

Social Dimensions of Sustainable Development Goals in Asian Countries: Visual Dynamic Research Mapping

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ABSTRACT

As the 2030 deadline for the United Nations' Sustainable Development Goals (SDGs) approaches, developing Asian nations face critical challenges in balancing economic expansion with the "social pillars" of sustainability. Despite the individual importance of poverty, hunger, health, and education, there remains a gap in understanding their dynamic, integrated interrelationships within the unique institutional and fiscal constraints of the Asian region. This study investigates the dynamic interrelationships among four key social pillars poverty, zero hunger, good health and well-being, and quality education, across 11 developing Asian economies. We employ a robust two-stage methodological approach. First, a systematic bibliometric analysis maps the scholarly landscape and thematic clusters using data from Scopus and Web of Science. Second, an empirical assessment is conducted using a dynamic panel Generalized Method of Moments model on longitudinal data 2017–2023 period to estimate short and long-run effects while addressing endogeneity and heterogeneity. Bibliometric mapping identifies poverty as a central intersectional node bridging healthcare, nutrition, and economics. Empirical results show reveal a strong persistence of poverty, confirming a path-dependent "poverty trap" in the region. While government spending on health and education shows a statistically significant relationship with poverty, its immediate impact is modest, suggesting that public investment effectiveness is often constrained by governance and implementation quality. Furthermore, improvements in neonatal mortality and nutritional status are strongly linked to significant reductions in poverty levels. The findings underscore that poverty, malnutrition, and child mortality are interconnected challenges that cannot be solved through isolated sectoral interventions. Achieving the 2030 Agenda in Asia requires integrated, evidence-based policy frameworks that combine targeted social spending with structural reforms to break intergenerational cycles of deprivation.

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1. INTRODUCTION

The United Nations' 2030 Agenda for Sustainable Development is conceptually rooted in Pigou's Welfare Theory (Błaszczak, 2024), which emphasizes the necessity of government intervention through redistributive policies, taxes, and subsidies to enhance the welfare of society's most vulnerable cohorts. Within this framework, health and education as positive externalities, alongside food subsidies to combat hunger, represent essential strategies for equitable access to basic needs. Simultaneously, correcting negative externalities is viewed as a prerequisite for achieving sustainable welfare. These principles are operationalized through the 17 Sustainable Development Goals (SDGs) (Hák et al., 2016), which provide a collective roadmap for eradicating poverty and hunger, improving health and education, reducing inequality, and fostering economic growth while preserving natural ecosystems. However, as the 2030 deadline approaches, there are significant concerns regarding whether global progress is occurring at the transformative scale required. This is particularly challenging because the SDGs demand a universal and inclusive approach to development that forces nations to balance rapid economic expansion with environmental conservation, a tension that is especially critical in developing regions (Cristóbal et al., 2021; and Amiry & Irianto, 2023).

Developing countries are specifically urged to prioritize the "social pillars" of the SDGs, such as SDG 1 is no poverty; SDG 2 is zero hunger; SDG 3 is good health and well-being; and SDG 4 is quality education (Amirya & Irianto, 2023). Despite growing academic interest in these areas, current literature lacks an integrated theoretical model capable of synthesizing empirical findings across these four dimensions to provide measurable policy direction. Empirical assessments and robust measurement frameworks are essential to bridge the gap between current development progress and future sustainability targets. Achieving the 2030 Agenda necessitates unprecedented resource mobilization across both public and private sectors to address the systemic challenges of inequality and poverty (Allen et al., 2018; Ranjbari et al., 2021; and Carpentier & Braun, 2020). Poverty remains a primary driver of malnutrition, creating a significant barrier to achieving zero hunger (Kien et al., 2016; Saleem et al., 2023; Braun et al., 2023; Peña & Bacallao, 2002; and Connor, 2011). Malnutrition, in turn, undermines broader health outcomes and perpetuates a vicious cycle of poverty (Smith & Haddad, 2015; and Helene, 2008). Education stands as a decisive factor in breaking this cycle, as higher educational attainment significantly improves the efficacy of poverty alleviation efforts (Tarabini, 2010; Katila et al., 2019; and Sachs, 2012).

Education stands as a decisive factor in breaking this cycle, as higher educational attainment significantly improves the efficacy of poverty alleviation efforts (Zhou, 2025; and Martin et al., 2024). Longstanding socioeconomic inequalities are largely rooted in disparate educational access. The relationship between poverty and health is similarly reciprocal (O'Donnell, 2024). Poverty limits access to essential healthcare services and contributes to heightened neonatal mortality rates (Ogundare et al., 2022; Pizarro, et al, 2022; Huicho et al., 2016; and Tam et al., 2016). Improving nutrition is therefore vital for strengthening human capital and increasing productivity, which are essential for escaping the poverty trap (Vorster, 2010; and Ullah et al., 2021). While public spending on health and education has consistently proven to enhance overall societal well-being, the efficiency and optimal allocation of such expenditures remain subjects of rigorous academic debate (Kundu, 2017; Ashiabi et al., 2016; Arize et al., 2024; and Herrera, et al, 2025). This underscores the need for context-specific policies that address the multifaceted and dynamic interrelationships between these social pillars.

Extensive scholarship has addressed each dimension of the SDGs individually, existing research fails to adequately examine the dynamic interactions between the four pillars of the social dimension. This oversight is particularly acute in the context of developing Asian nations, where the trajectory of progress diverges significantly from that of Africa, Latin America, or advanced economies. Such disparities are driven by unique institutional constraints, fiscal limitations, acute demographic pressures, and complex governance challenges. Consequently, the region continues to face persistent burdens of poverty, malnutrition, and neonatal mortality, necessitating the adoption of integrated, evidence-based frameworks over fragmented, sectoral analyses. Furthermore, significant gaps remain in our understanding of the temporal dynamics, both short- and long-term, between poverty, hunger, health, and education. Current literature often fails to evaluate the cumulative effectiveness of policy interventions designed to dismantle the intergenerational cycle of deprivation (Stoye et al., 2024; Han & Jeong, 2025; Black et al., 2013; Victora et al., 2008; Ledlie et al., 2018; Li & Li, 2024; Osakede, 2021; and Tharwani et al., 2023). Despite an increase in academic interest, the field lacks a unified theoretical model capable of synthesizing empirical findings across these four dimensions to provide measurable, strategic policy direction (Bezjian et al., 2025; and Aziz et al., 2021). By addressing these fragmentations, this study seeks to provide a more holistic understanding of how these social indicators co-evolve, thereby offering a more rigorous empirical foundation for sustainable development planning in Asia.

To address this critical gap, this study investigates the dynamic interrelationships among these four social pillars within 11 developing Asian countries, including Indonesia, India, Malaysia, Thailand, Myanmar, Philippines, Timor-Leste, Laos, and Pakistan. We employ a robust two-stage methodological approach. First, a systematic bibliometric analysis at this stage maps scholarly attention, conceptual evolution, and research clustering within the SDG social pillar literature to identify thematic fragmentation and unresolved conceptual tensions. Second, an empirical assessment using a panel GMM model in this study uses a GMM model to analyze how indicators of poverty, hunger, health, and education interact over time. This model allows for the estimation of short- and long-run effects while effectively addressing issues of endogeneity, heterogeneity, and serial correlation. This methodological integration provides a synergistic framework that links bibliometric knowledge gaps directly to empirical validation. The findings are expected to contribute novel insights for strengthening development strategies and improving the measurement frameworks essential to the SDG

implementation process. The remainder of this article is structured as follows, the second section details the research methodology and identification strategy; the third section presents the empirical results and a comprehensive discussion of the findings; and the fourth section concludes with a summary of the study's contributions and its implications for policy.

2. RESEARCH METHODS

2.1. Data.

To address the research objectives, this study adopts an integrated methodological approach combining bibliometric analysis with dynamic panel estimation via the Generalized Method of Moments (GMM). The bibliometric component evaluates the trajectory of scientific discourse surrounding the social dimensions of the Sustainable Development Goals (SDGs) by analyzing publication trends, thematic evolution, and conceptual clusters. The procedural flowchart for the bibliometric analysis is presented in Figure 1.

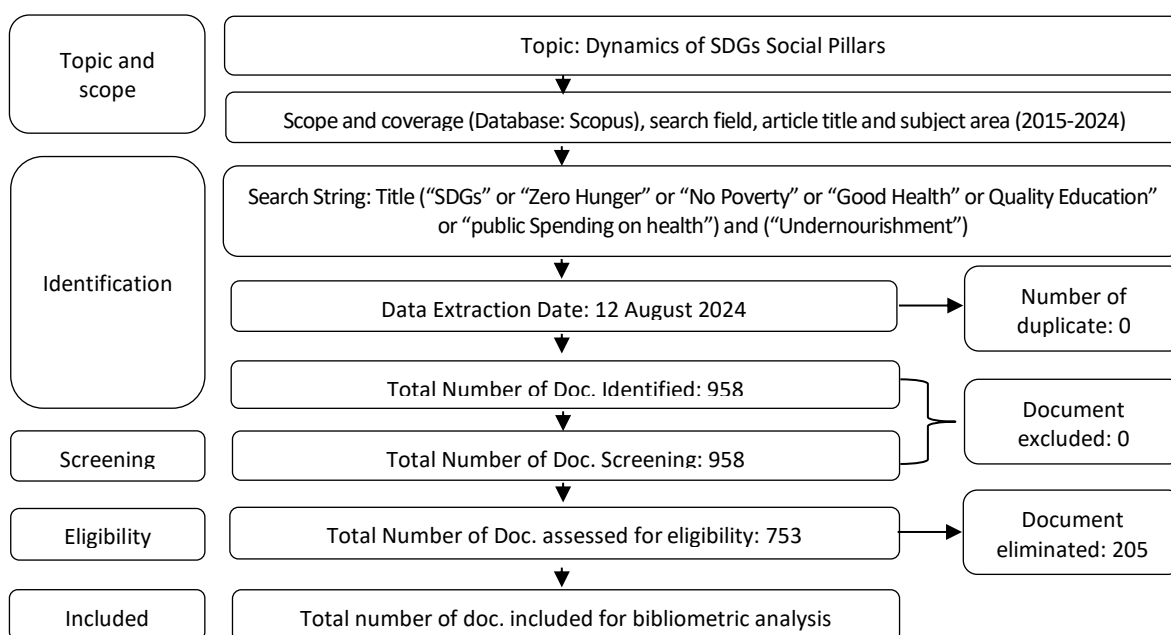


Figure 1 .The Procedural Flowchart for the Bibliometric Analysis

Following the framework established by Zupic & Čater (2015), a systematic search was executed across the Scopus and Web of Science databases for the period 2010–2024, utilizing predefined search strings and rigorous inclusion criteria. The resulting thematic mapping informs the selection of variables for the econometric specification, thereby ensuring theoretical and empirical coherence. The operational definitions of the variables included in the econometric model are presented in Table 1 as follows:

The dynamic panel analysis utilizes secondary data retrieved from the Sustainable Development Report 2024, cross-validated with World Bank (2023) indicators. The dataset comprises 11 developing Asian economies (Indonesia, Malaysia, the Philippines, Thailand, Vietnam, Myanmar, Timor-Leste, Laos, India, Iran, and Pakistan), selected based on their lower-middle-income status and the availability of longitudinal data. The seven-year longitudinal scope (2017–2023) was chosen to align with typical national policy planning cycles (5–7 years), providing a robust temporal window to evaluate policy impacts.

2.2. Model Specification

The study employs the Arellano-Bond test estimator, selected for its superior capacity to address endogeneity, autocorrelation, heteroscedasticity, and unobserved country-specific heterogeneity inherent in short panel structures (Arellano & Bond, 1991). Unlike static models, such as fixed effects, or difference-in-differences approaches, MM utilizes internal instruments derived from lagged variables to produce consistent and unbiased estimates when regressors correlate with past error terms. Mathematically, this can be formulated as follows:

$$Poverty_{it} = \beta_0 + \beta_1 Poverty_{it-1} + \beta_2 GHSE_{it} + \beta_3 NeoMortal_{it} + \beta_4 Undernourish_{it} + \mu_{it} \quad (1)$$

Here, $Poverty_{it}$ represents the poverty rate, defined as the proportion of the population living below the national poverty line; $Poverty_{it-1}$ is the lagged dependent variable, accounting for the persistence of poverty over time; $GHSE_{it}$ is government health and social expenditure; $NeoMortal_{it}$ is neonatal mortality rate per 1,000 live births, serving as a proxy for healthcare quality; $Undernourish_{it}$ is the share of the population with insufficient dietary energy intake; η_i represents unobserved country-specific effects; and μ_{it} is the idiosyncratic error term.

Table 1. Operational Definition of Variables

Variable	Definition	Measurement	Data Source
Poverty rate (<i>Poverty</i>)	The proportion of the population living below the national poverty line, indicating limited access to basic needs and economic vulnerability	% of population below the national poverty line	SDGs Report 2024, validated by World Bank (2023)
Government spending on education and health (<i>GSHE</i>)	Total government expenditure allocated to the education and health sectors.	% of total government expenditure of GDP	SDGs Report 2024, validated by World Bank (2023)
Neonatal mortality (<i>Neomortal</i>)	The number of deaths among live-born infants occurring within the first 28 days of life, serving as an indicator of maternal and neonatal healthcare quality	Neonatal mortality rate per 1,000 live births	SDGs Report 2024, validated by World Bank (2023)
Undernourishment (<i>Undernourish</i>)	The share of the population whose dietary energy intake is insufficient to meet minimum requirements for a healthy and active life	% of population experiencing undernourishment	SDGs Report 2024, validated by World Bank (2023)

3. RESULTS AND DISCUSSIONS

3.1. Results

The descriptive statistics provide a comprehensive overview of the variables examined across the selected developing Asian economies, based on a total of 77 observations. Table 2 presents the summary statistics for the period under study.

Table 2. Result of Descriptive Statistics

Statistic	Poverty	GSHE	NeoMortal	Undernourish
Mean	5.9652	5.3192	16.2716	8.8935
Median	5.0100	5.3800	14.0400	6.3000
Maximum	25.800	10.710	45.5200	27.600
Minimum	0.5300	2.5300	10.4000	2.9000
Std. Deviation	6.0762	1.8604	11.6597	6.2292

Government spending on education and health (GSHE) averaged 5.32%, with a range extending from 2.53% to 10.71%. The moderate standard deviation (1.86) indicates relatively consistent public spending allocations across the sample over time. The GSHE distribution is slightly right-skewed, suggesting that a small subset of observations reflects significantly higher investment levels. In contrast, neonatal mortality (NeoMortal) has a mean of 16.27 deaths per 1,000 live births, with a wide range between 10.40 and 45.52. The relatively high standard deviation (11.66) reflects substantial disparities in neonatal health outcomes among the sampled countries. The positive skewness indicates that several countries experience considerably higher neonatal mortality rates compared to the sample average. The poverty rate (Poverty) records an average of 5.97%, with values ranging from 0.53% to 25.80%. The high skewness (1.89) and kurtosis values suggest a right-skewed and leptokurtic distribution, indicating that poverty levels are unevenly distributed, with a concentration of lower values and a few extreme high observations.

Table 3. Result of Unit Root test using ADF-Fisher

Variables	Statistic	Prob. **
Poverty	54.500	0.000
GSHE	47.787	0.001
NeoMortal	48.530	0.000
Undernourish	33.955	0.049

Undernourishment exhibits a mean value of 8.89%, with a minimum of 2.90% and a maximum of 27.60%. The standard deviation of 6.23 indicates considerable variation in nutritional outcomes across countries. Similar to poverty, the distribution is positively skewed, implying that undermourishment remains particularly severe in a subset of countries within the sample. The Jarque-Bera test results indicate that all variables deviate from normality at the 5% significance level, suggesting non-normal distributions. This supports the appropriateness of employing the GMM Arellano–Bond estimator, which does not require strict normality assumptions and is suitable for dynamic panel data with heterogeneity and potential endogeneity issues. Table 3 report the results of the unit root test before testing the GMM model.

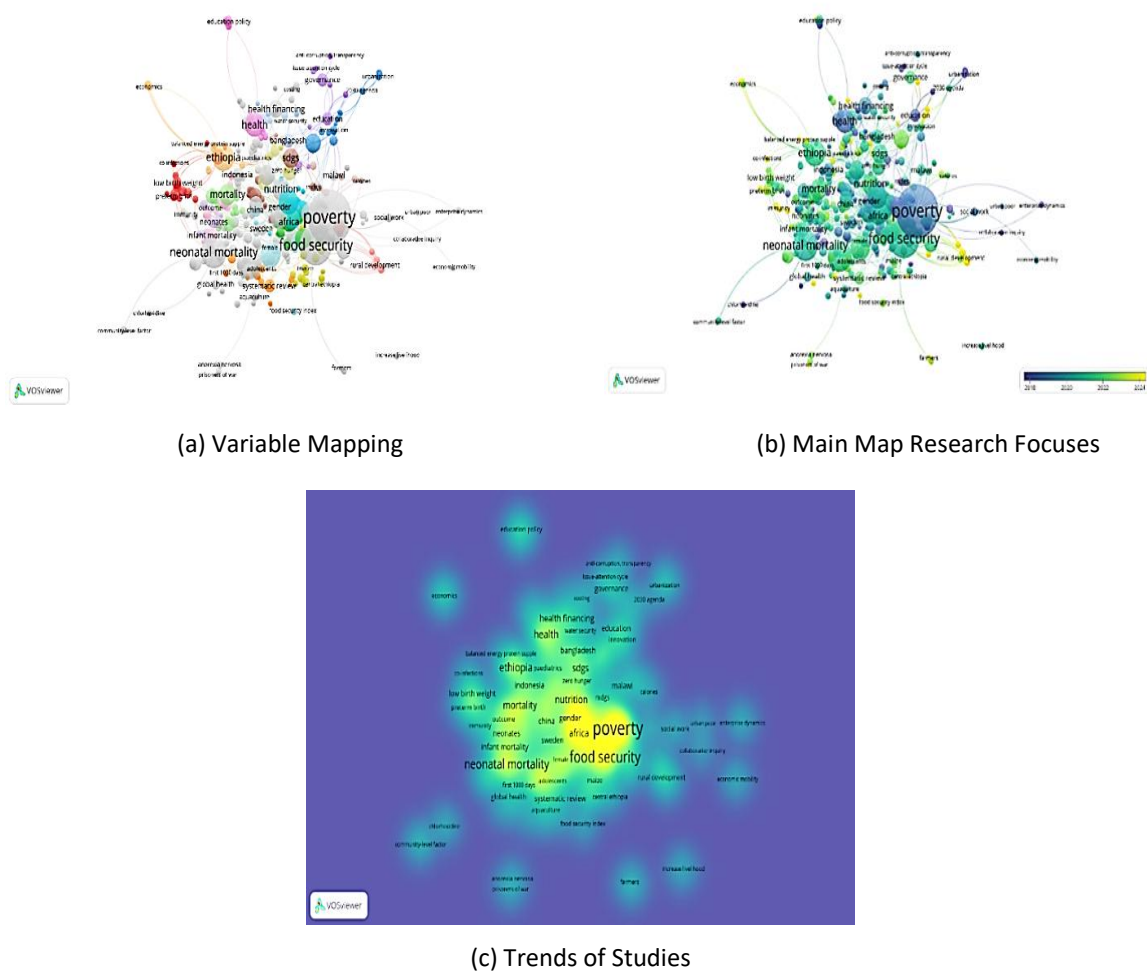


Figure 2. Variable Mapping; Main Map Research Focuses; and Trends of Studies

Prior to estimating the dynamic panel model, the stationarity of the variables was assessed using the ADF-Fisher Chi-square unit root test. As shown in Table 3, the null hypothesis of a unit root is rejected for all variables. Specifically, GSHE, NeoMortal, and Poverty are stationary at the 1% significance level, while Undernourish is stationary at the 5% level. These results confirm that the data series are integrated of first order one or $I(1)$, fulfilling the prerequisites for the Arellano-Bond GMM framework.

The first part of this study aims to examine the research landscape related to the variables of the social dimension pillars, namely poverty, malnutrition, adequate healthcare, and quality education. To map the relationships among these variables, Figure 2 (a) presents the visualization

of variable mapping. Figure 2 (a) presents a concept map illustrating the relationships among studies in the areas of poverty, resilience, healthcare financing, and nutritional adequacy. Research focused on poverty in this map is often linked to resilience, gender, and agriculture. Similarly, studies on health are correlated with those on education, healthcare financing, poverty, nutrition, and enhanced resilience. On the other hand, the topic of nutrition is associated with studies focusing on food security, child growth, and agriculture. The systematic review mapping reveals three main research focuses: food security, poverty, and health, as depicted in Figure 2 (b).

Next, we review the research trends related to poverty, health, and nutrition. This main cluster focuses on poverty and food security, encompassing studies such as food security, poverty, and rural development. In Figure 2 (c), the trends of diverse and interrelated studies are shown. From Figure 2 (c), key clusters in the research topics are identified. The first cluster relates to poverty and food security, encompassing issues of poverty, food security, and rural development. This cluster highlights efforts to alleviate poverty and improve food access for communities. The next cluster focuses on health and nutrition. It includes studies on child health, neonatal mortality, and undernutrition. This underscores the importance of early interventions to improve child health and reduce undernutrition, with the government playing a pivotal role in addressing these issues. The final cluster pertains to government roles and development strategies. This cluster focuses on the role of government expenditure on education and sustainable development agendas, emphasizing the importance of appropriate policies and strategies for achieving the SDGs.

The analysis of these research clusters reveals significant connections among them. For instance, the relationship between poverty and health demonstrates strong links between issues such as mortality, undernutrition, and poverty. This indicates that poverty is a primary factor contributing to child mortality and nutritional problems. Furthermore, food security and its links to health and well-being show that access to safe food is crucial for improving health and welfare, particularly for lower-income populations. Another area of focus is the role of education and government in achieving developmental goals.

Table 4 presents the results of the robustness checks for estimator bias, conducted by comparing the System GMM results against fixed effects (FE) and Pooled OLS (POLS) estimations. Following the decision criteria established by Bond (2002), the coefficient of the lagged dependent variable is considered unbiased if it lies within the range bounded by the FE and POLS estimates. Specifically, the FE estimate typically provides a downward-biased lower bound, while the POLS estimate serves as an upward-biased upper bound. As shown in the results, the lagged dependent variable coefficient (0.6716) is greater than the FE estimate (0.6108) and smaller than the POLS estimate (0.9633). Consequently, the GMM results satisfy the requirements for unbiasedness and consistency. The next result is the model estimation with GMM. The present Table 4 is the estimation result.

The GMM estimation results in Table 4 indicate that all tested variables poverty, government expenditure on health and education, neonatal mortality, and malnutrition in developing Asian countries (Indonesia, Malaysia, the Philippines, Thailand, Vietnam, Myanmar, Timor-Leste, Laos, India, Iran, and Pakistan) are statistically significant. This implies that poverty levels in these developing countries can be influenced by changes in government spending on health and education, neonatal mortality, and malnutrition. The results of the dynamic panel model show consistent and statistically meaningful patterns across all key variables. The coefficient for lagged poverty is 0.671 ($p < 0.01$), which indicates a strong persistence of poverty over time. This implies that 1% increase in poverty in the previous period leads to a 0.671% increase in the current period. This confirms that poverty in developing Asian countries is path dependent and tends to reproduce itself across periods unless met with sustained and targeted interventions. This result aligns with the view of Fosu (2017), who emphasizes that structural poverty requires long-term, cross-sectoral policy efforts.

Government spending on health and education shows a positive and statistically significant coefficient of 0.071 ($p = 0.0098$). Although higher GSHE is associated with a 0.071% rise in measured poverty, this counterintuitive direction is likely driven by reverse causality. In many developing economies, governments typically raise health and education budgets in response to worsening

poverty indicators or deteriorating health conditions. This interpretation is consistent with Arize et. Al (2024), who argue that increases in public spending do not always translate into better outcomes when governance quality, equity of service access, and implementation capacity remain weak.

Table 4. Result of Poverty Model Estimation

Dependent Variables = Poverty			
Variables	POLS	FE	GMM
	(1)	(2)	(3)
Poverty _{t-1}	0.963*** (0.042)	0.610*** (0.121)	-0.671*** (0.024)
GSHE	-0.131 (0.080)	0.106 (0.209)	0.071** (0.026)
NeoMortal	-0.016 (0.011)	-0.122 (0.182)	-0.348*** (0.043)
Undernourish	0.046 (0.030)	-0.201 (0.124)	-0.107*** (0.026)
Constant	0.489 (0.676)	5.226 (3.400)	
N	77	77	77
R ²	0.982	0.993	
F-stat	850.808***	553.777***	
Number of Instrument			11
Wald statistic <i>p</i> -value			0.000
Hansen J-stat (<i>p</i> -value)			8.581 (0.284)
AR(2) test (<i>p</i> -value)			0.045 (0.963)

Note: *, **, *** measures statistical significance at the 10%, 5%, and 1% level, respectively.

The health-related variables show negative and significant relationships with poverty. The coefficient for neonatal mortality is -0.348, this implies that 1% rise in neonatal mortality corresponds to a 0.348% decrease in the dependent variable. Similarly, undernutrition has a coefficient of -0.107, implying a 0.107% decrease in poverty for every 1% rise in malnutrition. In practical terms, these signs reflect that improvements in neonatal mortality and nutritional status are strongly linked with reductions in poverty. Lower infant mortality indicates more effective health systems and reduced financial burdens on households, which supports the broader economic role of child survival described by World Health Organization (2020). A decline in malnutrition also strengthens long-term human development outcomes and increases economic resilience, as emphasized by FAO (2022).

The model uses a first difference fixed effects estimator, which controls for unobserved heterogeneity across countries. Diagnostic tests support the model's validity. The J statistic is 8.58 with a probability value of 0.284, showing no overidentification problems in the instrument set. The standard error of regression is relatively low at 0.750, indicating that the model fits the data reasonably well. The results demonstrate that the dynamic specification successfully captures both the persistence of poverty and its relationship with health expenditure, neonatal mortality, and malnutrition. The subsequent Arellano Bond test is applied to assess model consistency and serial correlation, ensuring that the dynamic specification meets the required statistical assumptions.

Table 4 also report the results of the Arellano-Bond test. The basis for determining consistency is whether the probability value of the Arellano-Bond test is greater than the 0.05 significance level. The Arellano-Bond test is used to examine serial correlation in the residuals of dynamic panel data, serving as a requirement for consistency. From Table 4, it is evident that the AR(2) test yields a probability value greater than 0.05, specifically 0.963. This indicates no evidence suggesting that the model is inconsistent; in other words, the evidence fails to reject the null hypothesis, implying no serial correlation at a 0.05 tolerance level. Based on these results, the testing can proceed to the bias testing phase.

3.2. Discussions

The bibliometric visualization of the social pillars of the Sustainable Development Goals (SDGs) reveals a knowledge structure that is both geographically extensive and conceptually layered. Network mapping identifies poverty, food security, nutrition, and neonatal mortality as the central nodes within the semantic structure. Their high degree of centrality indicates that these issues are recognized as the primary determinants of the social dimensions of the SDGs. Notably, poverty emerges as an intersectional node, bridging discourse across healthcare, nutrition, economics, and geography. This pattern of interconnection underscores the complexity of social challenges, which are mutually reinforcing and necessitates integrated, systemic policy responses rather than isolated sectoral interventions. Temporal overlays illustrate a significant shift in scholarly attention over the past five years. Earlier research primarily focused on descriptive patterns, such as neonatal mortality and undernutrition. Conversely, more recent scholarship has transitioned toward structural themes, including public policy frameworks, livelihoods, economic mobility, and rural development. This evolution suggests a maturing academic understanding that moves beyond describing social outcomes to identifying their deep-seated systemic causes. It further highlights that social sustainability is contingent not only on direct health and education interventions but also on the design of equitable, inclusive, and evidence-based policies.

Density mapping supports this narrative by highlighting areas of high research concentration. While poverty, nutrition, and food security represent well-developed domains of study, lower densities around themes such as social protection, trust, and economic resilience point to critical knowledge gaps. Addressing these gaps is vital for strengthening social policy and will require transdisciplinary investigations that broaden both the scope and depth of current research. Within this conceptual landscape, the application of the GMM is both relevant and methodologically rigorous. GMM is uniquely suited for dynamic models involving endogeneity, heterogeneity, and panel data structures. The complex linkages identified in the network map—specifically the simultaneous relationships between poverty, food security, and health status—require an estimation method capable of capturing time-dependent dynamics.

By utilizing internal instrumental variables, GMM effectively mitigates biases arising from reverse causality or omitted variables. This makes the method an appropriate tool for the empirical validation of the theoretical relationships suggested by the bibliometric results. Furthermore, GMM enables longitudinal analysis that mirrors the temporal shifts shown in the overlay maps, providing a robust framework for assessing policy effectiveness and the long-term mechanisms influencing social well-being. In this capacity, GMM serves not merely as a statistical tool but as an analytical approach that aligns with the structural and temporal complexity of SDG social issues. Integrating bibliometric results with GMM estimation reinforces the necessity of a research framework that combines conceptual mapping with empirical testing. This synthesis supports the development of analytical models capable of informing policies that can adapt to the escalating complexity of global social development challenges.

The bibliometric analysis further shows that poverty emerges as the most central issue within the scientific discourse on SDG social pillars. As shown in Figure 2 (a), poverty is closely connected to food security, nutrition, health, and gender equality. Its role as a core node reflects the fact that poverty is both a cause and a consequence of many structural determinants of development. This supports long-standing theoretical arguments that poverty cannot be viewed as a single variable but as a multidimensional condition embedded in broader systems. The close link between poverty and food security, reflected in the main cluster, represents both a correlation and a deeper causal relationship. Poverty limits access to food in terms of quantity, quality, and diversity. Chronic undernutrition, in turn, reduces health and productivity, which reinforces the poverty cycle. This circular pattern means that poverty reduction strategies must be paired with measures that strengthen food security. Smith & Haddad (2015) stress that malnutrition rooted in poverty affects not only physical health but also cognitive and social development.

Health-related themes also feature strongly in the visualization. Figure 2 (b) shows increased attention to health financing, neonatal mortality, and child health. This shift mirrors findings from Connor (2011); and Black et al. (2013), who show that poverty restricts access to adequate health services and nutrition, which raises neonatal and child health risks. Victora et al. (2000) also emphasize that early childhood mortality is strongly influenced by nutritional status during the first thousand days of life, a period that shapes long-term human development. The density map in Figure 2 (c) shows that poverty, food security, and neonatal

mortality dominate research attention. This reflects the evolution of literature from sector-specific analysis to approaches that recognize interlinked social systems. Health, for instance, is now understood not only as an outcome of medical treatment but also as a product of economic conditions, public policy, and social norms. Another notable pattern is the emergence of themes related to women's empowerment and education. Their close ties to poverty and health highlight the importance of gender in understanding vulnerability. Studies consistently show that women in developing countries face structural barriers to education, employment, and economic resources. These barriers increase their risk of malnutrition and disease and limit their ability to provide adequate care for children. Women's empowerment therefore becomes both a development goal and a key mechanism for breaking cycles of poverty and undernutrition. These findings point to the need for holistic, cross-sectoral policies. Efforts to reduce poverty and improve food security must be combined with progress in health, education, and social protection. Collaboration across the agricultural, health, education, and social sectors is essential. Policies also need strong community participation, especially from vulnerable groups such as women and children. Robust data, evidence-based analysis, and regular evaluation are crucial to ensure that interventions match real needs. Overall, the bibliometric results show that poverty, malnutrition, and child mortality are interconnected challenges that require integrated and adaptive policy responses.

The model estimation results reinforce the conceptual insights derived from the bibliometric mapping by identifying significant structural relationships between poverty, public expenditure, and health outcomes in developing Asian countries. The estimation reveals a negative coefficient for the lagged poverty variable, which signifies a high degree of poverty persistence. This empirical evidence suggests that higher poverty levels in a given period significantly increase the probability of continued deprivation in subsequent periods, confirming the existence of a "poverty trap" that requires external policy intervention to break. Additionally, the government spending on health and education displays a positive sign and significant, indicating that while public social investment contributes to poverty reduction, its immediate impact is limited. This finding is consistent with the work of Tarabini (2010); and Sachs (2012), who emphasize that expanding access to education and health services for marginalized groups is a fundamental prerequisite for long-term social mobility and the achievement of SDG 4. Furthermore, as highlighted by Liu et al., (2023), such expenditures are critical for human capital accumulation and sustained economic growth. However, the relatively small magnitude of the coefficient in this study aligns with the observations of Kundu (2017); and Ashiabi et al. (2016), who suggest that fiscal allocations may fail to yield optimal welfare outcomes if they are not supported by robust institutional policies and effective implementation frameworks.

The health-related findings further validate the interconnected nature of the SDG social pillars. In accordance with Black et al. (2013); and Madewell et al. (2024), the model demonstrates that malnutrition remains a critical driver of neonatal and child mortality, particularly within low-income households. This indicates that neonatal health risks are not merely medical issues but are deeply rooted in the broader socioeconomic landscape, where poverty restricts access to adequate nutrition and healthcare services. This relationship is further supported by Adeyeye et al. (2017), who show that improving maternal education can significantly mitigate child mortality risks. Study by Li & Li (2024) provide evidence that increased health spending reduces neonatal mortality and supports SDG 3. Some studies, such as Osakede (2021), find limited effects of health spending, especially on maternal health. Tharwani et al. (2023) highlight the importance of education-led initiatives for improving health awareness among women. Previous studies also show that socioeconomic factors represented by GDP or GNI influence child mortality, as noted by Natarajamurthy (2025); and Samuel (2024). Neal & Falkingham (2015) discuss how public spending and health policy shape cross-country differences in mortality outcomes. Islam & Biswas (2021) emphasize the role of parental education in creating access to better health services. Collectively, these results demonstrate a strong alignment between the model estimates and established theoretical frameworks. The findings underscore that while spending on health and education serves as a vital tool for improving public welfare and addressing SDG 3, the efficacy of such interventions depends heavily on policy design, targeting accuracy, and a focus on the most vulnerable populations.

The findings of this study further align with Pigou's social welfare theory, which posits that targeted public expenditure and redistribution are essential for correcting social imbalances and enhancing aggregate welfare. Pigou argues that fiscal interventions can mitigate inequality by addressing systemic

failures in service delivery. The observed positive influence of health and education spending on poverty reduction, notwithstanding its modest magnitude, lends empirical support to this theoretical perspective. Specifically, expanding access to education and nutrition for marginalized populations creates structural opportunities that facilitate a transition out of deprivation, thereby echoing Pigou's emphasis on human capital as a driver of social equilibrium. Moreover, the empirical linkages between poverty, malnutrition, and neonatal mortality identified in this research are consistent with the findings of Black et al. (2013); and Li & Li (2024). These correlations substantiate the claim that socio-economic inequality directly impairs physical productivity and long-term welfare. Consequently, public interventions targeting nutrition and healthcare should be viewed as critical instruments for restoring social balance and breaking the intergenerational transmission of poverty.

The integration of bibliometric analysis with GMM estimation provides a comprehensive perspective on the social SDG landscape that neither method could achieve in isolation. While the bibliometric visualizations identify poverty, nutrition, and health as the most conceptually interconnected themes, they simultaneously highlight critical research lacunae in social protection and economic resilience. The GMM results reinforce this structure by demonstrating that the conceptual gaps in the literature correspond to measurable empirical dynamics: poverty remains persistent and is inextricably linked to undernourishment and neonatal health. Ultimately, this synthesis confirms that the challenges highlighted in academic discourse are mirrored in the real-world economic conditions of developing Asian nations, demanding a shift toward coordinated, cross-sectoral policies that combine social sector investment with robust nutrition and healthcare programs.

4. CONCLUSIONS

This study provides an integrated assessment of the central social challenges within the Sustainable Development Goals (SDGs) framework, specifically examining the nexus between public expenditure on health and education and poverty dynamics in 11 developing Asian economies. By synthesizing bibliometric mapping with dynamic panel GMM estimation, the research bridges conceptual discourse with empirical reality. The bibliometric evidence confirms that poverty, nutrition, and healthcare constitute the core pillars of the social SDG agenda, characterized by high thematic interconnectedness. However, the analysis also reveals a conceptual imbalance, with relatively limited scholarly attention directed toward social protection and economic resilience. This research gap is mirrored by structural challenges in the sampled nations, where empirical results demonstrate that poverty is highly persistent over time. While government expenditure on health and education contributes significantly to poverty reduction, its impact remains constrained, suggesting that fiscal spending alone is insufficient to dismantle entrenched cycles of deprivation without structural reforms. The findings yield several critical policy implications for developing Asian nations seeking to advance the social dimensions of the SDGs. First, poverty reduction strategies should move beyond isolated sectoral interventions. Effective progress requires coordinated policies across health, education, nutrition, and social protection systems. Second, increasing public spending must be accompanied by improvements in spending quality, targeting accuracy, and institutional effectiveness, particularly for vulnerable populations. Third, policies aimed at improving neonatal health and reducing malnutrition should be treated not only as health priorities but also as integral components of long-term poverty reduction and human capital development strategies. This study highlights that the conceptual gaps identified in current literature are reflective of broader structural challenges in developing Asia. Addressing these disparities requires evidence-based, integrated policy frameworks supported by targeted fiscal instruments and cross-sectoral coordination. Such a comprehensive approach is essential for achieving sustainable, inclusive development outcomes and fulfilling the transformative potential of the 2030 Agenda.

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