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THE IMPACTS OF URBANIZATION AND ECONOMIC GROWTH ON LIFE EXPECTANCY IN THE ASEAN-5 COUNTRIES

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Abstract

Urbanization and economic growth are key players in molding the societal fabric of the ASEAN-5 nations, thus directly affecting life expectancy. Hence, this study utilizes the Fully Modified Ordinary Least Square (FMOLS) approach to investigate the impact of health expenditure, economic growth, urbanization, and CO2 emissions on life expectancy in the ASEAN-5 countries from 1995 to 2020. The findings indicate that increased health expenditure and economic growth positively contribute to enhanced life expectancy in the region, highlighting the importance of healthcare investments and sustained economic development. However, the observed negative impact of urbanization underscores potential health challenges associated with rapid urban development, necessitating strategic urban planning. Policymakers are encouraged to prioritize healthcare budgets, focusing on infrastructure and accessibility, while fostering economic initiatives for indirect health benefits. Mitigating potential health risks linked to urbanization requires investments in healthcare facilities, sanitation, and public health awareness programs. This study offers nuanced insights for policymakers in formulating effective strategies to balance economic development with public health priorities in the ASEAN-5 countries.

Keywords*: Urbanization; Economic Growth; Life Expectancy; FMOLS*

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INTRODUCTION

Urbanization and economic growth have been integral components of global societal transformations, significantly shaping the landscape of human habitation and socioeconomic development. The concurrent processes of urbanization and economic growth are central to the evolution of modern societies, influencing various facets of life, including health outcomes (Zhang et al., 2022). This introduction seeks to explore the intricate relationships between urbanization, economic growth, and life expectancy, shedding light on the multifaceted dynamics that define these interconnections.

As populations gravitate toward urban centers, drawn by economic opportunities and the promise of a better quality of life, the implications for public health become increasingly profound. Urbanization, characterized by the growth and expansion of cities, brings about changes in lifestyle, environmental conditions, and access to healthcare services. Simultaneously, economic growth acts as a driving force behind urbanization, fostering infrastructural development, technological advancements, and improved standards of living. Together, these processes wield considerable influence over the overall health and well-being of populations (Gross & Ouyang, 2021).

The impact of urbanization on life expectancy is a subject of extensive research, with both positive and negative associations identified in different contexts. On one hand, urbanization often correlates with improved access to healthcare facilities, educational opportunities, and higher standards of living, contributing positively to life expectancy. On the other hand, rapid and unplanned urbanization can lead to challenges such as environmental degradation, inadequate healthcare infrastructure, and increased exposure to lifestyle-related health risks, potentially exerting negative effects on life expectancy (Zhang et al., 2022).

Similarly, economic growth, as a key driver of urbanization, plays a pivotal role in shaping health outcomes. A burgeoning economy enables investments in healthcare infrastructure, education, and social services, positively impacting life expectancy. However, the distributional aspects of economic growth, income inequality, and disparities in access to healthcare services may introduce complexities that affect different segments of the population variably (Chen et al., 2021).

This study aims to navigate the intricate nexus of urbanization, economic growth, and life expectancy by drawing insights from diverse studies conducted across various regions and contexts. By understanding the complexities of these relationships, policymakers, researchers, and public health professionals can develop informed strategies to harness the benefits of urbanization and economic growth while mitigating potential challenges. As we delve into the nuanced impacts of these intertwined processes, a comprehensive understanding emerges, providing a foundation for crafting effective public health policies that promote longevity and well-being in an ever-evolving global landscape.

An overview of life expectancy in ASEAN-5 countries

Figure 1 displays the life expectancy data for the ASEAN-5 countries—Malaysia, Thailand, Singapore, Thailand, and Philippines—spanning from 2010 to 2020. Notably, there is a consistent upward trend in life expectancy across all nations during this period. Singapore consistently maintains the highest life expectancy, showcasing a substantial lead over the other countries. Malaysia and Thailand also exhibit steady improvements, gradually narrowing the gap with Singapore. The Philippines and Indonesia, while experiencing positive trends, consistently report lower life expectancies compared to their regional counterparts. However, an anomaly emerges in 2020, where Indonesia experiences a decrease in life expectancy, potentially influenced by the global COVID-19 pandemic, contrasting with Singapore, which records a significant increase in life expectancy. These variations emphasize the influence of healthcare systems, public health initiatives, and socio-economic factors on life expectancy. Singapore's exceptional life expectancy underscores its advanced healthcare infrastructure and high living standards, while ongoing improvements across the ASEAN-5 nations reflect overall advancements in well-being and healthcare access.

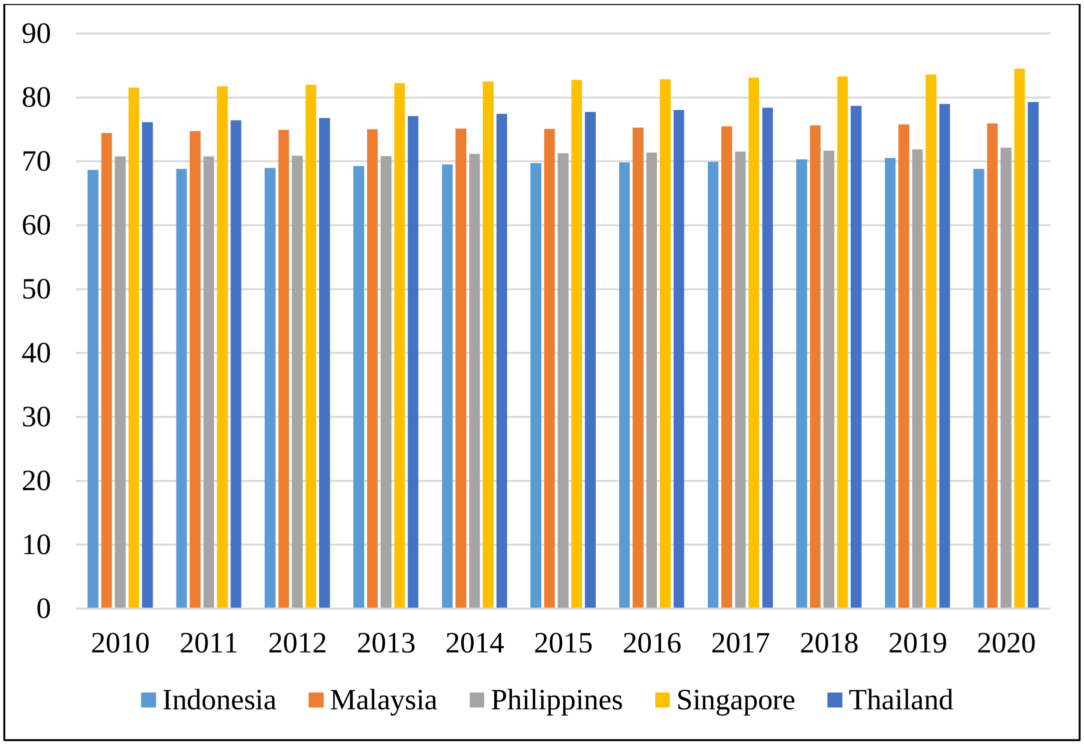

Figure 1: Life Expectancy in the ASEAN-5 Countries

LITERATURE REVIEW

The reviewed studies collectively contribute to the understanding of factors influencing life expectancy across different regions and contexts. Ahmad et al. (2023) and Nagarajah et al. (2020) both investigate the impact of urbanization on life expectancy but in distinct geographical settings. Ahmad et al. focus on South Asian countries, revealing significant negative effects of urbanization on life expectancy, emphasizing the need for income redistribution and increased health expenditures. In contrast, Nagarajah et al. (2020) study in Malaysia presents a positive impact of urbanization on life expectancy, highlighting the importance of improved healthcare access. These findings underline the importance of considering regional variations in the relationship between urbanization and life expectancy. Duba et al. (2018) and Ahmad et al. (2023) both examine the relationship between health expenditures and life expectancy, albeit with different emphases.

Duba et al. (2018) global analysis highlights the statistically significant link between health care expenditures and life expectancy across diverse countries, emphasizing the universal importance of healthcare spending. On the other hand, Ahmad et al. (2023) explores the moderating role of health expenditure in mitigating the adverse effects of urbanization on life expectancy in South Asian countries. The studies collectively underscore the crucial role of healthcare investments but within varying regional and contextual dynamics. Luo and Xie (2020) exploration of China's economic reform provides insights into the impact of income inequality on life expectancy. Their findings suggest a life loss attributed to increased income inequality, emphasizing the potential health consequences of economic disparities. This aligns with Ahmad et al. (2023) emphasis on income redistribution as a critical policy lever for improving population health. Together, these studies advocate for equitable economic policies to enhance overall life expectancy. Karimi Alavijeh et al. (2023) study on renewable energy, carbon emissions, health expenditure, and urbanization aligns with the broader theme of environmental sustainability and its impact on life expectancy. Their findings emphasize the positive association between renewable energy consumption, health expenditure, and urbanization with increased life expectancy, while carbon emissions exhibit a negative correlation.

This study, along with Duba et al. (2018) consideration of CO2 emissions, underscores the interconnectedness of environmental factors and health outcomes, providing valuable insights for sustainable health policies. Lee and Kim (2017) study in South Korea explores the impact of infant mortality, educational attainment, electric power consumption, and internet usage on life expectancy, revealing positive associations with the latter three factors. In contrast, Nguyen (2022) research on Vietnam, Laos, and Cambodia focuses on demographics, socioeconomics, and health care resources, showcasing a positive relationship between life expectancy and demographics and health care resources. Tarar (2022) examination of Pakistan delves into the relationships between economic, social, and environmental factors, emphasizing the importance of education, economic indicators, and environmental factors in influencing life expectancy. Chen et al. (2021) adopts a comparative approach across developed and developing countries, highlighting the nuanced influences of economic and environmental indicators on life expectancy. Lastly, Radmehr and Adebayo (2022) study in Mediterranean countries integrates health expenditure, sanitation, CO2 emissions, and economic growth, emphasizing the positive impacts of economic growth, health expenditure, and sanitation on life expectancy. Commonalities across these studies include the recognition of the multifaceted nature of life expectancy determinants, the positive influence of education, economic indicators, and health care resources, and the importance of balancing economic development with environmental sustainability.

The emphasis on nuanced regional variations, such as the positive impact of urbanization in Malaysia (Nagarajah et al., 2020) and the negative impact of urbanization in South Asian countries (Ahmad et al., 2023), further underscores the need for context-specific policy considerations. However, differences emerge in the specific factors studied and their varying impacts. For instance, Lee and Kim (2017) highlight the role of internet usage, while Radmehr and Adebayo (2022) incorporate sanitation and CO2 emissions. The emphasis on income redistribution in Ahmad et al. (2023) and Luo and Xie (2020) studies, and the focus on renewable energy in Karimi Alavijeh et al. (2023) research introduce additional dimensions. These differences highlight the complexity of life expectancy determinants and the need for tailored interventions based on regional, economic, and environmental contexts. In conclusion, while these studies collectively contribute valuable insights into the multifaceted determinants of life expectancy, the variations in their focus and findings underscore the importance of context-specific approaches for effective health policies worldwide.

METHODOLOGY

The purpose of this research is to thoroughly investigate and analyze the various effects of urbanization and economic growth on life expectancy in the ASEAN-5 nations, namely Malaysia, Thailand, Singapore, Indonesia, and the Philippines. The study aims to examine the interaction between urbanization patterns and economic progress to determine how these factors collectively impact life expectancy trends in these countries. By analyzing various socio-economic indicators and health-related data in detail, the research offers a nuanced understanding of the distinct or synergistic effects of urbanization and economic growth on life expectancy rates within the specified ASEAN-5 nations. The study intends to provide valuable insights into the complex dynamics involving health expenditure, economic growth, urbanization, CO2 emissions, and life expectancy in the ASEAN-5 nations by scrutinizing these variables.Thus, the specified model for this study is as follows:

$$LE_t = \alpha + \beta_1 \ln \ln HE_t + \beta_2 \ln \ln GDP_t + \beta_3 \ln \ln UP_t + \beta_4 \ln \ln CO2_t \, \varepsilon_t \tag{1}$$

In Equation (1), LE denotes life expectancy at birth (total years) in the five countries, HE signifies the percentage of government health expenditure in total GDP, GDP represents economic growth, UP stands for the urban population, and CO2 represents CO2 emissions in tons per capita. These variables offer insights into life expectancy, health expenditure, economic growth, urban population, and CO2 emissions. ε represents the random error term, and t denotes the year. Table 1 provides a detailed description of each variable utilized in this study. Examining these variables can enhance our understanding of the dynamics and impact of these factors on a given population or economy. The data used in this study spans from 1995 to 2020 and was gathered from diverse sources, including Country Economy and the World Bank.

Table 1: Variable Descriptions

Variable	Unit of Measurement	Description
Life Expectancy (LE)	Years	Life Expectancy at birth
Health Expenditure (HE)	Percentage (%)	Government Expenditure total GDP
Growth Domestic Product (GDP)	Current US$)	Real GDP Per Capita
Urban Population (UP)	Percentage (%)	Total Urban Population
CO2 Emissions (CO2)	Tons	CO2 Emissions Per Capita

Panel Unit Root Tests

Panel unit root tests are employed to assess whether the variables share the same level of integration. In this investigation, we evaluate the stationarity of life expectancy, health expenditure, GDP, urbanization, and CO2 emissions. Three panel-based methods denoted as LLC, IPS, and ADF, are utilized for unit root testing in this study. Each estimation technique involves testing unit roots in the panel using a specific model type, with one variant of each model being estimated. The variables (lnHE, lnGDP, lnUP, lnCO2, and lnLE) are estimated in their level form without a deterministic trend.

The LLC test assumes that all series are stationary, and in the alternate hypothesis, δ in equation (2) is considered homogeneous across the panel. In essence, the LLC is the most employed panel unit root test, and its specification is as follows:

$$\Delta Y_{it} = a_i + \delta_i Y_{it-1} + z'_{it} Y + e_{it} \tag{2}$$

In the given context, Δ represents the first difference operator, Y_it denotes the series of observations for country i, with T ranging from 1 to T time series observations. The term (z') represents the deterministic component, and e_it signifies independent and normally distributed random variables. The null hypothesis of the LLC test is H_0: δ_i= δ=0 for all i, while the alternative hypothesis is H_a: δ_i= δ<0 for all i. Generally, the LLC test relies on the pooled t-bar statistic of the estimator, providing higher power compared to individual observation unit root estimation.

In contrast to the LLC, which assumes homogeneity in autoregressive parameters (δ) across panels, the IPS test relaxes this assumption. The IPS test permits heterogeneity in the coefficient of δ under the alternative hypothesis by allowing separate unit root tests for the N -cross-section units. The hypotheses tested are as follows: H_0:δ_i=0 for all i against the alternative hypothesis of H_a: δ_1<0 for all i. In equation (2), the IPS replaces δ_i with δ. Essentially, the IPS test relies on the t-bar statistic for each cross-section unit and accommodates the possibility of individual series having unit roots. The Augmented Dickey-Fuller (ADF) test is employed to ascertain whether trending data should undergo first differencing or be regressed on deterministic functions of time to achieve stationarity.

Panel Cointegration

Once established that the variables are integrated of order one, the second phase of our empirical analysis focuses on investigating the existence of any long-term relationship among the integrated variables. We utilize Pedroni's (1999, 2000) panel cointegration techniques. Unlike traditional cointegration tests assuming homogeneity in vectors of cointegration, Pedroni's techniques allow for heterogeneity among individual panel members, representing an enhancement in cointegration analysis. Following Pedroni's approach, the specified cointegration relationship to be estimated is as follows:

$$lnLE_{it} = a_{it} + \delta_i t + \beta_1 lnHE_{it} + \beta_2 lnGDP_{it} + \beta_3 lnUP_{it} + +\beta_4 lnCO2_{it}\ \varepsilon_{it} \tag{3}$$

In the given equation, lnLE, lnHE, lnGDP, lnUP, and lnCO2 represent the natural logarithms of the observable variables for life expectancy, health expenditure, gross domestic product per capita, urbanization, and CO2 emissions, respectively. The variables are t=1,…t denote time periods, i=1,…,N refer to panel members, $a_{\_i}$ signifies country-specific effects, δ_represents deterministic time trends, and $\varepsilon_{\_it}$ is the estimated residual derived from the panel regression. The structure of the estimated residual is expressed as:

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \mu_{it} \tag{4}$$

The computed residual accounts for the long-run relationship's deviance. The panel cointegration test basically looks for unit roots in the estimated residuals of the panel in the absence of cointegration (the null hypothesis). Pedroni (1999) demonstrates that the cointegration test has seven distinct residual statistics: panel v-statistic, panel rho-statistic, panel (PP)-statistic, panel Augmented Dickey-Fuller (ADF)-statistic, panel group rho-statistic, group PP-statistic, and group ADF-statistic are the first seven statistics.

Based on the within-dimension technique, the first four statistics are referred to as panel cointegration statistics. By pooling the autoregressive coefficients across various members for the unit root tests on the computed residuals, the within-dimension enforces a common (ρ_i=ρ) coefficient. The within-dimension tests the following hypotheses: $H_0: \rho = 1\ \forall_i$ against the alternate $H_1: \rho_i = \rho < 1$. The final three statistics use the between-dimension technique and are group panel test statistics. By averaging the independently calculated coefficients for each country, the between-dimension allows for heterogeneous coefficients, in contrast to the within approach, which presumes a common coefficient under the alternative hypothesis. The between-dimension approach's hypotheses are stated as $H_0: \rho = 1$ for all i, against the alternate hypothesis of $H_1: \rho < 1$. In the presence of a cointegrating relationship, the residuals are expected to be stationary. The panel v-test is a one-sided test that rejects the null hypothesis of no cointegration in the case of a large positive test result.

However, when the other tests show significant negative statistics, they reject the null hypothesis that there is no cointegration. After confirming cointegration, the subsequent phase involves determining the prolonged association between life expectancy and variables such as health expenditure, gross domestic product, urbanization, and CO2 emissions, utilizing the Fully Modified Ordinary Least Squares (FMOLS) approach. In this research, EVIEWS 12 is chosen for its ability to efficiently manage data, conduct statistical and econometric analyses, and generate forecasts or model simulations. The FMOLS technique tackles both serial correlation and endogeneity issues, resulting in estimates that are asymptotically unbiased compared to simple Ordinary Least Squares (OLS) estimation. Another notable advantage of FMOLS lies in its capability to consider heterogeneity among individual panel members while estimating the long-term relationship.

RESULTS AND DISCUSSION

The findings anticipates that urbanization and economic growth will have a positive impact on life expectancy in ASEAN-5 countries such as Malaysia, Singapore, Thailand, and Indonesia. This implies that an increase in the utilization of urbanization and economic growth is likely to lead to an improvement in life expectancy. This chapter discusses the descriptive statistics results, cross-sectional dependance, pedroni cointegration test and total FMOLS.

Table 2: Descriptive statistics

	lnLE	**lnHE**	**lnGDP**	**lnUP**	**lnCO2**
Mean	4.2909	-3.6867	8.4272	4.0173	1.1503
Median	4.2836	-4.0687	8.1925	3.8782	1.1442
Maximum	4.4200	-1.3502	11.0213	4.6052	2.4749
Minimum	4.1780	-5.1850	6.1295	3.4104	-0.1863
Std. Dev.	0.0603	1.1460	1.1994	0.3512	0.8716
Skewness	0.3127	0.9725	0.6046	0.4704	0.0127
Kurtosis	2.3825	2.5528	2.5718	2.2080	1.5784
Jarque-Bera	3.8939	20.0802	8.2966	7.6249	10.1921
Probability	0.1427	0.0000	0.0158	0.0221	0.0061
Sum	519.2028	446.0891	1019.6960	486.0892	139.1873
Sum Sq. Dev.	0.4361	157.5922	172.6345	14.8031	91.1577
Observations	121	121	121	121	121

The descriptive statistics for every variable utilized in this study are shown in Table 2. The maximum, minimum, mean, and standard deviation values for lnLE, lnHE, lnGDP, lnUP, and lnCO2 are displayed in the table. Every variable's variation differs significantly, as seen by the table. The provided descriptive statistics offer a comprehensive overview of five variables: lnLE (Life Expectancy), lnHE (Health Expenditure), lnGDP (Gross Domestic Product), lnUP (Urban Population), and lnCO2 (CO2). LE, representing Life Expectancy, demonstrates a mean of 4.2909 and a median of 4.2836, indicating a relatively centered distribution.

HE, depicting Health Expenditure, shows a higher standard deviation (1.1460), suggesting considerable variability in expenditures. The skewness and kurtosis statistics for HE (0.9725 skewness and 2.5528 kurtosis) suggests a slightly right-skewed distribution with heavier tails compared to a normal distribution. The Jarque-Bera test results with probabilities of 0.0000 for lnHE, 0.0158 for lnGDP, 0.0221 for lnUP, and 0.0061 for lnCO2 indicate potential deviations from normality for these variables, implying that these datasets may not follow a perfectly normal distribution. The descriptive statistics provide insights into the central tendency, variability, and distribution characteristics of these variables, serving as a foundation for further statistical analysis and interpretation.

Table 3: Unit Root Results

Variables	**LLC**		**IPS**		**ADF**	
	Level	**1st Diff**	**Level**	**1st Diff**	**Level**	**1st Diff**
lnHE	2.1143	-3.8287***	2.1882	-4.6174***	2.9013	42.1851***
	0.9828	0.0000	0.9857	0.0000	0.9837	0.0000
lnGDP	0.5995	-4.6854***	2.5719	-4.4475***	1.2506	38.2311***
	0.7256	0.0000	0.9949	0.0000	0.9995	0.0000
lnUP	-2.5327***	-3.1567***	-0.7386	-1.5892*	9.0082	16.3502**
	-0.0057	-0.0008	0.2301	-0.056	0.3416	-0.0376
lnCO2	-1.5434*	-4.3883***	0.3595	-5.4695***	7.3889	48.2927***
	-0.0614	0.0000	0.6404	0.0000	0.6883	0.0000
lnLE	-0.7594	-2.1831**	1.6567	-5.1657***	3.1096	45.9277***
	0.2238	-0.0145	0.9512	0.0000	0.9787	0.0000

Note: *** is significant at 1%, ** is significant at 5% and * is significant at 10%

Table 3 displays unit root test results for different variables without trends, utilizing three different test statistics: LLC, IPS, and ADF. These tests assess whether the variables contain a unit root, which implies non-stationarity. In each test, two sets of values are presented: one for the level and another for the first difference of the variables. For instance, lnHE at the level yields a value of 2.1143 for LLC, indicating non-stationarity, while its first difference at -3.8287 indicates stationarity, as shown by the significance levels in parentheses (0.0001 for LLC, indicating statistical significance at 1%).

Similar patterns are observed for other variables such as lnGDP, lnUP, lnCO2, and lnLE. In most cases, the first differences of the variables show statistical significance, indicating stationarity, whereas the levels often suggest non-stationarity. The significance levels denote the strength of significance at 1%, 5%, and 10%, respectively. These results suggest that after differencing, the variables become stationary, which is essential for many time-series analyses and modeling techniques.

Table 4: Cross-Sectional Dependence Results

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	11.2909	10	0.3353
Pesaran scaled LM	0.2887		0.7729
Pesaran CD	1.3848		0.1661

The Cross-Sectional Dependence Test aims to assess whether observations across different entities or units in a dataset, such as individuals, countries, or regions, are independent or if there exists a dependence among them. The Breusch-Pagan LM, Pesaran scaled LM, and Pesaran CD are statistical tests used to detect this interdependence. Table 4 shows that the Breusch-Pagan LM test with a statistic of 11.2909 and a probability of 0.3353 suggests that there might not be strong evidence of cross-sectional dependence, implying relatively independent observations across units. Similarly, the Pesaran scaled LM test with a statistic of 0.2887 and a probability of 0.7729 further supports the notion of limited dependence among observations. The Pesaran CD test with a statistic of 1.3848 and a probability of 0.1661 indicates a moderate but not significant level of cross-sectional dependence. Overall, these test results collectively suggest that the dataset may exhibit relatively low cross-sectional dependence among the units or entities under consideration, indicating a certain level of independence across these entities in the dataset.

Table 5: Pedroni Cointegration Results

Within Dimension	Without trends	With trends
Panel v-Statistic	-0.0169	0.4127
	0.5067	0.3399
Panel rho-Statistic	0.1548	0.0212
	0.5615	0.5085
Panel PP-Statistic	-1.275	-2.4961***
	0.1012	-0.0063
Panel ADF-Statistic	-0.2995	-1.2989*
	0.3823	-0.097
Between Dimension	**Without trends**	**With trends**
Group rho-Statistic	1.3369	1.1278
	0.9094	0.8703
Group PP-Statistic	-0.1138	-1.9208**
	0.4547	-0.0274
Group ADF-Statistic	0.1411	-1.0422
	0.5561	0.1487

Note: *** is significant at 1%, ** is significant at 5% and * is significant at 10%

Table 5 illustrates the results of Pedroni co-integration tests, examining the presence of co-integration among variables within and between dimensions, considering panels and groups, with and without trends. In the context of panel data analysis, co-integration implies a long-term relationship between variables. Within the dimensions (examining panels), the v-Statistic and rho-Statistic values aim to assess co-integration. For instance, the Panel PP-Statistic (Phillips-Perron Statistic) being significant at 1% when considering trends suggests the existence of co-integration among variables. Similarly, the Panel ADF-Statistic, significant at 10%, implies potential co-integration when trends are accounted for within the panel dimension. Between dimensions (assessing groups), the Group PP-Statistic is significant at 5% when considering trends, suggesting co-integration among variables. However, other statistics like the Group ADF-Statistic don't indicate significance, suggesting less robust evidence for co-integration between groups. Overall, these tests assess the co-movement and long-term relationships among variables within panels and between groups in panel data analysis, providing insights into potential co-integration relationships in different dimensions and trend considerations.

Table 6: FMOLS Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
lnHE	0.0300***	0.0075	4.0250	0.0001
lnGDP	0.0064**	0.0029	2.1851	0.0316
lnCO2	0.0128	0.0124	1.0336	0.3042
lnUP	-0.1803*	0.0978	-1.8433	0.0688

Note: *** is significant at 1%, ** is significant at 5% and * is significant at 10%

The Fully Modified Ordinary Least Squares (FMOLS) estimation results are shown in Table 6. In panel data analysis, this estimation technique is frequently employed. The equations show how various factors—like health care costs, economic expansion, carbon dioxide emissions, and urbanization—are expected to affect life expectancy. The t-Statistics assess the significance of these coefficients. In this context, health expenditure and economic growth show statistical significance at 1% , implying a highly significant impact on life expectancy. CO2 emissions do not show statistical significance (p-value of 0.3042), suggesting its impact might not be statistically meaningful. urbanization demonstrates significance at 10%, indicating a potential but less robust impact on life expectancy. Hence, life expectancy will increase by 0.030% due to a 1% increase in health expenditure. Other than that, life expectancy also increases by 0.006% if economic growth increases by 1%. Finally, life expectancy will drop by 0.180% when urbanization increases by 1%.

CONCLUSIONS

In summary, the empirical study that used the FMOLS approach to evaluate the effects of economic growth, urbanization, health spending, and CO2 emissions on life expectancy in the ASEAN-5 countries between 1995 and 2020 produced insightful results. The results indicate that increased health spending and economic expansion are important factors that lead to improved life expectancy in the ASEAN-5 region. However, the identified adverse impact of urbanization on life expectancy highlights the intricate nature of this relationship, signaling potential health challenges linked to rapid urban development. These outcomes underscore the multifaceted dynamics influencing life expectancy, emphasizing the necessity for nuanced policy considerations. The demonstrated positive correlation between health expenditure and life expectancy accentuates the critical need for prioritizing healthcare investments. Governments and policymakers across the ASEAN-5 countries should contemplate augmenting healthcare budgets, with a focus on enhancing healthcare infrastructure, accessibility, and service quality.

Policies aimed at fostering sustained economic growth can significantly contribute to improved life expectancy. Initiatives that stimulate economic activities, generate employment opportunities, and enhance overall economic well-being can indirectly facilitate better health outcomes. In acknowledgment of the potential adverse impact of urbanization on life expectancy, policymakers are urged to adopt strategic urban planning measures. These may encompass investments in healthcare facilities, sanitation, and public health awareness programs, aiming to alleviate potential health risks associated with rapid urbanization.

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