THE IMPACT OF INDUSTRIALIZATION AND URBANIZATION ON ECONOMIC GROWTH IN THE CENTRAL AND SOUTH CENTRAL REGIONS

TÁC ĐỘNG CỦA CÔNG NGHIỆP HÓA, ĐÔ THỊ HÓA ĐẾN TĂNG TRƯỞNG KINH TẾ CÁC TỈNH VÙNG TRUNG VÀ NAM TRUNG BỘ

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Abstract - This study evaluates the impact of industrialization and urbanization on economic growth in the Central and South Central regions during the period 2010-2024. A quantitative panel data model is employed, incorporating estimation techniques such as OLS, REM, FEM, and Driscoll-Kraay standard error regression (DKSE). The results reveal that both industrialization and urbanization positively influence economic growth, albeit with varying magnitudes. Industrialization contributes by attracting labor, expanding production, and improving productivity, while urbanization facilitates infrastructure development and enhances human capital quality. Additionally, the Provincial Competitiveness Index (PCI) is found to exert a significant effect on regional economic performance. The findings underscore the importance of coordinated industrial and urban planning, as well as supportive policies for enterprises and the workforce, in order to maximize regional economic benefits and promote sustainable development.

Key words - Economic growth; urbanization; industrialization.

Tóm tắt - Nghiên cứu này đánh giá tác động của công nghiệp hóa và đô thị hóa đến tăng trưởng kinh tế tại các tỉnh vùng Trung và Nam Trung Bộ Việt Nam giai đoạn 2010-2024. Nghiên cứu sử dụng mô hình định lượng với dữ liệu bảng và các phương pháp ước lượng như OLS, REM, FEM cùng với hồi quy với sai số chuẩn Driscoll-Kraay (DKSE). Kết quả cho thấy, cả công nghiệp hóa và đô thị hóa đều tác động tích cực đến tăng trưởng kinh tế ở các mức độ khác nhau. Công nghiệp hóa thúc đẩy thu hút lao động, mở rộng sản xuất và nâng cao năng suất; thì đô thị hóa hỗ trợ phát triển hạ tầng và cải thiện chất lượng vốn con người. Đồng thời, năng lực cạnh tranh cấp tỉnh cũng tác động đáng kể đến tăng trưởng kinh tế. Nghiên cứu cho thấy sự cần thiết của việc phối hợp chặt chẽ giữa quy hoạch công nghiệp và đô thị, cùng các chính sách hỗ trợ doanh nghiệp và lao động, sẽ tối ưu hóa lợi ích kinh tế vùng đông thời góp phần thúc đẩy phát triển bền vững.

Từ khóa - Tăng trưởng kinh tế; đô thị hóa; công nghiệp hoá

1. Introduction

Industrialization and urbanization are two key drivers of economic growth in developing countries, especially in the context of global economic integration. The Central region of Vietnam, characterized by diverse natural conditions and a long, narrow terrain, is also an area heavily affected by climate change and natural disasters. During the country's transformation, the Central and South Central regions of Vietnam, comprising provinces from Thua Thien Hue to Ninh Thuan, have emerged as bright spots in the process of industrialization and urbanization, making significant contributions to economic restructuring, labor productivity enhancement, infrastructure improvement, and investment attraction. However, the extent to which these two factors impact economic growth in this region has not been thoroughly investigated.

In recent decades, the Central and South Central regions have experienced remarkable economic and social changes. The share of industry in the economic structure has increased thanks to the development of industrial parks, coastal economic zones, and processing and manufacturing industries. At the same time, urbanization has accelerated, with the expansion of major cities such as Hue, Da Nang, Nha Trang, and Quy Nhon. However, the pace of development is uneven across provinces, and the rapid increase in urbanization poses significant challenges in terms of the environment, resource allocation, and quality of life.

This study aims to assess the impact of industrialization and urbanization on provincial economic growth in the region during the period 2010-2024. Utilizing a quantitative model with key variables such as the industrialization index (cnhindex), urbanization index (DTHindex), and the Provincial Competitiveness Index (PCI), the research seeks to clarify the impact of these factors on economic growth. Studying this region is particularly meaningful as Vietnam's economy undergoes profound structural transformations. The development of the East-West Economic Corridor, free trade agreements (FTAs), and regional development strategies have created substantial opportunities for provinces in the Central and South Central regions. However, to fully capitalize on these opportunities, a balanced development strategy that effectively integrates industrialization and urbanization is essential for advancing Vietnam's sustainable growth objectives.

2. Theoretical basis of the study

2.1. Theoretical foundations related to the research topic

Industrialization, urbanization, and economic growth are strongly interconnected, as explained by various economic theories. For instance, the Neoclassical Growth Theory [1] emphasizes the roles of capital, technology, and labor, whereby industrialization and urbanization contribute to productivity enhancement and more efficient capital accumulation. The Structural Transformation

Theory [2] suggests the reallocation of labor toward the industrial sector constitutes a key driver of economic growth. Moreover, the model in [3] develops an explanation for rural-to-urban migration flows during industrialization, even when urban labor markets are unable to fully absorb the influx, thereby helping to account for phenomena such as unemployment and slum formation in developing countries like Vietnam.

Modern urban theories and empirical studies highlight the importance of industrialization and urbanization in economic growth. For example, [4] proposes the spillover effect from industrial-urban centers, supporting regional development and reducing inequality. Similarly, [5] emphasizes the advantages of economies of scale and knowledge spillovers observed in cities such as Shenzhen or Da Nang. In [6], the authors argue that urbanization must be accompanied by sustainable development policies such as public transportation and the promotion of clean industries. Meanwhile, [7] presents a staged model of urbanization, beginning with the expansion of large cities and later shifting toward the development of satellite towns, as evidenced in Bac Ninh and Binh Duong; [8] incorporates an institutional perspective, asserting that sustainable growth requires an appropriate legal and regulatory framework. In summary, industrialization can drive urbanization, but sustainable urbanization requires comprehensive planning and the adoption international best practices. Modern empirical approaches build upon the core arguments from growth theory, structural transformation theory, urban economics, and institutional economics, while also employing more contemporary indicators reflecting the outcomes, efficiency, and interactions of development processes. Such an approach is particularly well-suited for analyzing provincial economic growth in contexts of limited data and the multi-dimensional development characteristics of the Central and South Central regions of Vietnam.

2.2. Overview of related empirical studies

Numerous domestic and international empirical research have examined the the impact of industrialization and urbanization on economic growth, which can broadly be categorized into three main phases:

Foundational Phase (pre-1990)

Studies such as [2] and [9] reaffirm the central role of industrialization in the process of economic transformation. Meanwhile, [11] highlights the importance of human capital, and [3] introduces a rural-to-urban migration model to explain the dynamics of urbanization.

Extended Empirical Phase (1990–2020)

Subsequently, [5] highlights the role of major industrial centers in boosting productivity and attracting investment; [7] shows that strengthening satellite cities promotes more sustainable development. In addition, [6] underscores the importance of planning and environmental protection in sustaining long-term growth.

In China, [11] demonstrates the spillover effects from major industrial and urban zones to neighboring areas.

In Vietnam, [12] finds that urbanization contributes to growth but also exerts considerable pressure on resource allocation. Meanwhile, [13] reports that industrial zones significantly boosted GDP during the period of economic liberalization, though improved policies are required to mitigate adverse environmental and social consequences.

Modern Phase (2020 to present)

The outcomes of industrialization and urbanization in China have become increasingly synchronized, with [14] recommending more effective policy coordination for growth. Using the System GMM model, [15] finds that finance both promotes and slows the relationship between industrialization and urbanization in Africa. When evaluating 19th-century urbanization, the role of planning has received much attention as industrialization accelerated globally. Studies [16] and [17] both confirm the strong relationship between industrial-urban development and labor productivity, employment structures, and income.

However, in the Central and South Central regions of Vietnam, there remains a lack of updated quantitative studies assessing the long-term impacts of industrialization and urbanization. Moreover, policies aimed at promoting these processes sustainably have not been fully evaluated. Therefore, further research is needed to support effective regional economic policy-making.

3. Research methods

3.1. Analytical framework and model

Industrialization plays a crucial role in promoting urbanization through mechanisms such as labor migration, economic growth, and urban expansion. According to [3], income disparities between rural and urban areas are the primary driver attracting labor migration, contributing to the rapid increase in urban populations. However, the pace of urbanization may exceed the absorption capacity of the formal industrial sector, resulting in rising unemployment and the expansion of the informal economy. As noted in [5], industrialization fosters economies of scale, stimulates technological innovation, and enhances labor productivity, thereby driving urban expansion. Meanwhile, [7] emphasizes the role of satellite cities in alleviating pressure on major urban centers, thereby regulating the urbanization process more effectively. In addition, [6] asserts that to ensure sustainability, industrialization must be accompanied by investment in public transportation and the development of clean industries to mitigate negative impacts on the environment and urban infrastructure.

Based on theoretical and empirical evidence, this study employs a quantitative model to measure the impact of industrialization on urbanization, with the following variable structure: (1) the dependent variable is the natural logarithm of the Gross Regional Domestic Product (ln(GRDP)), reflecting changes in the economic scale of the province; (2) independent variables include the urbanization index (measured by the ratio of urban to total population and by urban land area), the industrialization index (measured by the share of industrial labor, the proportion of industrial output in GRDP, and FDI inflows into the industrial sector) and the Provincial Competitiveness Index with a one-year

lag (pci1); (3) control variables include the natural logarithm of lagged GRDP; and the interaction term between urbanization and industrialization.

According to modern growth theory, economic growth is significantly influenced by its own past outcomes due to inertia and the cumulative effects of capital over time. Incorporating lagged variables for economic growth (lny1) and the Provincial Competitiveness Index (pci1) into the model better reflects the dynamic nature of growth processes, while controlling for unobserved heterogeneity or time-series dependence commonly found in panel data. Furthermore, the inclusion of lagged variables helps mitigate autocorrelation and reduce estimation bias, thereby enhancing the reliability of the analysis of the impacts of industrialization (cnh) and urbanization (dth) on economic growth. This approach has been widely adopted in empirical studies such as [5], [6] on regional growth and development, especially as digital transformation, urbanization, and institutional factors are increasingly recognized as medium- and long-term drivers of local economic growth. This analytical framework enables a comprehensive assessment of the impacts of industrialization and urbanization on economic growth, while providing a practical basis for proposing optimal policies for sustainable urban development, balancing economic growth and quality of life. Therefore, the author proposes the following research model:

$$\text{lny} = f(\text{cnhindex}, \text{DTHindex}, \text{economic factors}, \text{social factors...}) + \varepsilon \quad (1)$$

Based on the findings of [14] - [19], the empirical model can be specified as follows:

$$lny_{it} = \beta_0 + \beta_1 \text{DTHindex}_{it} + \beta_2 \text{cnhindex}_{it} + \beta_3 \text{pci1}_{it} + \beta_4 \text{lny1}_{it} + \beta_5 \text{cnhXdth}_{it} + \varepsilon_{it} \quad (2)$$

Where lny_{it} is the natural logarithm of GRDP, DTHindex_{it} represents the urbanization index, cnhindex_{it} is the industrialization index, pci1_{it} is the Provincial Competitiveness Index with a one-year lag to capture policy effects, lny1_{it} is the lagged natural logarithm of GRDP reflecting path dependence and the accumulation of existing conditions, cnhXdth_{it} is the interaction term between industrialization and urbanization used to examine their combined effects on economic growth as in previous studies. Here, i denotes the province, and t denotes the year.

3.2. Estimation methods

The research employs a panel dataset encompassing both spatial (provincial) and temporal (2010–2024) dimensions. Based on this dataset, appropriate estimation methods for the specified econometric model can be applied, including Ordinary Least Squares (OLS), Fixed Effects Model (FEM), Random Effects Model (REM), and regression with Driscoll–Kraay standard errors (DKSE). These methods are particularly important in empirical economic analysis, especially for examining the interrelationship between industrialization and urbanization.

[18] notes that OLS is a widely applied method that minimizes the sum of squared errors and is straightforward to implement; however, it is prone to bias if the assumptions of no autocorrelation and homoscedasticity are violated. When analyzing panel data, FEM in [19] helps control for time-invariant differences between observational units, suitable when unobserved factors affect the dependent variable, but cannot estimate variables that do not vary over time. Conversely, the REM model from [20] assumes that fixed effects are uncorrelated with independent variables, yielding higher efficiency in large panel datasets but may be biased if this assumption is violated.

The author also employs regression with Driscoll-Kraay standard errors [21], as this method provides robust standard errors capable of adjusting for serial correlation, heteroskedasticity, and cross-sectional dependence in panel data, whereas FEM and REM do not effectively address cross-sectional dependence and are limited when data exhibit autocorrelation. FEM and REM only address heteroskedasticity and within-group autocorrelation when using clustered standard errors, while DKSE extends adjustment based on the dynamic covariance matrix, stabilizing results when T is sufficiently large (usually $T > 10$). Moreover, [21] demonstrates that DKSE does not require distributional assumptions about residuals as FEM and REM do, thereby increasing reliability when data exhibit dynamic correlations. Accordingly, DKSE adjusts standard errors to ensure accuracy when cross-sectional spillover effects exist - a common feature in studies of urbanization and economic growth. [22] also emphasizes that in cases of heteroskedasticity and autocorrelation, using DKSE yields more robust results than FEM or REM. Previously, [15] highlighted that industrialization promotes labor migration, consistent with [3], creating economies of scale [5] but also placing pressure on infrastructure [7]. In contrast to [14], this study does not consider the role of financial system development but emphasizes the need for appropriate policies. In [23], FEM was used to control for fixed effects, while DKSE has advantages in handling cross-sectional dependence. The findings are consistent with research in India [24], which shows that rapid urbanization often lacks adequate comprehensive planning; industrialization typically precedes urbanization but will eventually synchronize, underscoring the importance of regulatory policies to ensure sustainable development.

3.3. Research data

The study utilizes secondary data from the Statistical Yearbooks of provinces in the Central and South Central regions, from Thua Thien Hue to Binh Thuan, during 2010–2024, including GRDP, development investment, labor, human capital, Provincial Competitiveness Index, etc. The industrialization index is constructed from indicators such as GRDP per capita, industry share in GRDP (%), ratio of transportation land to total provincial area, ratio of trained labor (%), share of industrial labor (%), share of investment in industry, and number of hospital beds per 10,000 people. The urbanization index is determined from indicators such as urbanization rate (%), urban population growth rate (%), share of urban labor (%), and ratio of transportation land to total provincial area (%).

4. Research results

4.1. Descriptive statistics

During the period 2010–2024, the Central and South Central regions recorded GRDP growth rates of 6–8% per year, higher than the national average, particularly in Quang Ngai and Khanh Hoa due to the Dung Quat and Van Phong economic zones. Urbanization also increased significantly, from 30–35% in 2010 to approximately 40–45% in 2024, with major urban centers such as Hue, Da Nang, Quy Nhon, and Nha Trang playing a leading role. Industrialization exhibited disparities among provinces: Binh Dinh, Quang Ngai, and Quang Nam led in terms of industrial share and trained labor, while Phu Yen, Ninh Thuan, and Binh Thuan experienced slower progress but gradually improved owing to increased investment. Regarding urbanization, Da Nang was particularly notable, recording an urbanization rate above 87%, the highest in the country.

Table 1 presents descriptive statistics for the variables used in the model. The dataset consists of 135 observations from 9 provinces over 15 years, indicating overall good data quality, reasonable distributions, and sufficient variance to support regression analysis. The dependent variable lny (natural logarithm of GRDP) has a mean of 10.45 and a standard deviation of 0.49, reflecting moderate differences in growth among provinces. The main independent variables, industrialization index (cnhindex) and urbanization index (DTHindex), have means of 0.54 and 0.32, and standard deviations of 0.14 and 0.11, respectively, indicating substantial variation across provinces - sufficient to identify impacts on growth. The control variable pci1 (Provincial Competitiveness Index, lagged one year) ranges from 51.9 to 72.37, reflecting clear differences in business environments. The lagged GRDP variable (lny1) has a mean of 10.44, but its maximum value (17.60) is considerably higher than the mean, warranting further checks for potential outliers. The interaction term cnhXdth is well-distributed (mean 0.1679; std 0.12), not clustered at zero or excessively skewed, allowing assessment of the combined effect of industrialization and urbanization. Overall, the data is representative, well-dispersed spatially and temporally, and suitable for panel data modeling.

Table 1. *Descriptive statistics*

Variable name	Mean	Standard deviation	Minimum value	Maximum value
lny	10.4515	0.4905	9.0285	11.2798
DTHindex	0.3213	0.1088	0.1496	0.5475
cnhindex	0.5245	0.1497	0.0500	0.8666
Cpi	10.4445	0.7987	8.9901	17.6054
lny1	10.4432	0.7946	8.9875	17.5956
cnhXdth	0.1726	0.0759	0.0433	0.4765

(Source: Author's calculations based on data from the Statistical Yearbooks of provinces in the Central and South Central regions)

4.2. Stationarity tests

The Augmented Dickey–Fuller (ADF) test was employed to examine the stationarity of the data series. The results indicate that all original data series used are stationary, except for the urbanization index (DTHindex_it), which, after first differencing, becomes stationary at 1%, 5%, or 10% significance levels.

Table 2. *Stationarity test results*

Variable name	Z(t)	Critical Value 5%	p-value	Conclusion
lny	-3.524	-3.445	0.0369	Stationary
pci1	-5.823	-3.445	0.0000	Stationary
lny1	-7.777	-3.445	0.0000	Stationary
cnhindex	-3.876	-3.445	0.0131	Stationary
DTHindex	-3.262	-3.445	0.0728	Non-stationary
cnhXdth	-3.675	-3.445	0.0241	Stationary

Note: Null hypothesis H0: Series has a unit root (random walk). If p-value < 0.05, reject H0, series is stationary

4.3. Quantitative model analysis results

Table 3 presents the regression results from quantitative models analyzing the impact of factors on economic growth. The results obtained from the OLS, REM, FEM, and DKSE models are statistically significant, thereby supporting the validity of the model specifications and the reliability of the estimated coefficients.

Table 3. *Regression coefficient estimation results*

#	Estimation method			
	OLS	**REM**	**FEM**	**DKSE**
Dependent variable	***Economic growth - Lny***			
cnhindex	1.1770*** (0.1850)	1.0260*** (0.2148)	0.8356*** (0.2253)	1.1770*** (0.1589)
DTHindex	1.3712*** (0.3834)	0.6408* (0.3349)	0.6797** (0.3374)	1.3712*** (0.3275)
pci	0.0313*** (0.0072)	0.0337*** (0.0045)	0.0332*** (0.0043)	0.0313*** (0.0083)
Lny1	0.2096*** (0.0349)	0.0522** (0.0229)	0.0389* (0.0214)	0.2096 (0.0275)
cnhXdth	-0.5968 (0.3650)	0.8167** (0.3512)	1.3320*** (0.3760)	-0.5968 (0.2398)
_cons	5.3388*** (0.4391)	6.9139*** 0.2812)	7.0871*** (0.2576)	5.3388*** (0.8923)
R - sq	0.7043	0.6001	0.5334	0.7043
BP/CW test	0.0000			
vif	2.24			
Durbin-Watson	0.8512			
N	135			
Prob>F	0.0000			0.0000
Hausman test	0.0000			
Wooldridge test	0.0000			

*Note: Values in parentheses represent standard errors. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.*

(Source: Author's calculations based on data from the Statistical Yearbooks of provinces in the Central and South Central regions)

In the OLS model, the Durbin-Watson statistic is 0.8512, which is below the threshold of 2, suggesting possible autocorrelation. The VIF for the OLS model is 2.24, less than 5, indicating no severe multicollinearity among independent variables, ensuring the stability of estimates. However, the Breusch-Pagan/Cook-Weisberg test has a p-value of 0.0000, indicating heteroskedasticity in the OLS

model. The Wooldridge test also has a p-value of 0.0000, confirming the existence of autocorrelation in the panel data. These issues necessitate the use of alternative estimation methods to ensure result accuracy.

Considering REM and FEM models, the Hausman test yields a p-value of 0.0000, rejecting the null hypothesis H_0, indicating that the FEM model is more appropriate than REM. This result implies that fixed effects across observational units significantly impact economic growth and must be controlled for in the model. However, the FEM model still faces issues of autocorrelation and heteroskedasticity, necessitating the use of more robust standard error estimation.

To address these issues, the study applies regression with Driscoll–Kraay standard errors (DKSE), which adjusts the standard errors to mitigate heteroskedasticity and autocorrelation. This method provides more reliable estimates under panel data conditions with spatial and temporal correlation. R-squared values range from 0.5334 in the FEM model to 0.7043 (OLS and DKSE), indicating that the model variables explain between 53.34% and 70.43% of the variation in economic growth. The OLS and DKSE models have the highest R-squared, reflecting a good explanatory power of the independent variables. In contrast, the FEM model's lower R-squared suggests that fixed effects may not explain as much variation in economic growth as the other models.

Regarding the impact of independent variables, regression results show that the industrialization index (cnhindex) has a positive and highly significant effect at the 1% level in all models, with coefficients ranging from 0.8356 (FEM) to 1.1770 (OLS, DKSE). This finding underscores the pivotal role of industrial development as a primary driver of provincial economic growth. The urbanization index (DTHindex) also has a positive and highly significant effect, with coefficients ranging from 0.6408 (REM) to 1.3712 (OLS, DKSE), highlighting the significance of infrastructure investment. The Provincial Competitiveness Index (pci1) has a positive but small effect, with coefficients ranging from 0.0313 to 0.0373, suggesting that improvements in PCI positively influence growth, albeit not decisively. The lagged growth variable (lny1) has a positive and significant effect in the FEM and REM models, but its impact diminishes in other regressions.

Based on the DKSE-adjusted results, the model demonstrates that both the industrialization index (cnhindex) and urbanization index (DTHindex) have positive and statistically significant effects on provincial economic growth. This aligns with economic theories such as neoclassical growth [1], structural transformation [27], spatial spillover effects [4], and urban economics [5], confirming the parallel roles of industrialization and urbanization in promoting growth through productivity gains, economic agglomeration, improved resource allocation, and knowledge diffusion.

The interaction term (cnhXdth) yields inconsistent results across models: FEM shows a positive and significant effect at the 1% level, while OLS and DKSE indicate a negative effect; this suggests that the impact of industrialization-urbanization interaction may depend on how fixed effects are controlled. The negative coefficient in OLS and DKSE further indicates that the coordination between industrialization and urbanization is not fully synchronized and may even diminish positive effects if not properly planned. This is especially relevant in the Central and South Central regions, from Thua Thien Hue to Binh Thuan, where provinces exhibit uneven development between industrialization and urbanization. While Binh Dinh, Quang Ngai, and Quang Nam have established clear industrial foundations with high industry shares in GRDP, their urbanization process lags, urban infrastructure is not synchronized, urban population ratios are low, and satellite urban areas supporting industry are underdeveloped. Da Nang is a typical case of rapid urbanization and regional centrality, but industry does not yet account for a large GRDP share. Provinces such as Phu Yen, Ninh Thuan, and Binh Thuan remain at early stages of both processes, though they have significant potential for developing green industry and smart cities linked to renewable energy, logistics, and coastal tourism.

5. Conclusion and policy implications

5.1. Conclusion

Regression with Driscoll-Kraay standard errors (DKSE) was selected as the most appropriate estimation due to its strong explanatory power and ability to address heteroskedasticity and autocorrelation in panel data, ensuring robustness when analyzing the factors affecting economic growth. DKSE results indicate that rapid urban and industrial development in recent years both have positive and highly significant effects on provincial economic growth, highlighting the crucial role of urban planning and public investment in driving growth. Meanwhile, the Provincial Competitiveness Index (pci1) also exerts a positive but smaller effect, suggesting that improving the business environment contributes to growth but is not decisive. Although the interaction term between industrialization and urbanization (cnhXdth) is statistically significant in FEM but inconsistent across other estimations, implying that the combined effect of these processes may vary depending on the treatment of unobserved heterogeneity and fixed regional characteristics.

The DKSE-adjusted R-squared is 0.7043, indicating that the model variables explain 70.43% of the variation in economic growth. This result is consistent with the theories of [5], emphasizing the importance of urban development and infrastructure investment for sustainable economic growth. Additionally, the findings align with [14], showing that investment in infrastructure and public services plays a vital role in attracting labor and promoting urban economic expansion.

Overall, urbanization and industrialization are two key factors contributing to economic growth, but the magnitude of their impact may vary depending on specific regional conditions. To optimize the benefits of urbanization and industrialization, planning policies should aim for sustainable development, harmoniously combining infrastructure investment, enhanced competitiveness, and effective urban resource management.

5.2. Policy implications

Based on quantitative analysis and the practical development of the Central and South Central regions, several specific policy implications can be drawn to promote economic growth through effective coordination between industrialization and urbanization.

First, it is necessary to develop integrated planning for industrial and urban development in a synchronized and regionally connected manner. The study shows that industrialization and urbanization each have positive effects on growth, but their combined effect is not clearly defined and may even be offset if lacking linkage. Therefore, localities such as Quang Nam, Quang Ngai, and Binh Dinh should strengthen the planning of industrial zones in connection with satellite urban development, ensuring transportation infrastructure, housing, social services, and population attraction.

Second, priority should be given to forming regional growth poles with strong spillover and effective connectivity to adjacent areas. Centers such as Da Nang, Quy Nhon (Binh Dinh), and Nha Trang (Khanh Hoa) should be identified as nuclei for developing coastal industrial-urban corridors, linking with potential areas such as Ninh Thuan, Binh Thuan, and Phu Yen. Economic corridors along the North–South expressway, coastal roads, and major seaports should be synchronously invested to create effective regional linkages.

Third, industrial development should be oriented toward high technology, clean energy, and local job creation. Provinces like Ninh Thuan and Binh Thuan, with advantages in renewable energy, should attract investment in green, clean, resource-saving, and environmentally friendly industries, while encouraging integrated production–urban models to leverage urban infrastructure for industry and vice versa.

Fourth, the urbanization process should be accelerated in tandem with improving urban quality. Provinces with rapid industrialization but low urbanization rates, such as Quang Ngai and Quang Nam, should focus on urban infrastructure investment, expanding new urban residential areas, social services, and improving living environments to attract labor migration from rural to urban areas, thereby reducing pressure on central cities like Da Nang.

Fifth, continued improvement of the investment environment and local economic governance quality is essential. The results show that the PCI has a positive effect on growth, though its impact is not large. This requires provinces to intensify administrative reforms, enhance state management capacity, support enterprises, and improve the efficiency of public investment resource utilization.

In summary, industrialization and urbanization have the potential to serve as major drivers of growth in the Central and South Central regions if developed according to integrated, connected, and sustainable models. Close coordination between spatial planning, infrastructure investment, investment attraction policies, and human resource development will be decisive factors in transforming the region's growth model in the coming period.

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