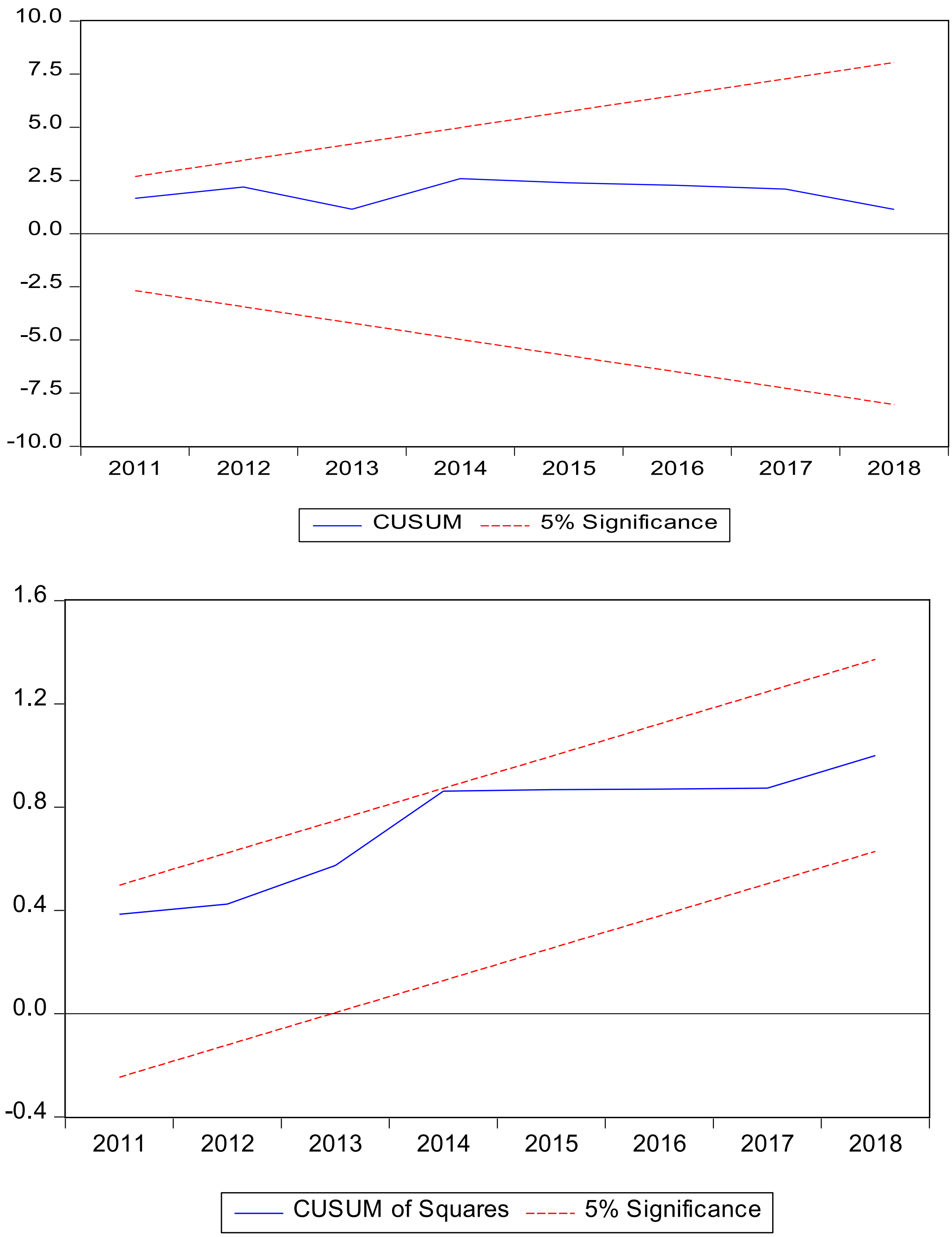

Fig. 4 Stability test: CUSUM and CUSUMSQ

Testing stability in error correction model

Even if there exists cointegration between variables, it does not mean that the estimated coefficient is stable [42]. In order to test the stability of the estimated coefficient, cumulative sum (CUSUM) and cumulative sum of square (CUSUMSQ) stability test [5] have been conducted. The graph of the stability tests is shown in Fig. 4.

It appears from Fig. 4 that the graph of CUSUM and CUSUMSQ lies between the critical limit represented by dotted lines at 5 per cent level of significance. This leads to the conclusion that all the coefficients are stable.

Table 3 ARDL(p) result

Variable	Model -I	Model – II
	LXP	*LXP*
	ARDL(3, 3, 3)	*ARDL (4,3,4,4)*
CO_2	4.0968 (24.855)*	4.785 (9.44)*
CO_2^2	−1.5191 (−25.951)*	−2.19 (−12.68)*
GLOBCO2	–	0.491 (3.865)*
ECT_{t-1}	−0.276 (−5.204)*	−0.243 (−7.646)*
Diagnostic statistics		
$AdjR^2$ 0.99	0.99	0.99
F Statistic	143.8	857.9
χ^2(*heteroskedasticity*)	0.68	0.38
JB(*normality*)	0.96	1.06
B-G (serial correlation)	0.31	0.15

Figures in the parenthesis represent value of *t* statistic

*, ** indicates level of significance at 1 percent and 5 percent

Conclusion and policy prescription

The prior emphasis of the Indian economy is to accelerate economic growth. However, there is an association between economic growth and emission which demands for giving a simultaneous look at growth and environmental dimensions. The concentration of CO_2 in the atmosphere has been growing in an exponential trend. This would be well imperative to adopt the policy of low carbon emission. However, a one-shot drastic reduction in emission may have serious welfare implication in terms of loss in income and employment. In view of this dual impact of emission that is economic and environmental impacts, the present study made an attempt to find the long-run relationship between CO_2 emission and life expectancy. The implicit assumption is that life expectancy is directly related with the economic affluence while it inversely depends on environmental pollution. Using ARDL bound test approach for long-run cointegration, the study draws conclusion that there is a nonlinear long-run relationship between CO_2 and life expectancy. This opposes the earlier findings of linear relationship between CO_2 and life expectancy. There is a threshold limit to which CO_2 affects life expectancy positively. Beyond that limit CO_2 emission significantly reduces life expectancy. On the basis of our regression coefficient, optimum CO_2 emission level has been computed as 1.29 metric ton per capita. However, as per World Bank data, the level of CO_2 emission in India has already surpassed 1.99 metric ton per capita in 2017. This suggests that India has already crossed the threshold limit of CO_2 emission. Hence, it is imperative to reduce the level of CO_2 emission till the optimum level by which the welfare can be increased. A strict decarbonised policy has to be adopted for which a change in production technology is much needed. In this respect, emission tax and pollution abatement technology—subsidy may be conducive to create incentives to reduce the level of pollution. However, one-dimensional preventive measure in the form of cut in the level of emission may be complemented by multidimensional measures like the provision of better health service facilities, development of health infrastructure, enrichment of climate-based knowledge and others may be equally important and an area having research interest. Finally, the study has one limitation while directing such policy-related suggestion that CO_2 is a transboundary pollutant, and hence, it may not be appropriate to assume that the present state of atmospheric CO_2 concentration is resulted from the production and consumption activities operated within the national territory of India.

Abbreviations

CO_2	Carbon dioxide
LXP	Life expectancy at birth
GDP	Gross domestic product
$GLOBCO_2$	Per capita global emission of CO_2
ARDL	Autoregressive distributed lag model
HDEG	Health degradation measure
ECT	Error correction term

Acknowledgements
Not applicable.

Author contributions
SD has designed the introduction, conceptual framework, and conclusion. Data & methodology and empirical findings are attributed to the contribution of SD and AD. Both authors read and approved the final manuscript.

Funding
No financial contribution from the public and private agencies is associated with the work.

Availability of data and materials
The sources of data used in the study are mentioned in the manuscript. However, we declare that if needed, data used in the study and other related materials can be provided by the corresponding author.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Received: 19 June 2022 Accepted: 19 December 2022
Published online: 25 February 2023

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