

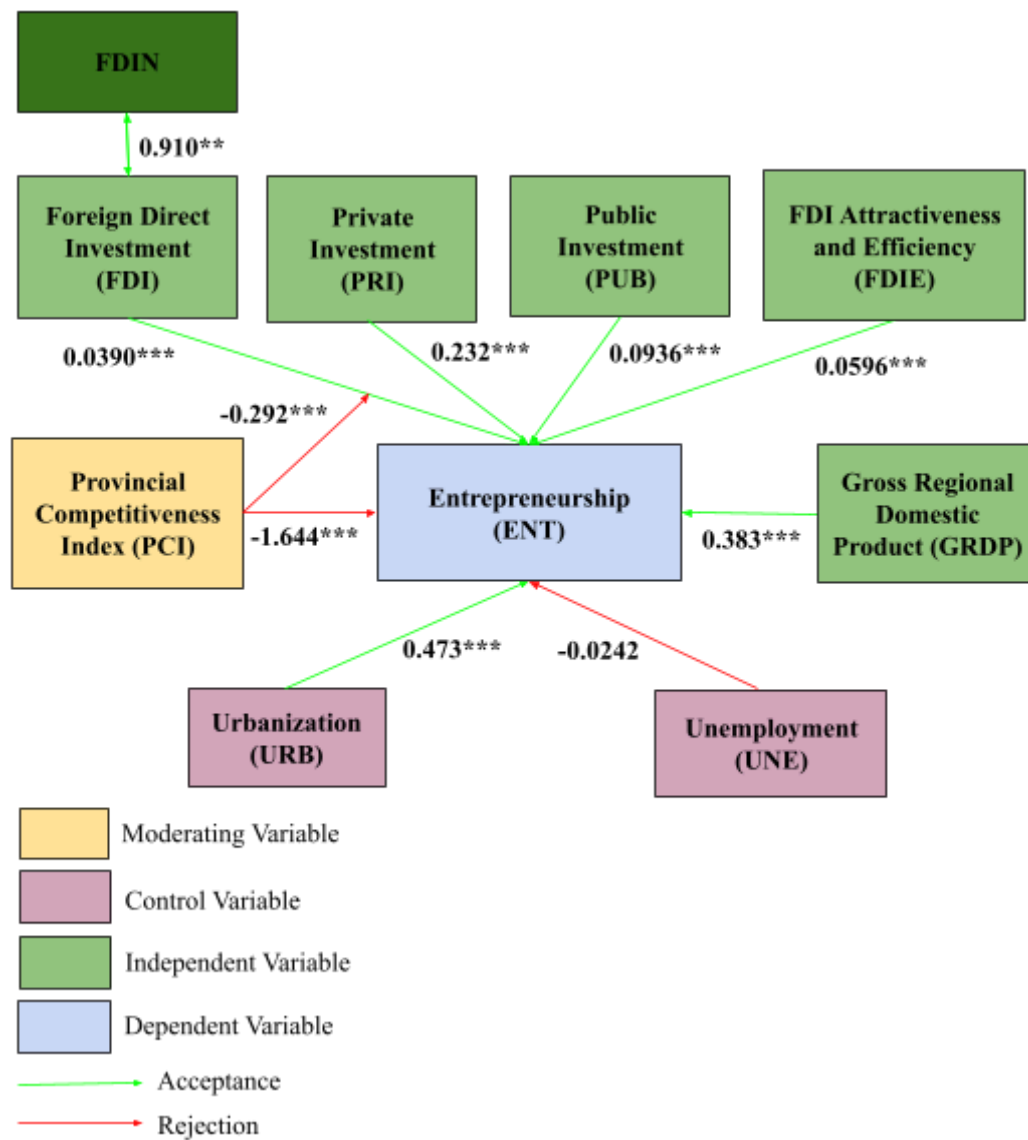
ABSTRACT

Entrepreneurship is a key driver of economic growth, innovation, and regional development, yet its dynamics remain uneven across Vietnam's provinces due to variations in governance, resource allocation, and investment efficiency. This study examines the interplay between private investment (PRI), public investment (PUB), foreign direct investment (FDI), foreign direct investment efficiency (FDIE) and entrepreneurship, with a focus on the moderating role of the Provincial Competitiveness Index (PCI). Employing panel data from 63 Vietnamese provinces spanning 2016 to 2022, the research applies advanced econometric techniques, including Feasible Generalized Least Squares (FGLS), Panel Corrected Standard Error (PCSE) to capture both direct and interaction effects.

Key findings reveal that PRI emerges as a robust and consistent driver of entrepreneurship, significantly bolstering new business formation across provinces. FDI shows a positive yet nuanced impact, with its efficiency contingent on PCI levels. Notably, while PUB enhances entrepreneurial activities, its effects are less pronounced due to inefficiencies in allocation. The interaction models highlight a paradox as higher PCI scores, though reflective of better governance, exacerbate competitive pressures from FDI, dampening local entrepreneurial growth. The inclusion of regional regressions provides deeper insights into spatial variations, revealing that FDI positively impacts entrepreneurship in economically advanced regions like the Red River Delta and Southeast but exerts crowding-out effects in less-developed areas such as the Mekong River Delta and Central Highlands. Similarly, public investment exhibits strong positive effects in certain regions while showing inefficiencies in others, underscoring the importance of tailoring investment strategies to regional contexts. This research contributes to the theoretical understanding of investment-entrepreneurship dynamics and provides actionable insights for policymakers in Vietnam.

Key words: *Entrepreneurship, Regional Economic Growth, Provincial Competitiveness Index (PCI), Private Investment, Public Investment, FDI, Vietnam.*

GRAPHICAL ABSTRACT



Source: Authors' compilation

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Data and sample selection

This study utilizes a robust dataset derived from the *Vietnam Statistical Yearbook* (2016-2022), which provides provincial-level data essential for analyzing entrepreneurship, regional economic growth, and investment dynamics across 63 provinces in Vietnam. By using data from 2016 to 2022, the study captures the trends following major economic reforms and the subsequent growth period, allowing for insights into how provincial economic factors have evolved in response to policy and market changes. The data encompasses crucial economic indicators, such as Gross Regional Domestic Product (GRDP), private and public investments, foreign direct investment (FDI), population size, labor force statistics, unemployment rates, and urbanization metrics. These variables are pivotal for evaluating entrepreneurship and economic growth, offering insights into the contextual and resource-based factors that shape business formation and expansion across provinces (Trinh & Lee, 2023).

Additionally, data on PCI and FDI Attractiveness Score, sourced from specialized provincial competitiveness and investment databases, complement the statistical yearbook data by capturing governance quality and investment efficiency.

PCI, in particular, provides an overview of institutional factors like transparency and regulatory quality, which are often influential in attracting private investment and promoting a conducive business environment (Diep & Nguyen, 2023). Thus, this data selection enables a comprehensive analysis by accounting for both economic and institutional factors influencing regional entrepreneurship.

3.2. Model Specification

This study examines how private investment, public investment, foreign direct investment (FDI), FDI Attractiveness Efficiency Score, and Gross Regional Domestic Product (GRDP) influence entrepreneurship across Vietnamese provinces, with the Provincial Competitiveness Index (PCI) as moderator. By integrating these factors, the model assesses how both economic conditions and institutional quality shape regional entrepreneurship, providing a comprehensive view of the pathways through which investments impact local business development.

3.2.1. Theoretical Model

In this study, the authors aim to explore the relationship between entrepreneurship (ENT) and the key factors influencing regional economic growth in Vietnam. Specifically, the authors investigate how Private Investment (PRI), Public Investment (PUB), Foreign Direct Investment (FDI), and the Provincial Competitiveness Index (PCI) affect entrepreneurship at the provincial level and are motivated by theories in chapter 2.

Building on a mix of regional growth and entrepreneurship theories (Slesman et al., 2021; Trinh & Lee, 2023; Nguyen et al., 2023), the authors propose the following theoretical framework as represented as :

$$ENT_{it}=f(PUB_{it},FDI_{it},HUC_{it},GRDP_{it}, UNE_{it}, URB_{it})$$

Where

ENT (Entrepreneurship) is the dependent variable, representing the level of new business formation in each province.

PRI (Private Investment) is the capital invested by private enterprises, which typically fosters innovation and supports the formation of new businesses (Nguyen et al., 2023; Vu, 2023).

PUB (Public Investment) is government expenditure aimed at infrastructure and development programs that create a favorable environment for entrepreneurship (Su Dinh Thanh et al., 2020).

FDI (Foreign Direct Investment) represents foreign capital entering the province, which may either directly or indirectly support entrepreneurship by bringing in resources, expertise, and access to international markets (Slesman et al., 2021).

FDIE (Foreign Direct Investment Efficiency) : The efficiency of FDI reflects how effectively foreign investments are utilized in the local economy. Efficient FDI, which is directed towards improving infrastructure and enhancing local capacity, is expected to have a stronger impact on entrepreneurship (Slesman et al., 2021).

PCI (Provincial Competitiveness Index) reflects the quality of governance at the provincial level, a crucial factor that determines how conducive the local environment is for new businesses (Trinh & Lee, 2023).

Controls include macroeconomic and regional factors such as **unemployment rate (UNE)** and **urbanization rate (URB)**, which have been shown to influence entrepreneurship (Nguyen & Trinh, 2018).

3.2.2. Model Specification with Econometric Approach

The authors expect that all four independent variables, PRI, PUB, FDI, FDIE and a moderating variable PCI, will have a positive relationship with ENT, meaning that higher investment (both public and private) and better governance should lead to more entrepreneurial activity. FDI, in particular, may have a differential effect depending on local governance quality as indicated by the PCI (Slesman et al., 2021).

The Baseline Model (OLS) serves as the foundation of our analysis by capturing the direct effects of the key variables (FDI, PRI, PUB, FDIE, GRDP, PCI, UNE, URB) on entrepreneurship across Vietnamese provinces. This model aims to establish a clear relationship between these independent variables and the dependent variable, ENT (entrepreneurship).

Model 1: Baseline Model for Entrepreneurship and Regional Growth

$$ENT_{it} = \beta_0 + \beta_1 FDI_{it} + \beta_2 PUB_{it} + \beta_3 PRI_{it} + \beta_4 FDIE_{it} + \beta_5 GRDP_{it} + \beta_6 PCI_{it} + \beta_7 UNE_{it} + \beta_8 URB_{it} + u_{it}$$

Where

ENT_{it} is Entrepreneurship (measured by the number of new businesses in province i at time t)

FDI_{it} Foreign Direct Investment in province i

PUB_{it} Public Investment in province i

PRI_{it} Private Investment in province i

FDIE_{it} Foreign Direct Investment Efficiency in province i

GRDP_{it} Gross Regional Domestic Product in province i

PCI_{it} Provincial Competitiveness Index in province i

UNE_{it} Unemployment rate in province i

URB_{it} Urbanization rate in province i

u_{it} is the error term.

While the Baseline Model gives us a general overview of the relationships, it assumes that there is no unobserved heterogeneity between provinces. However, regional characteristics, such as culture, governance, or historical investment patterns, might influence entrepreneurship but remain constant over time. To address this potential issue,

Model 2 incorporates Fixed Effects (FEM) to control for unobserved, time-invariant provincial characteristics (e.g., culture or historical factors). This allows us to isolate the true impact of the key variables on entrepreneurship by removing bias from unobserved heterogeneity across provinces. By employing FEM, the authors improve the robustness of our results, ensuring that the estimates of the relationships between PRI, PUB, FDI, FDIE, GRDP, PCI, UNE, and URB are not confounded by these unobserved provincial characteristics.

Model 2: Fixed Effects Model (FEM) for Economic Factors

$$\text{ENT}_{it} = \alpha_0 + \beta_1 \text{PRI}_{it} + \beta_2 \text{PUB}_{it} + \beta_3 \text{FDI}_{it} + \beta_4 \text{FDIE}_{it} + \beta_5 \text{GRDP}_{it} + \beta_6 \text{PCI}_{it} + \beta_7 \text{UNE}_{it} + \beta_8 \text{URB}_{it} + u_{it}$$

Where

α_0 represents the country-specific fixed effects control for unobserved heterogeneity across countries.

Although Model 2 (FEM) controls for unobserved heterogeneity, it may be too restrictive if the unobserved factors are not entirely constant over time. In some cases,

these factors might vary across both provinces and time periods, which FEM cannot adequately address. Model 3, the Random Effects Model (REM), assumes that the unobserved heterogeneity is random and uncorrelated with the independent variables. This model allows for more efficient estimation of coefficients, especially when the assumption of time-invariant characteristics across all provinces is too strong for the data.

Model 3: Fixed Effects Model (REM) for Economic Factors

$$ENT_{it} = \alpha_0 + \beta_1 PRI_{it} + \beta_2 PUB_{it} + \beta_3 FDI_{it} + \beta_4 FDIE_{it} + \beta_5 GRDP_{it} + \beta_6 PCI_{it} + \beta_7 UNE_{it} + \beta_8 URB_i + u_{it} + \epsilon_{it}$$

Where

u_{it} is the random effect for country i , assumed to be uncorrelated with the independent variables.

ϵ_{it} is the error term

While both FEM and REM account for unobserved heterogeneity, they do not explicitly address potential issues with heteroskedasticity (unequal variance across provinces) or autocorrelation (correlation of errors over time). These issues are common in panel data and can lead to inefficient estimates if not addressed. To account for these issues, Model 4 introduces Generalized Least Squares (GLS), a more robust estimation technique that handles heteroskedasticity and autocorrelation in panel data.

Model 4: Generalized Least Squares (GLS) for Economic Factors

$$ENT_{it} = \beta_0 + \beta_1 PRI_{it} + \beta_2 PUB_{it} + \beta_3 FDI_{it} + \beta_4 FDIE_{it} + \beta_5 GRDP_{it} + \beta_6 PCI_{it} + \beta_7 UNE_{it} + \beta_8 URB_i + u_{it}$$

where

GLS accounts for heteroskedasticity or autocorrelation in the panel data.

Even with GLS, panel data can still exhibit issues like cross-sectional dependence (where errors across provinces are correlated), which could bias standard error estimates. Model 5 uses Panel Corrected Standard Errors (PCSE), which are

designed to correct for cross-sectional dependence and provide more robust standard error estimates.

Model 5: Panel Corrected Standard Errors (PCSE) for Economic Factors

$$ENT_{it} = \beta_0 + \beta_1 PRI_{it} + \beta_2 PUB_{it} + \beta_3 FDI_{it} + \beta_4 FDIE_{it} + \beta_5 GRDP_{it} + \beta_6 PCI_{it} + \beta_7 UNE_{it} + \beta_8 URB_i + u_{it}$$

where

PCSE addresses issues with cross-sectional dependence and provides robust standard errors.

While Model 5 provides strong estimates of the direct effects of the variables on entrepreneurship, it does not allow for control for the possibility that the relationship of the key factors to entrepreneurship may lie in interactions between variables. It is, therefore, conceivable that this positive effect of FDI depends on the magnitude of PCI as a proxy for governance quality. The interaction term utilized in Model 6-in particular, interaction between FDI and PCI-explores how the quality of governance, proxied by PCI, moderates the effect of FDI on entrepreneurship. This model thus allows a deeper appreciation for how governance may influence the degree of effectiveness of foreign investment in engendering entrepreneurship.

Model 6: Interaction Model for Economic Factors (FDI_PCI)

$$ENT_{it} = \beta_0 + \beta_1 PRI_{it} + \beta_2 PUB_{it} + \beta_3 FDI_{it} + \beta_4 FDIE_{it} + \beta_5 GRDP_{it} + \beta_6 UNE_{it} + \beta_7 URB_i + \delta_1 (FDI \times PCI)_{it} + u_{it}$$

Where

$(FDI \times PCI)_{it}$ stands for the interaction term between FDI and PCI.

δ_1 stands for coefficient for the interaction term.

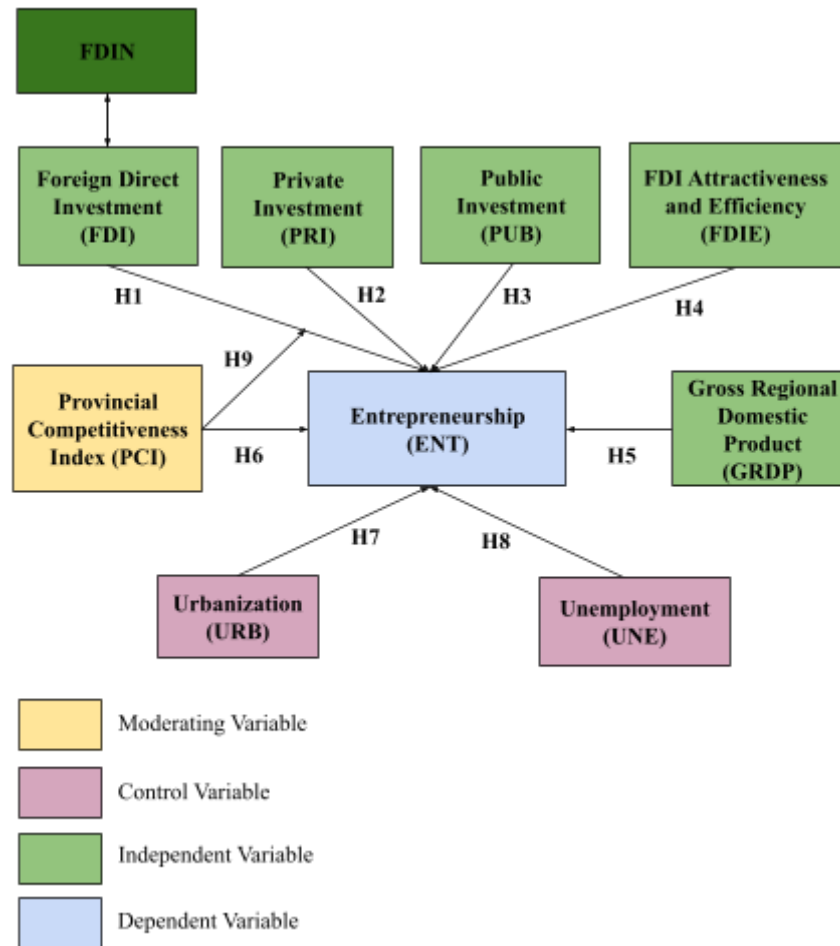
Model 7: Robustness check with replacement of FIDN.

$$ENT_{it} = \beta_0 + \beta_1 PRI_{it} + \beta_2 PUB_{it} + \beta_3 FDI_{it} + \beta_4 FDIE_{it} + \beta_5 GRDP_{it} + \beta_6 UNE_{it} +$$

$$\beta_7 \text{URB}_i + u_{it}$$

Where

FDIN_i stands for number of licensed projects of FDI (proxy for FDI to assess robustness check)



Source: Authors' compilation

Figure 1: Proposed research model

3.3. Variables measurement

3.3.1. Dependent Variable: Entrepreneurship

In this study, entrepreneurship is measured by the number of newly established enterprises in each province per year (GSO, year). This metric captures the rate of new business formation, which is widely recognized as an indicator of entrepreneurial

activity within a given region (Acs & Audretsch, 2003). The choice of newly established enterprises aligns with prior studies that emphasize entrepreneurship as a response to both opportunity and necessity, providing insights into how local conditions foster or hinder entrepreneurial activity (Sobel, 2008; Xu et al., 2021). Using provincial-level data on new enterprises allows the study to reflect variations in entrepreneurial dynamics across regions and assess how investments, governance, and economic growth collectively impact business creation. Furthermore, this variable facilitates spatial analysis by showing how entrepreneurship trends differ geographically, an approach that acknowledges Vietnam's diverse economic regions (Müller, 2016).

3.3.2. Independent Variables

The study includes five independent variables of which four primary independent variables represent different types of investment: private investment, public investment, foreign direct investment (FDI) and foreign direct investment efficiency (FDIE). Each investment type is quantified to capture its direct impact on entrepreneurship.

3.3.2.1. Private Investment

Measured by the capital invested by the private sector within each province annually, private investment reflects local confidence in the market and serves as an indicator of regional economic vitality. Prior studies demonstrate that private capital injection plays a critical role in enhancing local entrepreneurship by creating favorable market conditions and supporting business growth (Schumpeter, 1912; Dhingra et al., 2009). Private investment data provides insights into how domestic businesses contribute to regional economic expansion, which is essential for understanding internal economic drivers in developing regions (Acs et al., 2009).

3.3.2.2. Public Investment

Public investment, representing government expenditures in areas such as infrastructure, healthcare, and education, is measured by annual state investment within each province. Public investment is a critical variable as it facilitates the

development of foundational infrastructure, which indirectly supports entrepreneurship by providing essential services and increasing accessibility to resources (Aschauer, 1989). By isolating public investment, this study can differentiate between the roles of state-driven and private capital in influencing regional entrepreneurial activity, highlighting the public sector's contribution to building a supportive environment for new businesses (Nguyen et al., 2021).

3.3.2.3. FDI (Foreign Direct Investment)

FDI is measured by the registered foreign capital investment in each province annually, expressed in millions of USD. This variable captures the level of international economic interest and reflects the external factors driving economic activity within a region (Dunning, 2000). FDI not only brings capital but also introduces new technology, skills, and market networks, which collectively foster a conducive environment for local entrepreneurship. Prior research shows that FDI can generate positive spillover effects that benefit domestic businesses by enhancing innovation and competitive dynamics (Haddad & Harrison, 1993; Sahasranamam & Nandakumar, 2020). This study leverages FDI to explore how foreign investment impacts local business creation, particularly in the presence of strong institutional frameworks.

For robustness check, FDIN is accounted as a replacement for FDI capital and enhances robustness by providing a complementary perspective on foreign investment dynamics. Unlike monetary values, which can be skewed by a few large projects, FDIN captures the breadth of investment activities, reflecting investor participation across sectors and regions. This metric emphasizes inclusivity, showing how regions with smaller-scale or sectorally diverse investments contribute to economic growth. It also aligns with the Provincial Competitiveness Index (PCI) by highlighting governance and policy effectiveness in attracting multiple investors. By focusing on project count, FDIN mitigates outlier effects, reveals nuanced regional patterns, and validates whether the observed relationships hold under alternative FDI measures, ensuring a more comprehensive and reliable analysis.

3.3.2.4. FDI Attractiveness and Efficiency

In the work of Nguyen et al (2023), FDI attractiveness and efficiency at the provincial level in Vietnam are influenced by the interplay of several factors as analyzed using the Grey Delphi–DEA Model Approach (Nguyen et al., 2023). This methodology integrates the Grey Delphi method, Super Slack-Based Measure (Super-SBM), and DEA Malmquist models to assess provincial competitiveness indices (PCIs) and their impact on Foreign Direct Investment (FDI) inflows. The model evaluates both the efficiency and attractiveness of FDI from 2017 to 2022 across 63 provinces in Vietnam. Key findings revealed significant disparities in FDI efficiency and resource utilization, highlighting that most provinces operate below optimal efficiency levels.

The critical dimensions of PCI influencing FDI, identified in this study through the application of the DEA framework, include entry costs, access to land, transparency, and regulatory compliance, among others, which have been considered as inputs, while the cumulative FDI by capital and by cases as outputs. Ho Chi Minh City and Hanoi always received efficiency scores greater than 1, meaning better infrastructure, more effective administrative reforms, and strong economic governance among provinces. Meanwhile, northern mountainous and central highlands provinces received low efficiency scores because of the substandard state of infrastructure and lower policy proactiveness.

Dynamic productivity trends were captured through the DEA Malmquist Index, decomposing changes into efficiency improvement (catch-up effect) and technological progress (frontier shift). Findings showed that while certain provinces made strides in catching up to the efficiency frontier, the overall technological progress across provinces was uneven. The study emphasizes the critical role of targeted policies in addressing regional disparities, improving governance, and enhancing the overall investment climate to foster sustainable FDI growth. These insights provide a robust framework for policymakers to develop strategies that maximize FDI efficiency and align provincial development with national economic goals (Nguyen et al., 2023).

3.3.2.5. Gross Regional Domestic Product (GRDP)

The independent variable in this model is Gross Regional Domestic Product (GRDP), measured at current prices in billions of Vietnamese dong. GRDP serves as a comprehensive indicator of economic output within each province, reflecting the overall economic health and market potential for new businesses. The choice of GRDP as a mediator is based on regional economic theories that suggest economic growth is a critical pathway through which investments drive entrepreneurship (Müller, 2016). By positioning GRDP as a mediator, the study investigates whether investments indirectly promote entrepreneurship by first enhancing local economic conditions. This setup aligns with previous studies that show the GRDP's role in increasing demand for goods and services, expanding business opportunities, and improving infrastructure, which collectively create an environment that encourages business formation (Nguyen et al., 2022). GRDP thus bridges the relationship between investments and entrepreneurship, providing insights into the underlying economic processes that translate capital into entrepreneurial outcomes.

3.3.3. Moderating Variable: Provincial Competitiveness Index (PCI)

The Provincial Competitiveness Index (PCI), as outlined by PCI Vietnam, is developed through a systematic three-step process known as the "3 Cs." This process involves: (1) collecting data from business surveys and published sources, (2) calculating nine sub-indices and standardizing them to a 10-point scale, and (3) calibrating the overall PCI as a weighted average of these sub-indices, culminating in a maximum score of 100 points. To ensure representativeness, firms are selected through random sampling that reflects provincial populations, while stratification accounts for variations in firm age, legal type, and sector. The 2014 edition of the PCI, marking its 10th iteration, captured the perspectives of 10,000 domestic businesses and 1,500 foreign-invested enterprises regarding economic governance and the business environment across Vietnam's 63 provinces and cities. Moreover, the 2014 report addressed pressing issues such as Vietnam's entry into the Trans-Pacific Partnership Agreement (TPP) and provided insights into labor relations within foreign-invested enterprises.

Nguyen et al. (2023) further validated the relevance of PCI by applying the Grey Delphi method to evaluate whether the PCI effectively measures the competitiveness of Vietnamese provinces in attracting foreign direct investment (FDI). Comparing regional indexes across countries, the Grey Delphi analysis identified ten CIFs considered indispensable for FDI evaluation-all of which coincided with the current components of PCI in Vietnam. The coincidence underlined the soundness of the PCI as a strong framework in reviewing the levels of competitiveness of the provinces for attracting FDI. These CIFs not only give indications to which FDI investors must pay attention but also give indications for policy makers in assessing and building more effective economic governance and competitiveness in the provinces of Vietnam.

3.3.4. Control Variables: Urbanization and Unemployment

It controls the demographic and economic background of each province with the four important variables: urbanization, population, unemployment rate, and labor force size. Each of these variables provides the contextual information to better isolate the effect of investments and economic growth on entrepreneurship.

Urbanization: Urbanization is measured by the percentage of the population living in urban areas within each province. This variable captures the degree of urbanization, which often correlates with higher market demand, resource accessibility, and greater entrepreneurial opportunities (Kanbur & Zhuang, 2013). Higher urbanization rates typically reflect denser markets, which are favorable for business formation and growth.

Unemployment Rate: The unemployment rate, expressed as a percentage of the labor force, captures economic conditions within each province that may drive necessity-based entrepreneurship (Audretsch & Keilbach, 2004). High unemployment rates may prompt individuals to start businesses out of necessity, while lower rates may indicate favorable employment opportunities that reduce the need for self-employment.

To present elasticities, the research transforms the variables into natural logarithms. The derived coefficients indicate the effect of a 1% change in the independent variables on the dependent one.

Table 1: Variable Measurement

Name	ID	Description	Unit/Measurement
Entrepreneurship	ENT	Log of number of newly established enterprises per province, reflecting entrepreneurial activity levels.	Number of enterprises
Private Investment	PRI	Log of annual capital invested by private enterprises within each province, capturing local economic vitality.	Billion VND
Public Investment	PUB	Log of government expenditure on infrastructure, healthcare, and education, fostering a supportive environment for entrepreneurship.	Billion VND
Foreign Direct Investment	FDI	Log of registered foreign capital investment, reflecting international economic interest in a province.	Million USD
Foreign Direct Investment (Projects) - For robustness check	FDIN	Number of licensed FDI projects, providing a breadth-based measure of foreign investment activities.	Number of projects

Foreign Direct Investment Efficiency	FDIE	Efficiency of FDI utilization, calculated using DEA and incorporating PCI factors.	Efficiency Score
Gross Regional Domestic Product	GRDP	Economic output of a province, indicating market potential for businesses.	Billion VND
Provincial Competitiveness Index	PCI	Composite index of governance quality and business environment, measured by nine sub-indices (e.g., transparency, regulatory compliance).	Index (0–100 points)
Urbanization	URB	Log of the population living in urban areas, reflecting market accessibility and resource concentration.	Thousand person
Unemployment Rate	UNE	Percentage of the labor force unemployed, representing economic conditions within a province.	Percentage (%)

Source: Authors' summary

3.4. Research Methodology

This study employs a dataset including 63 provinces of Vietnam, covering the period from 2016 to 2022. Data sources include the Vietnam Statistical Yearbook for key indicators such as Gross Regional Domestic Product (GRDP), private and public investments, foreign direct investment (FDI), unemployment rates, urbanization, and entrepreneurial activity (ENT). To enhance the dataset, FDI Attractiveness and Efficiency metrics are derived using the integrated Grey Delphi-DEA Model from Nguyen et al. (2023), providing insights into how provincial governance impacts

investment efficiency. The dataset further integrates the Provincial Competitiveness Index (PCI) to evaluate governance quality and its influence on economic dynamics. These comprehensive data sources ensure the study's ability to address the complex interplay between investments, institutional quality, and entrepreneurship.

The research adopts a multi-model econometric approach, integrating Ordinary Least Squares (OLS), Fixed Effects Model (FEM), Random Effects Model (REM), Feasible Generalized Least Squares (FGLS), and Panel Corrected Standard Errors (PCSE). These methods facilitate robust analyses by addressing potential challenges like multicollinearity, heteroskedasticity, and cross-sectional dependence inherent in panel data. Key variables include private investment (PRI), public investment (PUB), FDI, GRDP, and PCI, along with interaction terms such as $FDI \times PCI$ to explore moderating effects. Entrepreneurship (ENT), measured by the number of newly established enterprises, serves as the dependent variable, reflecting regional entrepreneurial activity. This multi-layered framework enables the study to capture direct effects, moderating relationships, and nuanced regional dynamics.

In addition, the analytical process first considers descriptive statistics and diagnostic tests, including Pearson correlation and variance inflation factor analyses, to verify the validity of data and appropriateness of the model. Each econometric model was then systematically applied so as to present the estimated effects of PRI, PUB, FDI, and governance quality measured by PCI on ENT, considering both provincial and temporal heterogeneity. To confirm the findings, interaction terms and robustness checks, such as the substitution of FDI for the number of licensed FDI projects (FDIN), were considered. This has been cross-checked with the various models to ensure the reliability of the findings; the findings have been situated in theoretical frameworks and empirical evidence to inform actionable insights for policymakers and stakeholders in fostering entrepreneurship throughout Vietnam.

CHAPTER 4: EMPIRICAL RESULTS

4.1. Descriptive statistics

The authors have collected data of 63 provinces in the period from 2016 to 2022 with approximately 441 observations for each variable. The group displays statistical findings in charts with the following precise details:

Table 2: Descriptive statistics result

Variable	Obs	Mean	Std. Dev.	Min	Max
ENT	441	6.675	1.103	4.159	10.724
FDI	388	4.384	2.452	-2.303	9.029
PRI	378	9.609	.866	7.455	12.667
PUB	378	8.809	.768	7.486	12.3
FDIE	315	-3.6	2.114	-9.21	.477
GRDP	441	11.17	.943	3.989	14.219
PCI	441	4.15	.057	3.97	4.319
UNE	441	.669	.64	-1.609	2.242
URB	441	5.768	.863	4.084	8.895

Source: STATA 14.

The dependent variable ENT (Entrepreneurship), measured by the number of newly established enterprises in each province annually, serves as a key indicator of

entrepreneurial activity and regional economic dynamism. Descriptive statistics reveal a total of 441 observations over the study period, with a mean value of 6.675 and a standard deviation of 1.103. The minimum value is 4.159, whereas the maximum value is 10.724. These results highlight significant disparities in entrepreneurship levels across regions, emphasizing the influence of factors such as economic conditions, infrastructure, and local governance quality in fostering business creation.

The independent variable FDI (Foreign Direct Investment), measured as the annual registered foreign investment in each province (unit: million USD), represents a critical indicator of regional economic attraction and development. With 388 observations, the mean FDI value is 4.384, and the standard deviation is 2.452, indicating substantial variability in FDI inflows across provinces. The minimum value is -2.303 reflects instances of disinvestment or project cancellations, often occurring in less attractive regions for international investors. Conversely, the maximum value is 9.029. This significant disparity underscores the importance of economic conditions, infrastructure, and investment-friendly policies in shaping FDI inflows to different regions.

The independent variable PRI (Private Investment), measured as the annual capital invested by the private sector in each province (unit: billion VND), reflects the level of private sector participation and confidence in the market. With 378 observations, the mean value of PRI is 9.609, and the standard deviation is 0.866, indicating relatively modest variation in private investment across provinces. The minimum value is 7.455. Conversely, the maximum value is 12.667. These findings highlight the critical role of local economic conditions and policy support in fostering private investment.

The independent variable PUB (Public Investment), measured as the annual government budget investment in each province (unit: billion VND), reflects the extent of government support for infrastructure development and economic activities. The dataset includes 378 observations, with a mean value of 8.809 and a standard deviation of 0.768, indicating relatively low variability in public investment across provinces. The minimum value is 7.486. In contrast, the maximum value is 12.3. These findings underline the critical role of public investment in enhancing regional economic

conditions and supporting development, particularly in areas requiring significant government intervention.

The independent variable FDIE (FDI Efficiency Score) measures the efficiency of utilizing foreign direct investment in each province, reflecting the capacity to implement FDI projects effectively. The dataset includes 315 observations, with a mean value of -3.6 and a standard deviation of 2.114, indicating significant variation in FDI efficiency across provinces. The minimum value of -9.21 represents inefficiency or failure in implementing FDI in some underdeveloped provinces. Meanwhile, the maximum value of 0.477 is observed in provinces with strong management capacity and favorable investment environments. The negative mean value suggests that many provinces are still struggling to effectively leverage FDI inflows for economic growth. These findings highlight the need for improved governance, infrastructure, and local policies to enhance FDI efficiency and regional development.

The independent variable GRDP (Gross Regional Domestic Product), measured as the total regional product (unit: billion VND) in each province, is a key indicator of economic scale and regional economic strength. With 441 observations, the mean GRDP value is 11.17, and the standard deviation is 0.943, indicating moderate variation in economic scale across provinces. The minimum value is 3.989. In contrast, the maximum value is 14.219. This significant disparity highlights the uneven economic development among regions, emphasizing the critical role of factors like infrastructure, investment, and supportive policies in promoting regional economic growth.

The moderating variable PCI (Provincial Competitiveness Index), measured by the provincial competitiveness score, reflects the quality of economic governance and the business environment at the local level. With 441 observations, the mean PCI value is 4.15, and the standard deviation is a mere 0.057, indicating minimal variation in scores across provinces. The lowest value is 3.97. In contrast, the highest value is 4.319. The narrow range of variation suggests relative homogeneity in competitiveness across provinces, yet highlights crucial differences in governance and enterprise support, which can significantly influence regional economic development.

The variable UNE (Unemployment Rate) is measured as the proportion of the labor force in each province that is unemployed, reflecting the level of joblessness in

the local economy. The dataset includes 441 observations, with a mean value of 0.669 and a standard deviation of 0.64, indicating considerable variation in unemployment rates across provinces. The lowest value of UNE is -1.609. On the other hand, the highest value is 2.242. This analysis highlights the substantial differences in labor market conditions across provinces, which can significantly affect economic development and entrepreneurship potential in various regions.

The variable URB (Urbanization Rate) is measured as the percentage of the population living in urban areas within each province, reflecting the level of urbanization and the concentration of people in urban areas. With 441 observations, the mean value of URB is 5.768, and the standard deviation is 0.863, indicating considerable variation in the urbanization rate across provinces. The lowest value of URB is 4.084. In contrast, the highest value of URB is 8.895. This significant disparity highlights clearly in urbanization levels between provinces, which may significantly influence economic factors such as business opportunities and infrastructure development.

4.2. Pearson correlation coefficients matrix

Table 3: Pearson correlations result

Variables	(ENT)	(FDI)	(PRI)	(PUB)	(FDIE)	(GRDP)	(PCI)	(UNE)	(URB)
ENT	1.000								
FDI	0.604	1.000							
PRI	0.861	0.505	1.000						
PUB	0.753	0.463	0.717	1.000					
FDIE	0.791	0.697	0.665	0.545	1.000				

GRDP	0.881	0.604	0.829	0.757	0.795	1.000			
PCI	0.448	0.261	0.448	0.411	0.419	0.488	1.000		
UNE	0.345	0.219	0.294	0.232	0.439	0.324	0.295	1.000	
URB	0.908	0.470	0.781	0.721	0.672	0.834	0.436	0.394	1.000

Source: STATA 14.

The Pearson correlation coefficients table presented in this study provides an overview of the relationships between various study variables. The data reveals a strong correlation between Entrepreneurship (ENT) and several independent variables such as Foreign Direct Investment (FDI), Private Investment (PRI), Public Investment (PUB), FDI Efficiency (FDIE), and Gross Regional Domestic Product (GRDP). Specifically, ENT exhibits a very strong correlation with URB (Urbanization), with a correlation coefficient of 0.908, indicating that urbanization has a significant impact on entrepreneurship levels across provinces. This suggests that highly urbanized areas tend to create a favorable environment for new business formation. Moreover, the variables PRI, PUB, and FDIE are also strongly correlated with ENT, with coefficients of 0.861, 0.753, and 0.791, respectively, highlighting that private, public investments, and FDI efficiency all play crucial roles in fostering entrepreneurial activity at the provincial level.

The relationships between input variables (such as FDI and PRI) and economic development factors, particularly GRDP, also show significant correlations. For instance, FDI has a notable correlation with PRI (0.505), PUB (0.463), and GRDP (0.604), suggesting that foreign direct investment contributes to the development of the private sector, thereby promoting economic growth at the provincial level. Similarly, PRI and PUB exhibit strong links with GRDP, with correlation coefficients of 0.829 and 0.757, respectively. This indicates that investments in both private and public sectors can generate solid economic growth, which in turn fosters entrepreneurial opportunities.

However, the relationship between FDI and social factors such as UNE (Unemployment) shows a weaker correlation. FDI has a moderate correlation with UNE (0.219), suggesting that, in some cases, an increase in foreign direct investment may not directly lead to a noticeable reduction in unemployment. This could reflect the uneven distribution of investments across industries or regions that may not be directly associated with job creation. On the other hand, UNE has a mild positive correlation with URB (0.394), indicating that rapid urbanization may come with certain unemployment challenges, even though urban labor markets tend to be larger. These correlations provide valuable insights into factors that can influence new business development and job creation at the provincial level within the context of investment and economic growth.

4.3. Cross-sectional dependence test (CD test)

Table 4: Cross-sectional dependence test (CD test) result

Variable	CD-test
ENT	65.709***
PCI	86.405***
FDI	-0.786
PUB	36.615***
PRI	71.626***
FDIE	15.251***
GRDP	107.729***
UNE	8.536***
URB	104.605***

Source: STATA 14.

The Cross-sectional Dependence (CD-test) was conducted to examine spatial dependence among variables in the model. The results indicate that most variables exhibit significant spatial dependence, as evidenced by highly significant CD-test

value. Specifically, variables such as ENT (65.709***), PCI (86.405***), PUB (36.615***), PRI (71.626***), FDIE (15.251***), GRDP (107.729***), UNE (8.536***), and URB (104.605***) display strong spatial linkages. This suggests that these variables are not entirely independent across observational units but are influenced by similarities or spillover effects between regions.

4.4. Multicollinearity

Table 5: Variance inflation factor result

	VIF	1/VIF
GRDP	9.85	.102
URB	5.469	.183
FDIE	3.539	.283
PRI	3.347	.299
PUB	3.024	.331
FDI	2.055	.487
PCI	1.472	.679
UNE	1.313	.761
Mean VIF	3.759	.

The multicollinearity analysis, based on the Variance Inflation Factor (VIF), is presented in Table 5. The VIF indicates the degree of correlation among independent variables in the regression model. Conventionally, a variable is considered to pose a serious multicollinearity issue if its VIF exceeds 10. In this table, GRDP exhibits the highest VIF value (9.85), approaching the threshold, suggesting a high correlation with other variables but remaining within an acceptable range. URB (Urbanization) has a VIF of 5.469, reflecting moderate correlation but not severe enough to cause significant multicollinearity concerns.

Other variables, such as FDI, PUB, PRI, and FDIE, have VIF values ranging from 2.055 to 3.539, indicating relatively low correlations that are unlikely to compromise the model's reliability. The variables PCI (Provincial Competitiveness Index) and UNE (Unemployment) have the lowest VIF values (1.472 and 1.313, respectively), confirming that they are nearly independent and minimally influenced by other variables in the model. The average VIF value (3.759) also falls within the safe range, confirming that the research model does not suffer from severe multicollinearity issues, ensuring the robustness of the regression estimates.

4.5. Regression results (OLS-FEM-REM)

Table 6: Regression model results

	OLS	FEM	REM
FDI	0.0434*** (4.19)	0.00451 (0.91)	0.0114* (1.89)
PRI	0.264*** (6.97)	0.0669* (1.96)	0.109*** (2.84)

PUB	0.0530 (1.32)	0.0813*** (2.74)	0.0730** (2.08)
FDIE	0.0509*** (2.90)	-0.0367 (-1.19)	0.0831*** (3.36)
GRDP	0.377*** (5.87)	0.196** (2.15)	0.321*** (3.57)
PCI	-1.340*** (-2.96)	-0.198 (-0.60)	-0.928** (-2.48)
UNE	-0.0251 (-0.72)	-0.0253 (-1.24)	-0.0259 (-1.06)
URB	0.465*** (9.69)	-0.0371 (-0.44)	0.396*** (5.43)
_cons	2.367 (1.34)	4.137*** (3.72)	3.244** (2.42)
N	283	283	283

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: STATA 14.

Foreign direct investment (FDI): The regression results reveal that the impact of Foreign Direct Investment (FDI) on entrepreneurship varies across models. In the

OLS model, the estimated coefficient for FDI is 0.0434, significant at the 1% level (***), indicating a strong positive effect of FDI on new business formation. However, in the FEM model, the FDI coefficient decreases to 0.00451 and loses statistical significance, suggesting that FDI's influence diminishes when controlling for province-specific fixed effects. Conversely, the REM model estimates the FDI coefficient at 0.0114, significant at the 10% level (*), showing a positive but weaker effect under the random effects assumption. These discrepancies underscore the importance of selecting an appropriate model to accurately capture FDI's true impact.

Private investment (PRI): The regression results for private investment (PRI) indicate a positive and statistically significant impact on entrepreneurship, with varying magnitudes across models. In the OLS model, the coefficient for PRI (0.264, ***) is highly significant, underscoring the critical role of private investment in promoting entrepreneurial activity. In the FEM model, controlling for fixed effects, the coefficient is smaller (0.0669, *) but remains statistically significant at the 10% level, suggesting that private investment has a relatively stable influence despite provincial differences. The REM model shows a significant coefficient for PRI (0.109, ***), further confirming the positive contribution of private investment to the growth of new businesses.

Public investment (PUB): The regression results for public investment (PUB) indicate a positive impact on entrepreneurship, with variations in statistical significance across models. In the OLS model, the coefficient for PUB is 0.0530, but it is not statistically significant, suggesting that the relationship between public investment and entrepreneurship might be influenced by uncontrolled factors. However, in the FEM model, controlling for fixed effects, the coefficient for PUB (0.0813, ***) is highly significant at the 1% level, highlighting the importance of public investment in supporting entrepreneurial activity across provinces. Similarly, in the REM model, the coefficient for PUB (0.0730, **) is statistically significant at the 5% level, reinforcing the argument that public investment positively contributes to entrepreneurship development through improved infrastructure and essential public services.

FDI Efficiency (FDIE): The regression results for FDI Efficiency (FDIE) exhibit varying impacts on entrepreneurship across regression models. In the OLS

model, the coefficient for FDIE is 0.0509, statistically significant at the 1% level (***), affirming that FDI efficiency has a positive and significant influence on entrepreneurial activity. However, in the FEM model, the coefficient for FDIE becomes negative (-0.0367) and is not statistically significant, suggesting that the effect of FDIE might vary across provinces due to fixed local characteristics. Conversely, in the REM model, the coefficient for FDIE is 0.0831, also significant at the 1% level (***), indicating that, when accounting for random effects, FDI efficiency plays a vital role in fostering entrepreneurship, particularly through enhancing innovation and competitiveness.

Gross regional domestic product (GRDP): The regression results for GRDP demonstrate a positive and consistent impact of regional economic growth on entrepreneurship across models. In the OLS model, the coefficient for GRDP is 0.377, statistically significant at the 1% level (***), affirming that increased regional economic output plays a crucial role in fostering entrepreneurship. In the FEM model, the GRDP coefficient decreases to 0.196, remaining statistically significant at the 5% level (**), suggesting that the impact of GRDP on entrepreneurship persists, albeit weaker, when controlling for fixed characteristics of provinces. The REM model shows a coefficient of 0.321, significant at the 1% level (***), further reinforcing the notion that GRDP is a key determinant, supporting the formation of new enterprises by improving economic conditions and market opportunities.

Provincial Competitiveness Index (PCI): The regression results for PCI reveal a negative impact of the Provincial Competitiveness Index on entrepreneurship, with varying significance and magnitude across models. In the OLS model, the PCI coefficient is -1.340, statistically significant at the 1% level (***), indicating that an increase in PCI may create unintended barriers to new business formation, possibly due to compliance costs or complex regulatory requirements. In the FEM model, the PCI coefficient decreases to -0.198 and is not statistically significant, suggesting that the negative effect of PCI weakens when controlling for fixed provincial characteristics. The REM model shows a PCI coefficient of -0.928, significant at the 5% level (**), affirming that provincial governance factors may influence entrepreneurship under specific conditions.

Urbanization (URB) and Unemployment (UNE): The regression results reveal contrasting impacts of unemployment (UNE) and urbanization (URB) on entrepreneurship across models. For UNE, all three models (OLS, FEM, REM) estimate negative coefficients (-0.0251, -0.0253, -0.0259) with no statistical significance, indicating that unemployment has no meaningful effect on business formation. Conversely, URB shows a strong and significant positive impact in the OLS model (0.465, ***), but its coefficient becomes negative and insignificant in the FEM model (-0.0371), reflecting the influence of fixed effects. In the REM model, the coefficient for URB (0.396, ***) remains significant, highlighting urbanization's positive role in fostering entrepreneurship when fixed effects are not fully accounted for.

4.6. Method comparison test

Table 7: Method comparison test results

Test	
F-test	OLS and FEM
F	30.68
Prob > F	0.0000
Conclusion	Reject H ₀
Fit method	FEM
Breusch - Pagan test	
chibar2(01)	OLS and REM
	548.76
Prob > chi2	0.0000
Conclusion	Reject H ₀
Fit method	REM

Hausman test	
Chi2	FEM and REM
	209.90
Prob > Chi2	0.0000
Conclusion	Reject H ₀
	FEM
Fit method	FEM
The best fit model	

Source: STATA 14.

The authors performed an F-test for the first model pair, Pooled OLS - FEM, with the research hypothesis H₀: OLS model is suitable. The results indicated that both models yielded Prob > F = 0.0000, which is less than the 5% significance level, leading to the rejection of the null hypothesis H₀, suggesting that the FEM model is more appropriate.

For the next model pair, OLS - REM, the authors employed the Breusch-Pagan test with the research hypothesis H₀: OLS model is suitable. The results showed that Prob > Chi2 = 0.0000, indicating acceptance of the hypothesis that the REM model is more suitable than the Pooled OLS model.

Finally, the authors used the Hausman test with the research hypothesis H₀: REM model is suitable. The test results revealed that Prob > Chi2 was less than the 5% significance level, leading to the rejection of the null hypothesis H₀. Therefore, the authors concluded that the FEM model is the most suitable among the three models - Pooled OLS, FEM, and REM.

It is worth noting that the model has heteroscedasticity and does not have autocorrelation due to (Prob > Chi2 = 0.000) under FEM model and (Prob > F = 0.9114) under Wooldridge test. So the authors utilise the following models to overcome such noise of heteroscedasticity.

4.7. Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE)

The coefficients of FGLS model and the robustness check of PCSE model deliver as the following tables, which also serve the findings to answer the research questions (2) Analyze entrepreneurship and investment dynamics across Vietnam's 63 provinces and their regions from 2016 to 2022 and (3) Evaluate the moderating effects of the Provincial Competitiveness Index (PCI) on the relationship between investments and entrepreneurship.

Table 8: Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) result

	FGLS	PCSE
FDI	0.0390*** (6.22)	0.0434*** (4.12)
PRI	0.232*** (9.90)	0.264*** (7.78)
PUB	0.0936*** (3.54)	0.0530 (1.24)
FDIE	0.0596*** (7.26)	0.0509*** (3.16)
GRDP	0.383*** (7.66)	0.377*** (5.14)
PCI	-1.644*** (-4.85)	-1.340** (-2.37)
UNE	-0.0242 (-1.23)	-0.0251 (-0.78)
URB	0.473***	0.465***

	(13.82)	(8.61)
_cons	3.512***	2.367
	(2.76)	(1.13)
N	283	283

t statistics in parentheses
 *p<0.1, ** p<0.05, *** p<0.01

Source: STATA 14.

About Foreign direct investment (FDI), the results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models for FDI demonstrate its significant influence on entrepreneurship across provinces in Vietnam. Specifically, the regression coefficient for FDI in the FGLS model is 0.0390***, while in the PCSE model, the coefficient is 0.0434***. Both results confirm that FDI exerts a positive and statistically significant effect at the 1% level (***). These results align with existing literature and highlight FDI's transformative potential in enhancing entrepreneurial ecosystems, particularly in emerging economies like Vietnam. This positive findings can be explained by the following rationales:

Firstly, FDI's significance in Vietnam stems from its ability to bridge gaps in capital, technology, and expertise, particularly in provinces with underdeveloped entrepreneurial ecosystems. Studies such as Anwar and Nguyen (2010) have shown that FDI facilitates economic growth by introducing advanced technologies, fostering competition, and improving infrastructure, which collectively create a favorable environment for entrepreneurship. This effect is particularly pronounced in regions with strong institutional frameworks and skilled labor pools, as demonstrated in the positive performance of provinces like Ho Chi Minh City and Hanoi. Moreover, according to Chinh Phu News (2024), the emergence of tech unicorns such as MoMo and Sky Mavis showcases how FDI catalyzes innovation and entrepreneurial success

in sectors like fintech and blockchain, which are central to Vietnam's startup ecosystem.³

Secondly, the findings also reflect the spatial disparities in Vietnam's entrepreneurial landscape, where regions with better access to FDI benefit disproportionately. Provinces with robust infrastructure and high PCI scores attract more FDI, enabling them to leverage foreign investments to foster entrepreneurship. Le Thi Nham and Dang Thanh Tuan (2024) emphasized this point, noting that the efficiency of FDI attraction is highest in provinces with advanced infrastructure and skilled labor, such as Ho Chi Minh City. However, the analysis also highlights the need for targeted policy interventions to enhance FDI's impact in less developed provinces, where weaker institutional frameworks and limited infrastructure constrain its potential benefits. FDI's role in Vietnam's entrepreneurship growth also extends to knowledge transfer and capacity building. Slesman, Abubakar, and Mitra (2021) highlighted that institutional quality moderates FDI's effect on entrepreneurship, with stronger institutions amplifying its positive impact. Similarly, according to NIC (2021), Vietnam's startup ecosystem's resurgence after the COVID-19 pandemic, evidenced by record investments in 2021 and the rise of digital enterprises, illustrates how FDI fosters resilience and innovation.⁴ By supporting sectors like AI, advanced manufacturing, and e-commerce, FDI has driven Vietnam's shift toward a knowledge-based economy, strengthening its position as an emerging startup hub in Southeast Asia.⁵

³ From Chinh Phu News. (2024). *Viet Nam thang hang ve chi so he sinh thai khoi nghiep toan cau 2024*. Retrieved December 9, 2024, from <https://baochinhphu.vn/viet-nam-thang-hang-ve-chi-so-he-sinh-thai-khoi-nghiep-toan-cau-2024-102240607092853201.htm>

⁴ From the National Innovation Center (NIC). (2021). *Bao cao doi moi sang tao va dau tu cong nghe 2021 [Innovation and Technology Investment Report 2021]*. Retrieved from <https://nic.gov.vn/img/wpuploads/2022/05/Bao-cao-DMST-va-Dau-tu-Cong-nghe-2021.pdf>

⁵ From the Vietnam Science and Technology Agency (VISTA). (2022). *Startup Newsletter*, Issue 43/2022. Retrieved from https://vista.gov.vn/vn-uploads/startup/2022_12/startup-43.2022.pdf

These findings emphasize the strategic importance of fostering favorable conditions for FDI to thrive. Enhancing institutional quality, addressing regulatory constraints, and promoting balanced regional development are crucial steps to maximize FDI's impact on entrepreneurship. The Vietnamese government's initiatives, such as the National Innovation Center and Project 844, provide a roadmap for leveraging FDI to stimulate entrepreneurship and drive sustainable economic growth. By aligning these efforts with the insights from FGLS and PCSE models, policymakers can unlock FDI's full potential to catalyze entrepreneurship across Vietnam.

According to Banking Review (2024), startups in the fields of financial services, robotics, and renewable energy in Vietnam exhibit a dynamic work ethic and mutual support. This strong synergy has fostered a favorable local startup ecosystem. The growth of Vietnam-Singapore Industrial Parks (VSIPs), with the first established in 1996, has attracted \$18.7 billion in investment and created jobs for 300,000 workers. Vietnam is advancing along the value chain, transitioning from footwear and apparel to high-tech industries, including domestic fintech companies such as payment service providers Momo, ZaloPay, and VNPAY, as well as foreign startups. Consequently, capital expenditure and domestic infrastructure spending are expected to grow rapidly.⁶

According to Dan Tri News (2024), the electronics industry of Vietnam has progressed significantly alongside the second wave of foreign direct investment (FDI). In 2006, Samsung invested \$650 million in Vietnam, which has grown to \$20 billion in recent years. Intel also entered the Vietnamese market. At the time, Intel was the largest U.S. corporation in information technology and electronics. Its investment in Vietnam provided a major boost to the high-tech park in Ho Chi Minh City; Intel creates an ecosystem interconnected with domestic startups, universities, and research institutes in Ho Chi Minh City with approximately 30 units in the ecosystem currently supporting each other. Technology corporations play a vital role in accelerating

⁶ From Banking Review. (2024). *Dau tu truc tiep nuoc ngoai vao Viet Nam nam 2023 va trien vong nam 2024*. Retrieved December 9, 2024, from <https://tapchinganhang.gov.vn/dau-tu-truc-tiep-nuoc-ngoai-vao-viet-nam-nam-2023-va-trien-vong-nam-2024.htm>

enterprise growth, while universities have established key research institutes. Ho Chi Minh City has now developed some semiconductor chips, laying the foundation for advancing the semiconductor industry. During the second wave of FDI, capital flows have strongly impacted the technology sector. Professor Nguyen Mai highlighted Viettel as a prime example of spillover effects of FDI. Founded in 1997, Viettel was initially established as an independent military business entity. Between 2012 and 2013, it underwent organizational restructuring and collaborated with various international enterprises.⁷ However, this also implies that Vietnam must continue to enhance governance capacity, improve the efficiency of FDI utilization, and build supportive entrepreneurial ecosystems, particularly in provinces that have yet to fully capitalize on FDI inflows.

About Private investment (PRI), the results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models for PRI indicate a strong and consistent impact of private investment on entrepreneurship. Specifically, the regression coefficient of PRI in the FGLS model is 0.232***, while in the PCSE model, it is 0.264***. Both coefficients are statistically significant at the 1% level (***), underscoring that private investment is a major driver of new business formation. The results align with the literature, emphasizing PRI's role in fostering entrepreneurial activity by enhancing access to capital, resources, and opportunities for business development and can be explained by the following rationales:

Firstly, the resurgence of Vietnam's startup ecosystem after the COVID-19 pandemic further demonstrates the transformative role of PRI. According to the Ministry of Science and Technology (2023), record investments of \$1.4 billion in 2021 were driven largely by private capital, targeting emerging sectors such as fintech, AI, and e-commerce. This surge reflects how private investment adapts to market demands, pivoting towards industries less affected by economic shocks while supporting digital transformation initiatives. The rise of tech unicorns like MoMo

⁷ From Dan Tri News. (2024). "*Dai bang*" FDI va cu hich lich su cho kinh te Viet Nam. Retrieved December 9, 2024, from <https://dantri.com.vn/kinh-doanh/dai-bang-fdi-va-cu-hich-lich-su-cho-kinh-te-viet-nam-20241022165933462.htm>

exemplifies how private capital fosters innovation, strengthens the entrepreneurial ecosystem, and positions Vietnam as a regional startup hub.

Secondly, empirical evidence supports the robust relationship between PRI and entrepreneurship. Su and Bui (2017) found that private investment significantly enhances economic growth, particularly in provinces with better governance frameworks, as measured by the Provincial Competitiveness Index (PCI). Improved governance reduces entry barriers, informal charges, and operational inefficiencies, enabling private investors to allocate resources more effectively to entrepreneurial ventures. Similarly, Trinh and Lee (2023) highlighted that PCI subindices such as “Transparency” and “Land Access” positively influence enterprise growth, creating a favorable environment for private investments to flourish. The findings from these studies resonate with the observed outcomes in Vietnam, where entrepreneurial hotspots like Ho Chi Minh City and Hanoi benefit from a combination of strong private investment and supportive institutional frameworks.

Finally, private investment also plays a crucial role in bridging regional disparities in entrepreneurial activity. As highlighted in the “Status of Entrepreneurship in Vietnam,” provinces with robust private investment frameworks, such as Bac Ninh with its high-tech industrial zones, have become focal points for entrepreneurial ventures (Chinh Phu Newspaper, 2024). Conversely, less developed provinces face challenges in attracting private capital due to weaker infrastructure and institutional support. Addressing these gaps requires targeted policy interventions to ensure equitable access to private investment across all regions. Nguyen and Nguyen (2023) emphasized that enhancing PCI in underdeveloped provinces can unlock PRI’s potential to foster entrepreneurship and drive economic development.

About Public investment (PUB), the regression results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models for PUB reveal differences in the magnitude of public investment's impact on entrepreneurship. Specifically, the regression coefficient for PUB in FGLS is 0.0936***, which is statistically significant at the 1% level (***), whereas the coefficient in PCSE is 0.0530 and not statistically significant, suggesting that the

impact of public investment on entrepreneurship varies depending on regional and methodological factors. This discrepancy can be rationales by the following:

Firstly, public investment has traditionally played a pivotal role in creating an enabling environment for entrepreneurship by improving infrastructure, access to services, and overall business conditions. Vu (2023) emphasized the importance of optimizing public investment distribution to foster inclusive growth, particularly in underdeveloped regions. Public investment often acts as a catalyst for entrepreneurship by providing essential public goods such as transportation, communication networks, and education facilities (Chinh Phu Newspaper, 2024). This reflects the role of public funding in creating competitive advantages and attracting private initiatives.

Secondly, the lack of statistical significance in the PCSE results may point to inefficiencies or disparities in the allocation and management of public investment. Su, Hart, and Canh (2020) highlighted that while public spending enhances economic growth, inefficiencies in administrative processes can dilute its impact. In some cases, public investment may crowd out private initiatives, as suggested by Nguyen and Trinh (2018), who observed an inverted-U relationship between public and private investments. This dynamic indicates that while initial public funding supports entrepreneurship, excessive or misallocated investment may stifle private sector participation, thereby limiting its long-term impact.

Thirdly, the benefits of public investment are not uniformly distributed across provinces. The Red River Delta's provinces with highly quality and effective governance have successfully leveraged public investment to drive innovation and business formation, less developed provinces continue to face barriers. According to Nguyen (2019), the quality of governance significantly determines the effectiveness of public investment in fostering entrepreneurship and underscores the importance of aligning public investment strategies with regional needs and institutional capacities.

Public investment, supported by the state, plays a crucial role in fostering innovation among small and medium-sized enterprises. According to Phap Luat TP.HCM Newspaper (2024), Ho Chi Minh City is establishing the Innovation Startup Center with a proposal from Chairman Phan Van Mai emphasizing that the center should spaces for startups with connect young entrepreneurs with emerging and established businesses, thereby encourage young entrepreneurs and startups to

innovate and grow. In Decree No. 28/2023/ND-CP dated June 2, 2023, the Ministry of Science and Technology unify the management of innovation activities; build, guide, inspect and organize the implementation of mechanisms and policies to encourage and develop innovation, creative startups and mobilize investment resources for innovation and creative startups which will unify, synchronize and legalize major and fundamental issues such as policies on using budget capital to invest in innovation, creative startups.

Finally, according to the Doan Thanh Nien Newspaper (2024) since 2015, the province has launched a startup program to promote the entrepreneurial spirit in the community with the orientation of turning the province into a “Startup Locality”. Up to now, there are 11 start-up projects with over 200 young people receiving capital support from the Employment Fund through the Central Youth Union channel with a total amount of 2.8 billion VND; effectively maintaining the Provincial Youth Start-up Support Fund to support 10 projects with loans with a total amount of 1.7 billion VND. The result of implementing Decision No. 897 dated July 26, 2022 of the Program "Supporting Youth Start-ups for the period 2022 - 2030" is that "100% of specialized Youth Union officials at district and commune levels working to support youth start-ups are trained in knowledge about start-ups; 668 young people are supported to start-ups; 2,132 young people are equipped with knowledge and training to improve their capacity in start-ups and business administration...".

FDI Efficiency (FDIE): The results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models for FDIE demonstrate consistent and positive impacts of FDI efficiency on entrepreneurship. Specifically, the regression coefficient for FGLS is 0.0596***, statistically significant at the 1% level (***), while the coefficient for PCSE is 0.0509***, also significant at the 1% level (***). These findings indicate that effectively leveraging FDI significantly contributes to entrepreneurial activities across provinces. This aligns with the hypothesis that FDI not only provides capital but also facilitates the transfer of technology, managerial expertise, and access to global market networks, thereby enhancing the capacity of local businesses (Dunning, 2000).

Gross regional domestic product (GRDP): The results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models demonstrate that GRDP has a positive and significant impact on entrepreneurship. Specifically, the regression coefficient in FGLS is 0.383***, statistically significant at the 1% level (***), while the coefficient in PCSE is 0.377***, also significant at the 1% level (***). These findings confirm that regional economic growth, measured by GRDP, plays a critical role in fostering entrepreneurial activities. This aligns with theoretical perspectives on the relationship between economic growth and entrepreneurship (Audretsch & Keilbach, 2004). Higher GRDP levels signal expanded market opportunities, increased consumer demand, and improved economic infrastructure, all of which provide a conducive environment for the establishment and growth of new businesses.

For Vietnam, these findings underscore the importance of regional economic growth in fostering entrepreneurship. Provinces should focus on enhancing economic productivity through supportive policies such as infrastructure investment, workforce development, and the promotion of key industries tailored to local characteristics. Additionally, fostering inter-regional collaboration within the country could generate positive spillover effects, contributing to GRDP growth and improving entrepreneurial environments. These efforts not only promote sustainable growth but also help reduce regional disparities, ensuring more equitable development across Vietnam.

Provincial Competitiveness Index (PCI): The regression results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models reveal that the Provincial Competitiveness Index (PCI) has a significantly negative impact on entrepreneurship. Specifically, the FGLS coefficient is -1.644***, statistically significant at the 1% level (***), while the PCSE coefficient is -1.340**, significant at the 5% level (**). These results challenge conventional assumptions and call for a deeper exploration of the underlying dynamics.

This negative association may be attributed to structural issues within the PCI framework itself, as highlighted by Nguyen and Luu (2021). While PCI captures critical aspects of governance, such as transparency, informal costs, and business

support services, it may overlook broader economic and social determinants of entrepreneurship. Provinces with high PCI scores often impose stricter regulatory frameworks and higher compliance costs, inadvertently creating entry barriers for small and medium-sized enterprises (SMEs). Diep and Loan (2020) argued that PCI improvements sometimes prioritize procedural efficiency without addressing fundamental economic constraints, such as limited access to finance and skilled labor, which are crucial for entrepreneurial success. Additionally, the paradoxical impact of PCI on entrepreneurship may stem from regional disparities and inconsistencies in governance implementation. Trinh and Lee (2023) found that while higher PCI scores attract enterprises in less developed provinces, the benefits are not uniformly distributed across all regions. These findings align with those of Van Dinh Tue Thu and Pham Xuan Truong (2024), who observed that uniform institutional structures sometimes limit PCI's ability to address local economic inequalities, thereby constraining its effectiveness in promoting entrepreneurship.

From the perspective of entrepreneurship in Vietnam, the negative PCI coefficients reflect the challenges faced by provinces in translating governance improvements into tangible entrepreneurial outcomes. While regions like Hanoi and Ho Chi Minh City benefit from robust PCI-related policies, others struggle to adapt these frameworks to their unique contexts. For instance, the rapid growth of digital and technology startups, supported by PCI-driven initiatives, may inadvertently overshadow traditional sectors and SMEs. As noted in the *Chinh Phu Newspaper* (2024), the skewed focus on high-growth sectors can marginalize smaller enterprises, contributing to the paradoxical PCI-entrepreneurship relationship.

Another possible explanation lies in the evolving dynamics of Vietnam's entrepreneurial landscape post-COVID-19. The pandemic accelerated digital transformation and innovation, sectors where high PCI scores are more likely to have a direct impact. However, for traditional entrepreneurial ventures, which often rely on informal networks and lower compliance burdens, high PCI-driven formalization may increase operational costs and reduce flexibility. Nguyen and Nguyen (2023) highlighted that while PCI positively influences macroeconomic indicators like GRDP,

its relationship with micro-level entrepreneurship is more complex, often mediated by local economic conditions and sectoral dynamics.

According to PCI Reports (2023) from 2017 to 2022, Quang Ninh was the leading province in terms of economic management quality, with numerous initiatives to attract investment and reform administrative procedures. Bac Giang Province has been positively evaluated for "accompanying businesses" by the provincial government. It has focused on raising awareness across the entire government system about improving the investment and business environment and developing enterprises. The PCI 2022 survey shows that local governments need to make further efforts in creating a more favorable investment and business environment such as taxation, land management, social insurance, fire safety, and procedures for issuing conditional business licenses. According to Mr. Pham Cong Tan the 2022 PCI results between 2016 and 2022, informal payments by private enterprises significantly decreased, with the average share dropping from 8.1% to 3.8% during 2016-2020. Administrative reform efforts have reduced costs for businesses while ensuring compliance with legal requirements. However, the most significant difficulty for private enterprises is credit access. Financial institutions imposed unfavorable conditions (increasing from 41.8% to 58.7%), complicated loan procedures (rising from 46.2% to 58.6%), and delays in loan processing, significantly hindering businesses.

Unemployment (UNE): The regression results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models indicate that the unemployment rate (UNE) has a negative but statistically insignificant impact on entrepreneurship. The FGLS coefficient is -0.0242, and the PCSE coefficient is -0.0251. Neither result reaches statistical significance, suggesting that unemployment is not a clear determinant of entrepreneurial activity across Vietnam's provinces, which posits that unemployment may exert two opposing effects: on the one hand, higher unemployment can spur necessity-based entrepreneurship; on the other hand, an unstable economic environment may hinder access to capital and increase risks for new businesses.

Urbanization (URB): The results from the Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Error (PCSE) models reveal that urbanization (URB) has a positive and highly significant impact on entrepreneurial activity. The FGLS coefficient is 0.473***, and the PCSE coefficient is 0.465***, indicating a strong and stable relationship between urbanization levels and entrepreneurship development. These findings align with the theoretical framework that highlights urbanization's role in fostering dynamic business environments, particularly in areas with high population density, robust infrastructure, and access to larger markets.

4.8. Interaction model

Also, the coefficients of FGLS model and the robustness check of PCSE model deliver as:

Table 9: Interaction model results

	OLS	FEM	REM	FGLS	PCSE
FDI	0.997*** (2.70)	0.295 (1.25)	0.799*** (2.91)	1.252*** (4.15)	0.997** (2.06)
PRI	0.260*** (6.83)	0.0662** (1.98)	0.101*** (2.67)	0.227*** (9.75)	0.260*** (7.69)
PUB	0.0606 (1.50)	0.0779*** (2.62)	0.0668* (1.91)	0.0995*** (3.81)	0.0606 (1.43)
FDIE	0.0538*** (3.07)	-0.0376 (-1.25)	0.0847*** (3.47)	0.0636*** (7.83)	0.0538*** (3.34)
GRDP	0.363*** (5.70)	0.219** (2.42)	0.331*** (3.70)	0.340*** (7.21)	0.363*** (5.12)
UNE	-0.0371 (-1.08)	-0.0269 (-1.32)	-0.0295 (-1.21)	-0.0519*** (-2.71)	-0.0371 (-1.16)
URB	0.472*** (9.81)	-0.0427 (-0.51)	0.396*** (5.45)	0.505*** (15.19)	0.472*** (8.92)
PCI_FDI	-0.230** (-2.58)	-0.0701 (-1.24)	-0.190*** (-2.87)	-0.292*** (-4.01)	-0.230** (-1.97)

_cons	-3.083*** (-5.84)	3.125*** (4.08)	-0.559 (-0.77)	-2.979*** (-8.58)	-3.083*** (-5.58)
N	283	283	283	283	283

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: STATA 14.

The inclusion of the interaction term FDI×PCI provides valuable insights into how the Provincial Competitiveness Index (PCI) moderates the relationship between Foreign Direct Investment (FDI) and entrepreneurship. Across the five regression models (OLS, FEM, REM, FGLS, and PCSE), the interaction term FDI×PCI is statistically significant in OLS, REM, FGLS, and PCSE (except FEM), with coefficients of -0.230**, -0.190***, -0.292***, and -0.230**, respectively. These findings suggest a complex and potentially *paradoxical relationship* between Foreign Direct Investment (FDI) and the Provincial Competitiveness Index (PCI) in influencing entrepreneurship. The negative coefficients imply that higher PCI levels may dampen the positive effects of FDI on entrepreneurship, indicating that governance improvements could sometimes hinder rather than enhance the entrepreneurial benefits of foreign investments. Also, these can be reaffirmed the following rationales:

Firstly, while PCI improvements generally reflect better governance, they often introduce stricter compliance requirements, raising operational costs for FDI-backed ventures. Diep and Loan (2020) highlight that such rigidities may stifle the flexibility required for entrepreneurial innovation, particularly in high-PCI provinces, creating unintended barriers for FDI-driven entrepreneurship.

Secondly, high-PCI provinces tend to monopolize FDI resources, leaving less-developed regions underfunded. This regional imbalance limits the broader entrepreneurial benefits of FDI. Additionally, weak institutional absorptive capacities in certain provinces prevent effective utilization of FDI, as noted by Vu (2023) and Slesman, Abubakar, and Mitra (2021).

Finally, FDI often flows into high-growth sectors such as advanced manufacturing and e-commerce in high-PCI provinces. However, these investments can crowd out local entrepreneurs, increasing competition for resources and reducing opportunities for small and medium enterprises (SMEs), as observed by Nguyen and Nguyen (2023). This creates a paradox where FDI's positive potential is constrained by market dynamics and PCI priorities.

This interpretation aligns with the perspective that FDI's impact on local economies is context-dependent. In provinces with well-developed institutions, foreign investors may primarily focus on efficiency-seeking investments rather than actively integrating into or bolstering local entrepreneurial ecosystems. On the other hand, provinces with less competitive institutions might benefit more directly from FDI, as foreign investors fill institutional voids and directly stimulate entrepreneurship.

From a policy perspective, this result highlights the nuanced role of PCI in mediating the FDI-entrepreneurship nexus. Policymakers should not assume a uniformly positive interaction across all regions. In provinces with high PCI, strategies to attract and leverage FDI should emphasize integration into existing entrepreneurial networks and focus on knowledge transfer. For provinces with low PCI, efforts should prioritize institutional reforms to complement FDI inflows and maximize their entrepreneurial benefits.

The control variables retain their expected signs and significance as in previous sections. PRI and GRDP remain positive and significant, underscoring the roles of private investment and economic growth in driving entrepreneurship. PUB is significant in FGLS and PCSE, affirming the complementary role of public spending. URB continues to show a strong and positive relationship, while UNE remains insignificant, suggesting that urbanization is a more critical driver of entrepreneurship than unemployment rates.

The negative interaction term between FDI and PCI challenges simplistic assumptions about their relationship, offering a more nuanced understanding. While FDI is beneficial overall, its marginal impact on entrepreneurship diminishes in provinces with high PCI.

4.9. Robustness check

The coefficients of the another robustness check of using proxy of FDI as FDIN delivers as:

Table 10: Robustness check results

	OLS	FEM	REM	FGLS	PCSE
FDIN	1.326** (2.20)	0.365 (0.87)	1.294*** (2.82)	0.910** (2.30)	1.326** (1.99)
PRI	0.222*** (6.33)	0.0726** (2.12)	0.0929** (2.55)	0.208*** (8.60)	0.222*** (7.20)
PUB	0.0984*** (2.65)	0.0825*** (2.89)	0.0731** (2.29)	0.106*** (4.04)	0.0984*** (2.61)
FDIE	0.00746 (0.44)	-0.0338 (-1.17)	0.0384 (1.63)	0.0199* (1.76)	0.00746 (0.43)
GRDP	0.240*** (4.17)	0.165* (1.87)	0.275*** (3.37)	0.247*** (6.04)	0.240*** (3.89)
UNE	0.0132 (0.41)	-0.0365* (-1.69)	-0.0206 (-0.85)	0.00877 (0.40)	0.0132 (0.40)
URB	0.433*** (10.09)	0.0312 (0.38)	0.432*** (6.55)	0.407*** (14.56)	0.433*** (10.27)
FDIN_PCI	-0.273* (-1.90)	-0.0769 (-0.77)	-0.279** (-2.53)	-0.174* (-1.83)	-0.273* (-1.71)
_cons	-1.899*** (-3.85)	3.181*** (4.05)	-0.562 (-0.83)	-1.722*** (-4.89)	-1.899*** (-3.56)
N	269	269	269	269	269

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

The robustness check employs FDIN (number of licensed projects related to FDI) as an alternative to the original FDI variable, along with the interaction term FDIN x PCI to validate the consistency of the findings. Across the five models (OLS, FEM, REM, FGLS, PCSE), FDIN consistently demonstrates a statistically significant positive effect on entrepreneurship (ENT). Notably, the coefficients for FDIN in the OLS, REM, FGLS and PCSE models (1.326**, 1.294***, 0.910**, 1.326**, respectively) align with expectations, reaffirming that licensed FDI projects positively stimulate entrepreneurship. This finding is in line with the theoretical framework, which posits that FDI inflows enhance entrepreneurial activity by providing capital, technological know-how, and market access.

In Vietnam's context, the significance of FDIN highlights the importance of improving the licensing process for FDI projects to attract investments that promote entrepreneurship effectively. The FEM model, however, fails to capture a significant relationship, possibly due to unobserved heterogeneity within provinces, suggesting that FEM may be less effective in this context.

The interaction term FDIN x PCI exhibits a statistically significant negative effect on entrepreneurship in the REM and FGLS models (-0.279** and -0.174*, respectively), corroborating earlier findings that the Provincial Competitiveness Index moderates the relationship between FDI-related activity and entrepreneurship negatively. This suggests that in provinces with higher PCI scores, the benefits of increased licensed FDI projects on entrepreneurship may diminish, potentially due to regulatory inefficiencies or competitive distortions. While the OLS and PCSE models also show negative coefficients (-0.273*), these are only weakly significant or insignificant. This consistency across methodologies underscores that the moderating effect of PCI on FDIN is robust but complex, potentially influenced by localized factors that are not fully captured in the models. Policymakers in Vietnam should interpret these findings as evidence of the need for targeted improvements in regulatory environments to ensure that high-PCI provinces can more effectively convert licensed FDI into entrepreneurial growth. In terms of control variables, the

results are largely consistent with prior analyses (4.5 and 4.7), with variables like PRI, PUB, GRDP, and URB maintaining their signs and significance.

This consistency underscores the robustness of the model and supports the validity of the study's broader conclusions regarding the drivers of entrepreneurship in Vietnam. The robustness check thus strengthens confidence in the study's empirical findings and reinforces the importance of nuanced policy interventions to balance the benefits of FDI and PCI.

4.10. Results of sub-regional regression

In this part, the author's purpose is to answer the (4) How do regional and governance disparities across Vietnam affect entrepreneurial dynamics and investment outcomes? by employing FGLS and PCSE models on the 6 regions out of 63 provinces named: Red River Delta, Northern Midlands, North and South-Central Coast, Central Highlands, Southeast, Mekong River Delta. Additionally, FDIN and FDIN_PCI also served as a robustness variable for the regressions.

Table 11: Sub-regional regression (123)

	ENT	ENT	ENT	ENT	ENT	ENT
FDI	2.998*** (8.62)	2.930*** (7.35)	3.287*** (3.70)	2.656** (2.50)	-2.072** (-2.33)	-2.844** (-1.99)
PRI						
PUB	0.148**	0.174***	0.174**			
FDIE	0.194***	0.202***				
GRDP						
UNE	-0.234***			-0.0227		
URB			(-1.61)			
PCI_FDI						

_cons

N	55	55	49	49	67	67
----------	----	----	----	----	----	----

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Table 12: Sub-regional regression (456)

	ENT	ENT	ENT	ENT	ENT	ENT
FDI	0.540 (0.49)	0.540 (0.49)	0.796 (1.33)	1.082** (1.97)	0.480 (0.84)	-1.726*** (-2.69)
PRI	0.00526 (0.05)	0.00526 (0.05)	0.153* (1.76)	0.0889 (1.24)	0.0630 (1.53)	0.126** (2.10)
PUB	-0.0495 (-0.33)	-0.0495 (-0.33)	0.158 (1.26)	-0.0243 (-0.20)	0.192** (2.43)	0.224*** (2.72)
FDIE	0.0893** (2.23)	0.0893** (2.23)	-0.493*** (-2.77)	-0.643*** (-4.10)	0.0871*** (2.77)	0.108*** (3.50)
GRDP	1.085*** (14.16)	1.085*** (14.16)	0.377 (1.43)	0.633*** (2.68)	0.441*** (2.74)	0.333*** (2.77)
UNE	0.129 (1.28)	0.129 (1.28)	-0.0587 (-0.69)	0.00347 (0.04)	-0.214*** (-3.43)	-0.268*** (-3.86)
URB	-0.0763 (-1.09)	-0.0763 (-1.09)	0.891*** (6.07)	0.957*** (7.61)	0.570*** (6.32)	0.567*** (8.07)
PCI_FDI	-0.137 (-0.51)	-0.137 (-0.51)	-0.153 (-1.07)	-0.208 (-1.58)	-0.113 (-0.82)	0.420*** (2.74)
_cons	-3.852*** (-3.75)	-3.852*** (-3.75)	-7.270*** (-3.00)	-9.158*** (-4.25)	-3.441** (-2.20)	-3.042** (-2.45)
N	20	20	30	30	62	62

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Table 13: Robustness check of Sub-regional regression (123)

Variables	Red River Delta		Northern Midlands		North and South-Central Coast	
	FGLS	PCSE	FGLS	PCSE	FGLS	PCSE
FDIN	3.166*** (5.29)	3.189*** (5.07)	8.209*** (5.22)	8.315*** (4.09)	-5.459*** (-3.93)	-6.826*** (-4.49)
PRI	-0.0173 (-0.34)	0.00891 (0.17)	0.315*** (3.06)	0.439*** (3.48)	0.205*** (2.78)	0.280*** (3.33)
PUB	0.174*** (3.63)	0.139*** (2.69)	0.231*** (4.32)	0.242*** (3.86)	0.163* (1.81)	0.159* (1.68)
FDIE	-0.0131 (-0.20)	-0.00898 (-0.13)	0.0540 (1.60)	0.0796* (1.66)	0.0761*** (3.11)	0.0737*** (2.68)
GRDP	0.618*** (5.02)	0.577*** (4.51)	0.428*** (4.09)	0.295* (1.84)	0.159 (1.27)	0.148 (1.09)
UNE	-0.198** (-2.45)	-0.233*** (-2.66)	0.130*** (3.66)	0.131*** (2.85)	-0.178*** (-2.71)	-0.166** (-2.22)
URB	0.268*** (3.46)	0.296*** (3.68)	-0.0115 (-0.12)	-0.0134 (-0.12)	0.211*** (2.75)	0.0803 (0.87)
FDIN_PCI	-0.703*** (-4.79)	-0.707*** (-4.59)	-1.946*** (-5.12)	-1.983*** (-4.04)	1.362*** (4.11)	1.691*** (4.67)
_cons	-3.692*** (-3.89)	-3.311*** (-3.36)	-3.427*** (-3.31)	-3.046* (-1.90)	0.279 (0.32)	0.462 (0.48)
N	55	55	42	42	62	62

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Table 14: Robustness check of Sub-regional regression (456)

Variables	Central Highlands		Southeast		Mekong River Delta	
	FGLS	PCSE	FGLS	PCSE	FGLS	PCSE

FDIN	-2.461 (-0.81)	-2.461 (-0.81)	2.405*** (3.66)	2.436*** (3.78)	-0.503 (-0.37)	-2.725* (-1.87)
PRI	-0.00890 (-0.06)	-0.00890 (-0.06)	-0.0993 (-1.29)	-0.109 (-1.49)	0.0330 (0.74)	0.125** (2.08)
PUB	0.0152 (0.11)	0.0152 (0.11)	-0.168* (-1.67)	-0.190* (-1.81)	0.189*** (2.68)	0.269*** (3.49)
FDIE	-0.0234 (-0.35)	-0.0234 (-0.35)	-0.248** (-1.99)	-0.301** (-2.50)	0.0744** (2.41)	0.0707** (2.24)
GRDP	1.081*** (12.64)	1.081*** (12.64)	0.300 (1.54)	0.410** (2.25)	0.325** (2.20)	0.213** (2.00)
UNE	0.0552 (0.73)	0.0552 (0.73)	0.0488 (0.68)	0.0710 (0.85)	-0.202*** (-3.43)	-0.258*** (-3.89)
URB	-0.0488 (-0.69)	-0.0488 (-0.69)	0.862*** (8.83)	0.852*** (8.59)	0.595*** (7.85)	0.568*** (9.41)
FDIN_PCI	0.621 (0.84)	0.621 (0.84)	-0.498*** (-3.20)	-0.507*** (-3.31)	0.145 (0.45)	0.678** (1.98)
_cons	-5.139*** (-4.58)	-5.139*** (-4.58)	-0.784 (-0.42)	-1.854 (-1.07)	-2.185 (-1.50)	-2.313** (-2.07)
N	18	18	30	30	61	61

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

The findings for the *Red River Delta*, encompassing HNOI (Hà Nội), VPHUC (Vĩnh Phúc), BNINH (Bắc Ninh), QNINH (Quảng Ninh), HDUONG (Hải Dương), HPHONG (Hải Phòng), HYEN (Hưng Yên), TBINH (Thái Bình), HNAM (Hà Nam), NĐINH (Nam Định), and NBINH (Ninh Bình), underscore the pivotal role of Foreign Direct Investment (FDI) in fostering entrepreneurship (ENT). Across base models (FDI and PCI_FDI) and robustness checks (FDIN and FDIN_PCI), FDI consistently demonstrates a highly significant positive impact on entrepreneurship, with coefficients ranging from 2.930 to 3.189, highlighting the region's efficiency in

utilizing foreign investments. Public investment (PUB) also contributes significantly to entrepreneurship (coefficients from 0.139 to 0.174), reflecting the importance of government spending in enhancing infrastructure and public services. Additionally, the efficiency of FDI allocation (FDIE) positively influences entrepreneurship (0.194 to 0.202), underscoring the critical role of well-managed foreign investments. However, interaction terms such as PCI_FDI and FDIN_PCI are negative and significant (-0.703 to -0.714), suggesting that competitive pressures from FDI may hinder local entrepreneurial activity despite favorable governance quality (PCI). Policymakers should balance FDI inflows with strategies to mitigate competitive pressures on local businesses.

In the *Northern Midlands*, encompassing HGIANG (Hà Giang), CBANG (Cao Bằng), BKAN (Bắc Kạn), TQUANG (Tuyên Quang), LCAI (Lào Cai), YBAI (Yên Bái), TNGUYEN (Thái Nguyên), LSON (Lạng Sơn), BGIANG (Bắc Giang), PTHO (Phú Thọ), SLA (Sơn La), HBINH (Hòa Bình), ĐBIEN (Điện Biên), and LCHAU (Lai Châu), FDI's impact on entrepreneurship is moderated by structural challenges. FDI exhibits smaller positive coefficients in base models (2.656 to 3.287) compared to robustness checks (8.209 to 8.315), reflecting untapped potential for FDI-driven growth. Public investment (PUB) shows mixed results: negative associations in base models (-0.174) suggest inefficiencies, while positive coefficients in robustness checks (0.231 to 0.242) highlight the potential of effective public-private investment synergies. The efficiency of FDI allocation (FDIE) consistently supports entrepreneurship (0.0796 to 0.104). GRDP has a moderate positive impact (0.252 to 0.308), and interaction terms PCI_FDI and FDIN_PCI remain significantly negative (-0.639 to -1.983), indicating governance barriers. Targeted policies are needed to enhance governance, improve public investment efficiency, and align FDI strategies with entrepreneurial goals.

In the *North and South-Central Coast region*, covering THOA (Thanh Hóa), NAN (Nghệ An), HTINH (Hà Tĩnh), QBINH (Quảng Bình), QTRI (Quảng Trị), TTHUE (Thừa Thiên Huế), ĐNANG (Đà Nẵng), QNAM (Quảng Nam), QNGAI (Quảng Ngãi), BĐINH (Bình Định), PYEN (Phú Yên), KHOA (Khánh Hòa), NTHUAN (Ninh Thuận), and BTHUAN (Bình Thuận), FDI's relationship with

entrepreneurship is marked by challenges. FDI consistently exhibits negative coefficients (-2.072 to -6.826), indicating potential crowding-out effects on local businesses. Public investment (PUB) partially offsets these effects, showing positive and significant impacts (0.159 to 0.296). FDI efficiency (FDIE) remains a significant positive factor (0.0697 to 0.0761), emphasizing the importance of optimized capital allocation. Urbanization (URB) plays a crucial role, with strong positive effects (0.362 to 0.699), while interaction terms PCI_FDI and FDIN_PCI turn positive in robustness checks (0.514 to 1.691), suggesting that improved governance can mitigate adverse FDI impacts. Policymakers should focus on aligning FDI strategies with local needs, enhancing governance quality, and leveraging urbanization to support entrepreneurship.

In the *Central Highlands*, encompassing KTUM (Kon Tum), GLAI (Gia Lai), ĐLAK (Đắk Lắk), ĐNONG (Đắk Nông), and LDONG (Lâm Đồng), the impact of FDI on entrepreneurship is limited by structural inefficiencies. FDI's relationship with entrepreneurship is mostly insignificant (0.540 to -2.461), highlighting challenges such as weak infrastructure and low absorptive capacity. However, the efficiency of FDI allocation (FDIE) consistently has a positive impact (0.0893), indicating that better management of foreign investments could enhance their entrepreneurial benefits. GRDP emerges as the strongest driver of entrepreneurship, with highly significant coefficients (1.081 to 1.085), reflecting the critical role of economic output. Public investment (PUB) and urbanization (URB) show limited significance, and governance-related factors (PCI_FDI) are largely insignificant (-0.137). Policymakers should focus on addressing structural challenges, improving FDI efficiency, and strengthening infrastructure and governance to create a supportive entrepreneurial environment.

In the *Southeast region*, encompassing BPHUOC (Binh Phước), TNINH (Tây Ninh), BDUONG (Binh Dương), ĐNAI (Đồng Nai), BRVT (Bà Rịa - Vũng Tàu), and HCM (Hồ Chí Minh), FDI demonstrates a consistent and significant positive impact on entrepreneurship (coefficients from 0.796 to 2.436), reflecting the region's advanced infrastructure and dynamic economic environment. GRDP also significantly contributes to entrepreneurship (0.300 to 0.633), highlighting the importance of a

robust economic foundation. Urbanization (URB) further supports entrepreneurial activity, with strong positive coefficients (0.852 to 0.957). However, the efficiency of FDI allocation (FDIE) shows a significant negative impact (-0.493 to -0.643), suggesting inefficiencies that may crowd out local businesses. Public investment (PUB) presents mixed results, with minor negative effects in robustness checks (-0.168 to -0.190). Policymakers should optimize FDI utilization, improve public investment strategies, and leverage urbanization to sustain entrepreneurial growth.

In the *Mekong River Delta*, encompassing LAN (Long An), TGIANG (Tiền Giang), BTRE (Bến Tre), TVINH (Trà Vinh), VLONG (Vĩnh Long), ĐTHÁP (Đồng Tháp), AGIANG (An Giang), KGIANG (Kiên Giang), CTHO (Cần Thơ), HAUGIANG (Hậu Giang), STRANG (Sóc Trăng), BLIEU (Bạc Liêu), and CMAU (Cà Mau), FDI exhibits a negative and significant association with entrepreneurship (-0.503 to -2.725), indicating crowding-out effects on local businesses. However, FDI efficiency (FDIE) remains a consistent positive driver (0.0737 to 0.108), emphasizing the need for better allocation and management of foreign capital. Public investment (PUB) plays a critical role, showing strong positive impacts (0.189 to 0.269), particularly in supporting infrastructure and business development. GRDP and urbanization (URB) are also significant drivers, with positive coefficients (0.213 to 0.441 for GRDP; 0.567 to 0.570 for URB), reflecting the importance of economic output and connectivity. Policymakers should focus on optimizing FDI efficiency, enhancing public investment, and strengthening urban infrastructure to foster an inclusive entrepreneurial ecosystem while mitigating the adverse effects of foreign competition.

Table 15: Matrix table of sub-regional regression

	Red River Delta	Northern Midlands	North and South-Central Coast	Central Highlands	Southeast	Mekong River Delta
FDI/ FDIN	+(**)/+(**)	+(**)/+(**)	-(**)/-(**)	Insig	+(**)/+(**)	-(**)/-(**)
FDIE	+(**)/+(**)	+(**)/+(**)	+(**)/+(**)	+(**)/+(**)	-(**)/-(**)	+(**)/+(**)

PUB	+(***)/+(**)	Mixed (Insig/+(*))	+(***)/+(*)	Insig	Mixed (+(*)/-(*))	+(***)/+(**)
PRI	Insig	+(**)/+(*)	+(**)/+(**)	Insig	+(***)/+(**)	Insig
GRDP	+(***)/+(***)	+(**)/+(***)	+(***)/+(**)	+(***)/+(***)	+(***)/+(***)	+(***)/+(***)
URB	+(**)/+(**)	Insig	+(***)/+(**)	Insig	+(***)/+(***)	+(***)/+(**)
PCI_FDI	-(***)/-(***)	-(***)/-(**)	+(**)/+(**)	Insig	Mixed (-(*)/+(**))	+(***)/+(**)
UNE	-(***)/-(***)	Insig	-(***)/-(**)	Insig	Insig	-(***)/-(**)

where:

FGLS and PCSE results are presented respectively

+(***)/+(**)/+(*): Positive and significant at 1%, 5%, or 10%.

-(***)/-(**)/-(*): Negative and significant at 1%, 5%, or 10%.

Mixed: Conflicting results across models.

Insig: No statistical significance.

The findings of table 15 lay the foundation to answer the final research question of the research as (5) What recommendations can be implemented to foster entrepreneurship and leverage investments for sustainable regional economic growth?. Notably, the regional regression results reveal the following insights:

Firstly, the regional regressions highlight key insights into the relationship between entrepreneurship (ENT) and investments in Vietnam, emphasizing the importance of regional disparities and governance. FDI positively impacts entrepreneurship in developed regions like the Red River Delta and Southeast but has crowding-out effects in less-developed areas such as the Mekong River Delta and Central Highlands, underscoring the need for tailored FDI strategies.

Secondly, Public investment (PUB) supports entrepreneurship in regions like the Red River Delta but shows mixed results in the Northern Midlands and Southeast, requiring optimization to balance public and private sector roles. Governance (PCI) interactions often hinder FDI's effectiveness in certain regions while moderating its negative impacts in others, like the North and South-Central Coast.

Finally, Urbanization (URB) drives entrepreneurship in the Southeast and Red River Delta but is less effective in regions like the Central Highlands, while unemployment (UNE) consistently hampers entrepreneurship. These findings call for improving FDI efficiency, optimizing public spending, and leveraging governance and urbanization to foster balanced entrepreneurial growth across Vietnam.

4.11. Synthesis of hypothesis

Table 16: Table of Research Hypothesis

Research Hypothesis	Conclusion
Hypothesis 1: FDI has a positive effect on entrepreneurship in Vietnamese provinces.	Accepted
Hypothesis 2: PRI (Private Investment) positively influences entrepreneurship.	Accepted
Hypothesis 3: PUB (Public Investment) positively influences entrepreneurship.	Accepted
Hypothesis 4: FDIE (FDI Efficiency) positively influences entrepreneurship.	Accepted
Hypothesis 5: GRDP (Gross Regional Domestic Product) positively affects entrepreneurship.	Accepted
Hypothesis 6: PCI (Provincial Competitiveness Index) positively affects entrepreneurship.	Rejected

Hypothesis 7: URB (Urbanization) positively affects entrepreneurship.	Accepted
Hypothesis 8: UNE (Unemployment) has a positive effect on entrepreneurship.	Rejected
Hypothesis 9: The effect of FDI on entrepreneurship is enhanced by PCI.	Rejected

Source: Authors' summary