Int. j. adv. multidisc. res. stud. 2026; 6(3):2257-2264

Received: 07-05-2026
Accepted: 17-06-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

The Effect of Provincial Competitiveness on Gross Regional Domestic Product: Evidence from the Red River Delta, Vietnam, 2013–2023

Do Minh Chau
Faculty of Development Economics, University of Economics and Business, Vietnam National University, Hanoi, Vietnam

Corresponding Author: **Do Minh Chau**

Abstract
This study investigates the effect of the Provincial Competitiveness Index (PCI) on Gross Regional Domestic Product (GRDP) across the eleven provinces of Vietnam's Red River Delta from 2013 to 2023, aiming to provide updated evidence for the post-pandemic era marked by significant regional disparities. Utilizing a balanced panel dataset, the research employs econometric models and selects the Feasible Generalized Least Squares (FGLS) method to address heteroskedasticity and serial correlation. The findings reveal that PCI, foreign direct investment (FDI), and population all have a positive and statistically significant impact on GRDP, with a one-point rise in PCI corresponding to an average increase of VND 2,492 billion in GRDP. The study contributes fresh empirical evidence on the importance of local economic governance and implies that policymakers should focus on enhancing administrative transparency and procedural reforms as a core component of broader strategies to stimulate sustainable regional growth.

Keywords: Provincial Competitiveness Index, Economic Governance, Regional Growth, Panel Data, Red River Delta, Vietnam

1. Introduction

As economic decentralisation has deepened in Vietnam, the quality of provincial-level governance has become an important determinant of a locality's ability to attract investment and sustain economic growth. The Red River Delta is one of the country's key economic regions. Comprising eleven provinces and cities, it plays a major role in national growth, exports and budget revenue. In 2023 the region accounted for roughly 30.4% of national GDP, 36% of export turnover and 38% of state budget revenue, and its GRDP per capita of VND 131.9 million ranked second nationally (Ministry of Planning and Investment, 2024; VietnamPlus, 2024) [15, 31]. In 2024, four of the five localities attracting the most FDI nationwide were in the Red River Delta, with Bac Ninh and Hai Phong recording registered capital of USD 5.1 billion and USD 4.9 billion respectively (Foreign Investment Agency, 2025) [6]. These figures underline the region's prominence while signalling rising expectations for the quality of local economic management.

Behind these aggregate results, however, the region continues to display substantial disparities in economic scale and growth rates. In 2023, GRDP per capita in Hai Phong reached about USD 8,665, whereas agriculture-oriented provinces such as Thai Binh and Nam Dinh reached only around USD 2,500–3,000 (vietnam.vn, 2025). In the same year, Hai Phong's GRDP grew by 11.01%, far above Vinh Phuc's 2.37% (General Statistics Office, 2024) [7]. Such differences arise not only from natural endowments, geography and industrial structure but also from the quality of the business environment and the capacity of provincial economic management.

Against this backdrop, the Provincial Competitiveness Index (PCI) is a meaningful instrument for assessing the quality of local economic governance. Constructed by the Vietnam Chamber of Commerce and Industry (VCCI) in cooperation with USAID since 2005, the PCI measures the favourability of the business environment and the quality of provincial economic administration. According to the PCI 2023 report, the national average reached 66.66 points, a seventh consecutive year of improvement, and the Red River Delta led the country with 63.6% of its provinces in the “good” ranking group (VCCI, 2024) [29]. Nonetheless, intra-regional gaps remain pronounced: in 2024 Hai Phong led the nation with 74.84 points, while Hanoi ranked 24th with 68.38 points and Thai Binh ranked 30th with 67.87 points (pcivietnam.vn, 2024). This raises the question of whether differences in PCI help to explain the GRDP gaps among localities within the region.

Many studies have addressed the relationship between local governance quality and economic growth. Studies focused

specifically on the Red River Delta—particularly with data updated to the post-COVID-19 period—remain limited, however. The years 2022–2023 witnessed considerable changes in growth drivers, investment attraction and provincial PCI rankings. Re-examining the PCI–GRDP relationship over 2013–2023 is therefore necessary to provide fresh empirical evidence and to clarify the role of the business environment in local economic growth. This provides quantitative evidence to support policy aimed at improving the business environment, strengthening the administrative capacity of local government, and advancing the government's target of average GRDP growth of 9% per year over 2021–2030 (Government of Vietnam, 2022) [8].

The remainder of the paper is organised as follows. Section 2 reviews the literature and identifies the research gap. Section 3 sets out the theoretical framework. Section 4 describes the data and empirical methodology. Section 5 presents the estimation and diagnostic results. Section 6 concludes and offers policy recommendations, limitations and directions for future research.

2. Literature review

2.1 Domestic evidence

Tran, Grafton and Kompas (2009) [25], in "Institutions Matter: The Case of Vietnam" (Journal of Socio-Economics), laid much of the conceptual foundation for subsequent Vietnamese work on the role of economic institutions in firm performance. Combining 2006 PCI data with a 2005 enterprise dataset covering 63 provinces, they used multivariate OLS with the logarithm of firm value added as the dependent variable and controls for firm size, sector, region and ownership. Provincial institutional quality had a positive effect on firm value added, with transparency and legal institutions the strongest factors. Because the analysis was at firm level and cross-sectional, however, it captured micro-level effects rather than a direct macroeconomic impact on GRDP.

Ha and Hanh (2012) [9], in "Identifying the Public Administration Reform Performance through the Lens of PCI and GDP per Capita in Vietnam", analysed the relationship between public administration reform, PCI and provincial GDP per capita using 2010 cross-sectional data for 64 provinces, multivariate OLS and Pearson correlation. They found a fairly strong positive correlation between PCI and per-capita income, with land access and information transparency most closely related to economic outcomes. The cross-sectional design precluded causal inference and omitted key macroeconomic controls such as investment and labour.

Dinh Thanh Son and colleagues (2020) [5] treated PCI as a moderator between public spending and growth rather than a simple regressor, using two-stage estimation on data for 62 provinces over 2006–2015. Decomposing PCI into informal charges, transparency and policy bias, they found that the marginal effect of public spending on growth was constrained by inefficiency, that public spending and private investment were substitutes at the provincial level, and that better governance made the growth effect of fiscal spending more positive.

Thanh and Canh (2020) [24] examined whether fiscal decentralisation promotes provincial growth and how local governance quality moderates that relationship, using two-stage estimation on panel data for 62 provinces over 2006–2015 with fixed effects. Fiscal decentralisation was positively correlated with growth, but only where governance quality was high; in low-PCI provinces decentralisation produced no meaningful growth effect.

Le and Duy (2021) [11], in "Effect of Provincial Competitiveness Index on Enterprise Attraction in the Central Highlands, Vietnam", assessed the effect of PCI on enterprise attraction across five Central Highlands provinces over 2005–2019 using secondary and primary data. PCI was highly correlated with the number of enterprises, total labour and registered investment capital, with transparency, informal charges, labour training quality and business support services the strongest components. The absence of a full panel regression limited causal conclusions.

Dao and Ngo (2023) [4] used PCI as a proxy for the business environment when testing the effect of FDI on formal-sector output at the provincial level—one of the few Vietnamese studies applying the Arellano–Bond GMM estimator to a panel of 63 provinces over 2006–2014. Interacting FDI inflows with PCI scores, they found that FDI had a positive effect on output that was stronger in high-PCI provinces, reinforcing the case for including FDI as a control variable when assessing the PCI–GRDP relationship.

Among studies focused specifically on the Red River Delta, Nguyen Tai Vuong and colleagues (2023) [17] are the most directly relevant, using a panel of the region's eleven provinces over 2010–2021 and estimating fixed- and random-effects models with a Hausman test, VIF checks and tests for heteroskedasticity and serial correlation. Aggregate PCI and several component indices had positive effects on GRDP per capita, with Hanoi and Hai Phong leading on both PCI and GRDP. The study did not, however, cover the volatile post-pandemic years of 2022–2023.

Providing an inter-regional comparison, Tran Thi Thuy Dung and Duong Nguyen Thanh Phuong (2025) [26], of the University of Economics Ho Chi Minh City, studied the effect of PCI on FDI attraction across the thirteen provinces of the Mekong River Delta over 2013–2023, estimating pooled OLS, FEM and REM. Long An and Tien Giang emerged as leading investment destinations owing to consistently high PCI, and the study documented a COVID-19 disruption to the PCI–FDI relationship in 2020–2021. Although the dependent variable was FDI rather than GRDP, the study offers useful comparative evidence.

2.2 International evidence

Malesky, McCulloch and Nhat (2015) [13], in "The Impact of Governance and Transparency on Firm Investment in Vietnam" (Economics of Transition), were the first in the Vietnamese context to establish a genuine causal relationship between provincial governance quality and private investment, using instrumental variables and GMM on enterprise panel data for 2006–2010 with PCI scores for 63 administrative units and province- and year-fixed effects. Only transparency—especially the publication of planning documents—had a positive effect on private investment. The focus was private investment rather than aggregate GRDP, with no separate regional analysis.

Rahayu, Abdullah and Hanim (2017) [21] approached provincial competitiveness through international trade, using data for 33 Indonesian provinces over 2000–2016 and a panel error-correction model to analyse the effects of exports and gross fixed capital formation on GRDP growth in the short and long run. Exports and fixed capital affected GRDP growth in both horizons; the study relied on exports

rather than a composite governance index such as PCI.

Moirangthem and Nag (2021) [16] constructed a composite regional competitiveness index (RETRIQ) for 32 Indian states from entrepreneurship, technological readiness and institutional quality via principal component analysis, testing causality with Arellano–Bond GMM and Granger causality on panel data for 2008–2017. RETRIQ had a one-directional causal effect on regional growth, with institutions the most important long-run component. India's federal structure grants states greater policy autonomy than Vietnam's unitary state.

Harsono, Istiqomah and Gunawan (2025) [10] added unemployment and poverty as mediating variables, using data for 34 Indonesian provinces over 2010–2022 with mixed quantitative–qualitative methods. Regional competitiveness had a positive effect on GRDP, especially through infrastructure and institutions; introducing the mediators reduced the effects of human resources and the innovation ecosystem, indicating that part of their influence operates indirectly through lower unemployment and poverty.

2.3 Research gap

The literature provides extensive evidence on the relationship between provincial competitiveness and local economic development, but reveals two notable limitations of scope and depth. First, most Vietnamese studies stop before the COVID-19 pandemic or use data only to 2021, whereas 2022–2023—the post-pandemic recovery, during which investment, production and local economic management changed markedly—carries particular significance. Extending the sample to 2023 makes the analysis more current and more reflective of the region's new development context. Second, studies focused specifically on the Red River Delta remain relatively scarce, even though the region accounts for roughly 30.4% of national GDP (Ministry of Planning and Investment, 2024) [15]. This study addresses both gaps by providing updated empirical evidence and policy proposals to improve the business environment and support sustainable GRDP growth in the Red River Delta.

3. Theoretical framework

3.1 The Provincial Competitiveness Index (PCI)

The PCI is a tool for measuring the quality of economic governance and the favourability of the business environment at the provincial and municipal level in Vietnam (VCCI, 2006) [27]. Developed by VCCI with USAID from 2005, it is published annually for all 63 provinces and centrally governed cities. It does not measure economic scale, resource potential or natural advantage; rather, it captures how provincial governments operate the institutional framework and use delegated authority to create a favourable business environment (VCCI and USAID, 2024) [29].

The aggregate PCI score is standardised on a 100-point scale and is a weighted—not simple—average of ten sub-indices: (1) entry costs; (2) land access; (3) transparency and access to information; (4) time costs; (5) informal charges; (6) fair competition; (7) proactivity of provincial leadership; (8) business support services; (9) labour training; and (10) legal institutions and security. Weights are recalibrated by period to reflect the changing role of each governance domain in firm development and private investment (VCCI and USAID, 2022) [28]. The PCI is built mainly from a stratified random-sample enterprise survey supplemented by published data, making it a valuable source for research on the quality of provincial economic governance.

3.2 Gross Regional Domestic Product (GRDP)

GRDP is the market value of all final goods and services produced within a province or city over a given period, used to gauge the scale and growth of the local economy within the system of national accounts. In Vietnam, GRDP is compiled and published by the statistical authority following a unified procedure consistent with the 2008 System of National Accounts (Statistics Office, 2025) [23]. In principle it can be computed by the production, expenditure or income approach; in provincial practice the production approach predominates. Constant-price GRDP is used to remove price effects when analysing growth over time, while current-price GRDP per capita is used to describe relative living standards.

Drawing on the neoclassical (Cobb–Douglas) production function, GRDP growth depends on three groups of factors: physical capital (public, domestic private and foreign investment); labour (in both quantity and quality); and total factor productivity, reflecting technological progress, management and allocative efficiency. In the Red River Delta, recent growth has been closely tied to the expansion of manufacturing and high-technology industry, with provinces such as Bac Ninh, Hai Phong, Quang Ninh and Hung Yen becoming notable destinations for electronics, components, logistics and supporting industries (Prime Minister, 2024) [20]. Capital and labour are only inputs, however; the efficiency with which they are converted into value added depends on governance quality and the institutional environment. A substantial part of GRDP differences across provinces may therefore originate in the quality of the business environment.

3.3 Linking PCI and GRDP

3.3.1 Direct channel

Transaction-cost theory holds that economic efficiency depends not only on direct production costs but also on the costs of searching for information, negotiating, contracting, complying with administrative procedures and protecting legal rights (Coase, 1937; Williamson, 1985) [3, 32]. Provincial governments influence these costs through the speed of procedures, the disclosure of planning information, inspection frequency, policy consistency and the effectiveness of local legal institutions. As PCI improves, firms access information more easily, spend less time on procedures and face lower risk from informal charges, allowing faster investment decisions and more efficient resource allocation. At the provincial level this can raise allocative productivity—more value added from the same inputs—so PCI may affect GRDP directly by lowering transaction costs.

3.3.2 Indirect channel

PCI may also affect GRDP through intermediate channels. The first is investment attraction: a stable, transparent, low-risk governance environment lowers investors' expected costs, encouraging capital formation and expanded productive capacity. Meyer and Nguyen (2005) [14] show that differing institutional conditions across localities affect foreign investors' location and entry-mode decisions in Vietnam. The second channel is private-sector development:

PCI components such as entry costs, transparency, business support services and labour training relate directly to firms' ability to establish, survive and expand. When provinces reduce entry barriers and improve public services, the number of formal firms can rise, enabling the private sector to contribute more to output, employment and innovation.

3.4 Underlying theories

Endogenous growth theory: Following Romer (1990) [22] and Lucas (1988) [12], long-run growth depends not only on physical capital accumulation but also on knowledge, human capital, technological innovation and positive learning externalities, expanding the role of policy and institutions. At the provincial level, governments can shape growth by creating conditions favourable to investment in people, technology and innovation; PCI components such as labour training, business support services, transparency and legal institutions can all influence firms' long-run investment decisions.

Institutional economics: North (1990) [18] treats institutions as the formal and informal rules governing behaviour, with institutional quality affecting transaction costs, the security of property rights and contract enforceability. Acemoglu and Robinson (2012) [1] further emphasise the foundational role of institutions in explaining development gaps. In the Vietnamese provincial context, PCI can be read as an empirical measure of local institutional quality; the evidence of Tran, Grafton and Kompas (2009) [25] and Malesky, McCulloch and Nhat (2015) [13] supports this interpretation.

Local competitive advantage: Porter (1990) [19] argues that competitive advantage is created through the interaction of factor conditions, demand conditions, supporting industries and the competitive environment. Under the Diamond model, government can influence competitiveness by improving infrastructure, supporting firms, ensuring fair competition and strengthening the legal framework—dimensions that map closely onto the structure of the PCI and help explain why some Red River Delta provinces convert locational advantage and investment into stronger growth than others.

4. Data and methodology

4.1 Data

The study uses secondary balanced-panel data for the eleven provinces and cities of the Red River Delta: Hanoi, Hai Phong, Quang Ninh, Vinh Phuc, Bac Ninh, Hai Duong, Hung Yen, Thai Binh, Ha Nam, Nam Dinh and Ninh Binh. The study period runs from 2013 to 2023, giving 121 observations (eleven localities over eleven years). PCI data are drawn from the annual PCI reports published by VCCI and USAID. GRDP at constant 2010 prices, realised FDI and average population are compiled from the Statistical Yearbook of Vietnam, provincial statistical yearbooks and the General Statistics Office database. Using constant-price GRDP limits the influence of price fluctuations and ensures comparability over time. GRDP is the dependent variable; the three explanatory variables are PCI, FDI and population (POP).

4.2 Variables

Table 1: Variable definitions and expected signs

Type	Symbol	Variable	Unit	Expected sign
Dependent	GRDP	Gross Regional Domestic Product (constant 2010 prices)	VND billion	—
Independent	PCI	Provincial Competitiveness Index	points	+
Control	FDI	Realised foreign direct investment	USD billion	+
Control	POP	Average population	thousand persons	+

Source: Compiled by the author.

GRDP (constant 2010 prices) measures the real economic scale of each locality and is kept in levels (VND billion); a coefficient indicates the average change in GRDP, in VND billion, for a one-unit rise in the regressor, other things equal. **PCI** proxies the quality of provincial economic governance. **FDI** (realised) captures foreign capital actually deployed in production and business, an important variable given the region's deep participation in industrial and export production. **POP** reflects average population, which enlarges the domestic market and labour supply and also controls for natural scale differences across provinces, preventing the FDI and PCI coefficients from being contaminated by population-size differences.

4.3 Empirical strategy

After collection, the data were compiled in Microsoft Excel and processed in Stata 17 in long format with the columns Province, Year, GRDP, FDI, PCI and POP. The data were screened for missing values, duplicates, naming inconsistencies and unit errors, with outliers cross-checked against source. The quantitative procedure comprised: (1) descriptive statistics and a correlation matrix; (2) pooled OLS as a benchmark; (3) FEM and REM estimation; (4) a Breusch–Pagan test for individual effects; (5) a Hausman test to choose between FEM and REM; (6) diagnostics for multicollinearity (VIF), heteroskedasticity and serial correlation; and (7) FGLS estimation to correct detected defects.

Guided by the theoretical framework, the panel regression model is specified as:

$$GRDP_{it} = \beta_0 + \beta_1 PCI_{it} + \beta_2 POP_{it} + \beta_3 FDI_{it} + u_{it} \qquad (1)$$

Where β_0 is the intercept; β_1, β_2 and β_3 are slope coefficients; u_{it} is the error term; i indexes provinces and t indexes years.

4.4 Hypotheses

H1: PCI has a positive effect on the GRDP of Red River Delta provinces. A more transparent business environment, smoother administrative procedures and lower informal charges enable firms to expand investment and production (Tran, Grafton and Kompas, 2009; Malesky, McCulloch and Nhat, 2015; Meyer and Nguyen, 2005) [25, 13, 14].

H2: Population (POP) has a positive effect on GRDP. Population reflects market size and labour supply; it also controls for natural scale differences across provinces, reducing bias in the FDI and PCI estimates.

H3: FDI has a positive effect on GRDP. FDI supplements capital, expands productive capacity and can promote technology transfer, particularly in manufacturing-oriented

provinces (Anwar and Nguyen, 2010) [2].

5. Results and Discussion

5.1 Descriptive Statistics

Table 2: Descriptive statistics

Variable	N	Mean	Std. dev.	Min	Max
GRDP (VND bn)	121	207,028.02	242,548.90	28,987	1,333,915
PCI (points)	120	64.65	3.78	57.38	75.09
FDI (USD bn)	121	1.634	1.318	0.08	5.84
POP (000s)	121	2,008.31	1,892.49	797.00	8,560.00

Source: Author's estimation (Stata 17).

Mean GRDP is VND 207,028 billion, but the standard deviation (VND 242,549 billion) exceeds the mean and the range is wide (VND 28,987 billion to VND 1,333,915 billion), reflecting large disparities in economic scale across the region and supporting the use of panel data. PCI has 120 observations (one missing value), a mean of 64.65 points and a range of 57.38–75.09 with a standard deviation of 3.78, indicating relatively stable but not uniform governance quality. FDI averages USD 1.634 billion (range 0.08–5.84), concentrated in provinces such as Hanoi, Bac Ninh and Hai Phong. POP averages 2,008 thousand persons (range 797–8,560), with Hanoi far larger than any other province. Overall, most variables—especially GRDP and POP—show substantial dispersion.

5.2 Correlation analysis

Table 3: Correlation matrix

	GRDP	PCI	FDI	POP
GRDP	1.0000			
PCI	0.3034*	1.0000		
FDI	0.5709*	0.5317*	1.0000	
POP	0.8897*	−0.0215	0.3246*	1.0000

Source: Author's estimation (Stata 17).
Note: * significant at the 5% level.

PCI, FDI and POP are all positively correlated with GRDP. POP has the highest correlation with GRDP (0.8897), reflecting the common feature of provincial data that larger populations coincide with larger markets, labour forces and economic activity. This strong correlation also calls for caution in interpretation: where population strongly captures natural economic scale, the distinct effect of PCI may attenuate in some models, especially fixed effects, which exploit only within-province variation. PCI correlates with GRDP at 0.3034—positive but moderate—indicating that governance quality is related to but not the sole determinant of economic scale. The PCI–FDI correlation (0.5317) suggests that provinces with better business environments attract foreign capital more readily. As correlations among the regressors do not reach alarming thresholds, multicollinearity is examined further with VIF.

5.3 Pooled OLS

Table 4: Pooled OLS estimation results

Variable	Coefficient	Std. error	t	95% CI (low)	95% CI (high)
PCI	14,565.07	2,120.58	6.87	10,364.98	18,765.15
FDI	32,961.73	6,413.97	5.14	20,258.04	45,665.41
POP	107.19	3.78	28.36	99.71	114.68
Constant	−1,003,643	133,433.60	−7.52	−1,267,925	−739,360.70

Source: Author's estimation (Stata 17).
Note: N = 120; R^2 = 0.9150; Adj. R^2 = 0.9128; F(3, 116) = 416.31; Prob > F = 0.000; Root MSE = 71,906. All coefficients significant at 1%.

The pooled OLS model explains about 91.5% of the variation in GRDP, and the F-test (416.31; p = 0.000) rejects the joint insignificance of the regressors. All three explanatory variables are positive and significant at 1%: a one-point rise in PCI is associated with an average increase of VND 14,565 billion in GRDP; a one-USD-billion rise in FDI with VND 32,962 billion; and an increase of 1,000 persons with VND 107 billion. Because pooled OLS does not control for province-specific characteristics, these results serve only as a benchmark.

5.4 Multicollinearity

Table 5: Variance inflation factors

Variable	VIF	1/VIF	Conclusion
FDI	1.65	0.6043	No multicollinearity
PCI	1.48	0.6752	No multicollinearity
POP	1.19	0.8421	No multicollinearity
Mean VIF	1.44		

Source: Author's estimation (Stata 17).

All VIFs are below 2 and the mean VIF is 1.44, well within common thresholds (VIF < 10, or the stricter VIF < 5). Multicollinearity is therefore not a concern, and estimation of the PCI effect in the presence of the POP and FDI controls is stable and reliable.

5.5 Fixed- and random-effects models

Table 6: Fixed-effects (FEM) estimation results

Variable	Coefficient	Std. error	t	95% CI (low)	95% CI (high)
PCI	1,320.08	1,549.75	0.85	−1,752.44	4,392.60
FDI	29,231.08	5,286.10	5.53	18,750.88	39,711.28
POP	506.53	19.72	25.68	467.43	545.64
Constant	−943,663	82,553.14	−11.43	−1,107,333	−779,993.40

Source: Author's estimation (Stata 17).
Note: Within R^2 = 0.9244; Between R^2 = 0.9076; Overall R^2 = 0.8132; ρ = 0.9986; F(10, 106) = 57.29; Prob > F = 0.000.

The FEM controls for time-invariant province characteristics such as geography, initial infrastructure and development history. Within R^2 is 0.9244 and the F-test for fixed effects (p = 0.000) rejects equality of the province-

specific effects, confirming that pooled OLS is not the best choice. FDI and POP are positive and significant at 1%, but PCI, though positive, is not statistically significant. Because provincial PCI scores change slowly over time, once fixed effects remove between-province differences the remaining within-province variation in PCI may be too small to yield significance.

Table 7: Random-effects (REM) estimation results

Variable	Coefficient	Std. error	z	95% CI (low)	95% CI (high)
PCI	15,357.59	2,652.31	5.79	10,159.16	20,556.03
FDI	17,378.67	9,993.96	1.74	−2,209.14	36,966.48
POP	147.90	12.78	11.57	122.84	172.95
Constant	−1,111,298	163,008.80	−6.82	−1,430,789	−791,806.40

Source: Author's estimation (Stata 17).
Note: Within R^2 = 0.7059; Between R^2 = 0.9575; Overall R^2 = 0.8980; Wald $\chi^2(3)$ = 296.76; Prob > χ^2 = 0.000.

Under REM, PCI and POP are positive and significant, with PCI at 15,357.59. FDI is positive but not significant at 5% (p = 0.082), though its sign matches expectations. As REM assumes that the province-specific effects are uncorrelated with the regressors, a Hausman test is required.

5.6 Model selection tests

Table 8: Breusch-Pagan LM test

Component	Var	SD	Note
GRDP	5.93×10^{10}	243,526.90	Variance of GRDP
e	8.83×10^{8}	29,723.57	Idiosyncratic error
u	1.59×10^{9}	39,904.27	Province effect

Source: Author's estimation (Stata 17).
Note: chibar²(01) = 13.67; Prob > chibar² = 0.0001.

The Breusch–Pagan test (p = 0.0001) rejects the null of no individual effects, indicating that a panel model is preferable to pooled OLS.

Table 9: Hausman test

Variable	β (FEM)	β (REM)	Difference	SE
PCI	1,320.08	15,357.59	−14,037.52	—
FDI	29,231.08	17,378.67	+11,852.40	—
POP	506.53	147.90	+358.64	15.0177

Source: Author's estimation (Stata 17).
Note: $\chi^2(3)$ = 556.60; Prob > χ^2 = 0.0000.

The Hausman test (p = 0.0000) rejects the null, favouring FEM over REM. The warning of a non-positive-definite variance matrix indicates that the two coefficient sets differ substantially, so the result should be interpreted alongside the model diagnostics; on selection principles, however, FEM remains preferred for its ability to control unobserved province-specific characteristics.

5.7 FGLS estimation

Because the diagnostics point to heteroskedasticity and serial correlation, the study estimates the model by FGLS, which is more efficient when the error structure violates the usual homogeneity assumptions.

Table 10: FGLS estimation results

Variable	Coefficient	Std. error	z	95% CI (low)	95% CI (high)
PCI	2,492.02	477.66	5.22	1,555.82	3,428.21
FDI	40,161.30	2,896.02	13.87	34,485.20	45,837.39
POP	55.65	6.122	9.09	43.66	67.65
Constant	−180,622.40	29,968.69	−6.03	−239,359.90	−121,884.80

Source: Author's estimation (Stata 17).
Note: N = 120; groups = 11; Wald $\chi^2(3)$ = 506.66; Prob > χ^2 = 0.000. All coefficients significant at 1%.

Under FGLS, PCI, FDI and POP are all positive and significant at 1%, and the Wald test (506.66; p = 0.000) confirms joint significance. The PCI coefficient of 2,492.02 implies that a one-point rise in PCI is associated with an average GRDP increase of VND 2,492 billion, other things equal—support for the hypothesis that governance quality contributes positively to local growth by lowering transaction costs and enabling firms to expand. FDI has the largest coefficient (40,161.30), reflecting the prominent role of foreign capital in the region's growth, especially in industrialising provinces such as Bac Ninh, Hai Phong and Quang Ninh. The POP coefficient (55.65) is consistent with population's dual role as a source of labour and of domestic demand.

5.8 Comparison across models

Table 11: Comparison of estimated coefficients across models

Variable	OLS	FEM	REM	FGLS
PCI	14,565.07	1,320.08 (n.s.)	15,357.59	2,492.02
FDI	32,961.73	29,231.08	17,378.67 (n.s.)	40,161.30
POP	107.19	506.53	147.90	55.65

Source: Author's estimation (Stata 17).
Note: "n.s." denotes not significant at the 5% level; all other reported coefficients are significant at 5% or better. In FEM, PCI has p = 0.396; in REM, FDI has p = 0.082.

Across all four estimators PCI, FDI and POP carry positive signs, indicating a consistent direction of effect. Magnitudes and significance differ because each model handles the data structure differently. The PCI coefficient is large and significant under pooled OLS and REM but falls to 1,320.08 and loses significance under FEM, indicating that the effect of PCI operates mainly through cross-province differences in governance quality rather than within-province variation over time. Pooled OLS does not control for province-specific characteristics; FEM focuses on within-province variation; and FGLS corrects the model's defects, making it the preferred specification.

6. Conclusions and policy implications

6.1 Conclusions

Using a balanced panel of the eleven Red River Delta provinces over 2013–2023, this study finds that provincial competitiveness is positively associated with regional output. Descriptive statistics reveal wide disparities in GRDP, FDI and population, with economic centres such as Hanoi, Hai Phong, Bac Ninh and Quang Ninh far ahead of smaller provincial economies. All three variables are

positively correlated with GRDP, POP most strongly. The Breusch–Pagan test confirms individual effects and the Hausman test favours FEM, in which PCI is positive but insignificant—evidence that its effect is tied to cross-province differences in governance quality. After correcting for heteroskedasticity and serial correlation, the FGLS model shows PCI, FDI and POP all positive and significant at 1%: a one-point rise in PCI is associated with roughly VND 2,492 billion more GRDP, a one-USD-billion rise in FDI with about VND 40,161 billion, and 1,000 more persons with about VND 55.65 billion. Hypotheses H1–H3 are supported. The PCI coefficient is smaller than those of FDI and POP, indicating that governance quality is important but not the sole determinant of GRDP; local growth still depends heavily on investment, population, industrial structure, infrastructure and province-specific characteristics. Policies to improve PCI should therefore sit within a broader development strategy combining infrastructure upgrading, human-capital development and selective investment attraction.

6.2 Issues to address

The effect of PCI has not been converted evenly across the region. Some large economies have PCI rankings that do not match their central role—Hanoi, the region's leading economic, political and service hub, being a notable case—while provinces such as Nam Dinh and Thai Binh retain considerable room for reform in transparency, land access, informal charges and business support services. Improving PCI should mean addressing the specific component bottlenecks of each locality rather than simply raising the aggregate score. Post-pandemic recovery has further exposed differences in resilience: provinces with stronger industrial bases, more favourable business environments and more flexible administration recovered faster, while slower-recovering localities need targeted support in administrative reform, business assistance, access to resources and policy implementation. High-PCI provinces should play a role in disseminating reform experience to their peers.

6.3 Policy recommendations

6.3.1 For central government and ministries

Two central-level policy areas relate most directly to the findings: regional planning for the Red River Delta and selective FDI policy. The government should integrate business-environment improvement into the 2021–2030 regional plan and treat low-PCI provinces as a criterion for prioritising central-budget resources and technical assistance. The Ministry of Planning and Investment, with VCCI, should periodically assess the consistency between regional planning and PCI outcomes and add measures of digital transformation, land transparency and compliance costs to the next-generation index. On FDI, because attraction capacity varies widely across provinces, policy should shift from broad-based to selective attraction, prioritising high-technology projects with backward linkages to domestic private firms and high domestic value added, with tax and land incentives linked to improvements in the local business environment. Finally, the General Statistics Office should continue standardising GRDP compilation to international norms and publish complete, timely series to support evidence-based regional policy.

6.3.2 For provincial governments

At the local level, recommendations focus on the PCI components most able to affect GRDP quickly. First, provinces should intensify administrative-procedure reform and transparency—expanding online public services, adopting one-stop-shop systems and fully disclosing land planning and investment licensing—to reduce firms' transaction costs. Second, given that population has the strongest effect on GRDP among the controls, provinces should strengthen labour training and business support services, connecting vocational institutions to firms' actual recruitment needs, particularly in FDI-intensive sectors such as electronics, processing and logistics, and improving small- and medium-enterprise access to capital, technology and markets. Third, provinces should build genuine, regular public–private dialogue: since the PCI is built from private-sector feedback, improvement requires systematic listening, with formal feedback channels, annual PCI action plans and monitoring by component index rather than a focus on the year-end aggregate score alone.

6.4 Limitations and future research

The study has several limitations that point to future work. First, its scope is confined to the eleven Red River Delta provinces and does not cover all provinces nationwide; extending the sample—especially to the structurally distinct southern region—and lengthening the series beyond 2024 would allow comparison of the GRDP–PCI relationship across growth poles and assessment of its durability during recovery. Second, FGLS corrects for heteroskedasticity and serial correlation but does not fully resolve potential endogeneity between PCI and GRDP; future work could apply OLS with Driscoll–Kraay standard errors or instrumental-variable methods, and spatial models (spatial lag or spatial error) could test for spillovers among neighbouring provinces. Third, analysing the ten PCI sub-indices separately, rather than the aggregate score, would identify which components most affect GRDP and provide sharper guidance on reform priorities. Fourth, adding controls for transport infrastructure, education quality and the trained-labour share, once consistent province-year data are available, would improve explanatory power and reduce omitted-variable bias. Overall, the study offers initial empirical groundwork for evaluating the effect of local governance capacity on regional growth in Vietnam.

7. References

1. Acemoglu D, Robinson JA. Why nations fail: The origins of power, prosperity, and poverty. Crown Publishers, 2012.
2. Anwar S, Nguyen LP. Foreign direct investment and economic growth in Vietnam. Asia Pacific Business Review. 2010; 16(1-2):183-202.
3. Coase RH. The nature of the firm. Economica. 1937; 4(16):386-405.
4. Dao TBT, Ngo VD. Does foreign direct investment stimulate the output growth of the formal economic sector in Vietnam: A subnational-level analysis. International Journal of Emerging Markets. 2023; 18(11):5523-5541.
5. Dinh Thanh Son, Vu Minh Khuong, Bui Duc Hung. The role of governance quality in the efficiency of public spending: Evidence from Vietnamese provinces. Journal of Economics and Development. 2020; 274:2-15.
6. Foreign Investment Agency, Ministry of Planning and

Investment. Foreign investment attraction in 2024, 2025.
7. General Statistics Office. Statistical Yearbook of Vietnam 2023. Statistical Publishing House, 2024.
8. Government of Vietnam. Resolution No. 30-NQ/TW of the Politburo on socio-economic development and defence and security assurance of the Red River Delta to 2030, vision to 2045, 2022.
9. Ha T, Hanh L. Identifying the public administration reform performance through the lens of provincial competitiveness index and GDP per capita in Vietnam. Modern Economy. 2012; 3(1):11-15.
10. Harsono P, Istiqomah, Gunawan DS. The impact of regional competitiveness on GRDP: Mediating roles of unemployment and poverty in Indonesia. International Journal of Accounting and Economics Studies. 2025; 12(4):21-28.
11. Le NP, Duy LV. Effect of provincial competitiveness index on enterprise attraction in the Central Highlands, Vietnam. PLoS One. 2021; 16(9):e0256525.
12. Lucas RE Jr. On the mechanics of economic development. Journal of Monetary Economics. 1988; 22(1):3-42.
13. Malesky EJ, McCulloch N, Nhat ND. The impact of governance and transparency on firm investment in Vietnam. Economics of Transition. 2015; 23(4):677-715.
14. Meyer KE, Nguyen HV. Foreign investment strategies and sub-national institutions in emerging markets: Evidence from Vietnam. Journal of Management Studies. 2005; 42(1):63-93.
15. Ministry of Planning and Investment. Regional master plan for the Red River Delta for the 2021-2030 period, vision to 2050, 2024.
16. Moirangthem NS, Nag B. Measuring regional competitiveness on the basis of entrepreneurship, technological readiness and quality of institutions. Journal of Asian Economics. 2021; 75:101331.
17. Nguyen Tai Vuong, Le Thi Hoa, Tran Van Binh. The impact of PCI on GRDP in the Red River Delta, 2010-2021. Journal of Science and Technology, Vietnam National University, Hanoi. 2023; 39(2):45-60.
18. North DC. Institutions, institutional change and economic performance. Cambridge University Press, 1990.
19. Porter ME. The competitive advantage of nations. Free Press, 1990.
20. Prime Minister. Decision No. 368/QD-TTg approving the regional master plan for the Red River Delta for the 2021-2030 period, vision to 2050, 2024.
21. Rahayu R, Abdullah H, Hanim A. The role of exports and gross fixed capital formation in regional economic growth: Evidence from Indonesian provinces. International Journal of Economics and Finance. 2017; 9(10):117-128.
22. Romer PM. Endogenous technological change. Journal of Political Economy. 1990; 98(5, Part 2):S71-S102.
23. Statistics Office. National accounts and the compilation method for provincial GRDP, 2025.
24. Thanh SD, Canh NP. Fiscal decentralization and economic growth of Vietnamese provinces: The role of local public governance. Annals of Public and Cooperative Economics. 2020; 91(1):119-149.
25. Tran TB, Grafton RQ, Kompas T. Institutions matter: The case of Vietnam. The Journal of Socio-Economics. 2009; 38(1):1-12.
26. Tran Thi Thuy Dung, Duong Nguyen Thanh Phuong. The impact of the provincial competitiveness index on foreign direct investment attraction: The case of the Mekong River Delta. University of Economics Ho Chi Minh City, 2025.
27. Vietnam Chamber of Commerce and Industry (VCCI). The provincial competitiveness index 2005 of Vietnam, 2006.
28. Vietnam Chamber of Commerce and Industry (VCCI), USAID. Methodology and calculation of the PCI, 2022.
29. Vietnam Chamber of Commerce and Industry (VCCI), USAID. Provincial competitiveness index report PCI 2023, 2024.
30. Vietnam Chamber of Commerce and Industry (VCCI), USAID. Provincial competitiveness index report PCI 2024, 2025.
31. VietnamPlus. Red River Delta planning: Accelerating and catching up with global trends, 2024.
32. Williamson OE. The economic institutions of capitalism. Free Press, 1985.