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Analyzing the Impact of Factors Affecting the Provincial Competitiveness Index (PCI): Research in Vietnam in 2022

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Abstract

The Provincial Competitiveness Index is used to evaluate and rank Vietnam's provincial and city governments on the quality of economic governance and building a business environment. Since its publication, the PCI index has become an important tool to measure and evaluate economic management and administration in 63 provinces and cities of Vietnam based on the perception of the economic sector. private. The construction of the PCI index is not intended for purely scientific research or for comparison between provinces with high or low PCI scores. The meaning of building the PCI index is to understand and explain why some provinces and cities can surpass other provinces and cities in private economic development, job creation, and economic growth. The PCI index, published annually, will be a useful reference source for leaders of provinces and cities in particular, as well as policymakers in general. From here, we can identify bottlenecks in economic management as well as come up with appropriate solutions to carry out economic development activities most effectively. The research uses quantitative research methods. The research object is to analyze the impact of factors affecting the Provincial Competitiveness Index (PCI) in 2022 with land access indicators, transparency, dynamics, and pioneering of provincial leaders, labor training, and legal institutions in 63 provinces and cities in Vietnam in 2022. Results show that factors such as access to land (DD), transparency (MB), dynamism (ND), and labor training (LD) affect the PCI index; legal institutional factors (PL) do not affect the PCI index.

Keywords: PCI, Provincial Competitiveness Index, PCI Index

1. Introduction

The Provincial Competitiveness Index (PCI) is an index that evaluates and ranks the governments of Vietnam's provinces and cities in building a favorable business environment for business development. PCI was built in 2005 as a result of research cooperation between the Vietnam Chamber of Commerce and Industry and the Vietnam Competitiveness Enhancement Project, funded by the US Agency for International Development. PCI is an abbreviation of an English phrase starting with the letters P, C, -I. This phrase has many interpretations, but in the article we will only consider PCI, which is the abbreviation of the English phrase “Provincial Competitiveness Index," which means the provincial competitiveness index. The Provincial Competitiveness Index is used to evaluate and rank Vietnam's provincial and city governments on the quality of economic governance and building a business environment. Since its publication, the PCI index has become an important tool to measure and evaluate economic management and administration in 63 provinces and cities of Vietnam based on the perception of the economic private sector.

In recent years, the PCI index has seen many changes in rankings between provinces and cities, with changes from year to year. For example, Thanh Hoa province is a continuous locality with a growth rate among the leading groups in the country. However, the growth rate is opposite to the growth rate; Thanh Hoa's provincial competitiveness index (PCI) continuously declines, ranking 47th in the country in 2022. In 2022, the GRDP growth rate will reach 12.51%, ranking 7th in the country. Total state budget revenue exceeded VND 50,000 billion for the first time, exceeding 71% of the estimate and increasing by 24.6% compared to the previous year. However, Thanh Hoa province's PCI index continuously dropped in rankings, and in some years it even dropped points. In 2021, reaching 63.21 points, it ranked 43rd (down 0.7 points, down 15 places). In 2022, reaching 63.67 points, ranking 47th (up 0.46 points, down 4 places).

In fact, the picture of economic growth and PCI developments in a locality often has the same direction, but opposite cases are not rare. Because PCI and economic growth rate have a different scope of reflection, the constitutive elements, objects of evaluation, and objects being evaluated are different. Specifically, the economic growth of a locality in a year is the synthesis of the economic performance results of all forces and components. Meanwhile, PCI, a business's assessment of the quality of economic management and the level of companionship with the business community of the government system expressed through 10 important aspects (10 component indexes) of the investment and business environment, has a great impact on the performance of businesses. PCI's assessment time is also limited to each year and is not a legacy of previous years. Thus, it can be seen that economic growth is a result and is synthetic. PCI is a factor, but a very important factor, contributing to that overall result. Therefore, it sometimes happens that economic growth and PCI developments in a locality have opposite trends.

Research Purposes:

The PCI index is evaluated based on nine component indexes: market entry costs, land access, transparency, time costs to implement state regulations, unofficial costs, dynamism, quality of labor training, business support services, and legal institutions. The research objective is to evaluate the impact of some of the above factors on the PCI index.

The construction of the PCI index is not intended for purely scientific research or for comparison between provinces with high or low PCI scores. The meaning of building the PCI index is to understand and explain why some provinces and cities can surpass other provinces and cities in private economic development, job creation, and economic growth. The PCI results published annually will be a useful reference source for leaders of provinces and cities in particular, as well as policymakers in particular. From here, we can identify bottlenecks in economic management as well as come up with appropriate solutions to carry out economic development activities most effectively.

Research Object and Research Scope:

Research object: analyzing the impact of factors affecting the Provincial Competitiveness Index (PCI) in 2022

Scope of research: land access indicators, transparency, dynamics and pioneering of provincial leaders, labor training, and legal institutions of 63 provinces and cities in Vietnam in 2022.

2. Research Methods

2.1 Select Model Variables

Land access measures two aspects of the land issue that businesses face: whether access to land is easy to obtain, and whether the business feels secure and assured of stability when it has access. have business premises or not.

Transparency: measures the ability to access provincial plans and legal documents necessary for business operations; whether businesses can fairly access these documents and policies Are new policies and regulations consulted with businesses, the ability to implement those policies and regulations, and the level of convenience of the provincial website for businesses?

Dynamism and pioneering of provincial leaders: measuring the creativity and insight of provincial leaders in the process of implementing central policies as well as in launching their own initiatives to develop the economic sector and private sector, and at the same time evaluating their ability to support and apply sometimes unclear policies of the central government in a direction that is beneficial to businesses.

Labor training measures provincial leaders' efforts to promote vocational training and skills development to support local industries and help workers find jobs.

Legal institutions: measure the trust of private enterprises in the court and judicial system of the province, whether these legal institutions are considered by enterprises as effective tools to resolve disputes, or where businesses can complain about harassment by local public ministries.

2.2 Set Up and Build Econometric Models

- ***The Overall Regression Model Describes the Relationship between the Dependent Variable PCI and the Independent Variables in the Form***

$$PCI_i = \beta_1 + \beta_2 \times DD_i + \beta_3 \times MB_i + \beta_4 \times ND_i + \beta_5 \times LD_i + \beta_6 \times PL_i + u_i$$

In there:

- Dependent variable: PCI
- Independent variables:

+ DD: Access to land
+ MB: Transparency
+ ND: Dynamic feature
+ LD: Labor training
+ PL: Legal institution

- β_1: Blocking coefficient
- β_2, β_3, β_4, β_5, β_6: The slope coefficient corresponds to the independent variables: DD, MB, ND, LD, PL.
- ui: random error.

The Sample Regression Model has the Form

$$PCI_i = \widehat{\beta_1} + \widehat{\beta_2} \times DD_i + \widehat{\beta_3} \times MB_i + \widehat{\beta_4} \times ND_i + \widehat{\beta_5} \times LD_i + \widehat{\beta_6} \times PL_i + e_i$$

In there $\widehat{\beta_1}; \widehat{\beta_2}; \widehat{\beta_3}; \widehat{\beta_4}; \widehat{\beta_5}; \widehat{\beta_6}$ *are estimates of* β_1, β_2, β_3, β_4, β_5, β_6.

e_i: Residual of sample regression

Table1: Collect a Sample of Data for the Proposed Model

Province/City	PCI	DD	MB	ND	LD	PL
An Giang	62.37	7.08	6.19	6.60	5.05	6.86
BRVT	70.26	7.66	5.93	7.21	6.31	7.41
Bac Giang	72.80	7.29	6.30	7.62	6.80	8.60
Bac Kan	65.15	6.28	6.55	7.37	5.38	8.02
Bac Lieu	60.36	7.03	4.71	6.27	4.92	8.02
Bac Ninh	69.08	7.05	6.59	6.23	7.57	7.09
Ben Tre	68.04	7.49	5.25	6.88	5.40	7.83
Binh Dinh	66.65	7.21	5.97	6.86	5.46	8.04
Binh Duong	65.13	7.06	6.67	6.32	5.93	6.84
Binh Phuoc	64.32	7.12	6.37	7.20	5.09	7.49
Binh Thuan	64.39	6.41	6.18	6.12	5.19	6.50
Ca Mau	61.60	6.79	6.40	6.08	4.25	6.72
Can Tho	66.94	7.12	5.75	7.12	6.75	7.37

Cao Bang	59.58	5.98	4.54	6.66	5.30	7.33
Da Nang	68.52	6.61	6.72	6.96	6.80	7.58
Dak Lak	60.91	6.93	5.35	6.22	3.73	7.45
Dak Nong	64.87	6.71	6.34	6.83	4.71	7.20
Dien Bien	59.85	6.77	5.80	6.72	4.54	7.44
Dong Nai	65.67	6.77	5.49	6.57	5.74	7.05
Dong Thap	69.68	7.94	7.10	7.65	5.69	7.96
Gia Lai	64.00	6.74	5.45	6.62	4.86	7.57
HCM	65.86	6.45	6.12	6.07	6.43	6.96
Ha Giang	64.39	6.89	6.02	6.81	5.05	7.78
Ha Nam	64.00	5.93	5.87	6.88	5.86	7.12
Hanoi	66.74	6.21	6.32	6.35	7.51	7.23
Ha Tinh	67.18	6.85	5.70	6.43	6.49	8.08
Hai Duong	65.22	7.35	5.31	6.67	5.61	7.73
Hai Phong	70.76	7.22	6.22	7.49	6.57	7.87
Hau Giang	68.12	7.01	5.82	7.26	5.32	7.55
Hoa Binh	62.81	6.62	4.80	6.79	5.58	6.91
Hưng Yên	67.91	7.63	5.31	6.71	5.76	8.03
Khanh Hoa	67.74	7.20	5.55	6.59	6.13	7.63
Kien Giang	62.24	6.71	5.71	6.45	3.86	6.88
Kon Tum	64.89	6.47	6.08	6.46	5.51	7.21
Lai Chau	62.05	6.66	6.17	6.57	5.00	6.69
Lam Dong	67.62	7.84	5.80	6.80	5.66	8.18
Lang Son	67.88	6.42	6.38	7.25	5.94	7.89
Lao Cai	68.20	7.62	6.67	7.66	5.70	7.87
Long An	68.45	7.17	6.38	7.54	5.33	7.02
Nam Dinh	65.29	7.57	5.67	6.74	5.52	8.44
Nghe An	66.60	6.69	6.11	6.82	5.05	7.50
Ninh Binh	64.22	7.12	5.69	6.20	6.40	7.35
Ninh Thuan	65.43	7.00	6.08	7.11	5.20	7.60
Phu-Tho	66.30	7.25	6.05	7.26	6.53	7.51
Phu Yen	64.80	6.66	6.00	6.56	4.90	7.45
Quang Binh	63.41	6.60	6.72	6.42	5.77	6.99
Quang Nam	66.62	7.23	6.35	6.90	5.35	7.74
Quang Ngai	65.18	7.40	5.55	6.52	5.54	7.71
Quang Ninh	72.95	7.57	6.64	7.49	7.67	8.11
Quang Tri	61.26	5.76	5.94	6.71	5.49	6.78
Soc Trang	65.17	7.47	6.15	6.40	4.76	7.96
Son La	63.22	6.74	5.95	6.72	5.01	7.71
TT-Hue	69.36	7.25	6.75	6.71	6.13	8.35
Tay Ninh	62.31	6.95	5.67	6.07	4.17	7.44
Thai Binh	65.78	6.94	4.95	7.20	6.29	8.50
Thai Nguyen	66.10	7.90	5.97	6.67	6.33	7.91
Thanh Hoa	63.67	6.47	5.51	6.38	5.10	7.92
Tien Giang	63.17	6.34	5.87	6.49	4.86	7.14
Tra Vinh	66.06	7.17	6.35	6.82	4.70	7.16
Tuyen Quang	62.86	6.59	6.34	6.27	5.89	7.10
Vinh Long	64.40	6.98	5.59	6.53	5.54	7.49
Vinh Phuc	68.91	6.99	6.09	7.04	6.07	8.23
Yen Bai	63.09	6.05	6.23	7.42	5.17	7.76

3. Research Results and Discussion

Estimate the Regression Model using the OLS Method

Perform regression model estimation on Stata software with the following command:

regress pci dd mb nd ld pl

Source	SS	df	MS	Number of obs	=	63
				F(5, 57)	=	40.60
Model	412.727158	5	82.5454317	Prob > F	=	0.0000
Residual	115.902306	57	2.0333738	R-squared	=	0.7807
				Adj R-squared	=	0.7615
Total	528.629465	62	8.52628169	Root MSE	=	1.426

pci	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
dd	1.858643	.4334905	4.29	0.000	.9905933	2.726693
mb	1.267133	.3898159	3.25	0.002	.4865401	2.047726
nd	1.670856	.5147841	3.25	0.002	.6400187	2.701694
ld	1.680926	.2377141	7.07	0.000	1.204912	2.15694
pl	.7694725	.488087	1.58	0.120	-.2079048	1.74685
_cons	18.56887	3.952172	4.70	0.000	10.65478	26.48296

In there:
Total: value of TSS
Residual value of RSS
Model: value of ESS
Number of obs: size of the data sample
F: calculated value of the Fisher statistic for the data sample.
Prob: p-value of the F statistic.
R-squared: coefficient of determination
Adj. R-squared: correction coefficient of determination
Coef: regression coefficient
Std. Err: standard error of the regression coefficient
t: value of the T statistic for the sample
P>|t|: p-value of the T statistic

- **From the Above Estimation Results, we Obtain the Sample Regression Model**

$PCI_i = 18.56887 + 1.858643DD_i + 1.267133MB_i + 1.670856ND_i + 1.680926LD_i + 0.7694725PL_i + e_i$

Meaning:
$\widehat{\beta_1}$: It doesn't make sense because land cannot be 0.
$\widehat{\beta_2}$: When DD increases or decreases by one unit (under the condition that other factors remain unchanged), the PCI index increases or decreases by 1.858643 units.
$\widehat{\beta_3}$: When MB increases or decreases by one unit (under the condition that other factors remain unchanged), the PCI index increases or decreases by 1.267133 units.
$\widehat{\beta_4}$: When ND increases or decreases by one unit (under the condition that other factors remain unchanged), the PCI index increases or decreases by 1.670856 units.
$\widehat{\beta_5}$: When LD increases or decreases by one unit (under the condition that other factors remain unchanged), the PCI index increases or decreases by 1.680926 units.
$\widehat{\beta_6}$: When PL increases or decreases by one unit (under the condition that other factors remain unchanged), the PCI index increases or decreases by 0.7694725 units.

- **Coefficient of Determination:** R2 = 0.7807

So, 78.07% of the fluctuation of the PCI index depends on the fluctuation of DD, MB, ND, LD, and PL.

Test the Appropriateness of the Regression Model

With a 5% significance level and a 95% confidence level, we test the following pair of hypotheses:
H_0: The regression model is not suitable (R2 = 0).
H_1: The regression model is suitable (R2 > 0).
From the table above, we know that the **p-value (F)** = 0 < α = 0,05 should reject hypothesis H_0. So, the regression model is suitable at the 5% significance level.

Test the Influence of Each Independent Variable on the Dependent Variable

With a 5% significance level and a 95% confidence level, we test the influence of each independent variable on the dependent variable in turn.

- **Variable DD**

Test a pair of hypotheses:

$$\begin{cases} H_0: \beta_2 = 0 \\ H_1: \beta_2 \neq 0 \end{cases}$$

From the table above, we have: p-value (T) = 0 < α = 0,05, so the hypothesis H0 is rejected. So, DD has an impact on the PCI index.

- **Variable MB**

Test a pair of hypotheses:

$$\begin{cases} H_0: \beta_2 = 0 \\ H_1: \beta_2 \neq 0 \end{cases}$$

From the table above, we have: p-value (T) = 0.002 < α= 0,05, so we reject hypothesis H0. So, MB has an impact on the PCI index.

- **Variable ND**

Test a pair of hypotheses:

$$\begin{cases} H_0: \beta_2 = 0 \\ H_1: \beta_2 \neq 0 \end{cases}$$

From the table above, we have: p-value (T) = 0.002 < α= 0,05, so we reject hypothesis H0. So, ND has an impact on the PCI index.

- **LD variable**

Test a pair of hypotheses:

$$\begin{cases} H_0: \beta_2 = 0 \\ H_1: \beta_2 \neq 0 \end{cases}$$

From the table above, we have: p-value (T) = 0 < α= 0,05, so the hypothesis H0 is rejected. So, LD does affect the PCI index.

- **PL variable**

Test a pair of hypotheses:

$$\begin{cases} H_0: \beta_2 = 0 \\ H_1: \beta_2 \neq 0 \end{cases}$$

From the table above, we have: p-value (T) = 0.120 > α= 0,05, so there is no basis to reject hypothesis H0. So, PL does not affect the PCI index.

Perform Validation of the Model

Checking the Defects of the Regression Model

Check for missing variables.

Perform the Ramsey test on Stata software with the command:

regress pci dd mb nd ld pl
ovtest state

```
Ramsey RESET test using powers of the fitted values of pci
       Ho:  model has no omitted variables
                  F(3, 54) =      0.11
                  Prob > F =      0.9556
```

Test a pair of hypotheses:

$$\begin{cases} H_0: \text{The initial model has no missing variables.} \\ H_1: \text{The original model is missing variables.} \end{cases}$$

Use the p-value (T) at the 5% significance level.

The results show a p-value = 0.9556 > 0.05, so there is no basis to reject hypothesis H_0. So, it can be assumed that the original model does not miss relevant variables.

Error variance changes

Breusch-Pagan Test

Perform the Breusch-Pagan test on Stata software with the command:

estat hettest, iid

Test a pair of hypotheses:

H_0: The original model has an unchanged error variance.

H_1: The initial model has heteroskedasticity.

Use the p-value (T) at the 5% significance level.

The results show a p-value = 0.9037 > 0.05, so there is no basis to reject hypothesis H_0. So, it can be said that the original model has constant error variance.

White test

Perform the white test on Stata software with the command:

untested State, White

```
White's test for Ho: homoskedasticity
         against Ha: unrestricted heteroskedasticity

         chi2(20)     =     13.01
         Prob > chi2  =    0.8770

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	13.01	20	0.8770
Skewness	2.67	5	0.7504
Kurtosis	4.80	1	0.0285
Total	20.48	26	0.7683

Test a pair of hypotheses:

H_0: The original model has an unchanged error variance.

H_1: The initial model has heteroskedasticity.

Use the p-value (T) at the 5% significance level.

The results give a p-value = 0.8770 > 0.05. With a significance level of 5%, it can be assumed that the original

model has an unchanged error variance.

Multicollinearity Test
Secondary Regression
Perform sub-regression model estimation on Stata software with the command:

reg dd mb nd ld pl

Source	SS	df	MS	Number of obs	=	63
				F(4, 58)	=	4.88
Model	3.64471658	4	.911179146	Prob > F	=	0.0018
Residual	10.8207691	58	.186564984	R-squared	=	0.2520
				Adj R-squared	=	0.2004
Total	14.4654857	62	.233314285	Root MSE	=	.43193

dd	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
mb	.1132146	.1171377	0.97	0.338	-.1212619	.3476911
nd	.018549	.1559117	0.12	0.906	-.2935421	.3306401
ld	.0127157	.0719854	0.18	0.860	-.1313788	.1568102
pl	.4788854	.1338053	3.58	0.001	.211045	.7467259
_cons	2.454196	1.152944	2.13	0.038	.1463267	4.762065

Use the secondary regression method to detect multicollinearity in this model (5% significance level, 95% confidence level).
Test a pair of hypotheses:
H_0: The regression model does not suffer from multicollinearity (R2 = 0).
H_1: The regression model suffers from multicollinearity (R2 > 0).
From the table above, we have: p-value (F) = 0.0018 < α = 0,05, so we reject hypothesis H_0. So it can be said that the original model suffers from multicollinearity defects.

Correlation Coefficients
Calculate the correlation coefficient between independent variables with the command:

reg pci dd mb nd ld pl

correlate pci dd mb nd ld pl

(obs=63)

	pci	dd	mb	nd	ld	pl
pci	1.0000					
dd	0.5380	1.0000				
mb	0.4219	0.0886	1.0000			
nd	0.5753	0.2758	0.2801	1.0000		
ld	0.6750	0.1728	0.2398	0.2660	1.0000	
pl	0.4836	0.4837	-0.0880	0.4563	0.2446	1.0000

The results show that the correlation coefficient between independent variables is relatively low, so the problem of multicollinearity in the model is low.

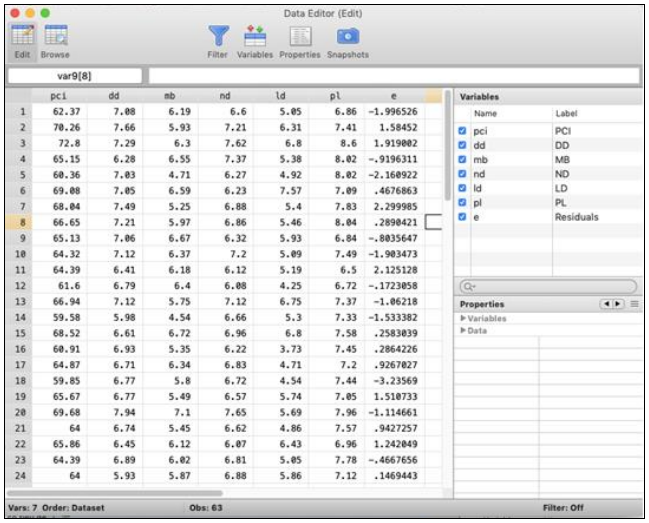
VIF Value: Variance inflation factor
vif

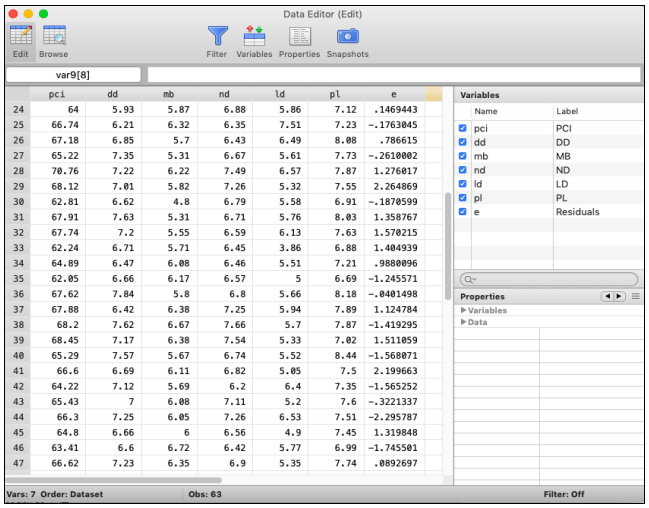
Variable	VIF	1/VIF
pl	1.71	0.583327
nd	1.46	0.682664
dd	1.34	0.748041
mb	1.24	0.806272
ld	1.16	0.863724
Mean VIF	1.38	

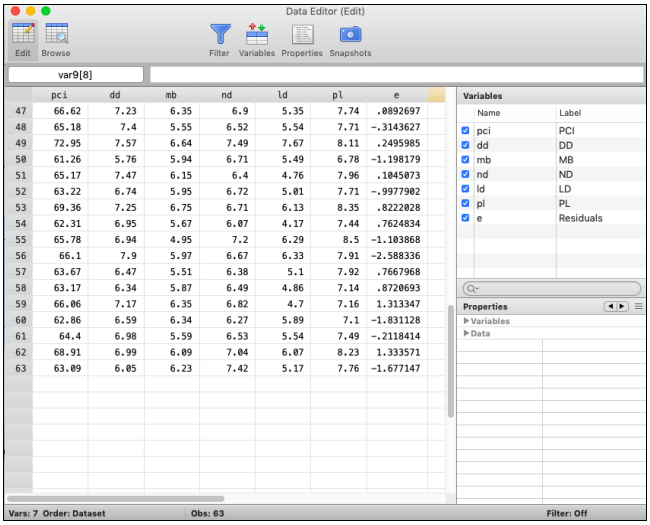
Because VIF = 1.38, the problem of multicollinearity in the model is low.

Test the Normal Distribution of Random Errors
Calculate molecular chains.

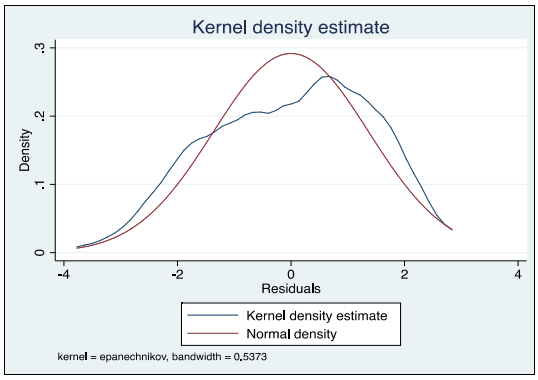
predict e, resid



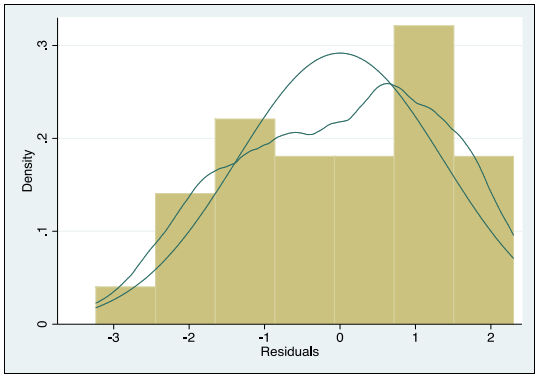




Draw a distribution chart of the residuals.
kdensity e, normal



Draw a histogram chart.
histogram e, kdensity normal



Verify via the swilk command

reg pci dd mb nd ld pl
swilk e

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
e	63	0.96885	1.761	1.223	0.11062

Test a pair of hypotheses:
H_0: A random error has a normal distribution.
H_1: Random error k has a normal distribution.
Use the p-value (T) at the 5% significance level.
P-value = 0.11062 > 0.05 has no basis to reject H_0. So, the random error has a normal distribution.
Verify via the sktest command
sktest e

Skewness/Kurtosis tests for Normality

				joint	
Variable	Obs	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	Prob>chi2
e	63	0.3741	0.0436	4.83	0.0893

Test a Pair of Hypotheses
H_0: A random error has a normal distribution.
H_1: Random error k has a normal distribution.
Use the p-value (T) at the 5% significance level.
P-value = 0.0893 > 0.05 has no basis to reject H_0. So, the random error has a normal distribution.

4. Conclusion and Recommendations

After estimating and testing the model with a 5% significance level and a 95% confidence level, the research team came to the following conclusion:

- The above model is consistent with sutra theory.
- Factors such as land access (DD), transparency (MB), dynamism (ND), and labor training (LD) affect the PCI index.
- The legal institutional factor (PL) does not affect the PCI index.
- The initial model does not omit relevant variables.
- The initial model has heteroskedasticity.
- The original model suffers from multicollinearity defects.
- The initial model has normally distributed random errors.

So, in order for provinces and cities to improve their PCI index and rise in the rankings, the authors offer a number of solutions, as follows:

- Focus on improving the land access index, transparency, and dynamism in all things.
- Train more workers, create jobs, and reduce unemployment for people.
- Leaders at all levels and sectors must be proactive in performing their responsible roles of supporting and accompanying businesses to create a dynamic and transparent business environment so that investors and businesses can feel secure. Investment and development of production and business in the province.
- Strengthen anti-corruption work; check the implementation of state regulations; strengthen discipline; improve public service ethics; and build a team of cadres, civil servants, and public employees that are truly clean and capable of meeting requirements. go on business; promptly and strictly handle cases of abusing positions, powers, and assigned tasks to cause difficulties for people and businesses.

5. References

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