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Research Article / *Araştırma Makalesi*

THE EFFECTS OF ECONOMIC INDICATORS AND INSTITUTIONS ON HUMAN DEVELOPMENT: A CLUSTERING ANALYSIS

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ABSTRACT

This study examines the complex relationship among consumption patterns, income levels, and human development, and interprets these interactions in relation to institutional quality at the national level. Utilizing 2023 cross-country data, this study examines the relationships between GDP per capita, personal consumption expenditure (PCE) per capita, and the Human Development Index (HDI). A combination of methods—such as analyzing existing research, testing relationships, applying Principal Component Analysis (PCA), and grouping countries using K-means clustering—helps to categorize 129 countries with complete data into three distinct development groups. While GDP and PCE per capita show a strong correlation, their relationship with the HDI is much weaker, indicating that economic indicators by themselves might not be sufficient to capture the outcomes of human development. The findings highlight the likelihood of sustained human development in nations with strong institutional frameworks and just systems. By linking the empirical clustering results with the institutional quality literature, this study contributes to the corpus of existing literature.

Keywords: *Human Development Index, Institutional Quality, Governance, Socioeconomic Inequality*

JEL Classification Codes: *O15, I32, I31*

KURUMLARIN VE EKONOMİK GÖSTERGELERİN İNSANİ GELİŞMİŞLİK ÜZERİNE ETKİSİ: KÜMELEME ANALİZİ

ÖZET

Bu çalışma, tüketim kalıpları, gelir düzeyleri ve insani gelişmişlik arasındaki ilişkiyi incelemekte; bu ilişkileri kurumsal kalite literatürü bağlamında yorumlamaktadır. 2023 yılı ülke verilerini kullanan bu araştırma, kişi başı Gayri Safi Yurtiçi Hasıla (GSYİH), kişi başına tüketim harcamaları ve İnsani Gelişmişlik İndeksi verileri arasındaki ilişkiyi incelemektedir. Dünya Bankası ve Birleşmiş Milletler Kalkınma Programı veri tabanlarından alınan verilerin Temel Bileşen Analizi (PCA) ve K-ortalamalar kümelemesi yöntemlerini kullanarak ülkeler sınıflara ayrılmıştır. Bu ayrım neticesinde verileri tam olan 129 ülke üç ayrı gelişme grubu olarak sınıflandırılmıştır. Kişi başı GSYİH ve tüketim verileri güçlü bir korelasyon gösterse de, HDI ile ilişkileri çok daha zayıftır. Bu sonuç da ekonomik göstergelerin tek

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başlarına insan gelişiminin sonuçlarını ölçmek için yeterli olmayabileceğini göstermektedir. Bulgular, güçlü kurumsal çerçevelere ve adaletli yönetim sistemlerine sahip ülkelerde sürdürülebilir insani gelişme olasılığının arttığını vurgulamaktadır. Bu çalışma, ampirik kümeleme bulgularını kurumsal kalite literatürüyle ilişkilendirerek mevcut akademik literatüre katkıda bulunmaktadır.

Anahtar Kelimeler: *İnsani Gelişmişlik Indeksi, Kurumsal Kalite, Yönetim, Sosyoekonomik Eşitsizlik*

JEL Sınıflandırması: *O15, I32, I31*

1. Introduction

Human development is not exclusively determined by economic development; social justice and institutional efficacy are also important factors that influence development outcomes. In traditional evaluations, national income or GDP per capita is often thought to increase human development. Recent research, however, has shown that income-based metrics are insufficient for measuring human development (Singh et al., 2025; Sušnik & van der Zaag, 2017). This judgment is valid in developing countries that do not have adequate access to health care, education, and basic services despite economic growth. This result creates a controversial situation about how human development status will evolve when economic indicators are not supported by a solid institutional structure. This research evaluates the relationship between economic indicators (GDP per capita and consumption expenditure (PCE) per capita) and human development measured by the Human Development Index (HDI), while interpreting the findings alongside institutional structure and social factors in the literature.

Scholarly research has emphasized the impact of governance structures (Stryzhak et al., 2022), economic performance (Fagbemi et al., 2021), and institutional quality (Onour, 2020) on socioeconomic inequality and human development outcomes. Few studies have thoroughly investigated the role of institutional strength, transparency, and quality using a multivariate, data-driven clustering framework, whereas previous research has mostly connected economic data to development levels. This research closes that gap.

This study aims to provide a more comprehensive perspective on national development by grouping nations into development clusters based on their social and economic characteristics. Bibliometric mapping of the existing literature, principal component analysis (PCA), and k-means clustering are used to both empirically analyze and contextualize significant relationships within the broader research framework.

The study casts doubt on the effectiveness of traditional income-based development models by showing that GDP and PCE alone are insufficient to capture the range of variance in HDI. Furthermore, by combining multivariate cluster analysis with bibliometric mapping, it draws attention to conceptual gaps and research trends in human development and governance and helps policy-makers formulate targeted development plans that consider institutional context, consumption patterns, and country typologies.

The main hypothesis of the study is that

H1: The Human Development Index is positively associated with income levels and consumption expenditures.

Sub-hypotheses within the framework of this main hypothesis;

H1a: GDP per capita and HDI are positively correlated.

H1b: HDI and PCE per capita are positively correlated.

H1c: Depending on their socioeconomic indicator profiles, nations form distinct development clusters.

This research offers an in-depth examination of policy frameworks that promote equitable and sustainable development in countries. It enhances our comprehension of the impact governance systems, consumption patterns, and financial resources have on human development. A closer examination of the research reveals the interconnectedness of strong institutions, growing financial markets, environmental protection, and the pursuit of equality in real-world contexts. The studies employ a range of techniques, including econometrics, forecasting, and decision analysis, to demonstrate that robust institutions and robust financial systems typically enhance people's lives. Every technique discussed relates to the crucial role that governance plays in the domains of politics, economics, and the environment. This paper explains the role of nations in reacting to emerging crises of the contemporary era.

2. Literature Review

The idea that human development is a complex process impacted by the interaction of economic performance, institutional quality, and social well-being is gaining traction. Although economic indicators like GDP per capita have been the mainstay of traditional approaches, new research shows the shortcomings of this one-dimensional viewpoint and emphasizes the significance of governance, education, and fair access to resources. This review synthesizes recent empirical and theoretical contributions related to the core elements of the present study, focusing particularly on the relationships among Gross Domestic Product (GDP), consumption expenditure (PCE), the Human Development Index (HDI), and institutional frameworks.

Numerous studies have reaffirmed the positive yet limited role of GDP per capita in predicting the Human Development Index (HDI). Singh et al. (2025) conducted a regression analysis looking at a range of economic and social indicators. They found that GDP per capita and average years of education were good predictors of the HDI, but GDP alone was not sufficient to explain it without accounting for social factors such as infant mortality rates and education levels. Similarly, Sušnik & van der Zaag (2017) highlighted that HDI is more closely linked to personal wealth and access to essential services than to the mere accumulation of national resources. Multi-spatial convergence cross-mapping applications have shown that eliminating resource inequality, rather than aggregate economic growth, is more important for enhancing human development. These results reinforce the observation that the current study finds limited relationships among GDP, personal consumption expenditures (PCE), and HDI, suggesting the need for a multidimensional analytical perspective.

Regional and sectoral factors complicate the relationship between GDP and the Human Development Index (HDI). A study by Pekarcikova & Pracharova (2023) focused on oil and gas-producing countries, revealing significant variation in the strength of the GDP-HDI correlation among the 14 largest oil and gas producers. For example, while nations like the United States and Norway exhibited strong positive correlations, others, such as Iraq and Kuwait, displayed weak or negligible connections between GDP and HDI. These inconsistencies reveal that high GDP (especially that resulting from underground resources) does not increase advanced human development unless supported by effective governance and inclusive policies.

This result emphasizes that the studies related to the field should not solely focus on classifying countries only according to income and they should focus on indicators other than income in categorizations made according to human development.

The significance of institutional quality in shaping human development has attracted considerable attention in recent literature. Kamalu & Wan Ibrahim (2022) assessed 14 developing countries using a Dynamic Common Correlated Effects approach and concluded that institutional quality has a statistically significant, long-term impact on the Human Development Index (HDI). Key factors such as the rule of law, regulatory quality, and anti-corruption measures are understood to affect development outcomes positively. Uddin et al. (2023) studied 70 developing countries and argue that approximately 38% of the change in HDI is due to changes in institutional quality. Studies on the subject argue that strong institutions contribute to economic performance and increase social welfare through improved governance and transparency. These studies emphasize that strong institutions and egalitarian systems are important for sustainable human development.

Further insights are provided by Stylianou et al. (2025), who conducted an analysis of inclusive human development using panel data from 24 Asian countries. By employing the inequality-adjusted Human Development Index (IHDI), their study identified significant relationships between governance indicators—such as political stability, control of corruption, and the rule of law—and human development outcomes. The methodological framework of this study is in line with the construction of governance indices using principal component analysis (PCA). According to their findings, inclusive governance promotes fair access to economic, educational, and health opportunities, supporting the notion that development is closely related to institutional effectiveness and goes beyond economic indicators.

Nguyen & Dinh Su (2021) conducted a comprehensive empirical study that looked at the connections between tourism, environmental sustainability, and institutional quality in 134 different countries. However, the results are conflicting: while higher institutional quality generally leads to better environmental outcomes, it may also make tourism's detrimental ecological effects worse. This implies that institutions in some countries may prioritize economic growth over environmental protection. The study provides a multifaceted perspective of environmental impact by utilizing principal component analysis to create composite environmental indices, which surpass traditional single-variable metrics like CO2 emissions. These results highlight the need to incorporate environmental reforms into institutional frameworks and cast doubt on the widely held belief that sustainability benefits follow naturally from improvements in institutional quality.

Adom et al. (2020) highlight an institutional dilemma in their study in Sub-Saharan Africa. Using a two-stage methodology, they investigate how banking sector performance affects energy efficiency, particularly in terms of energy intensity. Considering their results, they show that improvements in banking performance lead to improved energy efficiency in both the short and long term. However, similar to Nguyen and Su's results, these positive effects can be reversed in democratic regimes by the intervention of vested interests and low-trust political institutions. The study suggests that trustworthy governance cannot contribute to human development unless it is aligned with specific sector goals, such as environmental protection or energy efficiency. This result raises important concerns about institutional arrangements that prioritize political convenience over sustainable development.

The Strehler-Mildvan theory is reexamined by Zheng et al. (2011), who also present supporting data. Their examination of a large dataset from 42 nations covering almost 50 years shows complex patterns of longevity that are strongly influenced by institutional and ecological factors. Using finite mixture regression and principal component analysis, they demonstrate how national ecological systems—such as GDP per capita, urbanization levels, and agricultural output—act as key drivers. This conclusion is particularly relevant when examining regions such as Southeast Asia and Central America. According to the study's findings, sustainability is a biological process, but socioeconomic settings also have a significant impact.

In a related study, Zhou et al. (2011) examined the relationship between globalization and income inequality in 60 countries and discovered that, as measured by composite indices, globalization tended to be linked to a decline in income inequality. These results cast doubt on the widely held belief that inequality is made worse by economic integration. The study shows that the redistributive effects of globalization rely heavily on institutional support and careful policy design, thanks to a strong methodological approach that makes use of fixed effects and dynamic panel models. This supports the claim made by Zheng et al. (2011) that structural variables can result in more favorable social outcomes when applied skillfully.

Yamakawa et al. (2013) further investigate technological adoption and its diffusion under various institutional constraints by modeling mobile telephone diffusion in Peru using Gompertz and logistic growth curves. Their analysis reveals that GDP per capita, market structure, and regulatory tariffs are significant drivers of this diffusion. Notwithstanding market concentration and exorbitant costs, Peru's telecommunications industry has grown quickly, indicating that institutional support through regulation is crucial in determining access to technology. These findings align with those of Nguyen & Dinh Su (2021) in the tourism sector, where infrastructure and regulatory frameworks have both positive and negative influences on outcomes.

Mousavi & Lin (2020) advance the discussion within the financial sector by utilizing the PROMETHEE II multi-criteria decision aid to evaluate models for predicting financial distress. According to their findings, machine learning models perform better than conventional statistical techniques, especially when corporate governance metrics are taken into account. This observation supports the framework by considering a number of factors, including governance factors, which improve prediction and decision-making accuracy. The study shows that combining management data with statistical methods can increase institutional transparency and reduce systemic risks.

When these studies are taken as a whole, it can be suggested that policymakers should address economic, environmental, and human development issues jointly. Although strong institutions are typically seen as agents of progress, their efficacy hinges on striking a balance between social and ecological goals and economic growth. The findings highlight how important it is to develop integrated policy designs that support inclusive and sustainable development by integrating governance, regulatory, and technological innovation.

To sum up, the literature supports the main argument of the current study, which is that economic metrics alone cannot adequately capture human development. A comprehensive strategy that incorporates GDP, PCE, institutional quality, and social outcomes is necessary to comprehend the dynamics of development and produce perceptive typologies of national progress. These studies highlight the fact that in order to produce positive development outcomes, insti-

tutional quality needs to be combined with suitable policies and frameworks. This study builds on these findings by providing a multidimensional clustering analysis of economic indicators and interpreting the resulting development patterns within the broader institutional literature.

The Web of Science (WoS) Data search, conducted according to the following criteria, yields 78 articles related to the field. Then, the dataset from WoS is analyzed with the R 'Bibliometrix' package (Aria & Cuccurullo, 2017).

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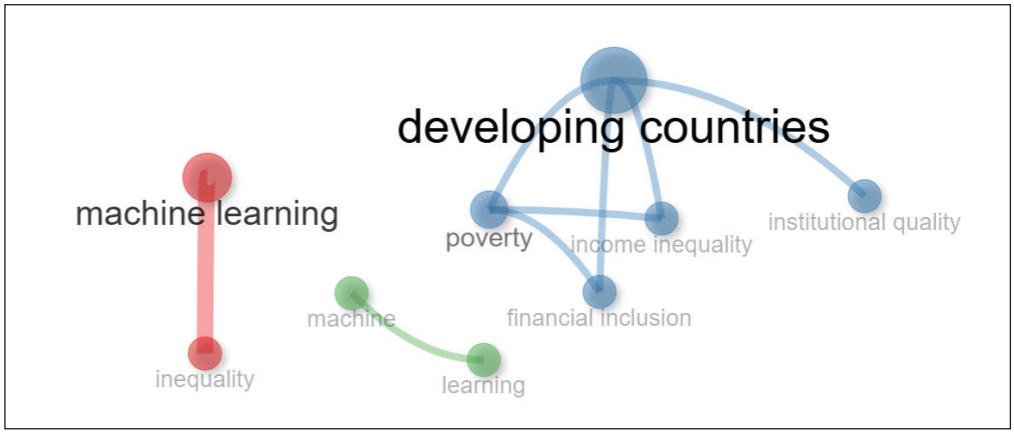
("Human Development Index" OR HDI OR "GDP per capita" OR "Private Consumption Expenditure" OR PCE OR "Corruption Perception Index" OR CPI OR "income inequality" OR "Gini coefficient" OR "governance indicators" OR "institutional quality" OR "social development" OR "socioeconomic indicators") AND

("clustering analysis" OR "k-means" OR "hierarchical clustering" OR "unsupervised learning" OR "machine learning" OR "principal component analysis" OR "PCA" OR "multivariate analysis") AND

("country-level analysis" OR "cross-national comparison" OR "developing countries" OR "global development" OR "comparative analysis" OR "regional clusters")) AND Article (Document Types)

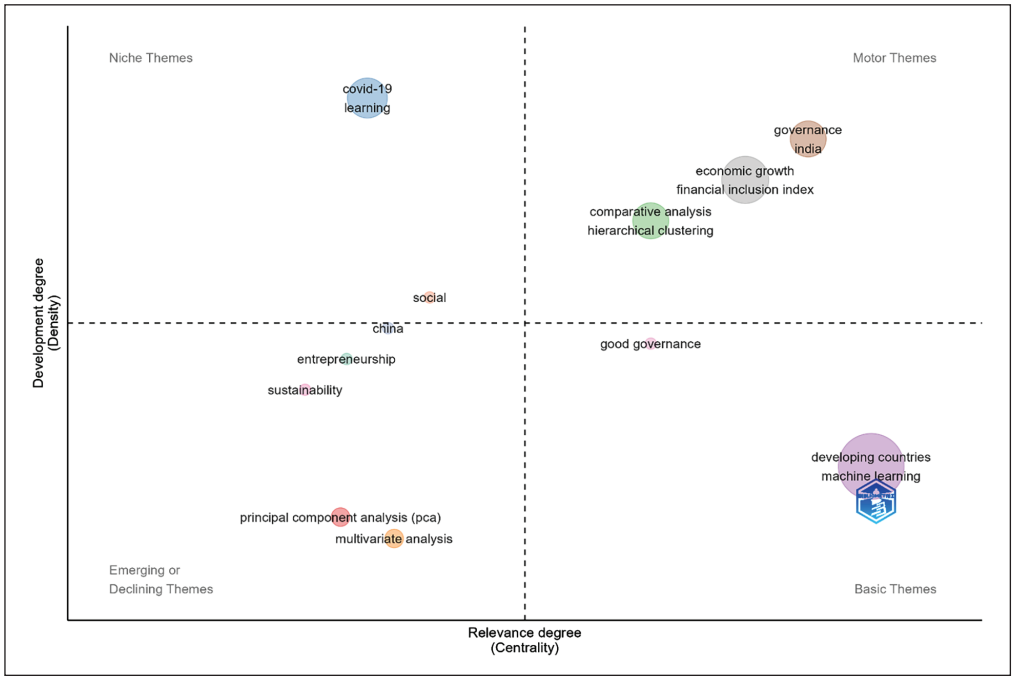
The co-occurrence network graph in Figure 1 shows the relation between keywords. The most prominent node is "developing countries," closely linked to terms like "poverty," "income inequality," "financial inclusion," and "institutional quality". This emphasizes how important the corpus's development-related issues are. On the other hand, "machine learning" creates a separate, smaller cluster that is directly linked to "inequality," indicating a more specialized field of study where social disparities are examined using algorithmic techniques. The visual distinction between the "developing countries" and "machine learning" clusters demonstrates that while both themes are significant, integrating data science and development studies may still be limited.

Figure 1: The Co-Occurrence Network Graph



The thematic map in Figure 2 organizes research clusters into four quadrants based on relevance (centrality) and development (density). "Developing countries" and "machine learning" are situated in the lower-right quadrant, categorizing them as basic themes—fundamental and widely discussed topics yet still underdeveloped in terms of methodological sophistication. The upper-right quadrant shows motor themes like "economic growth," "financial inclusion index," and "governance," which are both central and well-developed, indicating their critical role in advancing the research. In contrast, topics such as "PCA" and "multivariate analysis" are positioned in the quadrant for emerging or declining themes, suggesting either waning relevance or recent emergence without full integration into broader frameworks.

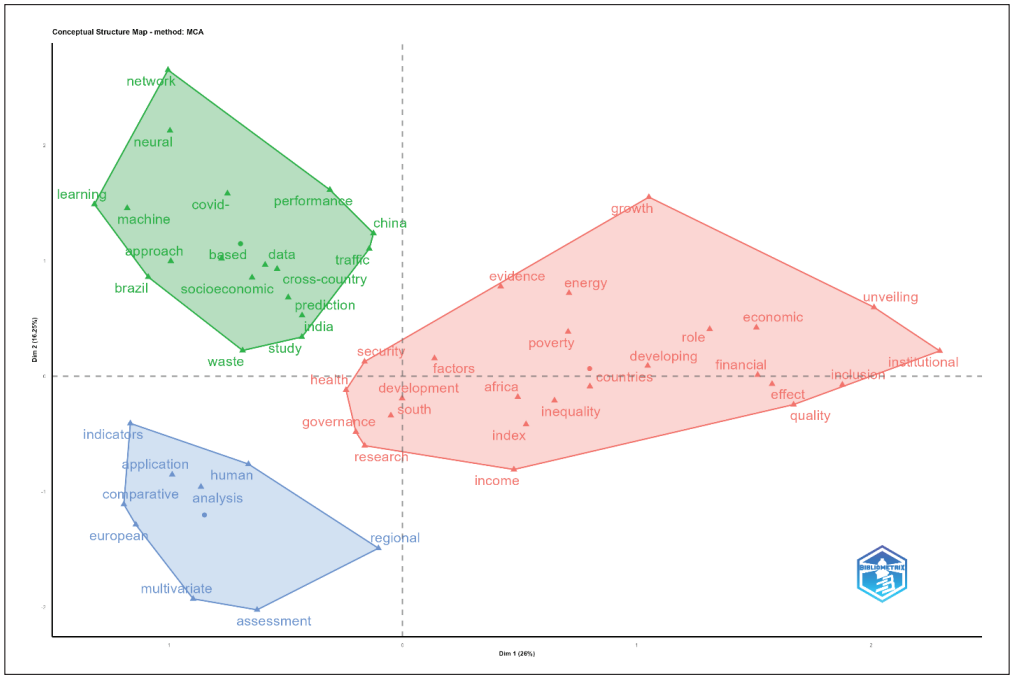
Figure 2: Thematic Map



The conceptual structure map in Figure 3, derived from Multiple Correspondence Analysis (MCA), visually distinguishes thematic areas into three main clusters. The red cluster focuses on development-related issues, including "poverty," "inequality," "institutional quality," and "economic growth," illustrating a unified thematic field concerning policy and governance in developing nations. The green cluster, encompassing terms such as "machine," "learning," "neural," and "performance," reflects technical and methodological research, particularly in the application of machine learning techniques. The blue cluster includes terms such as "assessment," "multivariate," and "comparative," indicating studies with a methodological or regional evaluation focus. The clear differentiation among clusters highlights the interdisciplinary na-

ture of the literature while suggesting a need for greater integration between methodological innovation and development policy analysis.

Figure 3: The Conceptual Structure Map



The word cloud in Figure 4 visually underscores the prominence of "developing countries" and "machine learning" as leading research areas, indicated by their large size and central position. The keywords "poverty," "institutional quality," "inequality," and "economic growth" closely follow, reflecting the social and economic focus of much of the literature. Methodological terms like "multivariate analysis," "PCA," and "comparative analysis" appear smaller, signifying their supportive yet less central role. The visual summary highlights an increasing convergence between social development themes and computational approaches, indicating that keywords related to governance and inclusion remain vital anchors in contemporary research.

Figure 4: Word Cloud

3. Research Methodology

This study uses a quantitative, data-driven clustering methodology that blends statistical modeling and bibliometric analysis to test the hypotheses put forth. The principal objective is to categorize nations according to important socioeconomic metrics and investigate the connection between human development outcomes and economic performance, while interpreting the results within the broader institutional quality literature. The analysis proceeds in five stages: data standardization, feature engineering, correlation analysis, cluster selection, and visualization through k-means clustering and principal component analysis (PCA).

The statistical tests are designed to evaluate the following:

- The strength and direction of correlations among socioeconomic indicators (supporting H1a, H1b),
- Whether distinct country groupings emerge based on indicator profiles (supporting H1c) and
- The interpretive value of these clusters about human development levels.

This study employs a data-driven methodology to classify countries based on key socioeconomic indicators, including the Human Development Index (HDI) (UNDP, 2025), GDP per capita, and consumption expenditure (PCE) per capita (World Bank, 2025). In the statistical clustering stage, institutional quality is treated as a theoretical and interpretive dimension rather than as a separate numerical input in the k-means model. The analysis employs both bibliometric review and statistical clustering to reveal the theoretical foundations and real-world patterns.

The approach is structured into five stages: data standardization, feature engineering, correlation analysis, cluster selection, and clustering visualization. Data for the year 2023 were collected from various sources:

- HDI data: United Nations Development Programme (UNDP).
- World Bank and related databases: GDP (NY.GDP.MKTP.CD), consumption expenditure (NE.CON.TOTL.CD), and population (SP.POP.TOTL).

Each dataset was loaded using the R programming language and standardized to ensure consistency across indicators. Only countries with complete data for all variables were retained (n=129).

In the data preparation stage, standardization, handling missing data, and correlation analysis are executed.

3.1. Standardization

All numeric variables were normalized to eliminate scale bias. Two derived features were created to normalize GDP and PCE by population size:

- GDP per capita = GDP / Population
- PCE per capita = PCE / Population

These metrics are essential for mitigating population size bias in the analysis.

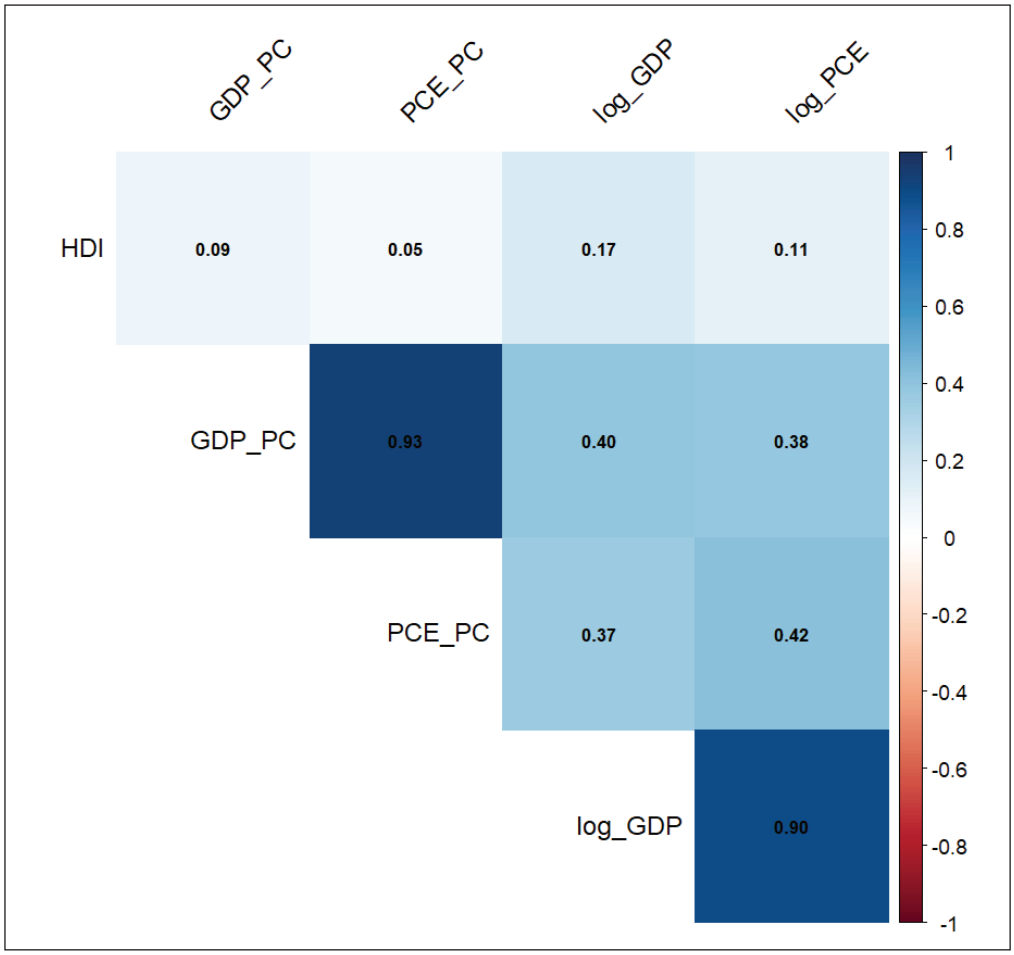
3.2. Handling Missing Data

Countries with incomplete data for the three indicators (HDI, GDP, PCE) were excluded. Not all countries from the original datasets were included in the final clustering analysis. To ensure comparability and avoid bias due to missing data, countries with unavailable values for the following indicators in 2023 were excluded: HDI, GDP, PCE, and Population.

3.3. Correlation Analysis

The correlation heatmap in Figure 5 reveals a robust positive relationship between raw GDP per capita and PCE per capita ($r = 0.93$), with similarly high correlations between their log-transformed counterparts (log_GDP vs. log_PCE, $r = 0.90$). Moderate correlations exist between the raw and log measures (e.g., GDP_PC vs. log_PCE, $r \approx 0.38$; PCE_PC vs. log_GDP, $r \approx 0.37$), indicating a consistent ranking of countries across both scales. In contrast, HDI shows only weak associations with both raw and log-transformed economic indicators (ranging from 0.05 to 0.17), suggesting that while income and consumption are closely intertwined, human development—as captured by HDI—adds a dimension of wellbeing that is not fully explained by per-capita GDP or PCE alone.

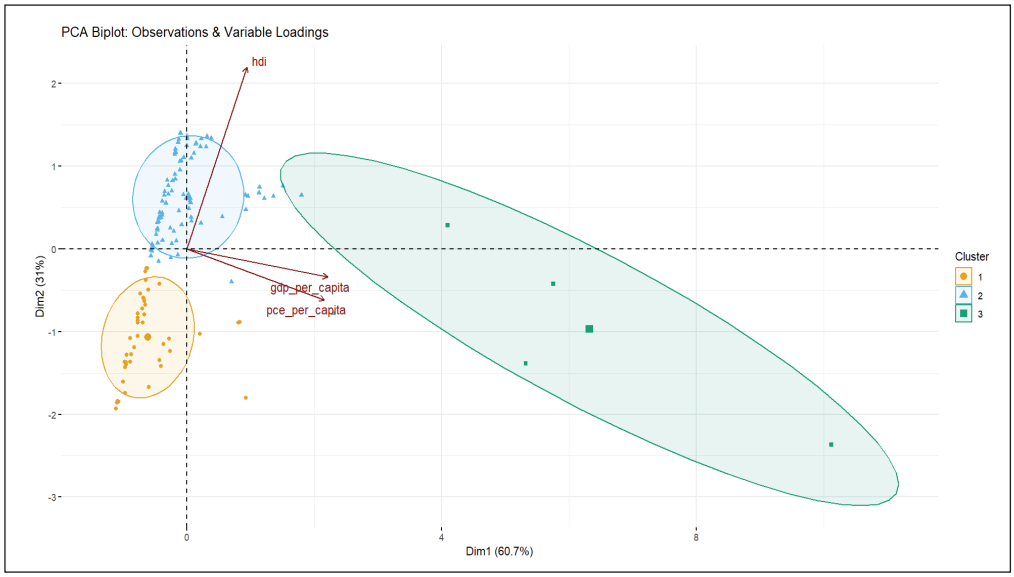
Figure 5: The Correlation Heatmap



3.4. Clustering Analysis and PCA Visualization

K-means clustering was conducted on the scaled dataset with three cluster centers. The three-cluster solution was retained because it offered an interpretable distinction among lower, middle-high, and ultra-high development profiles while preserving a compact presentation suitable for cross-country comparison. This selection is presented as an interpretable analytical choice rather than as a claim of formal statistical optimality. Subsequently, Principal Component Analysis (PCA) was utilized to reduce dimensionality and visualize the clustering structure.

Figure 6: PCA Biplot



The PCA biplot in Figure 6 illustrates the distribution of countries across three clusters, which group nations according to similar development patterns and economic structures. The biplot shows that the first principal component (Dim1, 60.7% variance) is driven almost entirely by the economic indicators (GDP per capita and PCE per capita arrows point strongly to the right). In contrast, the second component (Dim2, accounting for 31.0% of the variance) is most strongly influenced by HDI (as indicated by the upward-pointing arrow). Cluster 3 (green squares) lies far to the right on Dim1, confirming its status as the ultra-high-income group, but spans a moderate range on Dim2, indicating HDI variation within that small set. Cluster 2 (blue triangles) occupies the central-right region, blending moderate income with above-average HDI, while Cluster 1 (orange circles) clusters to the left and lower on both dimensions, reflecting both lower per-capita economic output and lower HDI. The ellipses show these groups, with clear differences along Dim1 and more subtle differences along Dim2.

Table 1 shows the average values for HDI, GDP per capita, and PCE per capita across clusters. The results indicate that Cluster 1 has lower HDI and GDP per capita than Cluster 2, while PCE per capita appears relatively close across these two clusters. This pattern should be interpreted cautiously, as per-capita consumption may reflect external transfers, aid, remittances, public support mechanisms, or differences in national accounting structures rather than household welfare alone. Cluster 3 records the highest GDP and PCE per capita, reflecting a distinct ultra-high-income profile. Therefore, Table 1 should be read as a comparative profile of the dataset rather than as a direct welfare ranking.

Table 1: Cluster Summary

Cluster	Avg. HDI	GDP per Capita	PCE per Capita
1	0.559	31,669	53,731
2	0.846	62,092	57,970
3	0.895	1,050,176	1,153,811

3.5. Countries in Each Cluster

Broadly speaking, the first cluster generally includes countries where human development, along with GDP per capita and PCE per capita, remains quite low. Here, opportunities for health, education, and the economy may be quite limited. Policymakers are likely to emphasize infrastructure projects and policies to help develop human capital and reduce poverty.

Table 2: Cluster 1

Afghanistan	Angola	Bangladesh	Benin	Burkina Faso	Burundi
Cabo Verde	Cambodia	Cameroon	Chad	Comoros	Côte d'Ivoire
Djibouti	El Salvador	Equatorial Guinea	Ethiopia	Gambia	Ghana
Guatemala	Guinea	Guinea-Bissau	Haiti	Honduras	India
Kenya	Lesotho	Madagascar	Mali	Mauritania	Mozambique
Namibia	Nepal	Niger	Pakistan	Rwanda	Senegal
Sierra Leone	Somalia	Sudan	Timor-Leste	Togo	Uganda
Zambia	Zimbabwe				

The second cluster includes countries with moderate development; their economic indicators generally indicate a reasonable balance. The HDI, GDP per capita, and PCE per capita are stable. These countries appear to have the potential to move into higher development groups through sustainable development and significant institutional adjustments.

Table 3: Cluster 2

Albania	Algeria	Argentina	Armenia	Australia	Austria
Azerbaijan	Bahamas	Bahrain	Belarus	Belgium	Belize
Bosnia & Herz.	Botswana	Brazil	Bulgaria	Canada	Chile
China	Colombia	Costa Rica	Croatia	Cyprus	Czechia
Denmark	Dominican Rep.	Ecuador	Egypt	Estonia	Finland
France	Gabon	Georgia	Germany	Greece	Hungary
Indonesia	Ireland	Israel	Italy	Japan	Kazakhstan
Latvia	Libya	Lithuania	Malaysia	Maldives	Malta
Marshall Is.	Mauritius	Mexico	Mongolia	Montenegro	Morocco
Netherlands	New Zealand	Nicaragua	Norway	Panama	Paraguay
Peru	Philippines	Poland	Portugal	Romania	Russian Fed.
Serbia	Singapore	Slovenia	Spain	Sri Lanka	Sweden
Switzerland	Thailand	Tunisia	Türkiye	Ukraine	United King.
Uruguay	Uzbekistan	Vietnam			

Ultimately, a cluster of countries exhibits high human development and significant economic prosperity. GDP per capita and PCE per capita tend to be significantly high. Policies in these countries tend to aim to maintain or even improve conditions, with a greater focus on innovation, sustainability, and social equity initiatives. Additionally, these countries are distinguished from other groups by their high GDP and small population sizes. This specific situation contributes to very high per-capita indicators.

Table 4: Cluster 3

Brunei Darussalam	Iceland	Luxembourg	Seychelles

3.6. Software and Tools

The analysis was conducted in R (version 4.3.5) using the dplyr, cluster, factoextra, ggplot2, and bibliometrix packages.

Bibliometric Analysis: Thematic and conceptual structures were extracted from the WoS database using the biblioshiny() interface and biblioNetwork(), thematicMap(), and conceptualStructure() functions.

3.7. Integration with Bibliometric Results

The clustering results are interpreted alongside the bibliometric findings, where “developing countries” and “institutional quality” appear as two main research topics. The three clusters reflect income-based development differences, while the institutional dimension helps

contextualize why similar economic profiles may produce different human-development outcomes. This shows how important it is to look at things from different perspectives.

4. Results and Discussions

According to the study conducted in three clusters, economic indicators alone cannot adequately determine development levels. The transformation of income into human well-being can be facilitated or hindered by the quality of governance systems, social justice and institutions. This classification supports the claim made by Sušnik & van der Zaag (2017) that human development should be viewed from various perspectives, focusing on institutional and structural elements that go beyond simple economic data.

Countries in Cluster 3 exhibit exceptionally high GDP per capita, high PCE per capita, and high HDI. These nations typically benefit from robust institutions, advanced social frameworks, and inclusive economic models. The combination of high income, spending, and human development points to a well-developed system where governance, innovation, and sustainability converge. A notable aspect of this cluster is the small population size of the included countries (Brunei Darussalam, Iceland, Luxembourg, and Seychelles), which permits very high per capita income levels that would be difficult to achieve in larger economies. The effects of a small population combined with concentrated wealth enable these countries to attain remarkably high economic indicators while sustaining robust welfare and governance systems. The influence of population size may also help clarify why these countries are categorized separately in this analysis.

However, this cluster faces potential future challenges. High consumption can cause environmental stress, and underlying income inequality may persist. Thus, policymakers in these nations need to pivot their focus from mere growth towards sustainability by investing in:

- Green infrastructure,
- Inclusive innovation policies,
- Long-term social equity programs.

These insights align with the warnings presented by Nguyen & Dinh Su (2021), which state that institutional integrity must also address environmental externalities. Human and economic development should be backed by strategies that foster resilience and ecological sustainability.

Cluster 2 – Moderate Development with Potential for Growth

Cluster 2 includes countries with moderate economic and human development metrics. Although their income and consumption levels are not among the highest, these countries maintain a relatively balanced GDP–PCE ratio and a higher HDI compared to Cluster 1, suggesting that institutional context may help explain differences in development outcomes. These nations are on a growth trajectory, and with effective policy reforms and inclusive governance, they stand a chance of advancing to high development status (Cluster 3).

This perspective is consistent with the view expressed by Kamalu & Wan Ibrahim (2022) that institutional quality significantly affects HDI over time, especially when supported

by strong governance and anti-corruption initiatives. Policy recommendations for the cluster with these characteristics can include increasing public sector transparency, expanding access to health care and education, and maintaining regional equity for underrepresented populations. Despite their moderate level, the cluster has a fairly broad scope and relatively high HDI data. It highlights the complexity of development and the shortcomings of assessments that only consider GDP.

Cluster 1 – Low HDI and Economic Indicators

Both human development and economic performance, as indicated by GDP and PCE per capita, are low in the nations that make up this cluster. The relatively close PCE averages between Clusters 1 and 2 should be interpreted cautiously, because consumption patterns may be shaped by remittances, aid, public transfers, or data classification differences. From a policy perspective, this cluster emphasizes the urgency of investing in healthcare, education, basic infrastructure, and institutional capacity.

Economic growth or aid may not produce better results for human development if there are weak institutions in place to distribute resources efficiently. This observation aligns with the views of Stylianou et al. (2025), who contend that weak governance and a lack of institutional fairness exacerbate inequality, even when consumption improves. Therefore, institutional reform—rather than just economic stimulus—is vital for achieving sustainable development in these countries.

4.1. Hypothesis Evaluation Summary

- H1a and H1b received weak directional support because the observed association between GDP/PCE and HDI was positive but limited.
- H1c was supported because distinct and interpretable clusters formed.

These results show that economic factors are associated with human development, but they do not fully determine it. This makes strong institutions and inclusive policies even more important.

5. Conclusion and Policy Implications

This research aims to examine the relationship between GDP per capita, PCE per capita, and Human Development Index (HDI) from different perspectives. By examining the literature in depth with the help of bibliometric analysis, correlation assessment, and clustering methods, three separate country clusters are created that are separated according to socioeconomic characteristics. According to the results of the research, high income and expenditure levels are associated with advanced human development.

However, there is a limited connection between HDI and economic indicators. It is obvious that multifaceted strategies beyond pure economic growth should be developed in order to achieve human development. Furthermore, it's interesting to note that GDP per capita varies greatly between underdeveloped and medium-developed nations, but per capita spending rates vary very little. Human development outcomes vary across nations with similar income levels, which highlights the significance of social and institutional factors.

As a result of the cluster analysis, three basic country typologies emerge:

- Cluster 1: Countries with low human development index and economic indicators that require investment in education, health, and infrastructure.
- Cluster 2: Medium-level developed countries with relatively higher HDI and high potential for development through inclusive policy reforms.
- Cluster 3: Economically developed countries with high human development index that need to prioritize sustainability, innovation and social equality.

The study's findings reveal that income alone cannot guarantee better human development. Effective governance, equitable distribution of resources, and institutional accountability help translate economic achievements into broader societal benefits. Since general solutions are insufficient, policymakers should develop country-specific policies tailored to the identified development cluster.

According to the bibliometric analysis, an emerging literature pattern focused on economic development and institutional quality but divided into sub-structures has been identified. Future research can be developed and policy decisions can be guided by bridging this academic gap using interdisciplinary approaches and cutting-edge methods such as machine learning and spatial analysis.

5.1. Limitations and Future Research

This study's cross-sectional design and reliance on data from a single year (2023) limit its generalizability over time. Future research should incorporate longitudinal data and explore alternative clustering techniques (e.g., hierarchical clustering, DBSCAN). Moreover, integrating additional governance indicators such as corruption perception or voice and accountability indices could yield a more comprehensive model of human development.

Contribution Rate Statement

All stages of the study were carried out by the sole author.

Conflict of Interest Statement

The author declares no conflict of interest regarding this study.

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