

Government Spending and Club Convergence in the Developing Countries

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Abstract

Understanding whether developing countries are converging toward similar income levels remains a central issue in regional development, given persistent disparities in fiscal capacity, institutional quality and structural transformation. While the convergence literature has identified convergence clubs, few studies have examined the role of fiscal policy in shaping club membership across heterogeneous developing economies. This study investigates convergence club patterns and the role of government spending in influencing club formation in 44 developing countries from 1990 to 2023. This study applies log-t regression to identify convergence clubs and uses multinomial logit regression to analyze the determinants of club membership. The results identify six convergence clubs and one divergence club, confirming heterogeneous long-run income dynamics among developing countries. Clubs 1 and 2 have relatively stronger and more stable economic performance, whereas Clubs 5 and 6 show lower income levels and slower convergence. The findings show that government spending significantly influences membership in convergence clubs, although its effects vary across groups. In lower-income clubs, higher government spending reduces the likelihood that countries remain trapped in lower-convergence paths, indicating that productive fiscal policy can accelerate structural transformation. The subperiod analysis further indicates some temporal heterogeneity in the fiscal policy-convergence relationship, particularly in the later subperiods. Population growth tends to slow convergence, while trade openness supports convergence through greater market integration. In contrast, the effects of foreign direct investment (FDI) remain mixed. These findings highlight the importance of fiscal efficiency and institutional capacity in promoting sustainable income convergence among developing countries.

Keywords: Club Convergence, Developing Countries, Economic Convergence, Fiscal Policy, Government Spending.

Introduction

Income inequality remains one of the most persistent challenges facing developing countries, particularly across Asia, Africa, Central America and Latin America. Many developing economies continue to experience uneven income distribution and divergent development trajectories. These disparities are shaped by differences in institutional capacity, fiscal policy effectiveness, structural transformation and integration into the global economy. This issue has become even more relevant in recent years, as globalization, demographic pressures and fiscal constraints have widened development gaps across regions (1, 2). The debate over whether poorer economies can catch up with richer ones has long been central to growth economics. The neoclassical growth model posits β -convergence, which states that economies with lower initial income levels tend to grow faster than wealthier economies, thereby reducing income disparities over time (3). Under this

framework, countries are expected to move toward a common steady-state equilibrium. Several studies have shown that countries may form multiple convergence groups or “clubs” rather than a single equilibrium, reflecting differences in structural characteristics, institutional quality and economic policy. To capture this heterogeneity, the club convergence framework allows for transitional heterogeneity and time-varying individual effects (4). The Phillips and Sul approach identifies groups of countries that share similar long-run growth paths, making it particularly relevant for developing economies with structural and institutional differences. Empirical evidence regarding club convergence supports this perspective, showing multiple convergence clubs rather than a single global equilibrium across many groups of countries (5-7). These findings suggest that income convergence is heterogeneous across countries, providing a basis

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for examining the factors that determine countries' membership in different convergence clubs. Among the factors influencing convergence, government spending is conceptualized in this study as a fiscal instrument that can affect countries' capacity to improve productivity and achieve income convergence. According to endogenous growth theory, productive public expenditure can affect long-run convergence through its effects on infrastructure, human capital and institutional capacity (8). Public investment in infrastructure reduces transaction costs and improves market connectivity, while spending on education and health strengthens human capital formation and labor productivity. These mechanisms can enhance productive capacity and facilitate structural transformation, particularly in lower-income economies. Empirical evidence supports this view, suggesting that public spending can foster inclusive growth and reduce regional disparities (9, 10).

However, the effect of government expenditure on growth remains highly conditional on institutional quality, fiscal discipline and governance efficiency. Fiscal expansion under weak institutional conditions may fail to support economic upgrading and may even reinforce divergence (11, 12). Thus, the effect of government spending on convergence depends on how effectively public resources are allocated and implemented. Productive public spending may accelerate structural transformation and support upward mobility into higher-income convergence clubs. In contrast, weak governance, fiscal inefficiency and poor expenditure composition may reinforce persistent divergence or low-income traps (13, 14). Therefore, government spending can operate through two opposing mechanisms: efficient and productive expenditure can accelerate convergence, while inefficient, poorly managed spending may hinder convergence and reinforce lower-income clubs. These mechanisms suggest that government spending may influence membership in convergence clubs by affecting productive capacity, human capital and structural transformation, thereby increasing the likelihood that countries move toward higher-income convergence clubs. Beyond government spending, convergence club membership may also be determined by other structural and external economic factors. In particular, foreign direct investment, population

growth and trade openness can influence countries' productivity, capital accumulation, structural transformation and integration into global markets, thereby affecting their long-run convergence trajectories (15, 16).

Although the literature on economic convergence has expanded considerably, several important gaps remain. First, evidence on convergence across heterogeneous developing economies remains limited, as previous studies have focused predominantly on developed countries. Second, club convergence studies have largely focused on identifying clubs rather than explaining their determinants. Third, the effect of government spending on convergence dynamics remains underexplored. Existing fiscal studies have largely focused on the direct relationship between government spending and economic growth, poverty, or human development (17-19), rather than on its role in influencing long-run convergence. Recent evidence suggests that the effects of government spending on economic performance are heterogeneous and depend on fiscal structures, expenditure efficiency and institutional conditions (20-23). This study addresses these gaps by integrating government spending into the club convergence framework to explain why countries follow different convergence paths.

This study contributes to the literature in three important ways. First, it extends the evidence on convergence by identifying heterogeneous income convergence clubs among 44 developing countries, rather than assuming a single convergence path. Second, it advances the club convergence literature by investigating the determinants of membership in convergence clubs using multinomial logit regression. Third, this study provides empirical evidence on the role of government spending in shaping club formation, offering policy-relevant insights into how fiscal policy can support long-run income convergence in developing countries. Furthermore, the study examines whether the relationship between government spending and convergence varies across economic periods, providing evidence of temporal heterogeneity in the fiscal policy-convergence relationship.

Based on this background, this study aims to:

- (a) identify convergence clubs among 44 developing countries during 1990–2023 using the Phillips and Sul log-t regression approach;

- (b) examine the determinants of convergence club membership using multinomial logit regression;
- (c) assess the role of government spending in shaping countries' membership in different income convergence clubs; and
- (d) examine whether the relationship between government spending and convergence club membership varies across different economic subperiods during 1990–2023.

Methodology

Research Design

This study employs a quantitative research design to examine patterns of income convergence and the role of government spending in shaping convergence clubs among developing countries. The research design consists of two main analytical stages. In the first stage, the study applies the Phillips and Sul (4) log-t regression approach to identify whether global income convergence exists and to detect the presence of convergence clubs. This method is particularly appropriate because it accommodates heterogeneity in growth dynamics and allows countries to converge toward multiple steady states rather than assuming a single common equilibrium. Through this approach, the study classifies countries into distinct convergence clubs based on similarities in their relative transition paths.

In the second stage, the study employs multinomial logit regression to analyze the determinants of membership in convergence clubs. This approach is used to estimate how government spending and other structural variables influence the probability of countries belonging to a particular convergence club. Since club membership is a categorical outcome with multiple possible groups, multinomial logit provides an appropriate framework for capturing the heterogeneous effects of explanatory variables across different levels of income convergence.

The independent variables in this study consist of government spending as the main explanatory variable, along with foreign direct investment (FDI), population growth and trade openness as control variables. These variables are selected for their theoretical relevance to explaining economic growth and convergence dynamics. Government spending reflects fiscal capacity and public investment; FDI captures external capital inflows

and technology transfer; population growth represents demographic pressure on economic resources; and trade openness measures the degree of integration into the global economy.

Overall, this research design integrates convergence analysis and probability modeling to provide a comprehensive understanding of both the existence of convergence clubs and the structural factors influencing their formation.

Data and Variables

This study employs balanced panel data for 44 developing countries over the period 1990–2023, yielding 1,496 country-year observations. The sample comprises countries classified as developing economies by the United Nations Department of Economic and Social Affairs (UN-DESA) in the World Economic Situation and Prospects (WESP). The countries were selected based on their classification as developing economies and the availability, consistency and completeness of data for all variables included in the analysis. The UN DESA/WESP classification provides a consistent institutional basis for defining the developing-country sample. The study uses secondary data obtained from the World Development Indicators (WDI) database published by the World Bank, which provides internationally comparable macroeconomic indicators and is widely used in empirical growth and convergence studies. The long observation period allows this study to capture long-run economic dynamics, structural changes and fiscal policy behavior across developing countries.

The dependent variable in this study is GDP per capita, measured in constant U.S. dollars and transformed into its natural logarithm ($\ln \text{GDPpc}$). The logarithmic transformation is used to reduce heteroscedasticity, normalize the data distribution and improve coefficient interpretation. GDP per capita is the primary indicator of economic performance and welfare and is commonly used in convergence studies to examine income dynamics across countries.

The main explanatory variable is government spending (GOV), measured as general government final consumption expenditure as a percentage of GDP. This variable reflects the scale of fiscal intervention in the economy and captures the role of public expenditure in supporting economic activities, infrastructure development, human capital investment and institutional strengthening.

In the context of this study, government spending is expected to influence convergence dynamics by affecting productivity and structural transformation.

To control for other important determinants of convergence, this study includes three additional variables. First, foreign direct investment (FDI) is measured as net inflows as a percentage of GDP. FDI represents external capital inflows that may enhance productivity through technology transfer, capital accumulation and knowledge spillovers. Second, population growth (POP) is measured as the annual percentage growth of the total population. This variable captures demographic pressure, labor force expansion and potential dilution effects on capital accumulation. Third, trade openness (TO) is measured as the sum of exports and imports as a percentage of GDP,

reflecting the degree of economic integration into the global market.

These variables are selected based on their strong theoretical and empirical relevance to the economic growth and convergence literature. Government spending represents fiscal policy capacity, FDI captures international capital and technological integration, population growth reflects demographic conditions and trade openness measures external market exposure. Together, these variables provide a comprehensive framework for understanding the structural determinants of convergence club formation among developing countries.

Table 1 presents the operational definitions, measurement units and data sources of all variables used in this study.

Table 1: Operational Definition of Research Variables

Variable	Symbol	Operational Definition	Unit of Measurement	Expected Effect	References
GDP per Capita	lnGDPpc	Gross Domestic Product per capita adjusted to constant prices and transformed into natural logarithm form to measure income level and economic performance	Natural log (constant US\$)	Dependent Variable	(24)
Government Spending	GOV	General government final consumption expenditure representing public expenditure in goods and services as a share of GDP	% of GDP	(+/-)	(24)
Foreign Direct Investment	FDI	Net inflows of foreign direct investment as a percentage of GDP, reflecting external capital inflows and technology transfer	% of GDP	(+/-)	(24)
Population Growth	POP	Annual percentage growth of the total population, capturing demographic pressure and labor force expansion	Annual %	(-)	(24)
Trade Openness	TO	Total exports and imports of goods and services relative to GDP, indicating economic integration with international markets	% of GDP	(+)	(24)

Log-t Regression

To analyze club convergence, this study applies the empirical framework of the log-t convergence test (4). This method is employed to examine whether

cross-country income dispersion declines over time. The first step is to calculate the relative transition parameter, denoted by h_{it} and the cross-sectional variance ratio H_t , as specified in Equation [1].

$$H_t = \frac{1}{N} \sum_{i=1}^N (h_{it} - 1)^2 \quad [1]$$

Where, h_{it} represents the relative transition component for country i at time t .

Subsequently, convergence is tested using the log-t regression method developed by Phillips and Sul, as specified in Equation [2].

$$\log\left(\frac{H_t}{H_t}\right) - 2\log(\log t) = a + b \log t + \epsilon_t \quad [2]$$

Where, H_t denotes the cross-sectional variance. If H_t approaches zero over time, convergence occurs. The coefficient b is the main parameter of interest in evaluating the convergence process.

The null hypothesis of the log-t test states that convergence exists among countries. The null hypothesis is rejected when the t-statistic is less than -1.65 . Therefore, if the t-statistic is < -1.65 , the null hypothesis of convergence is rejected. Conversely, if the t-statistic is ≥ -1.65 , the null hypothesis cannot be rejected, indicating evidence of convergence among countries.

To further identify patterns of club convergence or

divergence within a region, we use the Relative Transition Path analysis (25), which measures a region's position relative to the sample average of the observed variable over time. In club convergence analysis, RTP is useful for examining convergence dynamics and identifying the formation of convergence clubs. The relative transition parameter is defined in Equation [3].

$$h_{it} = \frac{(x_{it})}{\left(\frac{1}{N} \sum_{i=1}^N x_{it}\right)} \quad [3]$$

Where, h_{it} relative transition path of country i at time t , x_{it} is the GDP per capita of the country i at time t , $\frac{1}{N} \sum_{i=1}^N x_{it}$.

The average GDP per capita of all countries at the time t and N total number of countries in the sample. If $h_{it} = 1$, then the country i has the same GDP per capita level as the sample average. If $h_{it} > 1$, the country is above the sample average. If $h_{it} < 1$ indicates that the country is below the average. Changes in h_{it} over time indicate the dynamics of convergence. When the value of h_{it} moves to close 1, the country tends to converge toward the sample average. Conversely, If h_{it} moves away from 1, divergence occurs.

Convergence Club Formation Determinants

The Club Convergence method has limitations because it cannot directly explain the factors influencing the formation of convergence clubs. To overcome this limitation, this study employs Multinomial Logit (MNL) regression to examine the factors affecting the probability of countries joining a particular convergence club. The multinomial logit model equation is specified in Equation [4].

$$P(Y_i = j) = \frac{\exp(x'_{i,t}\beta_j)}{\left(\sum_{k=1}^J \exp(x'_{i,t}\beta_k)\right)} \quad [4]$$

Where, Y_i : convergence club category of country i , j : specific convergence club category, J : total number of convergence clubs, $x_{i,t}$: vector of independent variables consisting of GDP per capita, government spending, foreign direct investment, population growth and trade openness and β'_j : vector of regression coefficients for category.

This analysis provides a more comprehensive understanding of the dynamics of per capita income club convergence among developing countries and the factors that influence the formation of such clubs. Furthermore, to examine whether the relationship between government spending and convergence club membership varies across different economic periods, the MNL model is re-estimated separately for four

subperiods: 1990–1998, 1999–2007, 2008–2015 and 2016–2023. This subperiod analysis provides additional evidence on the temporal heterogeneity of the fiscal policy–convergence relationship and assesses whether the estimated effects remain consistent across different periods.

Results

The initial analysis in this study tested whether there was global income convergence among the developing countries in the study sample. The test was conducted using the log-t regression. The results of the global convergence estimation are presented in Table 2 using the log-t regression.

The estimated coefficient for global club convergence using log-t regression is -0.5900, with a t-statistic of -27.5396, well below the critical value of -1.65, indicating that the null hypothesis of global club convergence is rejected. These results

indicate no evidence of a single common convergence path among developing countries in the study sample. This finding suggests that developing countries have different per capita income growth paths. These results also suggests that the assumption of identical steady-state conditions does not hold for the entire study sample. The next stage of the analysis involves identifying convergence clubs among countries that do not move toward a common equilibrium but instead form clubs with similar structural characteristics.

Table 2: Results of Global Club Convergence Estimation with Log-t Regression

Variable	Coefficient (log t)	Standard Error	t-statistic
GDP per Capita (ln)	-0.5900	0.0214	-27.5396

Note: Log-t test based on Phillips and Sul. The null hypothesis of convergence is rejected if the t-statistic is below -1.65.

The rejection of the global convergence hypothesis in Table 2 indicates that countries in the sample have different growth trajectories. Therefore, the

analysis continues by identifying convergence clubs to determine groups of countries with similar convergence characteristics, as shown in Table 3.

Table 3: Club Convergence Results

Club	Number of Countries	Member Countries	Coefficient (log t)	t-statistic
Club 1	8	Botswana, Brazil, China, Dominican Republic, Gabon, Mauritius, Mexico, Turkiye	0.4445	3.3298
Club 2	18	Algeria, Bangladesh, Belize, Bhutan, Colombia, Ecuador, Egypt, El Salvador, Ghana, Guatemala, India, Indonesia, Iran, Paraguay, Peru, Philippines, Thailand , Tonga	0.4862	5.5631
Club 3	4	Bolivia, Morocco, Nepal, Tunisia	0.0817	0.8382
Club 4	4	Honduras, Kenya, Pakistan, Tanzania	0.2039	3.1921
Club 5	4	Burkina Faso, Cameroon, Mauritania, Senegal	0.2228	2.8820
Club 6	4	Chad, Guinea-Bissau, Mali, Niger	0.2023	0.5740
Divergent Club	2	Gambia, Madagascar	-0.7867	-2.6430

Note: Club classification is based on the log-t regression approach of Phillips and Sul. The null hypothesis of convergence is rejected when the t-statistic is below -1.65. Thus, a group is considered convergent when the t-statistic is greater than or equal to -1.65.

Table 3 presents the results of the club convergence analysis using the log-t regression approach. The estimation results indicate the presence of six distinct convergence clubs and one group with no evidence of club convergence. Empirical evidence shows that all clubs (clubs 1-6) have positive log-t coefficients and t-statistics exceeding the critical value of -1.65, indicating evidence of convergence in each club. Club 2 is the largest group, comprising 18 countries, mostly from Asia, Central America and Latin America, including India, Indonesia, Thailand , Algeria and

Paraguay. This club shows the strongest convergence with a coefficient of 0.4862, the highest among the other clubs. Meanwhile, Club 1, comprising 8 countries such as Brazil, China, Mexico and Turkey, is moving along a relatively similar growth path at a faster rate, reflecting the characteristics of countries with relatively stable middle-income economies.

The groups of countries in Clubs 1 and 2 converge faster towards their respective steady states. In contrast, Clubs 3 and 6 show relatively low coefficients of 0.0817 and 0.2023, respectively, with

smaller t-statistics than those of the other clubs, indicating that countries in these groups exhibit slower, less statistically robust convergence. These countries include Bolivia, Morocco, Nepal, Tunisia, Chad, Guinea-Bissau, Mali and Niger.

Meanwhile, there are two divergent countries: Gambia and Madagascar, indicated by a negative coefficient of -0.7867 and a t-statistic below the critical threshold of -1.65. Both countries likely face serious structural problems, including extreme poverty, low economic activity and limited institutional capacity. Overall, the findings of this study indicate that not all countries follow the same convergence growth path; rather, they

develop distinct growth paths. Countries tend to converge more closely within groups that share similar structural and economic characteristics, such as economic conditions, fiscal capacity, demographic conditions and levels of integration with the global economy. The next step in the analysis is to visualize the development of the relative transition paths over time for each convergence club formed in the previous estimation. This analysis allows us to identify whether each club is moving toward the same steady state. Figure 1 visualizes the relative transition paths for each convergence club.

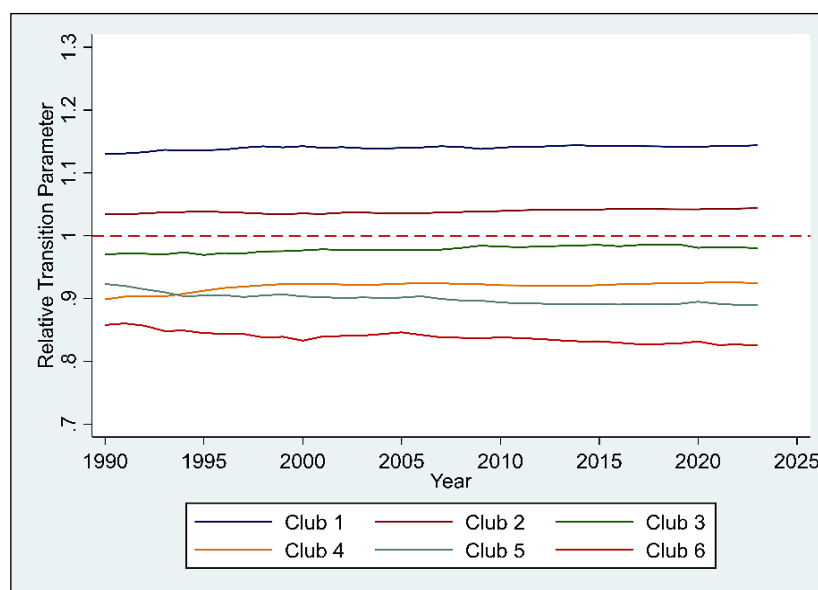


Figure 1: Transition Paths of Relative Income across Convergence Clubs

Figure 1 shows that countries within each club are gradually moving toward relatively equal income levels within their groups. Clubs 1 and 2 are above the average, reflecting higher income levels. Conversely, Clubs 3 and 4 are slightly below average, while Clubs 5 and 6, especially, Club 6 have the lowest income levels. The differences in trajectories between clubs indicate persistent inequality in per capita income, leading to

convergence within several groups rather than toward a single global equilibrium. The findings in Figure 1 indicate that convergence is not occurring globally, but rather within several groups with distinct characteristics. To strengthen this analysis, Figure 2 further presents a visualization of the dynamics of convergence between clubs over the study period.

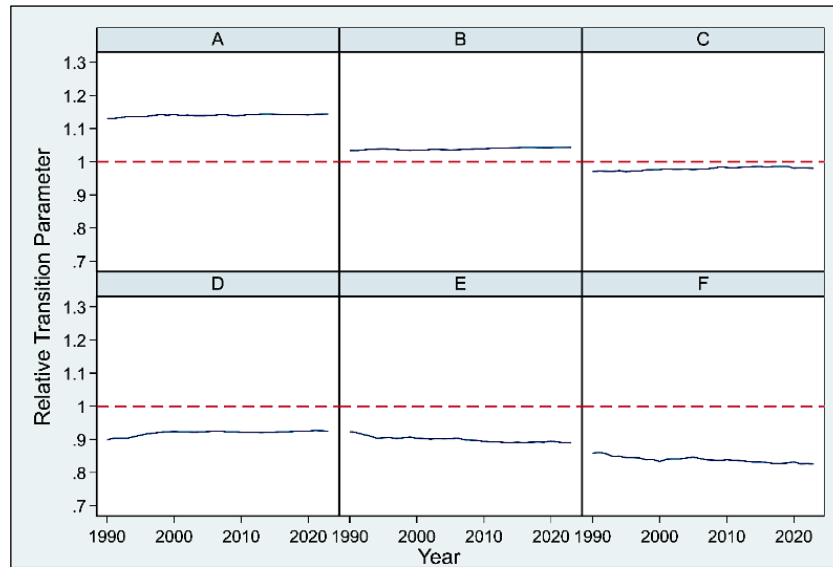


Figure 2: Within-Club Transition Dynamics of Relative Income.

(A) Club 1, (B) Club 2, (C) Club 3, (D) Club 4, (E) Club 5, (F) Club 6

Figure 2 shows that countries within each club tend to converge toward similar income levels. Clubs 1 and 2 have relatively higher incomes because their trajectories are above average. Conversely, Clubs 4, 5 and 6 are below average, indicating lower income levels. This convergence pattern indicates that convergence is not occurring evenly across all countries, but rather that several clusters with varying income levels are forming. In

Club 6, a country group still faces structural barriers to improving its performance. The differences in transition patterns across clubs suggest that the convergence process is influenced by each country's structural characteristics and economic policies, such as government spending. Therefore, further analysis is conducted to identify factors influencing country membership in each convergence club, as shown in Table 4.

Table 4: Determinants of Convergence Club Membership (Multinomial Logit)

Variables	Club 2	Club 3	Club 4	Club 5	Club 6
Government Spending	-0.121***	-0.024	-0.078***	0.070**	0.023
FDI	0.003	-0.023*	-0.022	-0.011	-0.001
Population Growth	0.033	-0.095	2.712***	3.596***	4.843***
Trade Openness	-0.002	-0.001	-0.016***	-0.032***	-0.057***
Constant	2.463***	0.455	-3.659***	-7.376***	-9.270***

Note: This table reports the multinomial logit results with Club 1 as the base category, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 4 shows the results of the analysis of factors influencing a country's entry into a particular convergence group, with Club 1 as the reference group. The main focus of this study is government expenditure as a key explanatory factor in cross-country convergence. The results indicate that government expenditure plays a significant role in determining a country's position within a convergence group. In Clubs 2 and 4, government expenditure has a significant negative effect. This result indicates that higher government spending reduces the likelihood that a country will remain in a lower-convergence club. To examine whether the relationship between fiscal policy and

convergence remains consistent over time, the analysis is extended by dividing the sample period into four economic subperiods: 1990–1998, 1999–2007, 2008–2015 and 2016–2023. These subperiods reflect differences in the global economic environment, including major financial crises, changes in globalization and trade, commodity price cycles and the COVID-19 shock. The convergence club classification is kept unchanged, while the multinomial logit model is re-estimated separately for each subperiod. The estimated coefficients for government spending across convergence clubs are reported in Table 5.

Table 5: Government Spending Coefficients by the Convergence Club and Across Different Economic Periods

Economic Subperiod	Club 2	Club 3	Club 4	Club 5	Club 6
1990–1998	-0.117***	0.003	-0.064	0.105**	-0.089*
1999–2007	-0.147***	-0.010	-0.060	0.069	0.057
2008–2015	-0.169***	-0.102*	-0.124*	0.040	0.437***
2016–2023	-0.087**	-0.017	-0.133*	0.256***	0.509***

Note: Club 1 is the base outcome. The coefficients represent the estimated effect of government spending on the relative likelihood of belonging to each convergence club compared with Club 1

The results in Table 5 indicate that the relationship between government spending and convergence club membership varies across economic subperiods, but the overall pattern remains relatively consistent. Government spending has a negative and statistically significant effect on Club 2 relative to Club 1 across all four periods, although the magnitude diminishes in the final period. For Clubs 3 and 4, the effects are generally negative but mostly not statistically significant. In contrast, the effect on Club 5 and Club 6 becomes increasingly positive in the later periods, particularly during 2016–2023. Overall, the results suggest some temporal heterogeneity in the fiscal policy–convergence relationship and provide additional evidence on its stability across different economic periods.

Discussion

The empirical findings reveal that government spending plays a significant role in shaping membership in convergence clubs among developing countries, although its effects vary substantially across income groups. In Clubs 2 and 4, government spending has a negative and statistically significant effect, indicating that higher public expenditure reduces the probability that countries remain in lower-convergence groups relative to the benchmark category. This finding suggests that fiscal policy can serve as a strategic instrument to accelerate economic upgrading and promote long-run convergence. Through investments in infrastructure, education, health and institutional strengthening, government spending enhances productive capacity and improves human development, thereby facilitating structural transformation and income catch-up. This result aligns with endogenous growth theory, which emphasizes the productive role of fiscal policy in stimulating long-run growth. Recent empirical evidence also supports this mechanism. Government spending can generate persistent long-run economic effects (16), while efficient

public expenditure can significantly improve human development outcomes, particularly in developing economies (19). Similarly, productive government spending can contribute to economic growth and poverty reduction, reinforcing the argument that fiscal policy can accelerate upward convergence (17).

The findings also indicate that the effectiveness of government spending depends not only on its magnitude but also on the quality of its allocation and fiscal management. Countries with stronger fiscal capacity and better governance systems are better able to channel public expenditure into productive sectors that generate long-term growth benefits. This finding supports the argument that the effectiveness of government spending is closely tied to institutional quality and policy efficiency. Public trust in the allocation of government spending influences economic behavior and fiscal legitimacy, suggesting that transparent and accountable public spending may improve economic outcomes (22). In addition, public spending decisions are often shaped by political and institutional environments, which can affect their developmental impact (23).

However, the results in Club 5 reveal a contrasting pattern, where government spending has a positive and significant effect on the probability of remaining in a lower-income convergence group. This suggests that larger government expenditure does not necessarily guarantee stronger economic performance. Instead, this finding may reflect inefficiency, fiscal leakage and misallocation of public resources. In countries with weak institutions, public spending may be directed toward unproductive sectors or consumed by administrative inefficiencies, thereby reducing its contribution to economic growth. The impact of government spending is highly heterogeneous and depends critically on fiscal structures, particularly taxation mechanisms (21). Similarly, the composition of local government spending matters significantly, as expenditure focused on social

services tends to yield stronger developmental outcomes than non-productive allocations (26). This reinforces the idea that the composition and efficiency of government expenditure are more important than its sheer size.

In Club 6, the effect of government spending is statistically insignificant, indicating that fiscal policy alone may not be sufficient to alter convergence dynamics in the lowest-performing economies. This result suggests that countries in the lowest convergence club face deeper structural barriers, including weak institutions, political instability, low human capital and limited economic diversification. This finding is consistent with previous evidence showing that government spending can be limited in its effectiveness in fragile economies when structural constraints dominate macroeconomic performance (13). Furthermore, the effectiveness of fiscal multipliers is highly state-dependent, implying that government spending may produce different outcomes depending on economic conditions and labor market rigidities (14). The subperiod analysis indicates some temporal heterogeneity in the government spending–convergence relationship. The negative and significant effect on Club 2 remains consistent across all four periods, while the effects on Clubs 5 and 6 become more positive in later periods. This suggests that the role of government spending may vary with changing economic conditions.

The control variables provide additional insights into the convergence process. Population growth has a strong positive effect on lower-convergence clubs, particularly Clubs 4, 5 and 6, indicating that countries with higher population growth are more likely to remain in lower-income groups. This result suggests that rapid population expansion can create significant pressure on public resources, labor markets and social infrastructure, making it more difficult for countries to improve per capita income and productivity. In developing economies with limited fiscal space, higher population growth may intensify development challenges and slow the catching-up process.

Trade openness, on the other hand, has a negative and significant effect on lower-income convergence clubs, implying that greater integration into international trade reduces the probability that countries remain in low-income groups. This finding suggests that international trade integra-

tion enhances productive efficiency, facilitates technology transfer and expands market access, thereby improving countries' competitiveness and accelerating convergence. Trade openness may also strengthen fiscal performance by broadening the tax base and increasing export revenues, thereby supporting productive public spending.

In contrast, the effect of foreign direct investment (FDI) remains relatively weak and inconsistent across convergence clubs. This suggests that FDI does not automatically generate uniform economic benefits across developing countries. While FDI can provide capital inflows, technological spillovers and managerial expertise, its effectiveness depends heavily on domestic absorptive capacity, institutional quality and industrial structure. In countries with weak institutions or low technological readiness, FDI may remain concentrated in extractive or enclave sectors without generating wider spillover effects for economic transformation.

The findings confirm that government spending is an important determinant of convergence club formation among developing countries. However, its effectiveness is highly contingent on the quality of expenditure, institutional capacity and structural economic conditions. Productive, efficient and well-targeted government spending can strengthen economic resilience, improve human capital and accelerate structural transformation, thereby increasing the likelihood that countries move toward higher-income convergence clubs. Conversely, inefficient and poorly managed fiscal expansion may reinforce persistent low-income traps. These findings imply that policymakers should focus not only on increasing public expenditure but also on improving spending efficiency, governance quality and fiscal sustainability to ensure that government spending effectively supports inclusive and sustainable long-run convergence.

Conclusion

This study aims to investigate patterns of club convergence and the role of government spending in shaping the formation of convergence clubs among 44 developing countries from 1990 to 2023. This study contributes to the literature by presenting evidence of heterogeneous income convergence among developing countries, identifying the determinants of membership in

convergence groups and demonstrating that the impact of government spending varies across convergence groups and economic periods. This study employs log-t and multinomial logit regression. The log-t regression is used to identify convergence club patterns, while the multinomial logit regression is used to examine the factors influencing the probability that countries join particular convergence clubs. The findings reveal six convergence clubs and one divergence group, indicating heterogeneous convergence dynamics among developing countries. Clubs 1 and 2 are predominantly composed of countries with relatively stronger and more stable economic performance, whereas Clubs 5 and 6 are characterized by lower income levels and slower convergence dynamics.

The multinomial logit estimation results indicate that government spending plays a significant role in determining membership in convergence clubs. In several lower-convergence clubs, higher government spending reduces the likelihood that countries will remain trapped in lower-income groups, suggesting that effective fiscal policy can support economic growth by investing in infrastructure, education, health and institutional development. Other explanatory variables also contribute to the convergence process. The subperiod analysis shows that the relationship between government spending and membership in convergence clubs varies over time. Government spending consistently has a negative and significant effect on Club 2, while its effects on Clubs 5 and 6 become more positive in later periods, particularly in 2016–2023. The analysis covers four periods: 1990–1998, the post-Cold War and early globalization period; 1999–2007, the pre-global financial crisis period; 2008–2015, the global financial crisis and recovery period; and 2016–2023, marked by slower global growth and the COVID-19 shock. These findings suggest some temporal heterogeneity in the fiscal policy–convergence relationship.

The findings imply that effective and productive government spending on infrastructure, education, health and institutional development can support long-run income convergence among developing countries. However, this study is limited by its reliance on aggregate government spending data and a relatively small sample of developing countries. Future research may examine specific

types of public expenditure, incorporate institutional quality and human capital variables and apply alternative econometric approaches to better understand convergence dynamics across countries.

Abbreviations

FDI: Foreign Direct Investment, GDP: Gross Domestic Product, GDPpc: Gross Domestic Product per Capita, GOV: Government Spending, lnGDPpc: Natural Logarithm of Gross Domestic Product per Capita, MNL: Multinomial Logit, POP: Population Growth, RTP: Relative Transition Path, TO: Trade Openness, WDI: World Development Indicators.

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Author Contributions

Yozi Aulia Rahman: Conceptualization, Methodology, Data Curation, Formal Analysis, Visualization, Writing - Original Draft Preparation, Fransiscus Xaverius Sugiyanto: Conceptualization, Methodology, Supervision, Validation, Writing -Review and Editing, Akhmad Syakir Kurnia: Conceptualization, Methodology, Supervision, Validation, Writing - Review and Editing.

Conflict of Interest

The authors confirm that there are no financial, personal, or professional relationships that could have influenced the research, analysis, or interpretation of the findings presented in this study.

Data Availability

The data supporting the findings of this study are publicly available from the World Bank's World Development Indicators database

Declaration of Artificial Intelligence (AI) Assistance

AI-assisted tools were used for language refinement and grammar checking, while data analysis and figure preparation were conducted by the authors using Stata. The authors reviewed all

outputs and remain fully responsible for the manuscript's content and conclusions.

Ethics Approval

None.

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