JOURNAL OF CULTURAL ANALYSIS AND SOCIAL CHANGE

Journal of Cultural Analysis and Social Change,
2026, 11(1), 3611-3621
ISSN: 2589-1316

Human Resource Development in The Southeastern Region of Vietnam: An Empirical Study 2010-2024

Nguyen Thi Huong[1*]

[1] *University of Labour and Social Affairs, Campus II, Ho Chi Minh City, Vietnam, Email: huongnt@ldxh.edu.vn*

***Corresponding Author:** huongnt@ldxh.edu.vn

Citation: Huong, N. T. (2026). Human Resource Development in The Southeastern Region of Vietnam: An Empirical Study 2010-2024, *Journal of Cultural Analysis and Social Change*, 11(1), 3611-3621. https://doi.org/10.64753/jcasc.v11i1.4776

Published: April 16, 2026

ABSTRACT

The Southeast region of Vietnam is notable for its economic performance; however, its human resources remain underdeveloped. Using panel data from six provinces and cities between 2010 and 2024, this study assesses the impact of public investment, cooperation among training institutions, and economic attractiveness on the proportion of the trained workforce. Using fixed effects, robust standard errors, instrumental variable estimation, and mediating repeated distributions, the authors confirm that all three factors have positive and statistically significant impacts. Labor productivity was found to have a partially mediating effect, accounting for approximately 69% of the total impact of enterprise training cooperation. Variables such as workforce size, population density, amount of foreign direct investment, and average value of fixed asset investment per unit of labor were not statistically significant at the 5% level. Therefore, this paper proposes focusing on strengthening targeted public investment, expanding the tripartite cooperation system, and improving strategies for recruiting and retaining skilled labor.

Keywords: Human resource development, Southeast region, mediating role, labor productivity, provincial merger, Vietnam.

INTRODUCTION

Before Resolution No. 202/2025/QH15 on the reorganization of provincial-level administrative units, the Southeast region consisted of six provinces and cities: Ho Chi Minh City, Dong Nai, Binh Duong, Ba Ria - Vung Tau, Binh Phuoc, and Tay Ninh. After the merger in June 2025, the Southeast region was reorganized into three new units. Specifically, Ho Chi Minh City was formed from the merger of the old Ho Chi Minh City, Binh Duong, and Ba Ria - Vung Tau. Dong Nai province was formed from the merger of the old Dong Nai and Binh Phuoc, and Tay Ninh province was formed from the merger of the old Tay Ninh and Long An. Therefore, the research data from the period 2010-2024 is compiled based on the old administrative boundaries.

It can be said that the Southeast region has always been considered the economic engine of the country, accounting for approximately 33% of the total regional product and 45% of state budget revenue. In 2024 alone, the average GRDP per capita in this region reached VND 165.6 million, 1.46 times higher than the national average of VND 113.6 million (General Statistics Office, 2025, pp. 92-93). Furthermore, labor productivity in the Southeast region, calculated at current prices, reached VND 303.8 million per worker, 37% higher than the national average of VND 222.0 million per worker (General Statistics Office, 2025, pp. 74-75). However, the proportion of the workforce aged 15 and over who have received training and hold degrees or certificates in the Southeast region in 2024 was only about 30.0%, significantly lower than the Red River Delta region, which was 43.8%, and only slightly higher than the national average of 28.4% (General Statistics Office, 2025, pp. 72-73). This shows that although

Copyright © 2025 by Author/s. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited..

the labor productivity of the Southeast region is high, the skill level of the workforce is low, reflecting an imbalance in the accumulation of human capital and human resources.

According to Resolution No. 24-NQ/TW dated October 7, 2022, of the Politburo on socio-economic development and ensuring national defense and security in the Southeast region, the goal of developing high-quality human resources by 2030, with a vision to 2045, has also been set. However, in Vietnam, there is a lack of extensive quantitative research in this field. In the past, most studies have focused on describing or proposing policies, failing to quantify the impact of factors such as public investment, business linkages, training institutions, and income on the proportion of trained workers.

Therefore, this paper attempts to answer three main questions. First, what is the impact of public investment, business-training linkages, and economic attractiveness (average income) on the proportion of trained workers in the Southeast region? Next, can labor productivity be considered a substitute for training efficiency, and is it truly a mediating variable in these relationships? Finally, do the control factors (labor force size, population density, FDI capital, and the technological level of enterprises) significantly affect the quality of human resources? Finally, are the proposed policy recommendations reasonable in the context of the newly restructured areas of the Southeast region following administrative mergers?

THEORETICAL BACKGROUND AND LITERATURE REVIEW

Theoretical Foundation

To understand the mechanism of regional human resource development, we need to rely on several basic theories. First, the concept of human capital was put forward by researchers such as Becker (1964) and Schultz (1961). They argued that investing in education, training, and healthcare can increase labor productivity as well as workers' income. At the regional level, if public investment in education and training, as well as the implementation of policies encouraging learning, is carried out, the skill level of the population will be raised. Another perspective, regarding institutions, was mentioned by DiMaggio & Powell (1983). They argued that organizations are often influenced by the regulations and norms of the surrounding environment.

In the Southeast region of Vietnam, the concentration of businesses and foreign direct investment (FDI) projects creates significant pressure. This pressure requires vocational schools, colleges, and universities to change their curricula to suit the needs of businesses and the labor market. Todaro's theory of labor migration, proposed in 1969, suggests that the influx of migrants from other regions into the Southeast – with a net immigration rate of +18.7% (General Statistics Office, 2025, pp. 60-61) – both supplements the workforce in the region and poses new challenges. One of the main challenges is the training and employment of workers, as migrant workers often have uneven skill levels.

Review of National and International Literature

In Vietnam, there have been many studies on human resources, but most have focused only on qualitative or descriptive statistical methods, and have not provided a comprehensive view of human resource development here. Some specific studies have focused on different aspects of human resources such as SWOT matrix analysis for human resource development in small and medium-sized enterprises, human resources in the public sector, or human resources in enterprises to meet the needs of economic and social development (Cong Tay, 2024; Truong Duc Thuan, 2024; Tran Minh Tuan, 2024; Nguyen Thi Huong, 2025). In particular, the study by Nguyen Thi Van Anh (2024) emphasized the urgent need for human resources for digital transformation and green economic development. Furthermore, studies on national vocational training policies have highlighted the gap between training and employment in the new context (Tran Hong Hai et al., 2025). Local studies have also confirmed the importance of collaboration between businesses and schools (Nguyen Hoai An, 2025; Tran Thi Yen Thanh, 2025; Nguyen Thi Huong, 2026). However, a common point among these studies is that no econometric model has yet assessed the simultaneous impact of multiple factors and tested their mediating roles.

Internationally, a study by Li, Chen & Fang (2021) on 31 provinces and cities in China during the period 2005–2018 showed that public investment had a stronger impact on labor quality in coastal provinces. Another study by Kumar & Kaur (2022) using data on industrial clusters in India also showed that practical training plays a crucial mediating role in the relationship between enterprise linkages, vocational schools, and labor productivity. Glaeser & Saiz (2004) also indicated that urban areas with highly skilled labor tend to have faster growth rates due to their skilled workforce.

In Vietnam, data from the General Statistics Office shows a disparity in the proportion of trained labor between regions. Specifically, the Red River Delta has the highest proportion of trained labor, reaching 43.8%, while the Southeast ranks second with approximately 30%. The lowest figure is in the Mekong Delta with only

 © 2025 by Author/s

18.4% (General Statistics Office, 2025, pp. 72-73). This difference shows that there are disparities between factors and between regions across the country.

Research Model and Hypothesis Development

Based on this, we created a model. In this model, the most important factor is the quality of human resources (Y), measured by the proportion of trained workers. There are three main factors affecting the quality of human resources. First, public investment (X1), measured by capital invested in the service sector, plays a significant role. Second, (X2) the link between businesses and training, measured by the number of operating businesses, is also a key factor. Third, (X3) economic attractiveness, measured by per capita income, also affects the quality of human resources. In addition, labor productivity plays a mediating role in this relationship. We also considered four other control factors, including labor size (C1), urbanization and population density (C2), foreign direct investment (FDI) measured by the number of projects (C3), and (C4) technological level along with average fixed asset equipment per worker in the enterprise.

Our hypotheses are developed as follows: Hypothesis 1 (H1) suggests that public investment has a positive impact on human resource quality. Hypothesis 2 (H2) proposes that the linkage between enterprises and training also has a positive impact on human resource quality. Hypothesis 3 (H3) suggests that economic attractiveness, measured through income, has a positive impact on human resource quality. Additionally, we propose several other hypotheses: H4, H5, and H6, in which labor productivity plays a partial mediating role in the relationship between public investment, business-training linkages, economic attractiveness, and human resource quality. Finally, hypotheses H7 to H10 relate to control variables; we expect these variables to have a positive impact, but the magnitude of the influence may be weak and possibly not statistically significant due to limitations in measurement or certain lags. We acknowledge that the proxies used in the study are crude and will be discussed in more detail in the limitations section of the study.

RESEARCH METHODOLOGY

Data Collection and Sample

Panel data for six provinces and cities in the Southeast region from 2010 to 2024 were obtained from the General Statistics Office (General Statistics Office, 2025). A total of 90 observed data points (6 different units over 15 years) were included. The data for X1, X2, X3, M, C1–C4 were not evenly distributed, so they were converted to natural logarithm (ln) for easier analysis. The variable Y (percentage) remained unchanged. For the variable X3 (average income per person), some years lacked sufficient information; to address this, we used linear interpolation for each province to obtain complete data.

Table 1. Description of variables and data sources

Variable	Symbol	Measurement (table number)	Unit	Note
Human resource quality	Y	Percentage of labor force aged 15+ with formal training and degree/certificate`	%	Input measure
Public investment (proxy)	X1	Realized investment in the service sector	Billion VND	Covers multiple sectors
Firm–training institution linkage (proxy)	X2	Number of active enterprises with production and business results	Enterprises	Reflects scale
Economic attractiveness	X3	Average monthly income per capita	Thousand VND	Proxy
Labor productivity	M	Labor productivity at current prices	Million VND/worker	Proxy for training effectiveness
Labor force size	C1	Labor force aged 15+	Thousand people	
Urbanization	C2	Population density (population/area)	People/km²	
FDI capital	C3	Number of licensed FDI projects	Projects	
Technological level	C4	Average fixed assets per worker in enterprises	Million VND	

Source: Compiled by the author from the General Statistics Office, 2025.

© 2025 by Author/s

Unit Root Tests and Model Selection

Before estimation, we performed stationarity tests on logarithmic series using two common methods.
These methods included:

- Levin–Lin–Chu (LLC) with the common assumption of a single unit root
- Im–Pesaran–Shin (IPS) which allows for different autoregressive coefficients between provinces.

Both tests were performed with a time trend and a maximum lag of 2, based on the AIC criterion. The test results showed that all variables such as Y, lnX1, lnX2, lnX3, lnM, lnC1, lnC3 were stationary at a significance level of $p < 0.05$. For lnC2 and lnC4, the IPS test yielded p-values of 0.082 and 0.076, respectively. Since these were at the borderline, we concluded that they were stationary at first-order differences. However, in the main models, we still use the level variable but add a time trend variable for control.

To select the appropriate model, we performed the F-test, Breusch-Pagan Lagrangian multiplier, and Hausman tests.
The results showed:

- The F-test had a p-value less than 0.001, which rejected the pooled OLS model.
- The Breusch-Pagan test also had a p-value less than 0.001, rejecting the pooled model compared to the random effects (RE) model.
- The Hausman test with $\chi^2(8) = 34.2$ and $p = 0.000$ showed the rejection of the RE model and support for the fixed effects (FE) model.

Therefore, we used the fixed effects model throughout the study. In addition, year dummies were included to control for common effects occurring in the same year across all provinces, such as the impact of the COVID-19 pandemic or changes in national policy.

To ensure the reliability of the results, we calculated the standard errors using the clustering method by province. This helps address the heteroskedasticity problem (verified by the xttest3 test with $p = 0.018$) and first-order autocorrelation (xtserial test with $p = 0.024$).

Testing Mediation Effects and Addressing Endogeneity

To test the mediating role of labor productivity (M), we use the Baron & Kenny method from 1986 combined with the 5,000-times bootstrap technique. The steps are as follows:

(1) Regress Y on X (and other control variables) – from which we obtain the sum coefficient c; (2) Regress labor productivity on X (along with control variables) – from which we obtain the coefficient a; (3) Regress Y on X and labor productivity – from which we obtain the direct coefficient c' and the coefficient b. The indirect effect is calculated as $a \times b$.

If the 95% bootstrap confidence interval of this effect does not contain zeros, we can conclude that labor productivity plays a mediating role.

The mediating rate is calculated as $= (a \times b)/c$.

In terms of endogeneity, we need to consider factors such as the number of firms and income. Both of these factors may have a correlation with error due to the inverse effect. For example, if the quality of labor is high, it may attract more businesses and increase income. To address this issue, we use instrumental variables in the framework of two-stage regression analysis (FE 2SLS).

The instrumental variables we use include:

* First-order lagged values of the number of businesses and income
* Number of newly registered businesses in the previous year (Statistics Bureau, 2025, p.129).

The Sargan test results show that these instruments are valid, with $\chi^2(2) = 2.34$ and $p = 0.31$. This means that we do not have enough grounds to reject the hypothesis that these instruments are valid. Furthermore, the Kleibergen-Paap test showed that the F-statistic = 19.7, which is greater than 10. This means we can reject the weak instrument phenomenon. All the above analyses were performed using Stata 18 software.

Table 2. Stationarity tests (LLC and IPS)

Variable	LLC (p-value)	IPS (p-value)	Conclusion
Y	0	0.001	Stationary
lnX1	0.002	0.003	Stationary
lnX2	0.001	0.001	Stationary
lnX3	0	0	Stationary
lnM	0	0	Stationary
lnC1	0.011	0.024	Stationary
lnC2	0.082	0.094	Stationary at first difference I(1)

 © 2025 by Author/s

lnC3	0.003	0.007	Stationary
lnC4	0.076	0.088	Stationary at first difference I(1)

Source: Author's calculation.

RESEARCH RESULTS

Descriptive Statistics and Correlations among Variables

Table 3 provides information on the variables after applying logarithmization, except for variable Y. Variable Y has an average value of 21.42%, and it varies considerably, from a low of 12.70% in Tay Ninh in 2019 to a high of 39.10% in Ho Chi Minh City in 2019.

The variables lnX1, lnX2, and lnX3 also show clear differences between different localities. Specifically, variable lnX1, representing investment capital in the service sector, varies from 7.98 to 12.89. Variable lnX2, representing the number of businesses, ranges from 6.54 to 12.10. Finally, variable lnX3, related to average income, ranges from 7.02 to 9.05.

The standard deviation of the variable lnM, representing labor productivity, is 0.98. This indicates a significant difference between localities, such as between Binh Phuoc with an lnM value of approximately 3.86 and Ba Ria - Vung Tau with an lnM value of approximately 7.26. This large difference is mainly due to the impact of the oil and gas industry.

Table 3. Descriptive statistics of variables (N=90)

Variable	Mean	Std. dev.	Minimum	Maximum
Y (%)	21.42	6.87	12.70 (Tây Ninh, 2019)	39.10 (Ho Chi Minh City, 2019)
lnX1	10.23	1.56	7.98	12.89
lnX2	8.91	1.87	6.54	12.1
lnX3	8.14	0.62	7.02	9.05
lnM	5.21	0.98	3.86	7.26
lnC1	7.21	0.73	6.13	8.48
lnC2	7.49	0.85	5.97	8.42
lnC3	3.67	1.44	0.69	6.12
lnC4	4.82	0.57	3.79	6.08

Source: Author's calculation from General Statistics Office data (2010–2024).
Note: lnX1–lnC4 is the natural logarithm of the original values. Y is the percentage.

Table 4 shows the Pearson correlation matrix, revealing the correlation between the variables in the study. From this table, we see that variable Y has a positive and fairly strong correlation with variables lnX2, lnX3, and lnM, with correlation coefficients of 0.67, 0.71, and 0.74, respectively. This indicates that provinces with a large number of businesses, high per capita income, and high labor productivity tend to have a higher proportion of trained workers.

The correlation between the main independent variables is moderate. Specifically, the highest correlation coefficient is between lnX2 and lnX3 with a value of 0.58. This shows that there is no multicollinearity between the independent variables, ensuring the validity of the model.

However, it should be noted that the correlation coefficient between lnC1 and lnC2 is quite high, reaching a value of 0.73. This is understandable because provinces with large populations usually have high population density. Despite the high correlation between these two variables, after performing conventional OLS regression, the VIF coefficients of both variables are less than 5. Therefore, we decided to keep both variables in the model to ensure the completeness and accuracy of the results.

© 2025 by Author/s

Table 4. Pearson correlation matrix

Variable	Y	lnX1	lnX2	lnX3	lnM	lnC1	lnC2	lnC3	lnC4
Y	1.00								
lnX1	0.38*	1.00							
lnX2	0.67*	0.45*	1.00						
lnX3	0.71*	0.49*	0.58*	1.00					
lnM	0.74*	0.42*	0.62*	0.65*	1.00				
lnC1	0.21	0.18	0.14	0.19	0.24	1.00			
lnC2	0.25	0.22	0.17	0.24	0.29	0.73*	1.00		
lnC3	0.53*	0.41*	0.59*	0.56*	0.60*	0.12	0.15	1.00	
lnC4	0.46*	0.39*	0.52*	0.48*	0.55*	0.09	0.11	0.48*	1.00

Source: Author's calculation. Note: * $p < 0.05$.*

Fixed Effects Regression Results for Direct Effects

Table 5 presents the estimation results of the fixed-effects model with three different constructs. Column (1) in the table includes the three main independent variables, along with the fixed effects for the province and year. Column (2) expands from column (1) by adding four control variables to consider their impact. Column (3) shows the most complete model, in which the labor productivity variable (lnM) is included, marking an important preparatory step for the subsequent mediating test.

In all three columns, the coefficients of lnX1, lnX2, and lnX3 are positive and statistically significant at the 1% or 5% level. Specifically, in column (2) – the preferred model because it fully controls for confounding factors – the coefficient of lnX1 is 0.129 ($p<0.05$). This means that when investment in the service sector increases by 1%, the proportion of trained workers will increase by approximately 0.13 percentage points. The coefficient of lnX2 is 0.238 ($p<0.01$), indicating a larger impact. When the number of businesses increases by 1%, the proportion of trained workers will increase by an additional 0.24 percentage points. Most importantly, the coefficient of lnX3 (average per capita income) is 0.309 ($p<0.01$). This confirms that economic attractiveness plays a key role. Provinces with higher incomes not only attract skilled workers but also create favorable conditions for investment in education and training.

Factors that did not significantly affect the results at the 5% level include: lnC1 ($p=0.38$), lnC2 ($p=0.35$), lnC3 ($p=0.23$), lnC4 ($p=0.14$). However, lnC4 (technological level) has a p-value of 0.07, close to the significance threshold. This indicates that considering the principal factors—labor force size, population density, number of FDI projects, and level of fixed asset equipment—does not further explain the differences in training rates between provinces and over time. The coefficient of determination R^2 in the sample increased from 0.621 in the first case to 0.692 in the third case, suggesting that the addition of control and mediating variables helps the model better explain the variation in variable Y.

Table 5. Fixed effects model – direct effects on Y

Variable	-1	-2	-3
lnX1	0.152** (0.048)	0.129** (0.051)	0.118** (0.046)
lnX2	0.261*** (0.062)	0.238*** (0.065)	0.221*** (0.059)
lnX3	0.342*** (0.079)	0.309*** (0.083)	0.293*** (0.077)
lnM			0.527*** (0.112)
lnC1		0.037 (0.042)	0.029 (0.039)
lnC2		0.045 (0.048)	0.038 (0.045)
lnC3		0.062 (0.051)	0.048 (0.047)
lnC4		0.081 (0.054)	0.069 (0.052)
Constant	0.432** (0.187)	0.378* (0.201)	0.212 (0.189)
Province FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R^2 (within)	0.621	0.643	0.692
N	90	90	90

 © 2025 by Author/s

Source: Author's estimation (Stata 18). Robust standard errors clustered by province in parentheses. *** p<0.01; ** p<0.05; * p<0.1.*

The Mediating Role of Labor Productivity: Bootstrap Results

We performed the Baron & Kenny procedure for each independent variable. However, we will present the most detailed analysis for X2, as this is the channel expected to have the strongest mediating effect.

Step 1: We examined the total impact of X2 on Y. We performed a regression of Y on lnX2, including the control variable and the fixed effect (FE). The result obtained is the equation: $Y = 0.52 + 0.44\ln X2$. The total coefficient c is 0.44, with a statistical significance level $p < 0.001$. This indicates that when the number of businesses (one representative of the association) increases by 1%, the proportion of trained workers increases directly by 0.44 percentage points.

Step 2: Next, we analyzed the impact of X2 on M, i.e., labor productivity. We performed a regression of lnM on lnX2, along with the control variable and fixed effects (FE). The results obtained were: $\ln M = 1.12 + 0.48\ln X2$. The coefficient a is 0.48, with a statistical significance level of $p < 0.001$. This indicates that the larger the number of enterprises, the higher the labor productivity, reflecting both economies of scale and linkage effects.

Step 3: Finally, we considered the combined effect of X2 and M on Y. The regression results showed: $Y = 0.31 + 0.19\ln X2 + 0.63\ln M$. The direct coefficient c' is 0.19, with a statistical significance level of $p = 0.012$, and the coefficient b is 0.63, with a statistical significance level of $p < 0.001$. Compared to the total coefficient c of 0.44, the direct coefficient c' decreased to 0.19, but was still statistically significant. The indirect effect was calculated as $a \times b = 0.48 \times 0.63 = 0.302$.

To test the statistical significance of the indirect effect, we performed bootstrap with 5,000 resamples. The results showed that the 95% confidence interval of the indirect effect was [0.185; 0.425], and did not contain 0. This led to the conclusion that labor productivity plays a mediating role in the relationship between enterprise-training linkage and human resource quality. The mediating proportion was calculated by dividing the indirect effect by the total effect, resulting in $0.302/0.44 = 0.686$, equivalent to approximately 68.6%. This means that more than two-thirds of the impact from the business-training linkage on human resource quality stems from improved labor productivity. The remainder, approximately 31.4%, is a direct impact from the business-training linkage on human resource quality. This impact may come from other mechanisms and policies, such as improving training programs, enhancing vocational practice, or simply from measurement errors.

Next, we performed a similar process with X1, the public investment factor. The results showed a total impact of 0.28, with a statistical significance level of p less than 0.01. The indirect effect, calculated as the product of a and b, was 0.154 with a 95% confidence interval from 0.087 to 0.231. The mediating proportion in this case was approximately 55%. For X3, the average income factor, the total effect was recorded as 0.39 with a statistical significance level of p less than 0.001. The indirect effect was 0.242, with a 95% confidence interval from 0.152 to 0.335. The mediating proportion in this case was approximately 62%.

In summary, labor productivity acted as a mediating factor in all three relationships considered. However, its mediating role was strongest when relating to the relationship between the enterprise and training.

Results of Endogeneity Treatment (2SLS)

Table 6 presents a comparison between the results of the conventional FE regression (column 2 of Table 5) and the FE 2SLS results using instrumental variables (first-order lagged values of lnX2, lnX3, and the number of newly registered businesses in the previous year). After adjusting for endogenous factors, the coefficient of lnX2 increased from 0.238 to 0.279 and remained statistically significant at the 1% level. Conversely, the coefficient of lnX3 decreased slightly from 0.309 to 0.301. The coefficient of lnM also showed a similar trend. Sargan test (p=0.31) and Kleibergen–Paap test (F=19.7) showed that the instrumental variables used were valid and not weak. This indicates that conventional FE estimates are not significantly affected by endogenous factors.

Table 6. Comparison of FE and FE-2SLS (dependent variable: Y)

Variable	FE	FE-2SLS (IV)
lnX1	0.129** (0.051)	0.138** (0.056)
lnX2	0.238*** (0.065)	0.279*** (0.081)
lnX3	0.309*** (0.083)	0.301*** (0.085)
lnM	0.527*** (0.112)	0.509*** (0.118)
Control variables	Yes	Yes
R^2 (within)	0.643	0.681
N	90	84 (due to lags)

© 2025 by Author/s

Source: Author's estimation. Instrumental variables: first-order lags of lnX2, lnX3 and the number of newly registered enterprises in the previous year (General Statistics Office, 2025, pp.129). Robust standard errors in parentheses. *** p<0.01; ** p<0.05.*

Sensitivity Analysis

To ensure that the results were not significantly affected by a particular province or period, we conducted further tests.

The Jackknife method (eliminating one province at a time): We successively removed one of the six provinces and re-ran the FE model (column 2, Table 5). The coefficients of factors lnX1, lnX2, and lnX3 changed by no more than 12% compared to the initial estimates. Notably, when removing Ba Ria – Vung Tau province (a province with very high labor productivity due to oil and gas exploitation activities), the coefficient of lnM decreased slightly from 0.527 to 0.491 but still maintained statistical significance. This indicates that the above results were not significantly affected by any outlier.

Instead of using labor productivity, we used the rate of informal employment (General Statistics Office, 2025, p. 71) as the variable representing training effectiveness. The low informal labor rate indicates good training effectiveness. The results show that the coefficient of this variable is negative as expected and statistically significant. However, the magnitude of this coefficient is smaller than that of the variable lnM (0.31 vs. 0.53). This suggests that the productivity channel remains more important in reflecting training effectiveness.

Regarding the Random Effects Model (RE): Although the Hausman test showed that the fixed effects model is more suitable, we still conducted an analysis with the random effects model to compare the results. The coefficients of the variables lnX1, lnX2, and lnX3 in this model have similar magnitudes to those in the fixed effects model, but with slightly smaller standard errors, which increases the statistical significance of the coefficients. This result further reinforces the previous conclusion about the model's suitability.

When considering the period from 2010 to 2019, we excluded the years affected by the COVID-19 pandemic and the post-pandemic recovery period. The results obtained remained almost unchanged, except for a slight decrease in the coefficient of the variable lnX3 from 0.309 to 0.287. This suggests that the impact of income may be influenced by domestic and international economic shocks.

Thus, the sensitivity analyses we performed confirmed that the main findings in this study are robust and independent of specific choices regarding the data sample or variables used in the analysis.

DISCUSSION

Interpretation of Key Findings

It can be said that the highest coefficient of per capita income (X3) accurately reflects the reality of the Southeast economic region. High-income localities such as Ho Chi Minh City, Binh Duong, and Dong Nai not only attract skilled labor from other areas but also have abundant financial resources to invest in education and training. This creates competitive pressure on wages and bonuses, forcing workers to actively improve their skills. Conversely, provinces with lower incomes such as Binh Phuoc and Tay Ninh often have lower rates of trained workers. This is often due to specific factors related to their starting point, such as being border regions or having a predominantly agricultural economy.

Furthermore, the impact of the linkage between businesses and training X2 (measured by the number of businesses) on the quality of human resources is quite significant, with a coefficient ranging from 0.238 to 0.279. This shows that the private sector plays a crucial role in improving the quality of human resources. In the Southeast region, where there is a high density of businesses, especially in industrial zones, an ecosystem has formed. There, vocational schools, colleges, and universities are forced to adjust their training programs to meet the needs of businesses. However, it should be noted that business data does not distinguish between businesses that have genuine links with training institutions. Therefore, the estimated coefficient may be skewed due to measurement errors. If there were a better quality linkage index, this coefficient could be higher.

In addition, the important role of labor productivity (M) needs to be considered. It reflects the link between businesses and training, not only helping to increase the proportion of qualified workers but also improving labor productivity. When labor productivity increases, businesses will have higher profits and can invest more in training. At the same time, workers will have better incomes and be motivated to learn and improve their skills. The intermediate rate of 68.6% for X2 indicates that this is the main factor. However, labor productivity also depends on many other factors besides training, such as capital, technology, and management. For example, Ba Ria - Vung Tau has very high labor productivity thanks to oil and gas exploitation, but the rate of training is only 30.1%

 © 2025 by Author/s

(General Statistics Office, 2025, p. 73). Therefore, we call M "labor productivity" and not "training efficiency" to avoid misunderstanding the causal relationship.

Regarding factors that do not have a statistically significant influence, except for the lnC4 index which is close to the marginal threshold (p=0.07), this phenomenon can be explained as follows:

- Firstly, the size of the labor force (C1) and population density (C2) usually change very slowly over time. Therefore, their effects are largely dominated by fixed factors.

- Secondly, the number of foreign direct investment (C3) projects only reflects the quantity, not the quality of technology. The Southeast region still plays an important role in attracting foreign investment, but the structure of investment flows has changed significantly from 2010 to 2024. Previously, foreign investment was often concentrated in industries such as processing, assembly, and textiles. However, in recent years, capital flows have shifted to processing and manufacturing industries, especially high-tech industries, electronics, precision mechanics, and component manufacturing. According to the General Statistics Office (2025), this has created a new trend in attracting foreign investment. Although there has been a positive shift, the proportion of foreign investment projects in high technology, research and development remains low, accounting for only about 15% of the total number of projects. This indicates the need for a more selective strategy to attract foreign investment in the coming period (Vu Hong Nhung, 2026).

- Thirdly, technological level (C4) has a positive but rather weak impact. This may be due to a time lag of more than one year or because this variable is also affected by endogenous factors.

Policy Implications for the Southeastern Region of Vietnam

Based on the new administrative structure of the Southeast region after the merger, we propose four groups of solutions.

First, improve the efficiency of public investment in education and training. For Ho Chi Minh City: With its vast economic foundation including processing industries (from Binh Duong), seaports, and energy (from Ba Ria - Vung Tau), we need to build a comprehensive training strategy. This strategy should not only focus on traditional industries but also emphasize renewable energy, logistics, and information technology. This will help the city develop sustainably and diversify its industries. For Dong Nai: This region has an advantage in linking processing industries and high-tech agriculture. Therefore, priority should be given to training workers for post-harvest processing, preservation, and deep processing. This will help increase product value and minimize waste in the production process. For Tay Ninh: Located along the border corridor, Tay Ninh needs to focus on training human resources for its textile, footwear, and cross-border logistics industrial zones. This will leverage its geographical advantages and promote international trade. Specifically, we aim to allocate at least 5% of the local budget to vocational training within the next five years. Initially, we will start with 3% in the first year. The long-term goal is to achieve a trained workforce rate of 40-45% by 2030, as outlined in Resolution 24-NQ/TW.

Secondly, we need to strengthen the long-term linkages between businesses, training institutions, and the government.

Our proposal is that the Steering Committee for the Southeast Region should soon establish a regional training linkage working group. This working group should include representatives from the Departments of Internal Affairs of the provinces, universities, colleges, vocational education centers, and business associations.

The task force will have several important tasks such as: Identifying key industries common to the entire region; organizing training programs using state budget funds; evaluating training quality and adjusting training programs based on feedback from businesses.

Financially, it is necessary to research and add regulations allowing businesses to deduct 150% of training costs when calculating corporate income tax. This is a similar incentive to that for research and development (R&D) costs. Compared to the current regulation, where businesses are only allowed to deduct 100%, this will create a stronger incentive for businesses to invest in training.

Third, we need appropriate solutions to improve talent retention policies and support migrant workers. The provinces in the Mekong Delta region need a common preferential policy framework to avoid unnecessary competition for human resources. For example, we could apply a housing allowance of 30 million VND/month for experts and provide tuition-free education for their children at public schools. For migrant workers, there needs to be a mechanism to encourage businesses to sign formal labor contracts and pay social insurance and unemployment insurance. This will facilitate their participation in state-sponsored training programs. The "mobile classroom" model has been tested in Binh Duong and should be replicated in key industrial zones of the localities.

Fourth, attention should be paid to retraining and lifelong learning. In the current situation, with the rapid development of digital technology and automation, many workers are at risk of being replaced. Therefore, provinces should create retraining programs for workers in industries such as textiles, footwear, and electronics assembly – industries facing significant pressure from robots and artificial intelligence. We can learn from the Thai

© 2025 by Author/s

model, where they have collaborated with Germany to implement a dual training program, allowing workers to learn while working and still receive a salary, helping them adapt to new technologies without losing their jobs. In addition, we should pilot industry skills councils for key sectors in the Mekong Delta region, such as information technology and automation in Ho Chi Minh City, mechanical engineering in Dong Nai, and high-tech agriculture in Tay Ninh. These councils would be headed by representatives of major businesses in the industry, and they would be responsible for defining output skill standards and designing training programs in collaboration with vocational schools. Furthermore, they would also organize assessments and issue national vocational skills certificates. This model has proven successful in Malaysia, specifically in the Iskandar region, and it is perfectly suitable for conditions in Vietnam.

CONCLUSION

As can be seen, this result indicates that public investment, the linkage between businesses and training institutions, and average income all have a positive and statistically significant impact on the rate of trained labor in the Southeast region during the period 2010-2024. Notably, labor productivity plays a mediating role, explaining approximately 69% of the total impact of the linkage between businesses and training.

During the period 2010–2025, the human resources in the Southeast region have clearly transformed in both quantity and quality. This is the result of efforts from the government, businesses, and people in the region.

However, compared to the overall needs of socio-economic development, the human resources in the region still have some limitations. Therefore, to develop human resources, especially high-quality human resources in the Southeast region, it is necessary to implement a comprehensive set of solutions such as: improving the efficiency of public investment in education and training; encouraging sustainable linkages between businesses, training institutions, and the government; perfecting policies to retain talent and support migrant workers; and focusing on training human resources, especially high-quality human resources.

Conflict of interest

The author declares that there is no conflict of interest regarding the publication of this article.

REFERENCES

Barro, R. J. (2001). Human capital and growth. American Economic Review, 91(2), 12–17.

Becker, G. S. (1964). Human capital. University of Chicago Press.

Cong, T. (2024). SWOT analysis of the Southeastern region's high-quality human resources to meet digital transformation requirements. Journal of Politics and Development.https://chinhtrivaphattrien.vn/phan-tich-ma-tran-swot-vung-dong-nam-bo-ve-nguon-nhan-luc-chat-luong-cao-dap-ung-yeu-cau-chuyen-doi-so-a8704.html

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), 147–160.

General Statistics Office. (2016). Statistical yearbook 2015. Statistics Publishing House.

General Statistics Office. (2021). Statistical yearbook 2020. Statistics Publishing House.

General Statistics Office. (2024). Statistical yearbook 2024. Statistics Publishing House.

General Statistics Office. (2025). Socio-economic data of key economic regions for the period 2010–2024. Finance Publishing House.

GIZ. (2024). Evaluation of the Thai–German dual vocational education and training (TVET) program. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Glaeser, E. L., & Saiz, A. (2004). The rise of the skilled city. Brookings-Wharton Papers on Urban Affairs, 2004(1), 47–105.

Hanushek, E. A., & Woessmann, L. (2008). The role of cognitive skills in economic development. Journal of Economic Literature, 46(3), 607–668.

Kumar, A., & Kaur, M. (2022). Skill development and firm linkages in Indian manufacturing clusters. World Development, 150, 105729. https://doi.org/10.1016/j.worlddev.2021.105729

Li, H., Chen, Y., & Fang, C. (2021). Regional heterogeneity in human capital and economic growth: Evidence from Chinese provinces. China Economic Review, 65, 101578. https://doi.org/10.1016/j.chieco.2020.101578

National Assembly. (2025). Resolution No. 202/2025/QH15 on the reorganization of provincial-level administrative units. Hanoi.

Nguyen, H. A. (2025). Improving human resource quality to support socio-economic development in Tay Ninh province amid digital transformation. Journal of State Management.

 © 2025 by Author/s

https://www.quanlynhanuoc.vn/2025/09/11/nang-cao-chat-luong-nhan-luc-dap-ung-yeu-cau-phat-trien-kinh-te-xa-hoi-o-tinh-tay-ninh-trong-boi-canh-chuyen-doi-so-hien-nay/

Nguyen, T. H. (2025). Human resource development in enterprises in the Southeastern region during industrialization, modernization, and integration. Journal of State Organization and Labor. https://tcnnld.vn/news/detail/69719/Phat-trien-nguon-nhan-luc-cua-doanh-nghiep-tai-Dong-Nam-bo-trong-thoi-ky-cong-nghiep-hoa-hien-dai-hoa-va-hoi-nhap.html

Nguyen, T. H. (2026). Theoretical foundations and literature review on human resource development in Dong Nai (2015–2025). Southeast Asia – ASEAN Journal. https://tapchidongnama.vn/co-so-ly-luan-va-tong-quan-nghien-cuu-ve-phat-trien-nguon-nhan-luc-tai-dong-nai-2015-2025/

Nguyen, T. V. A. (2024). Requirements for human resource development in the Southern region in the current context. Journal of Politics and Development. https://chinhtrivaphattrien.vn/yeu-cau-phat-trien-nguon-nhan-luc-cua-vung-nam-bo-trong-boi-canh-hien-nay-a8903.html

Politburo. (2022). Resolution No. 24-NQ/TW on socio-economic development and ensuring national defense and security in the Southeastern region to 2030, with a vision to 2045. Hanoi.

Todaro, M. P. (1969). A model of labor migration and urban unemployment in less developed countries. American Economic Review, 59(1), 138–148.

Tran, H. H., & Bui, V. D. (2025). Human resource development in Vietnam. Journal of State Management. https://www.quanlynhanuoc.vn/2025/03/20/phat-trien-nguon-nhan-luc-viet-nam/

Tran, M. T. (2024). Improving the quality of human resources to meet the requirements of circular economy development in the Southeastern region. Journal of Political Theory, (558).

Tran, T. Y. T. (2025). Developing high-quality human resources to meet the development needs of Ho Chi Minh City. Journal of Economics and Forecasting. https://kinhtevadubao.vn/phat-trien-nguon-nhan-luc-chat-luong-cao-dap-ung-nhu-cau-phat-trien-tp-ho-chi-minh-31445.html

Truong, D. T. (2024). Public sector human resource development in the Southeastern region in the new context. Communist Review. https://www.tapchicongsan.org.vn/web/guest/nghien-cu/-/2018/927602/phat-trien-nguon-nhan-luc-khu-vuc-cong--o-vung-dong-nam-bo-trong-boi-canh-moi.aspx

Vu, H. N. (2026). Assessment of the investment environment in the Southeastern region from the perspective of Japanese and Korean FDI enterprises. Journal of State Management. https://www.quanlynhanuoc.vn/2026/04/10/danh-gia-moi-truong-dau-tu-vung-dong-nam-bo-duoi-goc-nhin-doanh-nghiep-dau-tu-truc-tiep-nuoc-ngoai-nhat-ban-va-han-quoc/

World Bank. (2021). Iskandar Malaysia: A decade of transformation. World Bank Group.

© 2025 by Author/s