Article

Health Expenditure, CO2 Emissions, and Economic Growth: China vs. India

Sampson Agyapong Atuahene[1*], Kong Yusheng[2] and Geoffrey Bentum-Micah[3]

[1]School of Finance and Economics, Jiangsu University, Zhenjiang, China Email: 5103181207@stmail.ujs.edu.cn
[2]School of Finance and Economics, Jiangsu University, Zhenjiang, China Email: 1000001042@ujs.edu.cn
[3]School of Management, Jiangsu University, Zhenjiang, China Email: 5103181232@stmail.ujs.edu.cn

* Correspondence: 5103181207@stmail.ujs.edu.cn; Tel.: +8618605242710

Abstract: Researchers' attention has been turned on Health expenditure, Carbon emissions, and economic growth as they play a focal role in the current debate on environmental protection and sustainable development. Our paper endeavors to investigate the impact of economic growth and CO2 emissions on Health expenditure for two main countries in Asia (China and India) using a dynamic panel data model estimated employing the Generalized Method of Moments (GMM) for the period 1960–2019. Our empirical results show that there is a significant relationship between health expenditure, CO2 emissions, and economic growth. The empirical evidence indicates a significant positive impact of CO2 emissions on health expenditure whiles economic growth has a negative impact on health expenditure for both countries for the period under study. The population growth rate has transposed effect on India's health spending; on the other hand, its impact on China's health spending is significantly positive. The strong observable correlation between health expenditure and economic growth is crucial for economic development.

Keywords: health expenditure, economic growth, carbon emissions

JEL Classification: H51, Q52 F43

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1. Introduction

In recent decades, the relationship between a deteriorating environment, economic growth, and healthy spending has gained increasing attention in the literature. This relation is in three testable phases: unidirectional, feedback, and neutrality hypothesis. Fogel (2004) argued that 30 % of economic growth in England for the last two decades is connected to the enhancements in nutrition and health of its' populaces' (Fogel, 2004).

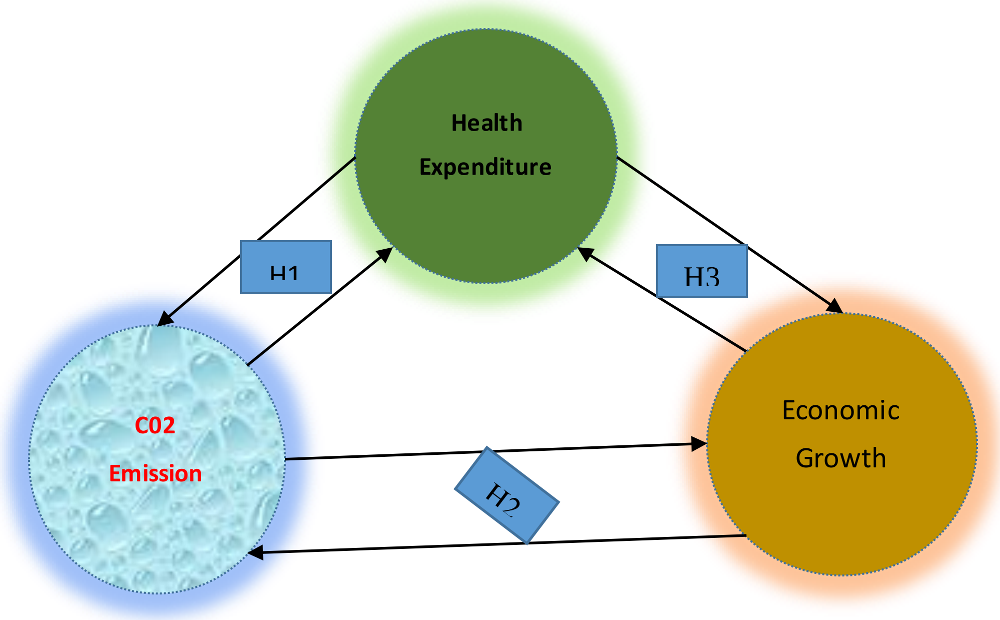
It is unchallengeable that there has been enormous research addressing either health expenditure with $C0_2$ or health expenditure with economic growth, nevertheless, a mixed effect of health expenditure and CO_2 with healthcare spending is still unexplored. Our article aims to fill this research gap by investigating both health expenditure and CO2 emissions implications for economic growth. Health is one of the most important factors to decide the quality of human capital whiles $C0_2$ emission causes climate change, which affects public health care and total production (GDP) (Abdullah et al, 2016). Quality human capital promotes economic growth. Therefore, there the need to investigate what potentially causes harm (CO_2 emissions) to quality of life among all living things and how it changes productivity (economic growth) and the cost associated with maintaining quality health-care (health care expenditure) (Portney, 2013).

This paper is to shed light on the causal relationship between CO2 emissions, health expenditures, and economic growth in China and India for the reason that not as much attention has been paid to from the nexus between the environment, health expenditures, and economic growth by academics.

Research questions

1. Do $C0_2$ emissions significantly affect Health expenditure?
2. Does economic growth has a significant impact on Health expenditure
3. What is the relationship between $C0_2$ emission and economic growth?

From our hypothesis, we come out with, a multi-directional hypothesis represented by the diagram. Multi-Directional Hypothesis Framework



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As projected by academics economic development is also causing environmental degradation, as carbon dioxide is one of the greenhouse gases that is considered to be the main cause of global warming and environmental degradation. Hypothesis H_1 to H_3 looks at the correlation that the three variables have with each other. We exploit the direct effect, indirect effect, and the reverse effect using econometrics analysis.

Study site

Our study centered on the case of China and India with a population size of 1.4 billion population and 1.393 billion respectively. These two countries are the most populous in the world and they are neighbors (Paul & Mas, 2016). India's economy is branded as a major emerging economy. It is ranked as number 5 and number 2 in the world by nominal GDP and by purchasing power parity (PPP) singly (Subramanian, 2019; Zhang & He, 2019). China has become a giant in world's economy its's private sector accounted for between 70% and 80% of GDP in 2018, and this same sector is also responsible for 80% of urban employment and 90% of new jobs. Considering, economic growth, and purchasing power parity (PPP) China is rank number 2 and number respectively.

Literature

The purpose of this study was to demonstrate the interaction between CO2 emissions, health Expenditure, and economic growth in China and India. The pairwise correlation variables between the primary studies will be discussed.

Health Expenditures versus Economic Growth

Bloom et al. Evaluated a production and functional model of macroeconomic growth, including two variables of professional and health experience, for a group of 104 countries. The results show that good health has a significant positive effect on overall production. Many previous studies have focused on assessing the impact of large-scale health sustainability, except for the distribution of health resources (Bloom, Kuhn, & Prettner, 2019). Badri & Badri tested the common complementarity between health spending and GDP in OECD countries (Badri & Badri, 2016). The results showed that health spending and gross domestic product were linked to 12 countries.
Lu et al, researched the dynamic relationship between environmental pollution, economic development, and public health (Lu et al., 2017). The results showed GDP per capita has a significant negative impact on perinatal mortality rates, and education and medical conditions also contribute significantly to promoting economic growth and improving the level of public health. Mehrara (2011) used ARDL to assess the relationship between health spending and economic growth (Mehrara, 2011). According to Hung and Shaw, empirical evidence shows that both health and education have significant positive effects on economic growth (Hung & Shaw, 2004).

Health Expenditures versus CO2 Emission

According to Cracolici et al, (2010), there is a unidirectional relationship between carbon dioxide emissions and health spending, except for less privileged countries (Cracolici, Cuffaro, & Nijkamp, 2010). In the study of Yazdi et al (2017). the ARDL method was used to investigate the positive correlation between carbon monoxide and sulfur dioxide and health expenditure (Khoshnevis Yazdi & Khanalizadeh, 2017). Beatty and Shimshack use a cohort analysis to study the relationship between carbon monoxide contact and kids' health (Beatty & Shimshack, 2014). A discovery was made by them that, the surge in carbon monoxide caused in a significant rise in children's health treatment. Boachie et al. work about Ghana used health expenditure during the period 1970-2008 (Kofi Boachie, Ramu, & Põlajeva, 2018). Their finding indicates that the correlation between health spending and carbon dioxide emissions is adverse.

CO2 Emissions versus Economic Growth

For the past twenty years, climate change has become a vital issue, and for the fear of global warming, most countries are worried about CO_2 emissions (Fernandes & Paunov, 2012). Apart from worldwide campaigns, laws, and regulations have been enacted by local and international bodies to reduce the amount of $C0_2$ emissions into the atmosphere and scientists are finding to heal the global of the dangers that have already been caused due to emission on harmful (Hufbauer, Charnovitz, & Kim, 2009). To grow and sustain economies new industries sprung up which depends on oil, gas, and other chemicals, as their main sources of energy leading to production and the magnification of the $C0_2$ externalities on public health (Lovins, 2013).

Experts say that the effective consumption of energy resources involves a higher level of economic growth (Bilen et al., 2008). However, the financial benefits that we enjoy today out of

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environmental goods and services, will go a long way to affect future generations (Clayton, Kals, & Feygina, 2016). Aye & Edoja (2017) find that without resorting to environmentally friendly techniques that improve the quality of the environment, as the economy grows, more carbon dioxide would be released, perhaps due to more activities that are industrial (Aye & Edoja, 2017).
According to Saidi and Hammami (2015), economic growth has a positive influence on energy consumption and is statistically significant (Saidi & Hammami, 2015). Halicioglu tested the feedback hypothesis between CO2 emissions and the economic expansion of Turkey (Halicioglu, 2009). Saboori et al (2012). studied the causal relationship between GDP growth and CO_2 emissions for Malaysia and discovered a one-way causality from GDP growth to CO_2 emissions (Saboori, Sulaiman, & Mohd, 2012). Saboori and Sulaiman (2013) identified an important relationship between carbon dioxide emissions and economic growth that supported the EKC hypothesis Singapore and Thailand in the long term (Saboori & Sulaiman, 2013).

Cai et al. (2018) used the recently linked ARDL Bootstrap app with structural separators to study the relationship between clean energy consumption, economic growth, and carbon emissions. They found a long-term and short-term relationship between economic growth and carbon emissions for the G-7 countries (Cai, Sam, & Chang, 2018). Panayotou (2016) noted that improving economic growth causes environmental problems since increasing production levels increases environmental pollution (Panayotou, 2016). Conversely, Acharyya (2009) maintains that the hypothesis linked to economic development and environmental problems is more complex (Acharyya, 2009). Hao and Liu (2015), on the other hand, argue that economic growth can improve environmental outcomes through clean and continuous production in countries (Hao, Liu, & Huang, 2015).

In general, these studies argue that there is a need to understand the dynamic environment and its impact on economic conditions and public healthcare.

Research Methodology

From the survey of these pieces of literature in both countries, we concluded that many academic researchers have focused their analysis on the relationship between health expenditures and economic growth while using the single equation method. This study contributes to this literature by examining the causal relationship between CO2 emissions, health expenditures, and economic growth using a dynamic panel data model estimated by the Generalized Method of Moments (GMM) (Arellano & Bond, 1991).

This study covers two major countries in Asia within the period between 1965 and 2019. The two countries selected for this study are India and China. Real GDP per capita (GDP) are obtained from the World Development Indicators, World Bank. Per capita real health expenditure (HE) in U.S. PPP dollars. CO2 emissions (CO2) data are retrieved from The BP Statistical Review of World Energy (available at http://www.bp.com/). All variables are transformed into a natural logarithm form. per our literature review variables such as economic growth, CO2 emissions, labor force, and total population forms the empirical models' variables around which research involving health expenditure, $C0_2$, and economic growth is seen to provide significant results. They generally found that these variables are important and have a statistically significant influence on economic growth.

Following Chaabouni and Zghidi, the relationship between CO_2 emissions, health expenditures, and economic growth is modeled using the production function. Output (H) can be written as a function of CO_2 emissions (CO_2), health expenditures (H), financial development (FD), population

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(p), capital (K), and labor (L). Financial development (physical capital accumulation), and Population serves as control variables.

$H = f(GDP, CO_2, FD, POP, K, L)$.

$gH_t = \beta 0 + \beta 1gGDP_t + \beta 2gCO_{2t} + \beta 3FD_t + \beta 4gK_t + \beta 5gPOP_t + \beta 6gL_t + \mu_t$.

$gH_{i,t} = \beta 0 + \beta 1gGDP_{i,t} + \beta 2\, gCO^2_{i,t} + \beta 3FD_{i,t} + \beta 4gK_{i,t} + \beta 5gPOP_{i,t} + \beta 6\, gL_{i,t} + \varepsilon_{i,t}$

We can also divide both provided by population and get each series
in per capita terms:

$gH_{i,t} = \beta 0 + \beta 1gH_{t-1}, t + \beta 2gGDP_{i,t} + \beta 3\, gCO_{2i,t} + \beta 4FD_{i,t} + \beta 5gK_{i,t} + \beta 6gPOP_{i,t} + \varepsilon_{i,t}$

where i represents country (in our study, we have 2 countries); t represents time (our time frame is 1960–2019); gGDP represents the economic growth rate of per capita, gH represents the Health Expenditure of per capita GDP, gCO2 the growth rate of per capita CO_2 emissions, gK represents the growth rate of capital stock, and gPOP represents the growth rate of population.

Results and Discussion

Descriptive Statistics

Variables	Obs	Mean	Std. dev	CV	Min	Max
India						
GDP per capita	51	1.299	0.577	0.749523	-0.150	1.988
CO2 emissions per capita	60	0.373	0.604	0.225292	1.318	0.746
Population	60	0.605	0.249	0.150645	0.015	0.847
Health Expenditure	20	3.671	0.456	1.673976	2.921	4.267
Financial development	60	3.193	0.302	0.964286	2.666	3.736
Labor Force	30	19.849	0.138	2.739162	19.573	20.019
Capital stock	60	15.580	0.946	14.73868	13.972	17.310
China						
GDP per capita	54	1.998	0.671	1.340658	-1.523	2.776

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CO2 emissions per capita	60	0.791	0.793	0.627263	-0.554	2.063
Population	59	0.097	0.5981	0.058016	-1.023	1.025
Health Expenditure	20	5.043	0.857	4.321851	3.746	5.998
Financial development	60	3.567	0.212	0.756204	2.756	3.843
Labor Force	30	20.423	0.062	1.266226	20.280	20.48
Capital stock	60	15.850	1.420	22.50700	13.816	18.347

Notes: Std dev. and CV indicate standard deviation and coefficients of variation (standard deviation-to-mean ratio), respectively.

For Table 1 above, the descriptive statistics mean, standard deviation (Std. Dev.), and the coefficient of variation (CV) of these variables are recorded. CO_2 emission is measured in metric tons per capita. The mean growth rate of CO_2 emissions per capita is high in China as compared to India and other parts of Asia. China is more volatile to CO_2 emissions; its coefficient of variation is 2.779, which is the highest compared to India with 0.746 of variation. Moreover, the average growth rate for GDP per capita is recorded highest in China. Indeed china follows the US as the second world's largest economy in terms of nominal GDP as followed by Japan, Germany, and India (Lea, 2019). The population growth rate for china has dropped drastically since the introduction of the one-child per family policy. India's population is on the rise with a mean of 0.605. They seem to be catching up with China. The coefficient of variation for the labor force of 20.423 and 19.849 is reported for China and India.

Table 2: Correlation matrix.

	GDP	H	CO_2	FD	LF	SC	pop
GDP	1.0000						
H	0.2163	1.0000					
CO_2	0.3684	0.9326	1.0000				
FD	0.5255	0.6606	0.8675	1.0000			
LF	0.4202	0.6370	0.8211	0.8153	1.0000		
SC	0.3396	0.7665	- 0.8589	0.7665	0.8241	1.0000	
POP	0.1430	0.7240	-0.8404	-0.7472	-0.8088	-0.8077	1.0000

Table 2 depicts the correlation matrix. The correlation between economic growth (GDP) and CO_2 emission is positive. Capital Stock is positively related to the GDP, Health expenditure labor force, and financial development. However, Carbon emission and capital have an antithetical relation. The relation between population and economic growth is positive. The relation between capital stock and the population is negative. The correlation indicates a positive correlation between CO_2 emissions,

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capital stock, and population growth. Financial development is positively correlated with economic growth, CO2 emissions, and capital. A negative correlation exists between population and all other variables except health expenditure and economic growth.

In the present study, we used a dynamic panel specification where lagged levels of the energy consumption are taken into account by using the Arellano and Bond (1991) GMM estimator. Our proposed model is as follows:

Dynamic panel data model

$$gH_{i,t} = \beta_0 gH_{i,t-1} + \delta gGDP_{i,t} + \gamma\ gCO2_{i,t} + \Sigma \sum_{j=1}^{3} \theta_j Z_{i,t} + \mu_{i,t} + \varepsilon_{i,t};$$

$i = 1, \ldots, N; t = 1, \ldots, T$

Where $gH_{i,t}$ stands for health expenditure of country i at t time, β_0 is the parameter to be estimated; Control is a vector of core explanatory variables used to model energy consumption (labor for, Capital stock, Population, and Financial development); μ is country-specific effects, and ε is the error term. Finally, δ captures the effect of economic growth while γ captures that of the CO2 emissions. This model contains the lagged dependent variables (gH_{it-1}) which are correlated with the error term. The use of panel ordinary least squares (OLS) estimator (with fixed and random effects) is problematic.

Table 3: Joint Results/combined effects (China and India)

Dependent Variables	Coefficient	t-statistic	Prob-value
HE_{t-1} (One year Lag of Health Expenditure)	-0.590	-2.184	0.0000*
GDP per capita	-0.583	-2.764	0.0163**
CO2 emissions per capita	6.338	3.917	0.0000*
Capital stock	1.300	3.631	0.0006*
Population	2.701	3.546	0.0008*
Labor Force	1.410	2.812	0.0069*
Financial development	-1.099	-4.282	0.0001*

R-squared	0.996413	Mean dependent VAR	42.89962
Adjusted R-squared	0.995999	S.D. dependent VAR	76.46123
S.E. of regression	4.836452	Sum squared resid	1216.346
Durbin-Watson stat	1.502751	J-statistic	0.267166
Instrument rank	8	Prob. (J-statistic)	0.605239

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Note:* Indicate significance at the 1% level. ** Indicate significance at the 5% levels. *** Indicate significance at the 10% level.

Sargan test/J-statistic (Arellano and Bond, 1991) is a test of over-identifying restrictions. Sargan tests show no evidence of misspecification at conventional significance levels. These results indicate that the model is a good specification. The Standard error of the regression (**S.E of regression**) measures the disturbance of the error term in the regression. Statistically S.E. of regression should not be above 15% of the mean of the dependent variable. Our S.E. of regression for Table 3 is 4.836, which is 11.21% of the mean dependent VAR of 42.89, meaning our model fits well to the dependent variable. For each of the estimates reported in Tables 3–6, the S.E of regression show evidence of a good model fit to the dependent variable. **Durbin-Watson stat:** Tests for serial correlation in the error term of the regression. The DW statistics in table 3-5 are 2, 1.8, and 1.5 respectively. These values fall with the acceptable zone of autocorrelation. According to the statisticians the acceptable zone is 1.5-2. Therefore For each of the estimates reported in Tables 3–5, the AR(2) tests show no evidence of autocorrelation.

When it comes to assessing the two countries, the GMM model is perfect because the adjusted R-square explains 99.5% of the model specification indicating that the model is a good specification. The value of H_{t-1} (−0.590) implies that between the two countries health spending is adjusted by 5.90% each year. We ascertain that economic growth has negative and statistically significant effects at a 5% level on Health expenditure. The coefficient of economic growth is 0.583 implying that a 1% increase in the growth rate of the GDP per capita (economic growth) conversely affects health expenditure by 0.583% for India. In the case of CO_2 emission, it has a positive and statistically significant effect on health expenditure and statistically significant at 1% level. Considering the CO_2 emission coefficient of 6.338, a 1% increase in a single unit of carbon emission is expected to increase the average health expenditure of these two neighboring countries by 6.338%. The variable of the population has a significant and negative effect on Health expenditure at all levels. The value of the coefficient of the population (2.701) infers that a 1% increase in population increases health expenditure directly and or indirectly by 2.701% for both countries. This has a link with Liang and Tussing's (2019) finding; that a one percent deviation from the GDP trend is positively correlated with a 0.61 percent deviation from the government health expenditure trend (Liang & Tussing, 2019).

Also, we find that the labor force has a positive and significant influence on health care expenditure at a 1% level of significance. A percentage increase in the active labor force leads to an upward review of the health care expenditure by 1.410%. The coefficient of a capital stock indicates that capital has a significant and positive effect on Health expenditure at the 10% level. A 1% increase in capital to support the industrial growth of India triggers a 2.53% increase in Health expenditure, ceteris paribus. This supports the consideration of capital stock in growth theories as well as empirical studies (Lucas, 1988)

Table 3 again shows that the impact of the financial development on health expenditure is negative and statistically significant at level 1%. With a coefficient of 0.266, all other this being equal a 1 percent increase in finances for development would reduce Health care spending by 0.226%.

Table 4: Results for China

Dependent Variables	Coefficient	t-statistic	Prop-value

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HE $_{t-1}$ (One year Lag of Health Expenditure)	1.141	15.039	0.0000*
GDP per capita	-5.168	-5.000	0.0003*
CO2 emissions per capita	7.783	1.401	0.0319**
Capital stock	4.380	4.760	0.0005*
Population	34.307	2.939	0.0124**
Labor Force	9.460	3.082	0.0095*
Financial development	-2.396	-2.867	0.0142**

R-squared	0.998798	Mean dependent var	218.8018
Adjusted R-squared	0.998196	S.D. dependent var	144.5323
S.E. of regression	6.138001	Sum squared resid	452.1007
Durbin-Watson stat	2.059463	J-statistic	0.603877
Instrument rank	8	Prob(J-statistic)	0.437103

Note:* Indicate significance at the 1% level.** Indicate significance at the 5% levels.*** Indicate significance at the 10% level.

The R-squared and the Adjusted R-squared in Table 4 explained how well the model explains the dependent and the independent variable. The Adjusted R-squared is 0.995, which means that it explains 99.5 percent of the link among the variables. These results indicate that the dynamic Health expenditure model is a good specification. The results of China are reported in Table 4. The one year lagged value of health expenditure H_{t-1} (1.141) suggests that health expenditure is improved by 11.41% each year. We find that economic growth proxy in Table 4 as GDP per capita has negative and statistically significant effects at a 1% level on health expenditure. The coefficient of economic growth is (-5.167) implying that a 1% increase in the growth rate of the GDP per capita decreases Health Expenditure by 5.167 % for China. Meanwhile, CO_2 emissions have a positive and statistically significant effect on Health expenditure and statistically significant at a 5% level. A 1% increase in CO2 emissions is anticipated to raise health expenditure by 7.78%. Table 4 shows that the impact of the financial development on energy consumption is negative and statistically significant at level. A 1% increase in domestic credit to the private sector is expected to reduce Health care demand by 2.867%. Financial development promotes investment however, it induces economic growth and stimulates $C0_2$ emission therefore it has an inverse relationship with health expenditure. The coefficient of capital stock, population, and labor force indicates show confirmation positive effect on Health expenditure. Capital stock and labor force are significant 1% level whiles the population is at

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a 5% level of significance. A 1% increase in capital enhances health care spending by 4.38%, ceteris paribus. An increase in population by 1% will trigger a 34.3% increase in health care expenditure directly and or indirectly by 34.3%.

Table 5: Result for India

Dependent Variables	Coefficient	t-statistic	Prop-value
HE $_{t-1}$ (One year Lag of Health Expenditure)	-0.590	-2.184	0.0496**
GDP per capita	-0.583	-2.764	0.0171**
CO2 emissions per capita	6.340	3.917	0.070***
Capital stock	2.530	2.104	0.0571***
Population	-18.764	-1.465	0.3762
Labor Force	6.660	0.919	0.2210
Financial development	0.226	1.291	0.0571***

R-squared	0.993796	Mean dependent var	44.42126
Adjusted R-squared	0.990695	S.D. dependent var	17.52317
S.E. of regression	1.690354	Sum squared resid	34.28757
Durbin-Watson stat	1.869436	J-statistic	4.907929
Instrument rank	8	Prob(J-statistic)	0.026734

Note: * indicate significance at the 1% level. ** Indicate significance at the 5% levels. *** Indicate significance at the 10% level.

The adjusted R-square and the R-square show the model can explicate more 95% of the model specification. Table 5 contains the statistical result for India. The value of the one year lagged health expenditure H_{t-1} (−0.590) implies that health expenditure of India is amended by 0.590 percent each year. We find that GDP per capita has negative and statistically significant effects at a 5% level on Health expenditure. The coefficient of economic growth is 0.583 implying that a 1% increase in the growth rate of the GDP per capita conversely affects health expenditure by 0.583 % for India. In the case of CO_2 emission, it has a positive and statistically significant effect on health expenditure and statistically significant at the 10% level. A 1% increase in CO2 emissions is expected to rise by 7.78%. Table 5 shows that the impact of the financial development on health expenditure is negative and statistically significant at level 10%. A 1% increase in finances for development is to increase Health care spending by 0.226%. Financial development promotes investment, which raises $C0_2$ creating health hazards resulting in higher health care spending. The coefficient of a capital stock indicates that capital has a significant and positive effect on Health expenditure at the 10% level. A 1% increase in capital to support the industrial growth of India triggers a 2.53% increase in Health expenditure, ceteris paribus. The variable of the population has an insignificant and negative effect on Health expenditure at all levels. However, considering only the coefficient of the population it suggests that a 1% increase in population reduces health expenditure directly and or indirectly by 18.7%.

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Summary of Results

Variable	Combined	China	India
HE $_{t-1}$ (One year Lag of Health Expenditure)	√(-)	√(+)	√(-)
GDP per capita	√(-)	√(-)	√(-)
CO2 emissions per capita	√(+)	√(+)	√(+)
Capital stock	√(+)	√(+)	√(+)
Population	√(+)	√(+)	X(-)
Labor Force	√(+)	√(+)	X (+)
Financial development	√(-)	√√(-)	√(+)

NOTE: √ denotes statistical significance X denotes statistical insignificance (+) denotes it has a positive effect on health expenditure (-) denotes it has a negative effect on the health expenditure

The results concerning the effects of CO2 emissions and economic growth on health expenditure for the three sections are summarized in *Table 6*. First, we discovered that economic growth negatively affects health expenditure and the p-values are statistically significant in the three sections. This indicates that an increase in economic growth implies a decrease in health care expenditure. Second, CO2 emissions have a positive and statistically significant effect on health expenditure in the three panels. Third, we found that capital also has a positive and statistically significant effect on health expenditure in the three panels. Next, the labor force has a positive and statistically significant effect on health expenditure in the three divisions. Our results are in line with the findings of (Apergis, Bhattacharya, & Hadhri, 2020; Eggoh, Houeninvo, & Sossou, 2015). Moreover, the population has a negative and statistically insignificant effect on Health spending only for India. Finally, the population has a positive and statistically significant effect on health expenditure only for the Indians.

Conclusion

Even though the literature on health expenditure, CO2 emissions, and economic growth has improved over the last few years, no study has examined the effect of economic growth and CO2 emissions on Health expenditure using a growth framework and dynamic equation models. The results are based on data from 1960 to 2019. We have examined this effect not only on a single country analysis but also on combined country-analysis.

Our results show that the effect of economic growth on health expenditure use is negative and statistically significant in China and India. Meaning, holding all other things constant, in china economic growth and health expenditure move in opposite directions. This suggests that even though these countries (China and India) are achieving massive economic growth, less attention has been paid to the health care of its citizens. We justify this by the fact that the one year lagged health expenditure coefficient is negative for both countries in all three panels.

Carbon dioxide emissions have a positive and statistically significant effect on health expenditure. Inferring that more harmful substances are being released in the atmosphere, causing

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the government to spend on health services. Rules, procedures, and scientific processes about carbon emissions have been made by global and national agencies to reduce carbon emissions however, most countries and major organizations still do not adhere to the safety rules. Though China and India are among the top ten carbon dioxide emitters, they have strengthened the laws and regulations about environmental safety.

The empirical review indicates that the population growth rate of India to exceed its health system improvement widening the gap of the number of house to a health facility. We recommended that India authorities work on its health system to march up with its population because our result indicated a negative influence between India's population and health expenditure. Chiefly, the role of the private sector in health should be upgraded so that the health expenditure can have a positive contribution to the economic development of India.

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