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Regional Economic Convergence and Spatial Inequality in Developing Countries: A Systematic Review

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Abstract
This study aims to analyze regional economic convergence and spatial inequality in developing countries through the Systematic Literature Review (SLR) approach based on the PRISMA 2020 guidelines. The literature search was designed using Scopus, Web of Science, and Google Scholar for publication for the period 2015–2026. The results of the synthesis show that regional economic convergence is uneven and does not always result in equitable development. Various studies identify convergence groups with different growth trajectories, which are influenced by industrialization, physical capital, productivity, human capital, infrastructure, institutions, and spatial relationships. Differences in indicators and analysis methods also affect the results of the study. Therefore, convergence analysis needs to integrate beta, sigma, group convergence, and spatial analysis approaches. Regional development policies need to be adjusted to regional characteristics to reduce inequality in a sustainable manner.
Keywords: *Regional Economic Convergence; Spatial Inequality; Developing Countries; SLR.*

INTRODUCTION

Development inequality between regions is one of the main problems in economic development, especially in developing countries. Differences in natural resource potential, quality of human resources, availability of infrastructure, economic structure, and institutional capacity cause each region to have different capabilities in creating economic growth. Regions that have better access to markets, technology, investment, and transportation networks tend to have greater opportunities to develop productive economic activities (Adigozelova, 2026). In contrast, regions that face limited access and production capacity are at risk of slower growth. These conditions can cause regional income gaps to persist in the long term (Garcia, 2025).

In regional economic studies, economic convergence is an important approach to explain whether income gaps between regions tend to narrow over time. Convergence generally refers to the tendency of lower-income regions to grow faster than higher-income regions (Gul, 2024). If the process is sustainable, the differences in income levels between regions are expected to be smaller. However, convergence does not always occur evenly. Differences in initial conditions, economic structure, institutional quality, and the ability of regions to utilize investment can result in different development trajectories.

Research developments suggest that convergence dynamics need to be understood by considering regional heterogeneity and spatial relationships. Nguyen's (2024) research, for example, identified seven income convergence groups spanning 61 provinces in Vietnam during 2010–2020. The study also found a pattern of spatial grouping, with high-income areas concentrated in major economic zones, while a number of low-income areas were located in mountainous areas. The findings show that the process of convergence can take place among specific groups of regions without necessarily generating a single income level for all regions.

A similar problem can be seen in Kacou's (2022) study on inter-regional inequality in Africa. Using nightlight data, the study examines the relationship between regional inequality, convergence, and the possibility of the formation of several conditions of economic equilibrium. This approach shows

the importance of considering indicators of economic activity and the possibility of different development trajectories when conventional regional income data have limitations.

From a policy perspective, an understanding of convergence and spatial inequality is needed to determine whether a country's economic growth is also followed by an equitable distribution of development benefits (Eva, 2022). Increased national growth does not necessarily lead to a decrease in regional disparities. Investment and economic activity may be concentrated in certain regions, while others may receive only limited benefits (Kacou's, 2022). Therefore, convergence analysis needs to pay attention not only to changes in average income, but also to income distribution, the formation of convergence groups, and the influence of economic relations between regions.

Although research on regional economic convergence has developed, the results are not always uniform. Differences in observation periods, units of analysis, economic indicators, estimation methods, and country characteristics can lead to different conclusions regarding the existence of convergence (Ibourk, 2023). In addition, the factors that explain convergence in one country may not have the same influence in another. These conditions create the need to systematically organize research findings so that general patterns, differences in results, methodological approaches, and research gaps can be identified more clearly.

Based on these problems, this study was prepared as a systematic literature review on regional economic convergence and spatial inequality in developing countries. The focus of the study is not only on the question of whether regions are converging, but also on how the process takes place, the factors that influence it, and the extent to which spatial relationships play a role in shaping regional development patterns.

This study is directed to answer the following research questions.

1. How has research on regional economic convergence and spatial inequality progressed in developing countries?
2. How does the literature explain patterns of regional economic convergence, including absolute convergence, conditional convergence, and club convergence?
3. What economic, social, institutional, and spatial factors are associated with the convergence or persistence of regional inequality?
4. How do spatial dependencies and economic spillovers between regions affect the dynamics of convergence?

METHODS

Research Design

This research is designed using the Systematic Literature Review (SLR) approach to identify, select, assess, and synthesize research results on regional economic convergence and spatial inequality in developing countries. The SLR approach was chosen because it allows the literature search process to be carried out based on explicit and replicable procedures. The reporting of the review process refers to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020, especially in explaining the strategies for identification, screening, feasibility assessment, and determination of included studies (Page et al., 2021). The focus of the study includes empirical research that analyzes the development of income or economic activity between regions, the existence of convergence, patterns of spatial inequality, and the factors that influence these dynamics. The unit of analysis can be a state, province, district/city, other administrative region, or regional region that can be compared consistently.

Literature Search Strategy

Literature searches are designed using the Scopus and Web of Science databases because they both provide coverage of cross-disciplinary scholarly publications, including regional economics, development economics, and economic geography. Google Scholar can be used as an additional search source to examine articles that may not be identified in the main database. Results from each source should be recorded separately so that the origin of the article and potential duplication can be searched. The planned publication range is 2015–2026, with the final search conducted and the date of the search recorded before the final screening (Page et al., 2021). Keywords were compiled using a combination of terms regarding convergence, regional inequality, spatial dependency, and developing countries. Examples of English-language search strategies are:

("regional economic convergence" OR "income convergence" OR "club convergence") AND ("spatial inequality" OR "regional inequality" OR "regional disparities" OR "spatial dependence") AND ("developing countries" OR "emerging economies")

The strategy needs to be tailored to the syntax of each database. Additional searches can use terms such as beta convergence, sigma convergence, spatial spillovers, and regional income distribution to expand the scope of relevant terms. The date of the search, the database, the complete search string, and the number of records found need to be documented in the research record.

Inclusion criteria are established to maintain the relevance and consistency of the literature analyzed. Criteria including:

1. Research articles published in the period 2015–2026 and available in English or Indonesian.
2. Research that focuses on developing countries or regions that are relevant to the context of developing countries' development.
3. Empirical studies that address regional economic convergence, income inequality between regions, regional economic groupings, or spatial dependencies.
4. Publications that adequately describe the data, units of analysis, research methods, and key results.
5. Scientific journal articles that go through a peer review process.

Exclusion criteria:

1. Articles that do not address convergence or inequality at the regional or spatial level.
2. The research only examines national economic growth without an analysis of relevant differences between regions.
3. Publications that do not provide a complete text or sufficient methodological information to be evaluated.
4. Editorials, opinions, popular reviews, and non-scientific publications that do not meet the research criteria.
5. Duplicate articles or publications that do not fit the research question.

Literature Selection and Screening

Literature selection is carried out through several stages. First, all records of search results are collected and checked to identify duplications. Second, titles and abstracts are examined based on the research questions as well as inclusion and exclusion criteria. Third, the full text of articles that pass the initial screening is evaluated to determine their feasibility. Fourth, articles that meet all criteria are designated as studies included in the synthesis.

The reasons for exclusion at the full-text review stage were systematically recorded. The entire process is summarized in the PRISMA 2020 flowchart, which shows the number of recordings at the identification stage, the number of duplicates removed, the number of articles screened, the number of full texts assessed, the reasons for exclusion, and the number of final studies included.

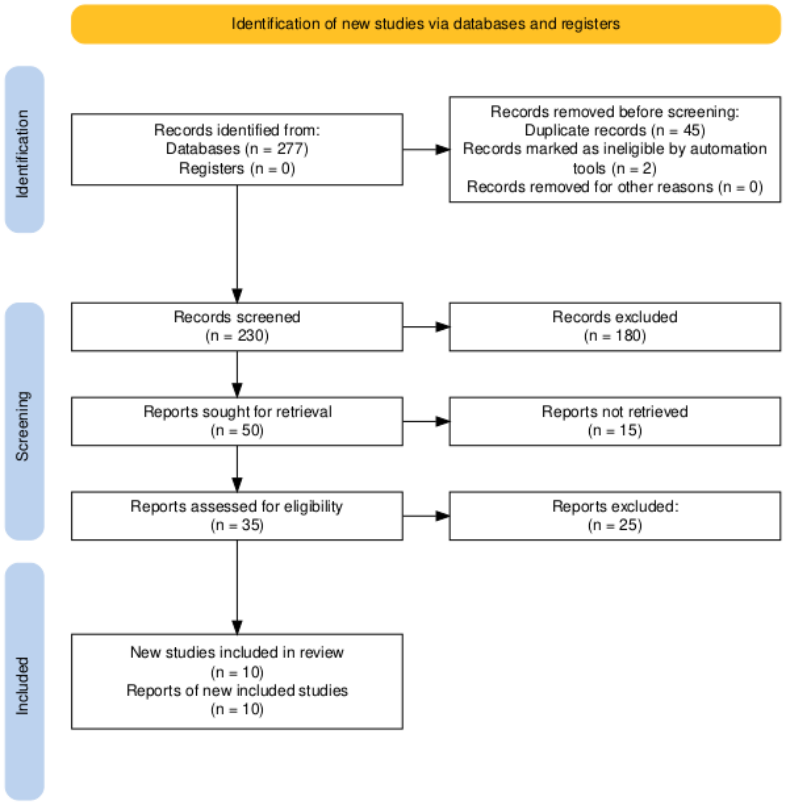


Figure 1. Prism 2020

RESULTS AND DISCUSSION

Studies of regional economic convergence and spatial inequality develop through a variety of approaches, ranging from income convergence testing to analysis of regional groupings and spatial dependencies. Research in this area seeks to explain whether low-income regions are able to catch up with high-income regions, whether regional disparities are decreasing over time, and whether regions form clusters with different development trajectories.

A number of studies show that the convergence process does not always take place uniformly. In Indonesia, Aginta et al. (2021) identified five income convergence groups at the district level, while Gunawan et al. (2021) found four convergence groups at the provincial level. In Vietnam, Nguyen (2024) identified seven income convergence groups. Meanwhile, Tipayalai and Mendez (2024) found three convergence groups in Thai provinces. These results show that conclusions about convergence can differ according to the unit of analysis, observation period, and estimation method.

Research on regional inequality also uses a variety of indicators. Per capita income is one of the main indicators, but labor productivity, capital accumulation, and nightlight data are also used to describe regional development dimensions. Mendez and Kataoka (2021), for example, analyzed disparities in labor productivity, capital accumulation, and interprovincial efficiency in Indonesia. Meanwhile, Kacou (2022) used nightlight-based inequality proxies to examine the dynamics of interregional inequality in 49 African countries. The diversity of focus and methods suggests that regional convergence studies are not enough to simply identify whether interregional incomes are

approaching. The analysis also needs to pay attention to whether inequality is reduced, whether different regional groups are formed, and how spatial characteristics and interactions relate to the process.

Table 1. Synthesis of Literature Review Results

No.	Researcher (Year)	Country/Region	Key Findings
1	Aginta et al. (2021)	Indonesia	Five convergence groups were identified; wealthy areas and large cities tended to be in the high-income group.
2	Gunawan et al. (2021)	Indonesia	Four convergence groups were found; industrialization increased the chances of entry into the high-income group.
3	Mendez and Kataoka (2021)	Indonesia	Differences in productivity, capital accumulation, and efficiency show the dimension of inequality between provinces.
4	Kacou (2022)	49 African countries	There is some imbalance of inequality; countries with high inequality tend to find it difficult to catch up with low-inequality groups.
5	Tipayalai and Mendez (2024)	Thailand	Inequality decreases, but provinces form three convergence groups with significant spatial dependencies.
6	Nguyen (2024)	Vietnam	Seven convergent groups were identified; physical capital, changes in economic structure, and spatial factors related to group formation.
7	Paradise (2023)	Indonesia	The inequality forms several convergence groups and shows spatial concentration and west–east regional gaps.
8	Eva et al. (2022)	Cross-country and regional	A decrease in inequality is not always followed by a decrease in spatial polarization; geographical factors still play a role.
9	Da Silva Lima (2024)	Brazil	The growth response to investment differs between groups; semi-arid regions show a lower response and are at risk of falling behind.
10	Ibourk (2023)	Afrikaans	Three convergence groups were identified; investment, human capital, and research and development related to the process of catching up.

Based on Table 1, there is an important difference between convergence at the aggregate level and group convergence. Research in Indonesia, Vietnam, and Thailand shows that regions within a country can form multiple groups with different income trajectories. The findings challenge the assumption that all regions will automatically move towards the same long-term income level. Aginta et al. (2021) found five convergence groups at the district level in Indonesia, while Gunawan et al. (2021) found four groups at the provincial level. The difference in the number of groups should not be

viewed as a contradiction. Both studies used different units of analysis and empirical designs. Analysis at the district level can capture local variations that are not seen in provincial aggregation.

Similar findings emerged in Vietnam. Nguyen (2024) identified seven convergence groups in 61 provinces, with high-income groups concentrated in major economic zones and low-income groups mostly found in northern mountainous regions. In Thailand, Tipayalai and Mendez (2024) found three convergence groups even though average indicators show a decrease in income inequality. The comparison suggests that an aggregate decrease in inequality does not necessarily mean that the gap between all regions disappears. Convergence can occur within certain groups, while the gap between high- and low-income groups persists. Therefore, the use of a single aggregate indicator risks masking heterogeneity in regional development trajectories.

Factors related to regional convergence and inequality can be grouped into initial economic conditions, structural transformation, production capacity, and geographical characteristics. In the Indonesian context, Gunawan et al. (2021) found that industrialization increases the likelihood of a province becoming part of a high-income group. These findings suggest that the structure of economic activity may be related to differences in the region's ability to increase income. Nguyen (2024) also identified the initial conditions of physical capital and changes in economic structure as factors related to the formation of convergence groups in Vietnam. Meanwhile, Kacou (2022) found that the initial conditions of development, natural resource income, urbanization, political institutions, development assistance, and infrastructure are related to the dynamics of regional inequality in African countries.

DISCUSSION

Convergence Doesn't Always Lead to Equity

The results of the comparison show that convergence and equity are interrelated, but not identical, concepts. Convergence describes the process of relative change in income or economic indicators between regions, while equity is related to the distribution of development benefits. A country can experience positive economic growth and a decrease in average inequality, but still have persistently lagging regions.

The findings of Kacou (2022) show that there is some regional imbalance in inequality in African countries. Countries in the high-inequality group do not show a strong tendency to move towards groups with lower levels of inequality. These conditions indicate the possibility of regional inequality traps, which are when initial characteristics and structural conditions make the change towards a more even development pattern slow. In Vietnam, Nguyen (2024) found seven convergence groups with income gaps still visible between groups. Meanwhile, Tipayalai and Mendez (2024) found that the decline in average inequality in Thailand coincides with the formation of several equilibrium groups. These findings show that aggregate indicators need to be complemented by distribution analysis and geographical patterns.

Methodologically, beta convergence testing alone is not enough to conclude that regional inequality is declining. Beta analysis tests the relationship between initial income and subsequent growth, while sigma convergence tests changes in income dispersion. Group convergence analysis provides additional information about the possible existence of different development trajectories. The use of several complementary approaches can lead to a more comprehensive understanding.

Structural Heterogeneity and Inequality Persistence

Structural heterogeneity is one of the important explanations for the differences in development trajectories between regions. Differences in physical capital, productivity, economic sector structure, market access, and institutional capacity can cause regions to respond differently to growth opportunities. Research by Gunawan et al. (2021) shows that industrialization is related to the opportunities of Indonesian provinces to be in the high-income group. The findings of Nguyen (2024)

also place physical capital accumulation and changes in economic structure as factors related to the formation of convergence groups in Vietnam. Both studies affirm the relevance of the internal conditions of regions in explaining variations in development outcomes.

However, infrastructure development and increased investment do not automatically guarantee equitable distribution. The impact of investment depends on location, connectivity to economic networks, and the ability of regions to develop productive activities. If investment is concentrated in developed economic centers, the gap between the center and the suburbs can persist or even increase. The results of Kacou (2022) also show that the initial conditions of development, urbanization, natural resources, institutions, development assistance, and infrastructure are related to regional inequality patterns. The findings show that inequality needs to be understood as the result of the interaction of various factors, not as a consequence of a single variable. Thus, equity policies need to consider the initial characteristics of the region as well as structural barriers that limit the ability of regions to take advantage of growth opportunities. Uniform policies for all regions are at risk of being less effective if regions have different production capacities and development constraints.

Spatial Dependence and the Impact of Economic Spillover

Findings from Indonesia, Thailand, and Vietnam show that interregional relationships are an important part of convergence dynamics. Spatial dependency can arise through production, trade, labor mobility, and infrastructure networks. These relationships make economic changes in one region affect other regions. In this context, the construction of growth centers can create benefits for the surrounding region if transportation networks, production relationships, and market access allow for the spread of economic activity. However, growth centers can also strengthen economic concentration if productive resources continue to move to areas that already have advantages.

Nguyen's (2024) findings on spatial externalities between regions show that inter-regional relationships can be complementary in physical capital accumulation, but competitive in industrial development. This means that adjacent regions can support each other in infrastructure development, but at the same time compete to attract investment and industrial activities. The policy implication is that regional development strategies need to consider economic relationships across administrative boundaries. Governments can develop connectivity between growth centers and surrounding areas, strengthen regional production networks, and increase the capacity of disadvantaged regions to take advantage of economic opportunities. The effectiveness of such policies still needs to be tested through empirical evaluation, rather than assumed based on geographical proximity alone.

Differences in Indicators and Measurement Methods

Differences in indicators are one of the reasons why the results of regional convergence research are not always consistent. Per capita income, labor productivity, poverty rate, household expenditure, and nightlight intensity measure different economic aspects. Therefore, findings obtained from one indicator cannot be directly considered applicable to other indicators. Firdaus (2023), for example, found the number of different convergence groups for GDP per capita, household expenditure, poverty, and average length of schooling at the district level in Indonesia. These results show that changes in income distribution do not always align with changes in household welfare, poverty, and education.

Kacou (2022) uses nightlight as a proxy for regional inequality in African countries. Such an approach can be helpful when conventional regional economic data are limited, but nightlight is not entirely synonymous with income or welfare. Therefore, the interpretation of the results needs to consider the validity of the indicators and the scope of economic activity represented. Differences in methods also need to be considered. Beta and sigma convergence testing, group convergence models, and spatial analyses have different analysis objectives. When studies use different units of analysis or observation periods, the results should not be compared as if all studies measured the same phenomenon

in an identical way. Therefore, SLR synthesis needs to consistently record variable definitions, units of analysis, study periods, estimation methods, and data limitations. This step is necessary so that differences in findings can be explained substantively and not simply summarized as conflicting results.

CONCLUSION

Regional economic convergence in developing countries is complex and uneven. Economic growth does not necessarily reduce inequality because regions can experience convergence within certain groups, while gaps between groups persist. These dynamics are influenced by structural factors, such as physical capital, industrialization, productivity, human capital, infrastructure, institutional quality, and spatial interactions that can drive economic spillover and strengthen the concentration of production activities.

Convergence analysis needs to integrate various welfare indicators and methods, including beta, sigma, group, and spatial approaches. In terms of policy, reducing inequality requires infrastructure development, strengthening human capital, increasing productivity, developing local economies, and evaluating policies oriented towards disadvantaged areas.

RECOMMENDATION

The government needs to implement regional development policies that are inclusive and in accordance with the characteristics of each region through strengthening infrastructure, human capital, productivity, and the local economy. Further research is suggested to expand the scope across countries, integrate welfare indicators, and use empirical methods that are able to identify the influence of structural and spatial factors on regional economic convergence as the basis for more effective and sustainable policy formulation.

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