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Article

Research on the economic development level differences among economies under the RCEP framework

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Abstract: Cross-border economic cooperation plays a vital role in helping China overcome challenges posed by national borders and address regional economic imbalances. Given the significant heterogeneity of borders and the localized spatial constraints of border effects, this study examines the spatial patterns of economic changes among economies in the Regional Comprehensive Economic Partnership (RCEP). Using the Theil index, the study compares economic development disparities across RCEP member countries, while applying α-convergence and β-spatial convergence models to empirically explore economic development trends. The results reveal that the coefficient of variation in per capita GDP initially decreases and then increases, reaching its lowest point in 2019. This indicates a narrowing gap in per capita GDP, reflecting α-convergence and a more balanced distribution of economic development. Furthermore, absolute β-convergence is observed across 14 RCEP economies (excluding Myanmar), although spatial spillover effects are only significant at the aggregate level, with no spillover detected within subgroups. In conditional β-convergence, significant spatial effects are found in the overall and economically developed groups, while the economically underdeveloped group does not show such effects and is better explained by an ordinary panel model. Additionally, the study identifies that factors such as population growth rate, government public expenditure, fixed asset investment rate, and openness to trade have significant negative impacts on per capita GDP under the RCEP framework. These findings provide valuable insights into the dynamics of regional economic convergence within the RCEP and underscore both opportunities and challenges in achieving more balanced economic development.

Keywords: RCEP economies; Theil index; spatial convergence; α-convergence; β-convergence; Moran's index

1. Introduction

The Regional Comprehensive Economic Partnership (RCEP) is an economic agreement between the Association of Southeast Asian Nations (ASEAN) and six other countries that have existing free trade agreements, namely Australia, China, Japan, South Korea, and New Zealand. The agreement aims to foster a comprehensive, high-quality, and mutually beneficial economic partnership. Officially proposed at the East Asia Summit in 2012, RCEP's primary objective is to achieve balanced economic growth and deepen integration among the participating economies, extending beyond the scope of traditional free trade agreements within ASEAN. By promoting closer cooperation in areas such as trade, investment, services, and e-commerce, RCEP seeks to enhance regional economic coordination and create a more unified economic space.

In the context of significant economic disparities among countries and regions globally, the Regional Comprehensive Economic Partnership (RCEP) plays a pivotal role in advancing regional economic integration. However, the process of global economic integration faces substantial challenges and cannot be realized in the short term. Throughout the ten years of RCEP negotiations, the regional economic system has undergone structural changes and imbalances (Yin et al.) [1]. While regional economic integration strengthens the interconnectedness of member countries' interests and contributes to overall regional development, it also positively influences global economic integration. Nonetheless, regional disparities persist throughout the integration process, and these disparities are a fundamental condition for the success of regional economic integration. It is only when countries exhibit similar economic structures and demonstrate convergence in per capita income that regional disparities can be mitigated, thereby fostering cooperation among nations. Once a regional integration framework is established, if integration serves to reduce internal development gaps, it will reinforce the foundation for further integration and promote deeper cooperation. Conversely, if integration exacerbates disparities and intensifies regional imbalances, it may undermine the very basis of integration.

Therefore, identifying countries with similar economic development trajectories or those that are catching up with one another is a critical step in advancing regional economic cooperation, and this process will be essential for the eventual formation of a monetary union. Recent research by Affizzah et al. [2] suggests that due to large output gaps between RCEP economies, complete aggregate convergence has not been achieved. However, the study highlights the emergence of "club convergence, indicating that although convergence among RCEP economies is weak, there is potential for gradual alignment towards similar economic growth trajectories. This implies the possibility of stronger economic cooperation and deeper economic integration among RCEP economies, both currently and in the future.

RCEP plays a central role in promoting regional economic integration, particularly in fostering economic convergence among its member states. Several studies have identified varying degrees of convergence among RCEP members in areas such as industry, income, and energy intensity. Zheng [3] demonstrates that following the implementation of RCEP, industrial integration among member countries deepened, while trade and investment cooperation within the region significantly increased, particularly with regard to high-quality collaboration within industrial chains and the enhancement of resilience. Rahman et al. [4], using a nonlinear time-varying coefficient model, analyzed sectoral value-added convergence and revealed a tiered convergence pattern, with developed countries (such as Japan, Singapore, and South Korea) and emerging economies (such as China, Malaysia, and Thailand) forming distinct economic "clubs". This indicates the potential for gradual convergence within the RCEP region. Tepa and Pilihan [5] further noted that while income convergence among RCEP members is slow, the region exhibits a convergence pattern characterized by seven economic "clubs", suggesting that member countries are gradually aligning toward similar growth paths. Xia and Gulinaer [6] focused on the convergence of energy intensity between China and other RCEP members, finding that market reforms and increased foreign direct investment have facilitated convergence in energy intensity. Notably, the energy intensity gap between China and developed countries has narrowed, while the gap with developing countries has widened. In conclusion, RCEP provides a platform that fosters economic convergence among its member states. Through enhanced industrial cooperation and strengthened economic ties, RCEP has contributed to regional economic integration and relative convergence. Despite significant economic disparities among member countries, the implementation of RCEP has established a robust foundation for deeper regional integration and demonstrated resilience and adaptability. This paper seeks to analyze the evolving trends in the economic development disparities among RCEP economies and, based on this analysis, examine the feasibility and strategic pathways for further cooperation within the RCEP framework.

This paper attempts to analyze the trends in economic development disparities among RCEP economies and, based on this, examines the feasibility and path selection of RCEP cooperation.

2. Comparison of economic development levels among RCEP economies: Theil index

Commonly used indicators for studying regional disparities include the Gini coefficient, the coefficient of variation, and the Theil index. Among these, the Theil index stands out due to its ability to measure income disparities across different economies, as well as variations over time, between regions, and across different levels of analysis. Its main advantage is its decomposability, making it a popular choice in empirical research. Typically, a smaller Theil index value signifies smaller differences between individuals and narrower development gaps between regions, while a larger Theil index indicates more pronounced regional development disparities. In this study, to further examine the economic development gaps among RCEP economies [7], the Theil index is selected as the primary tool for analysis, with the following calculation formula:

$$\mathrm{T} = \sum_{i=1}^{I} \frac{P_i}{P} \mathrm{In}(\frac{P_i/P}{Y_i/Y})$$

where P represents the total GDP income of the region I. P_i represents the total GDP income of all I th regions; Y_i represents the total population of the region I. Y represents the total population of all I regions, and T represents the Theil index, which calculates the per capita GDP disparity between regions.

Comparison of Theil index for economic development differences among RCEP economies

Using the Theil index to assess regional development disparities, this study examines the economic differences among RCEP economies from 2001 to 2022, based on GDP and population data. Leveraging the decomposability of the Theil index, RCEP economies are classified into three tiers according to their per capita GDP (in USD).

The first tier comprises developed economies, including Singapore, Brunei, Japan, Australia, New Zealand, and South Korea, all of which have a per capita GDP exceeding USD 10,000, aligning with the standards of developed nations.

The second tier consists of less-developed economies, such as China, Thailand, and Malaysia, with an average per capita GDP ranging from USD 3000 to 10,000.

The third tier includes underdeveloped economies, including Indonesia, Vietnam, the Philippines, Laos, Myanmar, and Cambodia, all of which have per capita income below USD 3000. By categorizing RCEP economies in this manner, the economic development disparities among these three groups can be analyzed, as illustrated in the following table.

Table 1. Theil index of economic development differences among RCEP economies (2001–2022).

Year	Total Theil Index	Interregional Difference Index	Intra-regional Difference	Total Difference
2001	0.54476	0.41931694	0.025242699	0.444559639
2002	0.507745	0.386286	0.025187	0.411472
2003	0.497678	0.377522	0.022152	0.399674
2004	0.485148	0.368962	0.021023	0.389984
2005	0.448865	0.339945	0.018333	0.358278
2006	0.393122	0.292582	0.017685	0.310267
2007	0.339337	0.251386	0.015024	0.26641
2008	0.30394	0.223217	0.011914	0.235131
2009	0.282625	0.208474	0.009834	0.218308
2010	0.261633	0.189875	0.010591	0.200466
2011	0.240126	0.175256	0.010446	0.185702
2012	0.223234	0.164957	0.009656	0.174613
2013	0.182044	0.139728	0.008242	0.147969
2014	0.161428	0.129363	0.006762	0.146225
2015	0.14232	0.118901	0.006505	0.125406
2016	0.146312	0.120949	0.006172	0.127121
2017	0.136971	0.115046	0.006336	0.121383
2018	0.128783	0.11236	0.00621	0.11857
2019	0.122215	0.106257	0.005837	0.112094
2020	0.119123	0.106773	0.00548	0.112253
2021	0.109581	0.102965	0.008717	0.111682
2022	0.098784	0.089949	0.011208	0.101156

Data source: Data from RCEP economies are obtained from the World Bank. The results are calculated by the author.

From 2001 to 2022, interregional economic disparities steadily declined, signaling a narrowing of the economic gap between the three groups of economies—developed, less-developed, and underdeveloped (**Table 1**). In terms of intra-regional economic disparities, the trends can be divided into four phases. During the first phase (2001–2009), intra-regional disparities within the three groups decreased, indicating more balanced economic development within each group. In the second phase (2010–2016), the decline in intra-regional disparities continued, but at a slower pace. The third phase (2017–2021) saw a more significant reduction, likely due to the strengthening of regional cooperation under RCEP, which contributed to greater economic convergence within each group. However, in the fourth phase (2021–2022), intra-regional disparities slightly increased, possibly due to the economic disruptions caused by the COVID-19 pandemic, which affected key variables such as GDP, per capita income, and population growth. Overall, total regional disparities showed a steady decline, reflecting a gradual narrowing of the economic gap between regions, suggesting that regional integration mechanisms like RCEP have been effective in reducing economic inequalities within the Asia-Pacific region.

3. Spatial convergence of economic development among RCEP economies

3.1. Spatial autocorrelation analysis

Spatial autocorrelation analysis examines whether the observed values of a variable in one region are influenced by the values of the same variable in neighboring regions. It can be approached from two distinct perspectives:

Global autocorrelation involves analyzing the overall pattern across the entire area, typically addressing questions such as whether the pattern exhibits clustering or dispersion. Local autocorrelation, on the other hand, focuses on identifying specific clusters or "hotspots" within the global pattern. These localized clusters may either contribute to the overall clustering trend or represent areas of heterogeneity that deviate from the broader regional pattern [8]. This analytical approach is crucial for understanding the spatial dependencies and potential clustering of economic development trends among RCEP economies, shedding light on how regional economic behaviors are interconnected across neighboring countries.

3.2. Global spatial autocorrelation analysis

Moran [9] introduced the first measure of spatial autocorrelation to analyze random phenomena distributed across two or more dimensions. This method quantifies the correlation between neighboring observations within a spatial pattern (Boots and Getis) [10]. The calculation is based on dividing the spatial covariance by the total variation, providing a metric for assessing the degree of spatial dependence within a given area. The formula for the Moran's *I* index is as follows:

$$\text{Moran's } I = \frac{\sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}(Y_i - \overline{Y})(Y_j - \overline{Y})}{S^2 \sum_{i=1}^{n}\sum_{j=1}^{n} W_{ij}}$$

In this formula, n represents the number of regions with observed values, Y_i and Y_j represent the attribute values of spatial units i and j, $\overline{Y}$ is the average of all observed values, and W_{ij} is an element of the spatial weight matrix that represents the spatial proximity or connection strength between geographical units i and j.

The resulting value typically ranges from −1 to 1. A value close to +1 indicates positive spatial autocorrelation, meaning that similar values tend to cluster together in space. A value close to −1 suggests negative spatial autocorrelation, where similar values are spatially dispersed. A value of 0 indicates a random distribution, with no significant spatial autocorrelation present.

3.3. Local spatial autocorrelation analysis

The Local Moran's *I* index is a metric employed to assess spatial autocorrelation between individual geographic units and their neighboring units. It is particularly useful for identifying spatial clusters, such as hotspots and cold spots, as well as spatial outliers, which refer to regions that exhibit significant deviations from their surrounding areas.

The formula for Local Moran's *I* is as follows:

$$I_i = \frac{(x_i - \overline{x})}{S^2} \sum_i W_{ij} \, (x_i - \overline{x})$$

In this formula, I_i represents the attribute value of the spatial unit, x_i reflecting the similarity between that unit and its neighboring units i; $\overline{x}$ is the average of all observed values; S^2 is the variance of all observed values; and W_{ij} is an element of the spatial weight matrix, representing the spatial proximity or connection strength between geographical units i and j. Local Moran's I calculates covariance instead of summation. When the local value significantly exceeds the mean, the geographic unit can be interpreted as part of a cluster, either of high or low values, indicating spatial homogeneity. In contrast, significantly lower local values suggest a dispersed or heterogeneous pattern. The Local Moran's *I* index ranges from −1 to 1. A value of −1 indicates a highly dispersed pattern, where high and low values tend to be adjacent, while a value of +1 denotes a highly clustered pattern, with similar high or low values grouping together. A value of 0 suggests a random distribution, implying no significant local spatial autocorrelation.

A Global Spatial Autocorrelation Test was conducted to examine the spatial distribution patterns of per capita GDP across RCEP economies from 2001 to 2022. This analysis aimed to assess the degree of spatial dependency and identify potential clustering or dispersion of economic development within the region. The test evaluates whether neighboring economies exhibit similar economic characteristics or if disparities in per capita GDP are spatially dispersed across the RCEP area. The empirical results of this test, as shown in **Table 2**, provide insight into the regional patterns of economic development, highlighting areas of concentrated growth or disparity, which can inform policy recommendations for regional economic integration and cooperation.

As shown in **Table 2**, the Moran's *I* values for the GDP of RCEP economies are all positive, and each value passed the 1% significance level test. Additionally, the *Z*-scores ranged from 1.503 to 1.877, further confirming the reliability of the results. The global spatial autocorrelation test reveals a significant spatial correlation in the per capita GDP of RCEP economies. From 2001 to 2022, the Moran's *I* values mostly ranged between 0.02 and 0.05, indicating a certain degree of spatial autocorrelation, meaning neighboring economies tend to have similar per capita GDP performances. Although the spatial autocorrelation did not reach statistical significance in most years, several results from 2002 to 2005 showed a noticeable clustering effect. Overall, with the deepening of regional cooperation within RCEP, the spatial autocorrelation of economic disparities has decreased, especially after 2020, when the Moran's *I* value dropped to its lowest point, indicating a reduction in economic disparities within the region and a gradual advancement of economic integration. However, the Moran's *I* value for 2022 dropped once again, reflecting a significant decrease in the spatial autocorrelation of economic disparities between RCEP member states, suggesting that economic growth within RCEP economies is not randomly distributed across regions but is influenced by neighboring regions.

Table 2. Global spatial autocorrelation test for per capita GDP of RCEP economies (2001–2022).

Year	Moran' *I*	*Z*-Score	*p*-value*
2001	0.022	1.529	0.063
2002	0.039	1.756	0.040
2003	0.049	1.877	0.030
2004	0.049	1.848	0.032
2005	0.052	1.871	0.031
2006	0.040	1.694	0.045
2007	0.044	1.751	0.040
2008	0.032	1.590	0.056
2009	0.036	1.656	0.049
2010	0.035	1.636	0.051
2011	0.026	1.503	0.066
2012	0.026	1.524	0.064
2013	0.033	1.635	0.051
2014	0.039	1.709	0.044
2015	0.039	1.726	0.042
2016	0.044	1.781	0.037
2017	0.041	1.750	0.040
2018	0.033	1.641	0.050
2019	0.032	1.624	0.052
2020	0.040	1.734	0.041
2021	0.026	1.559	0.059
2022	0.013	1.381	0.084

Note: The table should include the values of Moran's *I*, *Z*-scores, and *P*-values for each year from 2001 to 2022, alongside an interpretation of the results, which typically provides insight into whether clustering, dispersion, or random distribution was observed during each period. Data source: The data for RCEP economies is obtained from the World Bank, and the results are calculated by the author. The *p*-value represents the statistical significance level, where $p < 0.05$ indicates significance.

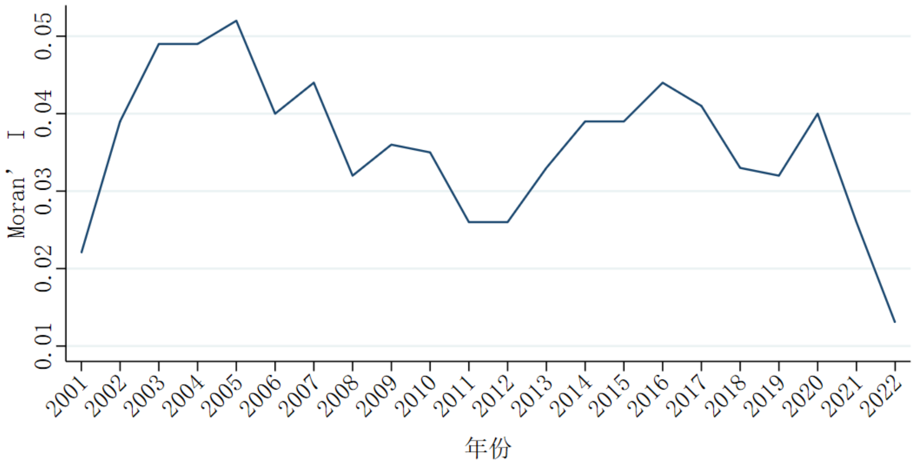

Figure 1. Global trend of per capita GDP in RCEP economies.

The chart illustrates the temporal variation in Moran's *I* values for the RCEP economies from 2001 to 2022 (**Figure 1**). Moran's *I*, as a measure of spatial autocorrelation, quantifies the degree to which per capita GDP values are spatially correlated, reflecting the extent of similarity between neighboring regions.

The analysis reveals significant fluctuations in Moran's *I* values over the study period, with distinct peaks and troughs. The highest values were observed in the early 2000s, particularly around 2003, suggesting a period of pronounced spatial clustering, where RCEP economies exhibited high levels of economic similarity. This indicates a phase of greater economic coherence within the region, likely driven by common economic conditions or converging growth trajectories.

From the mid-2000s onwards, a general decline in Moran's *I* values is evident, particularly after 2007, with several years showing diminished spatial autocorrelation. This decline suggests an increasing divergence in economic performance between neighboring regions within the RCEP economies. The widening economic disparities could be attributed to external shocks, such as the global financial crisis, and differing rates of economic development across member states.

A marked decline in Moran's *I* values occurred after 2020, particularly in 2021 and 2022, likely reflecting the profound economic disruptions caused by the COVID-19 pandemic. The reduction in spatial autocorrelation during this period signifies a growing divergence in regional economic development, suggesting that the pandemic exacerbated disparities in economic performance across the RCEP economies.

The global spatial autocorrelation analysis provides a broad overview of the economic development patterns within RCEP (Regional Comprehensive Economic Partnership) economies, confirming the existence of spatial correlation in per capita GDP across these nations. However, this analysis does not specify the exact clustering patterns, such as high-high, high-low, low-high, or low-low clusters. A more detailed local spatial autocorrelation analysis is required to identify the specific regions and their corresponding clustering patterns.

Such an analysis would enable the identification of regions characterized by high-high clusters, where areas with higher per capita GDP are concentrated, as well as low-low clusters, where regions with lower per capita GDP tend to cluster together. Additionally, it would reveal areas with high-low and low-high clustering patterns, indicating regions where disparities in economic development are present. This localized analysis is crucial for understanding the spatial heterogeneity of economic development across the region, providing critical insights for policy formulation aimed at addressing regional inequalities and fostering balanced growth.

By identifying localized clustering patterns, the analysis will enhance the understanding of spatial dependencies between regions, thereby facilitating more targeted regional development strategies. These findings will be instrumental in guiding policy interventions that optimize resource allocation, promote regional cooperation, and address the specific developmental needs of individual areas within the broader RCEP framework.

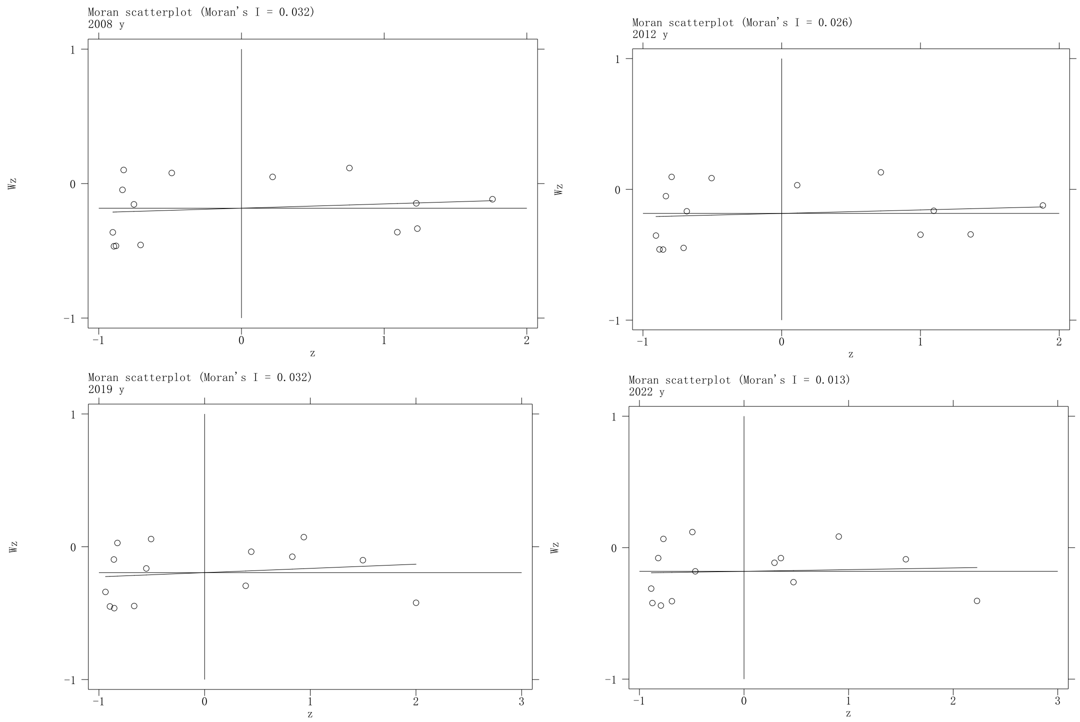

Figure 2. Local Moran's *I* scatter plots for per capita GDP of RCEP economies in 2008, 2012, 2019, and 2022 (from left to right).

The Moran's *I* scatterplots (see the **Figure 2**) for 2003, 2012, 2019, and 2022 provide insights into the spatial relationships within the economic data across these years. In 2003, the scatterplot reveals a very weak positive spatial autocorrelation, as indicated by the Moran's *I* value of 0.032. The points are widely dispersed with limited clustering, suggesting an absence of significant spatial correlation in economic development across regions during this period. Similarly, the 2012 scatterplot shows a slightly lower positive spatial autocorrelation (Moran's $I = 0.026$), with a similarly sparse distribution of points. While there is a modest suggestion of weak spatial dependence, the overall relationship between neighboring regions remains minimal, and no pronounced clustering is evident from the graph. The Moran's *I* value for 2019 remains at 0.032, consistent with the result from 2003, indicating a similarly weak positive spatial autocorrelation. Although there is some weak indication of spatial clustering, the distribution of points suggests that the spatial dynamics of economic development across regions have not substantially changed over the years. In 2022, the Moran's *I* value decreases further to 0.013, indicating an even weaker positive spatial correlation than in previous years. The nearly horizontal distribution of points suggests a decline in spatial dependencies between regions, which may indicate either a fragmentation of economic development or a reduction in the spatial influence of neighboring regions. In summary, the analysis of Moran's *I* across these years consistently shows weak positive spatial autocorrelation, with no significant clustering patterns identified. The relatively stable or declining values of Moran's *I* suggest that spatial dependence between regions in terms of economic growth has remained minimal or diminished, underscoring the need for further localized spatial analysis to better understand regional economic disparities within the broader context.

From **Table 3**, it can be observed that Low-Low (LL) and High-Low (LH) clustering patterns are relatively common, indicating that the economic growth of RCEP economies exhibits both significant spatial positive correlation (i.e., similar economies are spatially clustered) and spatial negative correlation (i.e., high-income and low-income economies are spatially adjacent). This suggests a distinct spatial agglomeration effect in the economic development of RCEP economies.

Table 3. Spatial correlation patterns of per capita GDP in RCEP economies (2008, 2012, 2019, and 2022).

Country	2008	2012	2019	2022
China	3	3	3	3
Indonesia	2	2	2	2
Thailand	3	3	3	3
Singapore	4	4	4	4
Philippines	3	3	3	3
Malaysia	2	2	2	2
Vietnam	3	3	3	3
Cambodia	3	3	3	3
Laos	3	3	3	3
Brunei	4	4	4	4
Japan	4	4	4	4
South Korea	1	1	4	4
Australia	4	4	4	4
New Zealand	1	1	1	1

Data source: The data for RCEP economies is obtained from the World Bank, and the results are calculated by the author.

In 2008, the spatial correlation patterns of RCEP economies displayed significant heterogeneity. China, Thailand, the Philippines, Vietnam, Cambodia, and Laos exhibited moderate spatial correlation, suggesting a relatively even distribution of per capita GDP across these countries. In contrast, Singapore, Brunei, Japan, and Australia showed high spatial correlation, reflecting a more concentrated and homogeneous distribution of economic activity. Indonesia and Malaysia, however, demonstrated lower spatial correlation, indicating greater regional imbalances in economic development.

By 2012, the spatial correlation patterns remained largely stable, with only a few changes. Most countries maintained the same spatial correlation as in 2008. However, South Korea's spatial correlation increased from 1 in 2008 to 4 in 2012, reflecting a shift toward a more concentrated and regionally homogeneous economic development model. Other high-correlation countries, including Singapore, Brunei, Japan, and Australia, continued to exhibit highly concentrated economic patterns, while Indonesia and Malaysia persisted with lower spatial correlation values.

In 2019, the overall trend of spatial correlation remained consistent. China, Thailand, the Philippines, Vietnam, Cambodia, and Laos continued to show moderate spatial correlation, while Singapore, Brunei, Japan, and Australia maintained their high levels of spatial concentration. South Korea's spatial correlation remained at 4, further reinforcing the trend toward a more centralized economic structure. New Zealand continued to show the lowest spatial correlation, indicating ongoing spatial dispersion in its economic development.

In 2022, the spatial correlation patterns across RCEP economies remained largely consistent with those observed in previous years. China, Thailand, the Philippines, Vietnam, Cambodia, and Laos continued to demonstrate moderate spatial correlation. Singapore, Brunei, Japan, and Australia maintained their high levels of spatial concentration. South Korea persisted with a high spatial correlation, further emphasizing the spatial homogenization of its economic structure. Notably, New Zealand continued to exhibit the lowest spatial correlation, reflecting the continued spatial dispersion of its economic activity.

In conclusion, the spatial correlation patterns of per capita GDP across RCEP economies reveal both continuity and change. High-income countries such as Singapore, Brunei, Japan, and Australia consistently demonstrate high spatial correlation, indicating concentrated and well-developed economic landscapes. In contrast, countries like Indonesia, Malaysia, and New Zealand exhibit more dispersed economic development, as reflected by lower spatial correlation values. The shift in South Korea's spatial correlation highlights a significant change in its regional economic structure. Meanwhile, countries such as China, Thailand, the Philippines, Vietnam, Cambodia, and Laos maintain moderate spatial correlation, suggesting a relatively stable distribution of economic development, though regional disparities remain significant. These patterns underscore the importance of targeted policy interventions to address regional imbalances and the broader dynamics of economic development within the RCEP framework.

3.4. Analysis of economic convergence among RCEP economies

The concept of economic convergence is derived from the neoclassical growth model introduced by Solow [11]. According to this model, due to diminishing marginal returns to capital, and assuming identical technological conditions, less-developed regions are expected to grow at a faster rate than more developed ones. In the convergence literature, the most widely discussed concepts are β-convergence and α-convergence. β-convergence posits that the income gap between poorer and wealthier countries will narrow over time, as poorer countries are expected to experience faster growth than their more developed counterparts. In contrast, α-

convergence refers to the overall level of economic disparities and their trend over time, while β-convergence focuses on the changes in the rate of economic disparities. Economic convergence is further categorized into absolute convergence and conditional convergence. Absolute convergence implies that poorer economies will eventually catch up with wealthier ones without any additional conditions. On the other hand, conditional convergence suggests that economies will converge in their growth rates if they share similar structural and institutional characteristics, such as savings rates, population growth, and technology [12,13].

3.4.1. α-convergence

α-convergence refers to the reduction in the dispersion of per capita output across countries or regions over time. When the disparity in per capita output between different countries or regions gradually diminishes, it is considered an indication of α-convergence. This dispersion is commonly measured using indicators such as the standard deviation, the Gini coefficient, and the coefficient of variation. These metrics are frequently employed to assess the development gap between various economic entities. A decreasing coefficient of variation or similar measures typically signals the presence of α-convergence, while an increasing trend in these indicators suggests divergence.

The formula for the standard deviation is as follows:

$$\alpha_t = \sqrt{\frac{1}{N}\sum_{i=1}^{1}(\mathrm{In}Y_t^i - \mathrm{In}\overline{Y}_t)^2}$$

In this formula, Y_t^i represents the per capita output of country i at time t, and $\overline{Y_t}$ denotes the average per capita output of all economies in period t. If the variance α_t^2 or standard deviation α_t decreases over time, it can be interpreted as evidence of convergence among the economies.

The formula for the coefficient of variation is as follows:

$$CV = \alpha_1/\mu_1$$

In this formula, α_1 represents the standard deviation of the observed indicators at time t and μ_1 represents the mean of the observed indicators.

The formula for the Gini coefficient is as follows:

$$G = \frac{1}{2n(n-1)\mu}\sum_{j=1}^{n}\sum_{i=1}^{n}|y_j - y_i|$$

In this formula, y_j represents the observed indicator for the j country or region, and $|y_j - y_i|$ represents the absolute difference between any two observed values. μ denotes the mean of the observed indicators. The Gini coefficient reflects the disparity in development levels among different entities and is one of the most widely used indicators. Its values range between 0 and 1, where 0 indicates perfect equality and 1 represents maximum inequality.

Table 4 presents a detailed overview of key economic indicators for the RCEP member economies from 2001 to 2022. The table includes the Gini coefficient, standard deviation, and coefficient of variation for each year, which are commonly used to measure economic inequality and the dispersion of economic activity.

Table 4. Coefficient of variation, standard deviation, and Gini coefficient of RCEP economies.

Year	Gini Coefficient	Standard Deviation	Coefficient of Variation
2001	0.61972	10615.72	1.248995
2002	0.60322	10598.11	1.197823
2003	0.59879	11816.71	1.185086
2004	0.60029	13645.13	1.180138
2005	0.58753	14587.81	1.151992
2006	0.57501	15200.1	1.126826
2007	0.56823	16696.44	1.112203
2008	0.57536	18242.54	1.124541
2009	0.57342	16512.78	1.121588
2010	0.5689	19519.75	1.108915
2011	0.57122	22865.98	1.115222
2012	0.57214	23855.35	1.118434
2013	0.56568	23343.53	1.105286
2014	0.55602	22395.43	1.079126
2015	0.55092	20205.94	1.074071
2016	0.5456	19751.13	1.058243
2017	0.54706	21009.59	1.061453
2018	0.54582	22310.04	1.060265
2019	0.53899	21787.63	1.045374
2020	0.53632	20591.47	1.037262
2021	0.55518	24792.37	1.084814
2022	0.56119	25807.96	1.109367

Data source: All data are sourced from the World Bank and calculated by the author.

The Gini coefficient, a standard measure of income or wealth inequality, has shown a gradual decline from 0.61972 in 2001 to 0.53632 in 2020, indicating a reduction in income inequality across the RCEP region. However, there was a slight uptick to 0.56119 in 2022, suggesting a modest increase in inequality over the most recent period. This pattern indicates that, while income inequality generally decreased over the two decades, the recent years saw a slight reversal, likely reflecting shifting economic dynamics within the region.

The standard deviation, which measures the spread or dispersion of per capita output, has experienced an upward trend from 10,615.72 in 2001 to 25,807.96 in 2022. This increase suggests that the disparity in economic performance across RCEP economies has widened over time, with more pronounced differences in per capita output across the region. The standard deviation's rise aligns with the expanding economic disparities in recent years, highlighting a growing divergence in economic development across member states.

The coefficient of variation, which combines both the standard deviation and the mean to offer a normalized measure of dispersion, has followed a similar trajectory. It has decreased from 1.248995 in 2001 to 1.037262 in 2020, before rising again to

1.109367 in 2022. This trend reflects a decrease in the relative dispersion of economic activity during the earlier years, followed by an increase in the more recent period. The coefficient of variation's overall decline suggests a reduction in relative inequality during the earlier part of the 21st century, while the recent uptick signals a return to greater economic divergence among the RCEP economies.

In conclusion, the data presented in **Table 4** indicates a complex evolution of economic inequality and dispersion across RCEP economies. While income inequality (as measured by the Gini coefficient) generally declined over the two decades, recent years have seen a reversal of this trend, with a slight increase in inequality. Meanwhile, the rise in both the standard deviation and coefficient of variation reflects growing economic disparities within the region. These findings underscore the importance of considering both the overall level of inequality and the dispersion of economic outcomes when assessing the economic dynamics of the RCEP economies.

3.4.2. *β*-convergence

The existing literature provides valuable insights into the coordinated development of regional economic integration; however, there remains a lack of consensus among scholars regarding whether the economic development of RCEP economies has exacerbated or reduced regional economic disparities. A notable study by Deng and Fan [7] examines the convergence relationship in economic development differences between China and ASEAN. However, this study primarily employs a conventional panel model and does not consider the spatial spillover effects of regional economic development.

In response to this gap, the present paper integrates the framework of economic growth convergence and applies a spatial econometric model to investigate the causal relationship between per capita GDP and regional economic growth disparities among RCEP economies. This approach offers both theoretical support and decision-making insights for fostering coordinated regional economic development.

Building upon the β-convergence theory proposed by Barro and Sala-I-Martin [14], we develop the following OLS model for analyzing regional economic growth convergence, intentionally excluding spatial factors from consideration.

$$\text{In}(\frac{PGDP_{i,t+1}}{PGDP_{it}}) = \alpha + \beta\text{In}(PGDP_{it}) + \mu_i + \eta_t + \varepsilon_{it}$$

This equation represents the absolute convergence model for regional economic growth, where $\frac{PGDP_{i,t+1}}{PGDP_{it}}$ is the economic growth rate, indicated by the actual per capita GDP growth rate over time for a given region. $\text{In}(PGDP_{it})$ represents the initial level of economic development, measured as the logarithm of actual per capita GDP for a region at the beginning of the period. β is the convergence coefficient, and if $\beta < 0$, it indicates absolute convergence, meaning regional economic disparities tend to decrease. If $\beta > 0$, it suggests economic divergence, where regional economic development becomes more uneven. The convergence speed is given by β, μ_i and ε_{it} represent time effects and random error terms, respectively.

Considering the clear spatial correlation characteristics of regional economic convergence, the model introduces a spatial panel model. Common spatial econometric models include the spatial lag model (SAR), the spatial error model

(SEM), and the spatial Durbin model (SDM). The spatial Durbin model is a general form of both the spatial lag model and the spatial error model. The absolute spatial convergence model is constructed as follows:

SAR:

$$\text{In}\left(\frac{\text{PGD}P_{i,t+1}}{\text{PGDP}_{\text{it}}}\right) = \alpha + \beta\text{In}(PGDP_{it}) + \rho\sum_{j=1}^{n}\omega_{ij}\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) + \mu_i + \eta_t + \varepsilon_{it}$$

SEM:

$$\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) = \alpha + \beta\text{In}(PGDP_{it}) + \mu_i + \eta_t + u_{it}\; u_{it} = \lambda\sum_{j=1}^{n}\varpi_{ij}\mu_{it} + \varepsilon_{it}$$

SDM:

$$\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) = \alpha + \beta\text{In}(PGDP_{it}) + \rho\sum_{j=1}^{n}\omega_{j}\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) + \gamma\sum_{j=1}^{n}\omega_{ij}\text{In}(PGDP_{it}) + \mu_i + \eta_t + \varepsilon_{it}$$

In this model, ρ represents the spatial lag coefficient, which reflects the influence of neighboring countries’ per capita GDP growth rates on the economic growth of other countries. λ is the spatial error coefficient, capturing the spatial effects within the random disturbance term, while γ stands for the spatial lag coefficient of the independent variable, indicating the impact of neighboring countries' current GDP levels on the GDP growth rate of the target country.

When selecting between an ordinary panel model (OLS) and the three spatial models (SAR, SEM, SDM), the general approach is as follows: First, a basic panel regression model is established, and the LM statistic is employed to test for spatial autocorrelation. If spatial autocorrelation is detected, at least one of the spatial lag models (SAR) or the spatial error model (SEM) is considered valid. Subsequently, the spatial Durbin model (SDM) is established, and the Wald statistic and LR statistic are used to assess whether the SDM can be reduced to either a SAR or SEM model. The specific procedure can be found in the work of Lesage and Pace [15].

The spatial weight matrix can be constructed based on geographical distance, economic and social distance, or other factors. To mitigate potential endogeneity issues arising from economic and social distances, this study uses the inverse square distance matrix, where the spatial weight matrix is determined by the inverse of the square of the geographical distance. This approach assumes that as geographical distance increases, economic interdependence between countries diminishes (Qu and Lee) [16]. The weight matrix is thus set as follows:

$$\omega_{ij} = \begin{cases} 1/d_{ij}^2 (i \neq j) \\ \;\;0 \quad (i = j) \end{cases}$$

The conditional convergence model builds upon the absolute convergence model by introducing a set of control variables that significantly influence economic growth. This adjustment enables the examination of convergence trends in regional economies while considering key growth factors. The resulting conditional convergence model can be formulated as follows:

The Ordinary Panel:

$$\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) = \alpha + \beta\text{In}(PGDP_{it}) + \delta X_{i,t+1} + \mu_i + \eta_t + \varepsilon_{it}$$

SAR:

$$\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) = \alpha + \beta\text{In}(PGDP_{it}) + \rho\sum_{j=1}^{n}\omega_{ij}\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) + \delta X_{i,t+1} + \mu_i + \eta_t + \varepsilon_{it}$$

SEM:

$$\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) = \alpha + \beta\text{In}(PGDP_{it}) + \delta X_{i,t+1} + \mu_i + \eta_t + u_{it}\; u_{it} = \lambda\sum_{j=1}^{n}\omega_{ij}\mu_{it} + \varepsilon_{it}$$

SDM:

$$\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) = \alpha + \beta\text{In}(PGDP_{it}) + \rho\sum_{j=1}^{n}\omega_{ij}\text{In}\left(\frac{PGDP_{i,t+1}}{PGDP_{it}}\right) + \gamma\sum_{j}^{n}\omega_{ij}\text{In}(PGDP_{it}) + \delta X_{i,t+1} + \mu_i + \eta_t + \varepsilon_{it}$$

Table 5. Absolute β-convergence of economic development levels for grouped RCEP economies.

	Overall	**Developed Economies**	**Less Developed Economies**	**Underdeveloped Economies**
	SAR	**OLS**	**OLS**	**OLS**
β	−0.0513***	−0.1368***	−0.0220	−0.0821**
	(−3.03)	(−2.91)	(−0.78)	(−2.17)
v (%)	0.25	0.70	0.11	0.33
LM-error	2.594 [0.107]	0.606 [0.436]	0.100 [0.751]	2.624 [0.105]
Robust LM-error	0.061 [0.805]	0.673 [0.412]	0.178 [0.674]	1.367 [0.242]
LM-lag	4.642** [0.031]	0.309 [0.578]	0.236 [0.627]	1.315 [0.251]
Robust LM-lag	2.109 [0.146]	0.377 [0.539]	0.313 [0.576]	0.059 [0.808]
Wald-sem	1.28 [0.2581]	0.99 [0.3195]	1.01 [0.3145]	4.51** [0.0338]
Wald-sar	1.49 [0.2220]	1.93 [0.1649]	0.92 [0.3372]	2.70 [0.1002]
LR-sem	1.27 [0.2596]	0.98 [0.3231]	1.03 [0.3091]	4.29** [0.0383]
LR-sar	1.47 [0.2247]	1.90 [0.1683]	0.93 [0.3355]	2.82* [0.0930]
Individual Effects	YES	YES	YES	YES
Time Effects	YES	YES	YES	YES
N	294	126	63	105
R^2	0.587	0.629	0.815	0.648

Note: t-statistics are in parentheses, p-values are in square brackets, and the significance levels are indicated by * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

In this model, $X_{i,t+1}$ represents a vector of control variables that influence per capita GDP, including: GDP growth rate (RGDP), Population growth rate (GPOP), Government public expenditure rate (FE), Fixed asset investment rate (FAR), Trade openness (TRD), Industrialization level (IND). Each of these variables is expressed as a percentage of GDP. The data for these variables are sourced from various databases, including the FAO Statistical Database (FAOSTAT), the International Monetary Fund (IMF), the World Bank (WBI), and the OECD database. Due to incomplete data for

Myanmar, it has been excluded from the underdeveloped group in the convergence analysis. The results of the absolute convergence in per capita GDP are shown in **Table 5**.

The results of the absolute β-convergence model for the RCEP economies, as presented in the table, reveal significant insights into the economic convergence process across different groups of economies. The overall β coefficient is −0.0513, statistically significant at the 1% level, indicating a general trend of β-convergence, meaning that less-developed economies within the RCEP region tend to experience higher growth rates in per capita GDP, thereby narrowing the income gap with more developed economies. The β coefficient for developed economies is −0.1368, also significant at the 1% level, suggesting that developed economies are experiencing faster growth in per capita GDP relative to their initial levels, thus supporting the concept of β-convergence within this group. In contrast, the β coefficient for less-developed economies is −0.0220, which is not statistically significant, implying that the economic development of less-developed economies within the RCEP region does not show a clear convergence pattern, potentially due to structural or institutional factors. However, the β coefficient for underdeveloped economies is −0.0821, significant at the 5% level, indicating a moderate degree of convergence in per capita GDP within this group, suggesting that underdeveloped economies are catching up with more developed counterparts at a faster pace. Spatial econometric tests, including the LM-error and LM-lag tests for spatial autocorrelation, provide further validation, revealing varying degrees of significance across the groups. Particularly, the LM-lag statistic for the overall model and underdeveloped economies is significant, suggesting the presence of spatial dependence in the growth rates of per capita GDP. The Wald-sem and LR-sem statistics for underdeveloped economies show statistical significance, confirming the suitability of the spatial error model (SEM) for this group, while the Wald-sar and LR-sar tests indicate that the spatial lag model (SAR) may be more appropriate for the overall group and developed economies. Overall, these findings provide substantial evidence of economic convergence across different groups within the RCEP region, though the speed and degree of convergence vary significantly. The results highlight the importance of considering both spatial dependence and regional disparities when analyzing economic convergence within the RCEP economies.

The results of the conditional β-convergence model for the RCEP economies, as shown in the **Table 6**, provide valuable insights into the dynamics of economic convergence across different groups. The β coefficient for the overall group is −0.0458, statistically significant at the 5% level, indicating a general convergence trend among RCEP economies when controlling for key factors. This suggests that less-developed economies within the region are catching up with more developed economies in terms of per capita GDP growth. For developed economies, the β coefficient is −0.3642, highly significant at the 1% level, providing strong evidence of convergence within this group. This indicates that developed economies are experiencing significant per capita GDP growth relative to their initial levels. In contrast, the β coefficient for less-developed economies is positive (0.0599) but not statistically significant, implying that there is no clear convergence pattern within this group, potentially due to structural or institutional factors. For underdeveloped economies, the β coefficient is −0.1618, significant at the 1% level, indicating moderate convergence. This suggests that underdeveloped economies are narrowing the gap with more developed regions in terms of per capita GDP growth.

Key control variables such as GDP growth rate, population growth rate, government expenditure rate, fixed asset investment rate, trade openness, and industrialization show varying effects across different groups. Notably, the GDP growth rate has a statistically significant positive effect on convergence across all groups, especially in developed and underdeveloped economies. The government expenditure rate significantly affects convergence only in developed economies, while industrialization has a positive and significant impact across most groups, particularly in developed economies and the overall group.

Spatial econometric tests further confirm the validity of the models. The LM-error and LM-lag statistics indicate the presence of spatial dependence, particularly in the overall and underdeveloped economies, underscoring the importance of accounting for spatial effects in the analysis. The Wald-sem and LR-sem statistics provide strong evidence supporting the suitability of the spatial error model (SEM) for most groups, while the Wald-sar and LR-sar tests suggest that the spatial lag model (SAR) is more appropriate for analyzing the convergence dynamics in developed economies.

Overall, these results provide robust evidence of conditional convergence within the RCEP economies, with significant variation in the speed and degree of convergence across different groups. The findings emphasize the importance of considering both regional characteristics and spatial dependencies when analyzing economic convergence across the RCEP region.

4. Through the analysis, the following conclusions can be drawn regarding the convergence of RCEP economies

4.1. α-convergence conclusion

As demonstrated in **Table 4**, the per capita GDP of the 15 RCEP economies showed signs of α-convergence over time. Initially, the coefficient of variation declined, reaching its lowest point in 2019. This trend reflects a reduction in the per capita GDP disparity between RCEP economies, suggesting a movement toward more equitable economic development. However, after 2019, the coefficient of variation increased, largely driven by the impact of global economic crises, the COVID-19 pandemic, and heightened geopolitical tensions. These factors contributed to a widening economic gap, signaling the absence of α-convergence post-2019. This shift emphasizes how external shocks can disrupt the process of regional economic convergence, underscoring the importance of resilience in addressing economic inequalities during periods of global instability.

4.2. β-convergence conclusion

4.2.1. Absolute β-convergence conclusion

As presented in **Table 5**, the overall RCEP economies, as well as the developed and underdeveloped subgroups, exhibit evidence of absolute β-convergence.

Specifically, for the RCEP group as a whole, the β coefficient is significantly negative at the 1% confidence level, confirming the presence of absolute β-convergence. The developed and underdeveloped groups also demonstrate significant convergence, with negative and statistically significant β coefficients. However, the less developed group, which includes China, Thailand, and Malaysia, shows weaker evidence of absolute β-convergence. This may be attributed to the widening economic gap, particularly driven by China's rapid economic growth.

The convergence rates differ across the groups: the overall RCEP group shows a convergence rate of 0.25%, the developed group exhibits a convergence rate of 0.70%, the underdeveloped group shows 0.33%, while the less developed group experiences a much slower convergence rate of only 0.11%.

4.2.2. Conditional β-convergence conclusion

As shown in **Table 6**, the overall RCEP economies, as well as the developed and underdeveloped groups, all exhibit evidence of conditional β-convergence. After accounting for factors such as GDP growth rate, population growth, government expenditure, fixed asset investment, trade openness, and industrialization, the convergence trend remains statistically significant. Relative to absolute β-convergence, the speed of conditional β-convergence is enhanced for both the developed and underdeveloped groups, thereby confirming the effectiveness of the selected control variables.

Table 6. Conditional β-convergence of economic development levels for grouped RCEP economies.

	Overall	**Developed Economies**	**Less Developed Economies**	**Underdeveloped Economies**
	SDM	**SDM**	**SAR**	**OLS**
β	−0.0458**	−0.3642***	0.0599	−0.1618***
	(−2.57)	(−9.05)	(1.51)	(−2.80)
GDP Growth Rate	0.0109***	−0.0058**	0.0141***	0.0075**
	(5.30)	(−2.03)	(6.81)	(2.04)
Population Growth Rate	−0.0171**	0.0082	0.0622	0.0401
	(−2.42)	(1.15)	(1.10)	(0.51)
Government Expenditure Rate	−0.0005	−0.0120***	−0.0038	0.0010
	(−0.35)	(−6.61)	(−1.39)	(0.44)
Fixed Asset Investment Rate	−0.0031***	−0.0035**	−0.0022	−0.0023
	(−2.64)	(−2.07)	(0.96)	(−1.37)
Trade Openness	−0.0002	−0.0032***	−0.0002	0.0009**
	(−0.60)	(−7.09)	(−0.45)	(2.26)
Industrialization	0.0038**	0.0158***	0.0001	0.0031*
	(2.44)	(5.71)	(0.03)	(1.69)
ρ/λ	−0.1674*	−0.4290***	−0.5319***	
	(−1.74)	(−5.75)	(−4.47)	
v (%)	0.22	2.16	—	0.84
LM-error	10.486*** [0.001]	0.872 [0.350]	0.001 [0.971]	0.415 [0.519]
Robust LM-error	4.534** [0.033]	3.890** [0.049]	4.179** [0.041]	0.518 [0.472]

Table 6. (*Continued*).

	Overall	Developed Economies	Less Developed Economies	Underdeveloped Economies
	SDM	SDM	SAR	OLS
LM-lag	5.955** [0.015]	0.000 [0.997]	2.016 [0.156]	0.043 [0.836]
Robust LM-lag	0.002 [0.962]	3.018* [0.082]	6.194** [0.013]	0.146 [0.703]
Wald-sem	27.43*** [0.0003]	38.33*** [0.0000]	10.54 [0.1600]	24.04*** [0.0011]
Wald-sar	27.43*** [0.0003]	74.37*** [0.0000]	20.58** [0.0044]	44.85*** [0.0000]
LR-sem	25.81*** [0.0005]	34.99*** [0.0000]	8.81 [0.2663]	20.19*** [0.0052]
LR-sar	25.98*** [0.0005]	53.97*** [0.0000]	16.28** [0.0227]	34.11*** [0.0000]
Individual Effects	YES	YES	YES	YES
Time Effects	YES	YES	YES	YES
N	294	126	63	105
R^2	0.248	0.007	0.031	0.744

Note: *t*-statistics are in parentheses, *p*-values are in square brackets, and significance levels are marked with * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The spatial effects vary across the different groups. In the overall RCEP group, the spatial dependence shifts from the SAR model to the SDM model, revealing a significant negative spatial spillover effect at the 10% level. This suggests that economic activities in one region have a direct influence on neighboring regions.

Economic Implications: Factors such as population growth, government expenditure, fixed asset investment, and trade openness exhibit a significant negative impact on per capita GDP. These variables contribute to increased market demand, labor supply, government support, and international trade, all of which in turn facilitate GDP growth. In contrast, the GDP growth rate and industrialization show no significant effect on changes in per capita GDP.

5. Recommendations and policies

The exploratory spatial data analysis results indicate that the economic growth of RCEP economies has significant spatial correlation. The econometric model incorporating spatial effects shows that there is both α-convergence and β-convergence in the economic development of RCEP economies, though the convergence speed is relatively slow.

Within the RCEP framework, the economic development levels of member countries vary significantly, presenting both opportunities and challenges. To better promote regional economic integration and common development, the following policies and recommendations are proposed:

(1) Amid challenges to globalization and rising protectionism, China should leverage the Belt and Road Initiative (BRI) to drive deeper regional economic integration, with the Regional Comprehensive Economic Partnership (RCEP) at its core. The BRI has gained global support, offering a unique opportunity for China to strengthen economic ties with RCEP countries. By enhancing infrastructure connectivity, streamlining trade, and promoting investment, the BRI can accelerate economic integration, fostering a more efficient and resilient regional economy [17,18].

As multilateralism faces increasing challenges, China's continued promotion of the BRI and advocacy for an open, rules-based trade system are crucial. This strategy will reinforce China's leadership within RCEP and address the fragmentation of the global economy. Furthermore, China should use the BRI to deepen economic cooperation with RCEP members, boosting the region's collective response to global economic changes.

China should prioritize infrastructure development, policy coordination, and people-to-people exchanges, facilitating the flow of goods, services, capital, and knowledge. Cooperation with RCEP members on trade rules and reducing non-tariff barriers will ensure inclusive regional growth. Through the BRI and RCEP, China can set a new standard for regional cooperation, advancing shared growth and sustainable development, while consolidating its leadership in the global economy.

(2) China should further deepen regional economic integration by expanding domestic demand, enhancing regional trade cooperation, and increasing investment in technological innovation and green industries [19]. In particular, efforts should focus on strengthening infrastructure in the central and western regions to reduce regional development disparities. Indonesia should increase investments in education and vocational training to improve the quality of its workforce, while modernizing both the manufacturing and service sectors. Strengthening transportation and energy infrastructure will improve the investment environment and attract more foreign capital. Thailand should prioritize supporting small and medium-sized enterprises (SMEs), fostering innovation in the digital economy and green technologies. Additionally, optimizing tax policies and simplifying administrative procedures will improve the business environment and stimulate market dynamics. As a regional economic hub, Singapore should continue to lead in technological innovation, especially in the digital economy and artificial intelligence, while strengthening economic cooperation with other RCEP countries and enhancing regional financial connectivity to solidify its position in the global economy.

The Philippines should focus on strengthening infrastructure, particularly in transportation and communications, to enhance logistical efficiency. Expanding export-oriented industries and increasing trade with China and other Asian economies will further boost its international competitiveness. Malaysia should enhance regional educational cooperation to promote talent development, support high-value-added industries, and encourage technological innovation, particularly in the electronics, automotive, and green energy sectors, to strengthen its position in global value chains. Vietnam should continue optimizing the legal environment and reducing taxes to attract foreign capital into high-tech and high-value-added industries. Simultaneously, more investment should be directed towards human capital, particularly in improving the education system to enhance workforce skills and sustain economic growth. Cambodia should continue advancing industrialization, particularly in light industries and processing sectors, while focusing on agricultural modernization to increase productivity and promote rural development, thus narrowing the urban-rural divide.

Laos should strengthen infrastructure, especially in transportation connectivity with neighboring countries, to improve logistical efficiency. Additionally, promoting sustainable development in tourism and agriculture will create more job opportunities and stimulate economic growth. Brunei should accelerate its economic diversification efforts, reducing reliance on oil and gas, and fostering emerging sectors such as finance, tourism, and green energy. Enhancing cooperation with other RCEP economies will improve its position within regional supply chains. Japan should continue leading in research and the application of digital economy and AI technologies, promoting industrial upgrading, and enhancing technological cooperation with RCEP countries to boost regional innovation capacity and ensure long-term economic growth. South Korea should further advance high-tech industries, such as semiconductors and renewable energy, and increase domestic consumption and investment. Additionally, improving the social security system will ensure sustainable economic growth and social inclusivity.

Australia should strengthen economic cooperation with the Asia-Pacific region, particularly with RCEP countries, to promote trade liberalization. By advancing environmental policies and adopting clean energy technologies, Australia can enhance its international competitiveness in agriculture, mineral resources, and high-end manufacturing. New Zealand should maintain its strengths in agriculture and environmental sustainability while accelerating the development of its digital economy. Strengthening cooperation with other RCEP economies, particularly in areas such as climate change, green technologies, and sustainable development, will promote long-term economic stability across the region.

These policy recommendations are designed to address the unique economic challenges and opportunities faced by each RCEP member at various stages of development. Through regional integration and multidimensional cooperation, these nations can achieve long-term, sustainable economic growth and shared prosperity.

(3) Further deepen regional economic integration and enhance global economic integration:

To better integrate into the global economic system, RCEP member countries should deepen internal cooperation mechanisms and focus on advancing the establishment of an RCEP economic community. In this process, it is recommended that member countries strengthen coordination and collaboration in key areas such as trade, investment, finance, and technological innovation, in order to facilitate the optimal allocation and flow of resources within the region. Additionally, RCEP should establish long-term dialogue and cooperation frameworks with other major global economic entities, such as the European Union (EU), the African Union (AU), and Mercosur, particularly in areas such as multilateral trade rules, sustainable development, and the digital economy, to promote the process of global economic integration.

As RCEP continues to evolve, expanding its membership to include more Asia-Pacific economies should become a strategic priority. To this end, it is suggested that a flexible and operational access mechanism be designed within the existing agreement framework, which would lower the barriers for new members while ensuring a balance of interests among the regional parties. Such an expansion would not only enhance RCEP's international influence and competitiveness but also strengthen its ability to address global economic uncertainties, thereby providing a more solid foundation for both regional and global stability and prosperity.

Through these measures, RCEP would not only enhance its own economic growth potential but also contribute valuable insights and experience from the Asia-Pacific region to the improvement of the global economic governance system.

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