OBSERVARE
Universidade Autónoma de Lisboa

e-ISSN: 1647-7251
Vol. 12, Nº. 2 (November 2021-April 2022)

JANUS.NET
e-journal of International Relations

A KUZNETS ADAPTIVE APPROACH TO LIFE EXPECTANCY AT BIRTH: AN APPLICATION ON RISING POWERS

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Abstract

This study aims to test the validness of Kuznets' hypothesis in major rising powers between the years of 2000 and 2018 within the scope of the relationships between life expectancy at birth (throughout the paper-life expectancy-LE) and economic growth. Using panel data analysis method, we investigate if there is a curve such as Health Kuznets Curve (HKC) for life expectancy. The empirical findings indicate that the validity of HKC hypothesis could not be obtained for Brazil, Mexico, Russian Federation, South Africa and Turkey. A U-shaped relationship exists between these two variables for these countries. In other respects, we found empirical evidence of a Kuznets'curve and inverted U-shaped relations between economic growth and life expactancy for Australia, China, Indonesia and Korea. Empirical evidence also suggests that there is not any relationship between economic growth and life expectancy for India.

Keywords

Life Expectancy, Rising Powers, Economic Growth, Panel Data Analysis, Kuznets's Hypothesis

How to cite this article

Ünal, Hüseyin; Kinik, Hülya (2021). A Kuznets adaptive approach to life expectancy at birth: an application on rising powers. In Janus.net, e-journal of international relations. Vol12, Nº. 2, November 2021-April 2022. Text… Consulted [online] on the date of the last visit, https://doi.org/10.26619/1647-7251.12.2.11

Article received on October 17, 2020 and accepted for publication on March 19, 2021

A KUZNETS ADAPTIVE APPROACH TO LIFE EXPECTANCY AT BIRTH: AN APPLICATION ON RISING POWERS

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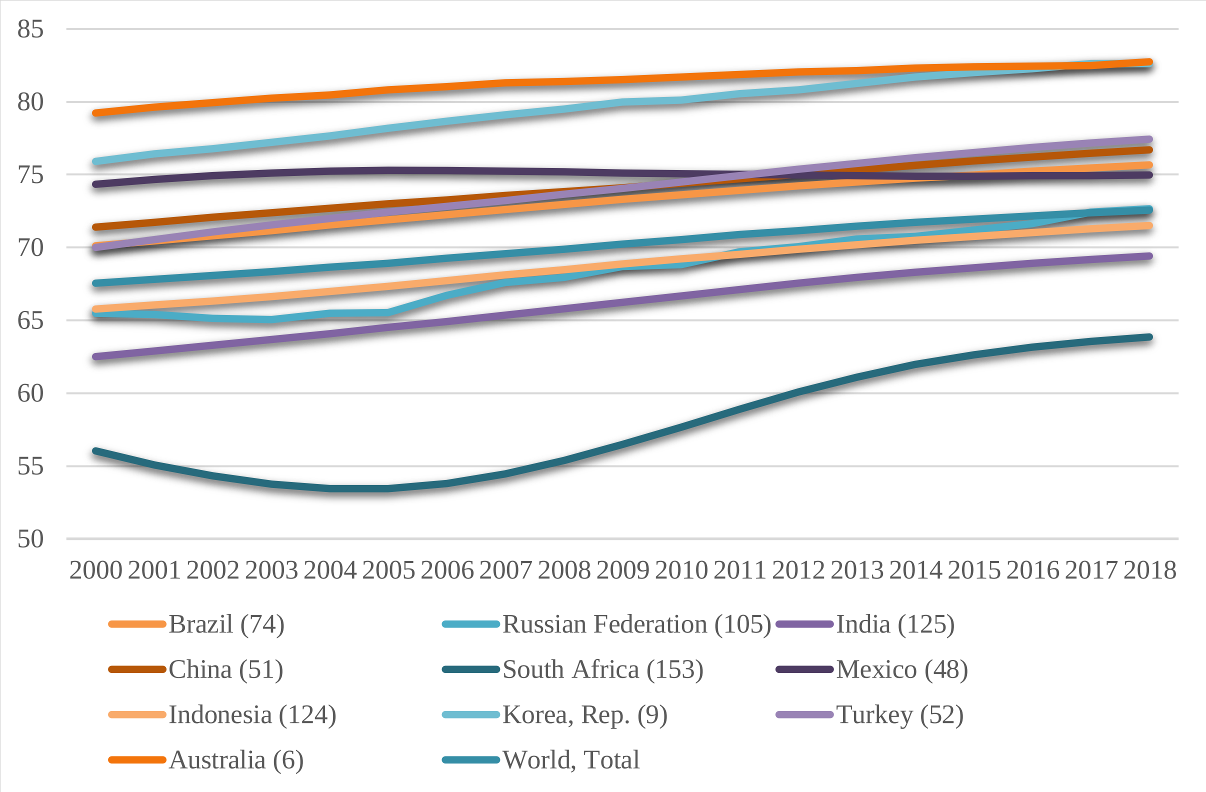
Introduction

Life expectancy is among the most significant indicators of health and public welfare widely used to measure the general health status of a population. In practice it is a reasonable proxy for population health (Canning 2012: 1784) and a measure that summarizes the mortality level of a given population in a given year. It provides us with key information about the development level of a country's welfare state (Bayın, 2016: 94). Health issues have become essential as countries with higher life expectancy have a tendency to show a better level of development and achieve long-term economic development (Hassan et al, 2016: 105).

In this context, we analyze the relationship and causality between life expectancy and economic growth and different control variables under the Simon Kuznets's "inverted U-curve hypothesis" for 10 rising powers named BRICS group (Brazil, Russia, India, China, South Africa) and MIKTA countries (Mexico, Indonesia, Korea, Turkey and Australia) during the period 2000-2018, using panel data method. Although rising powers phenomenon is a new concept, it has been a subject to many studies but there has been very little published on their status in health. These countries not only prioritize economic development, but they also put emphasis on the cooperation in the field of global health. They have been recognised for their capacity and potential to influence global health. On the other hand, BRICS and MIKTA countries together represent nearly 50% of global population. Accordingly, it is crucial to analyze their situation in terms of life expectancy as a key representation of a population's general state of health.

Over the past few decades, new rising powers have achieved notable success with regard to their life expectancy. These improvements have been result of several factors such as growing incomes and increasing education as well as governments' attempts to develop their citizens' health status. Global life expectancy at birth in 2018 was 72.5 years ranging from the lowest as 63.9 years for South Africa to the highest as 82.7 years for Australia among selected countries. As the Figure 1. shows that during the given period, there has been an increase in life expectany of South Africa but it is stil below the world average. On the other hand, Australia and Korea rank among ten nations with the highest life expectancy. The life expectancy at birth is 77.4 years for the total population in Turkey which ranked 52 in the world in 2018.

Figure 1. Life Expectancy At Birth (both sexes combined, world rank, 2018)



Source: World Bank, World Development Indicators

Within this framework, this study is organized as follows: the first part summarizes the existing literature on the determinants of life expectancy; section 2 reviews Kuznets Hypothesis as theoretical background and describes the method of data collection and methology of the study; section 3 examines the results of the study and the latest section reports the conclusions.

1. Literature Review on the Determinants of Life Expectancy

Numerous previous studies devoted to investigate different life expectancy determinants have taken into consideration several factors like income, inflation, education, health care spending, improved water coverage and sanitation, employment rate, urbanization, and many others. However, there is a lack of consensus about the variables that determine life expectancy in empirical evaluation. The only consensus is that income affects life expectancy positively.

In his cross-sectional study, Grossman (1972) investigated that inflation negatively affects life expectancy, and household welfare was generally damaged due to increasing prices. Preston (1976) evaluated the relative importance of income and variations in income in determining the levels and fluctuations in the level of life expectancy. The main result of his study is that life expectancy was correlated with per capita income, but eventually changes in income have been quite unimportant since World War II to affect changes in life expectancy.

In their study, Rogers and Wofford (1989) found that urbanization, agrarian population, illiteracy rate, safe drinking water, average calorie per person and doctor per population had a significant role on life expectancy for developing states. Gulis (2000) found that income per capita, public spending on health, access to water, calorie intake and rate of literacy are highly effective in determining life expectancy for 156 countries of the world. Kalediene and Petrauskiene (2000) indicated that urbanization is among the main life expectancy determinants for both developed and developing countries as they are able to reach better medical aid, more opportunities for education and advanced social and economic background which positively affected the health.

Hussain (2002) have also studied factors that affect life expectancy based on the cross-sectional data using multiple OLS. The result of his study suggested that life expectancies in developing countries could be significantly developed if close attention was given to fertility decrease and raising calorie intakes.

Yavari and Mehrnoosh (2006) examined how socio- economic factors affect life expectancy based on multiple regression analysis. The results of their study suggest a positive and strong interaction between life expectancy and per capita income, health expenses, literacy rate and daily caloric intake. Their study also shows that the number of people per doctor negatively affects life expectancy in African countries. Erdogan and Bozkurt (2008) analyzed the correlation between life expectancy and economic development in Turkey between 1980-2005 basen on ARDL boundary test model. They asserted that economic growth positively affects life expectancy in Turkey.

Kabir (2008) examined the socio-economic factors that have effect on life expectacy with ten widely used variables for 91 developing countries by applying multiple regression probit models. The findings suggest that almost all explanatory variables turned out to be unimportant, showing that socio-economic conditions can not be regarded as influential on the life expectancy of developing nations all the time.

Lei et al. (2009) explored the socioeconomic determinants of life expectancy in Beijing by using the linear stepwise regression model. The results show that floor space available per rural resident and GDP per capita have a positive relationship with life expectancy, while there is a negative relationship between life expectancy and the rural population proportion and illiteracy rate.

Balan and Jaba (2014) investigated the factors that determine life expectancy in Romania between 1970 and 2008. The results of their study reveal that a positive relationship exists between life expactancy and wages, the number of beds in hospitals, the number of doctors, and the number of readers subscribed to libraries. In addition, the proportion of the Roma population and the illiterate population ratio have negative effects on life expectancy.

Bilas et al. (2014) examined life expectancy for 28 European Union countries during 2001-2011 using panel data analysis method. They pointed out that both GDP per capita and level of education expained between 72.6% and 82.6% of differences in life expectancy.

Based on data from 1970 to 2012, Ali and Ahmad (2014) also studied determinants of life expectancy for Oman by using ARDL boundary test method. In their analysis, they included the following determinant factors: per capita income, food production, schooling rate, population growth, inflation and CO2 emissions. According to the results, food production and schooling rate positively affect life expectancy and have statistically significant effects on life expectancy while inflation and per capita income had negative and unreasonable impacts on life expectancy. The results also suggest that population growth had a negative and significant effect on life expectancy while CO2 emissions had positive and statistically insignificant impact on the life expectancy in the long-term and a negative and statistically significant effect in the short-term.

Jaba et al. (2014) studied the correlation of health expenditures with life expectancy in selected 175 countries between 1995 and 2010 by using panel data method. There is a significant correlation between these two variables.

Memarian (2015) analyzed the relationship among health spending, life expectancy and economic growth in Iran from 1989 to 2011 deploying the ARDL econometric model. He found that as life expectancy and health care expenditure increased economic growth increased as well.

Based on A Vector Autoregression (VAR) Analysis method, Sede and Ohemeng (2015) analyzed the socio-economic determinants of life expectancy in Nigeria between 1980 and 2011. They mesured the effects of different independent variables as follows: per capita income, secondary school enrolment, public expenditures on health, unemployment rate and the Naira exchange rate. Schooling rate in secondary education, per capita income and government expenditure on health were not significant in determining the life expectancy in Nigeria. However, unemployment and exchange rate had a significant effect on life expectancy.

Şahbudak and Şahin (2015) studied the relationship between health indicators and economic growth in BRIC countries between 1995 and 2013 by using panel data method. They used GDP as dependent variable and included the share of health expenditures in GDP, life expectancy at birth and child mortality rates as independent variables. Results showed that there is a positive relationship among the share of health expenditures in GDP, life expectancy at birth and economic growth; but negative correlation exists between economic growth and child mortality rates.

Monsef and Mehrjardi (2015) studied the determinants of life expectancy in 136 countries during 2002-2010 based on panel data analysis method. Their study shows that unemployment and inflation have a significant negative effects on life expectancy. However, a positive relationship exists among the gross capital formation, national income, and life expectancy.

Hassan et al. (2016) researched the relationship between life expectancy rate and expenses on health, GDP, education index, improved water coverage, and improved sanitation in 108 developing countries during 2006-2010 based on panel data analysis. The empirical results indicate that there is a positive correlation between life expectancy rate and all selected indicators.

Within these framework, this paper tries to answer what factors determine life expectancy as a key elemet for the nation’s health status for BRICS and MIKTA groups based on panal data analysis as a parallel of Kuznetz' theoretical model. Several authors have examined Kuznets' hypothesis with cross-country data, but these studies have generally tested the validity of this hypothesis analyzing relationship between income growth and environmental pollution. Therefore, this study will make a significant contribution to the scarce literature which have tested the validity of Kuznets' hypothesis in health. Nevertheless, country selection is another substantial contribution for existing literature on rising major powers. Based on the literature review, the data used in this study were listed below and they were all obtained from World Bank's website.

- LE = Life expectancy at birth, total (years)
- GDP = Real GDP per capita (2010 constant)
- INF = Inflation rate (annual %)
- POPD = Population density (people per sq. km)
- HE = Current health expenditure per capita(% of GDP)
- FR = Fertility rate (births per woman)

2. Testing For a Kuznets Curve: Econometric Methodology

Simon Kuznets' "inverted U-curve hypothesis" is among the most enduring and significant arguments in the social sciences history. Kuznets's central purpose was to question if inequality in income distribution increase or decrease during a country's economic growth (Kuznets, 2015: 1). At early stage of development little inequality is seen in a poor country. Later, inequality worsens as income increase, but after reaching a peak, inequality begins to decrease with more increase in growth. Present studies which have referred to and tested a health Kuznets' hypothesis are quite rare. While some of the studies confirmed a Kuznets' curve others failed to find any evidence. For instance, Sahn and Younger (2009) examined the relation between level of well-being and inequality at inter-country and intrahousehold levels by applying individuals' body mass index (BMI) as the proxy of well-being. They did not find an evidence of a quadratic curve for BMI-inequality. Molini et al. (2010) have also explored a relationship between the Human Development Index (HDI) and the index of concentration of BMI in developing countries applying quadratic specifications. They found a U-shaped relation between inequalities in BMI and HDI for Vietnam.

In the study, the Kuznet hypothesis adapted for 10 rising powers between 2000 and 2018 is tested with the following model:

$$InLE_{it} = \gamma_0 + \gamma_1 InGDP_{it} + \gamma_2 InGDP_{it}^2 + \gamma_3 InHE_{it} + \gamma_4 InPOPD_{it} + \gamma_5 InFR_{it} + \gamma_6 INF_{it} + e_{it} \quad (1)$$

where, i denotes rising powers, t denotes year 2000-2018 under observation, γ_0 denotes constant term, γ_1, γ_2, γ_3, γ_4, γ_5 and γ_6 denote the effects of the regressors on the life expectancy, and e_{it} denotes the error term. Besides these, $InLE_{it}$ is the log-transformed life expectancy, $InGDP_{it}$ is the log-transformed per-capita real GDP, $InHE_{it}$ is the log-transformed current health expenditure, $InPOPD_{it}$ is the log-transformed population density, $InFR_{it}$ is the log-transformed fertility rate and INF_{it} is inflation rate. The data on life expectancy (year), real GDP per capita (2010 constant), fertility rate (births per woman), current health expenditure (% of GDP), population density (people per sq. km) and inflation rate (annual %) are achived from the World Development Indicators.

Equation (1) indicates the effects of economic growth, inflation rate, health expenditure, population density and fertility rate on the life expectancy. We also present an experimental model to examine whether there is a KC for life expectancy by adding $(InGDP_{it}^2)$ to the model. If $\gamma_1 < 0$ and $\gamma_2 > 0$, there will be a U-shaped relationship between life expectancy and real GDP growth rate, but If $\gamma_1 > 0$ and $\gamma_2 < 0$, there will be a inverse U-shaped relationship between real GDP growth rate and life expectancy (HKC valid).

2.1. Cross-sectional dependence test

It is important to test the Cross-Sectional Dependence (CD) in estimating panel data models. If CD is checked, the estimator results can be unbiased and consistent (Pesaran, 2004; Breusch and Pagan, 1980). Therefore, cross section dependence should be determined in panel data. LM test proposed by Breusch and Pagan (1980) is used for panel data whose cross-section (N) dimension is smaller than the time dimension (T). The LM test statistic is calculated as follows:

$$LM = \sum_{i=1}^{N-1} \sum_{j=i+1}^{N} T_{ij}\, \hat{\rho}_{ij}^2 \quad \sim \quad \chi^2 \ \frac{N(N-1)}{2} \tag{2}$$

in which $\hat{\rho}_{ij}$ denotes the correlation coefficients and calculated as follows:

$$\hat{\rho}_{ij} = \frac{\sum_{t=1}^{T} e_{it} e_{jt}}{(\sum_{t=1}^{T} e_{it}^2)^{1/2} \left(\sum_{t=1}^{T} e_{jt}^2\right)^{1/2}} \tag{3}$$

For LM test, the null hypothesis is H_0: $\hat{\rho}_{ij} = Cov(e_{it}, e_{jt}) = 0$ (cross-sections are independent) and the alternative hypothesis is H_1: $\hat{\rho}_{ij} = Cov(e_{it}, e_{jt}) \neq 0$ (cross-sections are dependent).

2.2. Panel unit root test

In the existing literature, according to the cross-sectional dependence, panel unit root tests are examined under two groups as first generation and second generation. First generation unit root tests give unreliable results in the occurrence of CD. Second generation unit root tests are tests that are robust to CD (Pesaran, 2007; Phillips and Sul, 2003). In this study, we use second-generation CADF (cross-sectionally augmented ADF) and CIPS (cross-sectionally augmented IPS) unit root tests to examine the stationarity of the series (Pesaran, 2007). The CADF regression is identfied in Eq.(4).

$$\Delta Y_{it} = \alpha_i + \beta_i Y_{it-1} + \delta_0 \bar{Y}_{t-1} + \delta_1 \Delta \bar{Y}_t + \epsilon_{it} \tag{4}$$

Firstly, the CADF statistics are calculated for each cross-section in the panel data from the t statistcs ratios of β_i in shown Eq.(4). Then CIPS statistics are computed for the entire panel by taking the average of the CADF test statistics.

$$CIPS = \frac{1}{N}\sum_{i=1}^{N} CADF_i \tag{5}$$

In Eq.(5) CIPS statistics values are compared with the table Critical Values (CV) calculated by Pesaran's Monte Carlo simulation, which tests the stationary hypotheses. If the calculated CIPS statistic values are smaller than the table CV, the null hypothesis that assumes the existence of the unit root is refused. If not, the null hypothesis are accepted and the series are said not to be stationary (Pesaran, 2007: 277-278).

2.3. Slope homogeneity test

It is important to check the slope homogenity of the cross-section units in the panel data, in the occurrence of CD. This is because, the units in the panel data can interact with each other and slope heterogeneity may occur. Therefore, it is necessary to check slope homogenity in order to make reliable estimation (Breitung, 2005). The first known studies in the literature on heterogeneity with panel data were conducted by Swamy (1970). The next the standardized dispersion statistic ($\bar{\Delta}$) and the biased-adjusted one ($\bar{\Delta}_{adj}$) was proposed by Pesaran and Yamagata (2008). This statistics, which utilizes $E(\bar{z}_{it}) = k$ and $var(\bar{z}_{it}) = \frac{2k(T-k-1)}{T+1}$, are described in the following equations

$$\bar{\Delta} = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - k}{\sqrt{2k}}\right) \sim \chi^2_k \tag{6}$$

$$\bar{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}\tilde{S} - E(\bar{z}_{it})}{\sqrt{var(\bar{z}_{it})}}\right) \sim N\,(0,1) \tag{7}$$

where $\tilde{S}$ denotes Swamy test statistic. In the heterogeneity test, the null hypothesis is defined as the slope coefficients are homogeneous.

2.4. The AMG estimator

This article make use of Augmented Mean Group (AMG) estimator that is immune to slope heterogeneity and CD. The AMG estimator was proposed by Eberhardt and Teal (2010) and Eberhardt and Bond (2009). The procedure for the AMG test is shown in Eq.(8) and Eq.(9).

$$\Delta Y_{it} = \alpha_i + \beta_i \Delta X_{it} + \sum_{t=1}^{T} \delta_t D_t + \gamma_i \Delta f_t + \epsilon_{it} \tag{8}$$

$$AMG = \frac{1}{N}\sum_{i=1}^{N}\widetilde{\beta_\iota} \qquad (9)$$

in Eq.(8) express an OLS regression at first difference, θ and Δ represent the coefficient of dummy variable and the first order difference operator, respectively, in Eq.(9) which $\widetilde{\beta_\iota}$ indicates the estimates of β_i.

3. Empirical Results and Discussion

In this article, the impacts of economic growth, inflation rate, health expenditures, population density and fertility rate on life expectancy at birth were analyzed for 10 rising powers using panel data method during the period from 2000 to 2018. Table 1. shows the sum of the selected countries' statistics on the basis of these variables. Using these data, first of all, the cross-sectional dependency of the series (since T> N) was examined with the Breusch and Pagan (1980) LM test. According to the results of CD, the stability of the variables was tested with the CIPS test, one of the second generation unit root tests, and the test results were presented in Table 2. In the second step, the heterogeneity of the slope parameters was checked with the Pesaran and Yamagata (2008) test and the results were summarized in Table 3. In the final phase, the relationship between the series was estimated by using the AMG estimator which is resistant to the CD and the heterogeneity of the slope coefficient, and the results were given in Table 4.

Table 1- Summary statistics of BRICS and MIKTA countries

Country	LE	GDP	HE	POPD	FR	INF
Australia	81.360	51209.913	8.449	2.838	1.837	2.694
Brazil	73.130	10468.200	8.393	23.122	1.901	6.495
China	74.127	4361.510	4.443	141.673	1.632	2.196
India	66.157	1334.378	3.678	407.740	2.697	6.363
Indonesia	68.742	3073.312	2.691	132.004	2.460	6.788
Korea, Rep.	79.656	22021.771	5.865	508.278	1.195	2.525
Mexico	75.005	9545.083	5.618	57.856	2.390	4.638
Russian Federation	68.465	9996.949	5.100	8.790	1.498	10.727
South Africa	57.844	7048.591	7.355	41.959	2.568	5.360
Turkey	74.010	11091.942	4.769	93.621	2.215	16.364
Descriptive Statistics						
Mean	71.850	13015.170	5.636	141.788	2.039	6.415
Median	72.760	9139.397	5.237	73.542	2.099	4.920
Maximum	82.749	56864.330	9.467	529.359	3.311	54.915
Minimum	53.444	826.593	1.909	2.493	0.977	-0.732
Standard Deviation	6.858	14041.350	1.916	166.825	0.506	6.923
Skewness	-0.679	1.995	0.243	1.314	-0.048	4.668
Kurtosis	3.285	5.999	2.030	3.211	2.293	30.717

Table 1. illustrates that Australia has the highest value in terms of life expectancy, per capita income and health expenditure, and has the lowest value in terms of population density. Although Korea has the lowest fertility rate, it is the country with the highest population density. Turkey and then Russia differ greatly from other countries in terms of high inflation rates. Except South Korea, Australia and China, all countries in the table have inflation rates above the world average. While India draws attention as the country with the highest fertility rate, it generaly has the latest place among the given countries in terms of other variables. India's life expectancy is less than other countries in the table.

Table 2- Cross-section dependence and panel unit root tests results

	Breusch-Pagan LM [p-value]	CIPS-stat. (level)
InLE	646.60*** [0,000]	-2.599***
InGDP	725.02*** [0,000]	-2.671***
$InGDP^2$	723.02*** [0,000]	-2.597***
InHE	266.68*** [0,000]	-2.575***
InPOPD	702.39*** [0,000]	-3.089***
InFR	464.53*** [0,000]	-2.316**
INF	107.81*** [0,000]	-2.898***

Notes: ** and *** denote at the 5% and 1% significance levels, respectively. Critical values for the CIPS test are -2.560, -2.290 and -2.150 at 1,5, and 10 percent at level, respectively.

According to the Breusch-Pagan LM outcomes presented in Table 2., the null hypothesis is refused and alternative hypothesis, which states that there is CD was accepted. Therefore, it was decided that there is a CD between units. The CIPS statistics, used in the occurrence of the CD, presented on the right of Table 2. demonstrated that all variables are stationarity at levels.

Table 3- Slope heterogeneity test results

Slope homogeneity	Test statistics	p-value
$\bar{\Delta}$	5.556***	0.000
$\bar{\Delta}_{adj}$	7.301***	0.000

Note: *** indicates 1% significiance level

The homogeneity tests of the slope coefficients were checked by Pesaran and Yamagata (2008) test. According to all standardized dispersion $(\bar{\Delta})$ and biased-adjusted $(\bar{\Delta}_{adj})$ statistics given in Table 3., the null hypothesis which assumes that the slope coefficients are homogeneous is rejected at the 1% significance level. Accordingly, we can conclude that the slope coefficients of the panel data used in the study are heterogeneous.

Table 4-Panel AMG parameter estimation results for Life Expectancy

Country	InGDP	InGDP²	InHE	InPOPD	InFR	INF	**HKC**
Australia	17.666*** [0.000]	-0.813*** [0.001]	-0.048 [0.342]	-0.204*** [0.008]	-0.058** [0.013]	-0.001 [0.680]	✓
Brazil	-3.428** [0.031]	0.180** [0.034]	-0.012 [0.272]	-0.266*** [0.000]	-0.242*** [0.000]	-0.001 [0.339]	U-Shaped
China	0.173** [0.014]	-0.015*** [0.000]	-0.005 [0.257]	1.060*** [0.000]	0.015 [0.917]	-0.001 [0.781]	✓
India	0.177 [0.270]	-0.015 [0.146]	0.006 [0.396]	0.412*** [0.000]	0.113*** [0.000]	-0.001 [0.257]	X
Indonesia	2.194*** [0.008]	-0.146*** [0.004]	0.002 [0.674]	0.308*** [0.008]	-0.391** [0.014]	-0.001 [0.385]	✓
Korea, Rep.	2.144*** [0.000]	-0.108*** [0.000]	0.012 [0.361]	-0.164 [0.391]	-0.022*** [0.000]	-0.001 [0.610]	✓
Mexico	-7.041*** [0.006]	0.385*** [0.006]	0.031*** [0.002]	-0.917*** [0.000]	-0.559*** [0.000]	-0.001*** [0.006]	U-Shaped
Russian Federation	-3.071*** [0.006]	0.172*** [0.005]	0.049** [0.029]	0.151 [0.665]	-0.025 [0.234]	-0.001 [0.643]	U-Shaped
South Africa	-51.547*** [0.000]	2.906*** [0.000]	0.082 [0.170]	0.769*** [0.000]	0.491* [0.053]	-0.001 [0.498]	U-Shaped
Turkey	-1.994*** [0.002]	0.108*** [0.002]	0.009 [0.358]	-0.118 [0.134]	-0.144* [0.078]	-0.001*** [0.000]	U-Shaped
Panel	-4.473 [0.427]	0.266 [0.392]	0.013 [0.258]	0.103 [0.565]	-0.082 [0.363]	-0.001*** [0.000]	X

Notes: ***, ** and * denote at the 1, 5 and 10 percent at levels, respectively. INF coefficients is taken as -0.001 because the parameters are less than -0.001 in models.

Table 4. shows that HKC hypothesis is valid in Australia, China, Indonesia and Korea suggesting that life expectancy increases with economic development up to a turning point, while economic growth continues to increase, life expectancy begins to drop after this turning point. On the other hand, there is a U-shaped relationship between life expectancy and economic growth for Brazil, Mexico, Russian Federation, South Africa and Turkey. In other words, for these countries, as economic growth increases life expectancy decreases up to a turning point and then these variables begin to increase together. Population density and fertility rate positively affect life expectancy at birth for India, and there is no relationship between economic growth and life expectancy at birth.

According to the results in Table 4., health expenditures positively affect the life expectancy only in Mexico and the Russian Federation, and there is no relationship between the given variables in other countries. The results also demonstrate that the fertility rate has a negative effect on life expectancy in general. The inflation rate coefficient is negative for each country, but this variable does not affect life expectancy in the given period except Turkey and Mexico. While the population density negatively affects life expectancy in Australia, Brazil and Mexico, it has a positive effect on life expactancy in China, India, Indonesia and South Africa.

Conclusion

Life expectancy is one of the most important indicators of health and community well-being used to measure the general health status of the population. It is an identifiable measure of the overall mortality level of a given population over a given period of time and it is often used to compare health status disparities between countries. Life expectancy is also an indicator of a country's economic and social development. There are several studies aimed at revealing the level of life expectancy and the variables affecting it. Some of these studies aimed to analyze the trends in life expectancy over time; some of them aimed to compare the health status of countries; others aimed to examine the relationship between life expectancy and variables that affect life expectancy. The identification of the factors that affect LE is expected to contribute to the planning of future health resources and services. In addition, learning more about the relationships between these two variables is significant for policy implementations for governments to cope with challenges resulted from increasing life expectancy.

In this study, we examine the existence of a quadratic relationship between economic growth and life expectancy at birth for BRICS and MIKTA countries and test for a health Kuznets's curve and which has been widely overlooked in the literature by using panel data method. The results of the AMG model applied in the study suggest that the relationship between economic growth and life expectancy seems to fit a Kuznets' curve for Australia, China, Indonesia and Korea. On the other hand, the validity of HKC hypothesis could not be obtained for Brazil, Mexico, Russian Federation, South Africa and Turkey. There is a U-shaped relation between economic growth and life expectancy at birth for these countries. We did not find any evidence of a quadratic curve for India, which means there is no quadratic relationship between economic growth and life expectancy at birth. In this case, it is thought that there may be a linear relationship between economic growth and life expectancy at birth for India in the examined period, and further studies are recommended to reveal what extent and how exactly these or other factors affect life expactancy in major rising powers.

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