Causal Linkage among Tax Revenue, Provincial Competitiveness and Economic Growth at the Provincial Level: Evidence from Vietnam

*Nguyen Phuong Lien  
Hoa Sen University  
8 Nguyen van Trang, District 1, Ho Chi Minh City, Vietnam  
Tel: 0918604066  
Email:* [*phuongliennhl48@gmail.com*](mailto:phuongliennhl48@gmail.com)

**Abstract:**

To investigate the role of governance and economic growth at the provincial level, this study conducted the Granger causality test for a panel data of 60 provinces in Vietnam from 2006 to 2014 and found that there is an existence of bi-directional causality linkage between provincial competitiveness (hereafter we call “governance”) and economic growth. Furthermore, running a two-step system generalized method of moments estimation (SGMM), this work shows the general provincial competitiveness index and tax revenue have a significantly positive impact on economic growth at a 1% level in three models. Notably, the effects of components of tax revenue and sub-provincial competitiveness on growth are diverse. In addition, student rate, and poverty rate relate negatively to economic growth. These findings imply that policymakers should focus on the increasing provincial competitiveness index as well as setting up an effective tax collection system for rising growth. Moreover, local governors are better providing variety of career options to reduce both ratios of student and poverty for sustainable developing economies in their areas.

**Keywords:** Governance, tax revenue, provincial competitiveness index, economic growth, Granger causality test, SGMM.

1. **Introduction**

Vietnam is one of the world’s developing countries. At the present time, the provincial governments in Vietnam are improving their policies to attract FDI flow. How does the authorities’ capability at the provincial level affect the economy in Vietnamese provinces? Furthermore, Jenkins (2004) indicated that Vietnam has to reduce poverty in rural areas for development [1]. In addition, Acemoglu and Robinson (2012) argue that reducing the poverty rate will promote the rising of the economy [2]. Much less attention has been paid to assess the effect of the provincial competitiveness index on growth. Furthermore, in the past two decades, there has been little in the literature to shed light on the capability of provincial governance in an emerging market such as that of Vietnam, and there is a big question: “How does governance correlate to economic growth?” This study has been conducted with the research title “Causal linkage among tax revenue, provincial competitiveness and economic growth at the provincial level: Evidence from Vietnam” to answer this question.

The research aims to: (1) Investigate the relationship between governance and economic growth for a data set of 60 provinces in Vietnam in the period 2006-2014; (2) Measure the effect of the level of governance on economic growth in the same period.

1. **Literature review and analytical framework**

There is little literature on the growth effect of local government’s capability on issuing policies or standards. In a case study conducted in Korea, Taiwan, and Japan, Amsden (1989) postulated that economic growth relies on the way of imposing policies, standards, and taxation by the local authorities [3]. Furthemore, with a study that applied the game theory about the authorities in Colombia, Acemoglu, García-Jimeno, and Robinson (2015) argued that the competence to obey government law, the capability to provide public goods or services as well as the competence to design the regulatory standards for activities of economy, can demonstrate the capability of the authorities [4]. In a province whose authorities have a weakness in these competences, there will be a negative relationship to the economic outcome. Dincecco and Katz (2012) investigated the panel data of 11 countries in Europe at a provincial level and they argued that the authorities who are able to extract resources effectively can gain a higher economic outcome [5]. In the long term, the capabilities of government at a provincial level are key success factors in the raising up of the economy. Phan (2013) conducted an empirical research on data at a provincial level in Vietnam from 2006 to 2010 and found that the authorities who focus on improving the below sub-competitiveness index such as: land right access, minimal informal charges, and proactive leadership should affect positively the business of firms and this will indirectly increase economic growth [6]. However, his study did not consider the problems of the effect from the dependent variable of lag on present economic activities. William (2013) ran an empirical research for an American dataset and found that the big cities provide firms with huge business opportunities and also charge large payments [7]. Knutsen (2013) performed OLS, PSCE, and FE models on a panel data of Sub-Sahara countries in Africa from 1984 to 2004, and implied that the growth effect of democracy relies on the capability of authorities [8]. Consequently, in areas where government has a weak administration, but has strong democracy, it still positively relates to growth. Majid, Mohamed, Haron, Omar, and Jomitin (2014) conducted a survey on misappropriation in two city councils in Malaysia and indicated that the local authorities have a key role in the implementation of national development plans and policies, so that they take a major part in their area’s economic growth [9].

Moreover, tax revenue and governance play a crucial role in an economy. The amount of tax revenue contributes a key element for creating the national budget (Hakim and Bujang 2012) [10]. A number of studies reported in the literature point out the complicated impact of tax revenue and governance on economic growth (Acemoglu, 2010; R. J. Barro, 1991; Barro and Sala-i-Martin, 1992; Cooray, 2009; Hakim and Bujang, 2012; Helms, 1985) [11][12][13][14][10][15]. Furthemore, that developing countries face the corruption problem is a major cause of tax loss (Alm, Jackson, and McKee, 1992; Bird and Martinez-Vazquez, 2008; Krugman, Obstfeld, and Melitz, 2012) [16][17][18]. In addition, authorities’ capability is a key element for developing economies in Asean countries (Acemoglu et al., 2015; Amsden, 1989; Evans, 1995; Johnson, 1982) [4][3][19][20]. Our study here suggests that the capability of governance in collecting tax revenue should affect economic outcomes in each province. Nevertheless, there are few studies which examine the linkages between governance capability and economic growth at the Vietnamese provincial level. Furthermore, this study fixes the limitation of endogenous issues by applying two-step SGMM for a dynamic panel data.

The previous literature provided the analytical framework base for the argument below: First, this work applies a causality test based on Granger’s (1969) rule and follows Hurlin (2004) and Yousefi (2015) to test the null hypothesis: and [21][22][23]. Second, the logarithm of gross domestic product per capita (GDP per capita) represents economic growth that has been used in a large number of studies in the literature (Barro, 1991, Cooray 2009, and Acemoglu 2010) [12][14][11]. In addition, there is much less empirical research about the relationship between GDP per capita and a provincial competitiveness index. This work learns from studies by Anh, Thai and Thang (2007), and Phan (2013) to measure the impact of provincial competitiveness indicies [24][6]. Third, Cooray (2009) expanded the production function based on the argument of Mankiw, Romer, and Weil (1992): (1), where Y denotes economic growth, A stands for technology, K is physical capital; h represents human capita, g is a government quality and is a level of governance quality that measures the provincial competitiveness indices [14][25]. The paper follows the argument of Cooray (2009) and uses the student rate representing human capital that is able to be applied to new technology in an economy [14].

1. **Research methodology and data**
   1. **Research data**

This study extracts the data of 60 provinces in Vietnam in the period 2006-2014 from the GSO website for these variables: tax revenue, structure of tax revenue, real GDP per capita and student rate. (First, we collected the number of student from college and university through the GSO website, then divided it by the total population in each province). In addition, the set of provincial competitiveness indices was provided by the Vietnam Chamber of Commerce and Industry (VCCI) with the guidance of the United States Agency for International development (USAID/Vietnam). The VCCI conducts an annual survey of private firms and FDI firms in each province. They then do a statistical analysis to gain the provincial competitiveness index overall and specific indicators. In terms of the number of provinces, although consisting of officially 64 provinces by 2014, there were some newly-merged or newly-split provinces, thus it was impossible to attain a complete set of data about those provinces. Accordingly, this research could merely work on data of 60 provinces (see Appendix A1 - List of research provinces in Vietnam).

Furthermore, the period 2006-2014 observed the United States real estate bubble burst which influenced tremendously those countries importing and exporting goods from and to America. Vietnam was also not an exception, suffering from disadvantageous influences.

Table 1: The stastical description of research variables

| **Variable** | **Obs** | **Mean** | **Std. Dev.** | **Min** | **Max** |
| --- | --- | --- | --- | --- | --- |
| Rgdpc (Real GDP per capita) (million VND) | 540 | 27.182 | 37.589 | 3.76 | 393.93 |
| Taxrev (Total tax revenue) (billion VND) | 540 | 2941.204 | 103.944 | 2706.522 | 3327.63 |
| FDITaxrev (Tax revenue from FDI firms) (billion VND) | 528 | 1120.86 | 3600.349 | 0.01 | 34326 |
| PINTaxrev (Personal income tax collection) (billion VND) | 539 | 2472.969 | 204.23 | 1797.44 | 3075.12 |
| ENVTaxrev (tax revenue for protection of environment (billion VND) | 522 | 2500.735 | 107.797 | 2163.96 | 2864.26 |
| ASSTaxrev (Tax revenue from assets) (billion VND) | 524 | 2635.923 | 122.999 | 1970.16 | 3030.79 |
| Stdrate (Student rate) (%) | 540 | 0.040 | 0.127 | 0.000 | 1.172 |
| Povrate (poverty rate) (%) | 540 | 15.654 | 10.332 | 0.01 | 58.2 |
| PVCi (General provincial competitiveness index with weighted) (Index) | 540 | 57.000 | 6.078 | 36.759 | 77.197 |
| **Provincial competitiveness indexes (index) (PCI1-PCI10) (Sub-institutions)** | | | | | |
| PCI1 | 539 | 7.950 | 0.894 | 4.955 | 9.598 |
| PCI2 | 540 | 6.328 | 0.909 | 3.037 | 8.842 |
| PCI3 | 540 | 5.840 | .844 | 2.457 | 8.854 |
| PCI4 | 540 | 6.330 | 0.953 | 3.243 | 8.943 |
| PCI5 | 540 | 6.004 | 1.129 | 2.638 | 8.929 |
| PCI6 | 540 | 5.555 | 1.494 | 1.753 | 8.858 |
| PCI7 | 540 | 5.055 | 1.3796 | 1.387 | 9.389 |
| PCI8 | 540 | 4.801 | 1.345 | 1.397 | 9.620 |
| PCI9 | 540 | 5.126 | 0.975 | 1.921 | 9.597 |
| PCI10 | 540 | 4.846 | 1.196 | 1.996 | 7.909 |

Table 1 indicates that Ba Ria - Vung Tau has a highest GDP per capita, while Ha Giang stood at the bottom of the column. On the one hand, Binh Duong gains the highest general provincial competitiveness index with 77.197 points, on the other hand the lowest point is only 36.759 (Lai Chau). In term of tax revenue, Ho Chi Minh City topped the table whilst Tuyen Quang stands at the end of the table. There is a big gap in income per head and governance quality between rich and poor provinces in Vietnam.

* 1. **Research methodology**

To get the first objective, the research examines the relationship among three variables such as: tax revenue, provincial competitiveness index and GDP per capita, this research follows the Hurlin (2004) to employ the Granger causality test by using the below equations [22]:

In which:

*PVCiit* denotes the general competitiveness weighted in province i (i runs from 1 to N) at time t (t runs from 1 to T).

*Rgdpit:* stands for GDP per capita of province i at time t, and *Taxrevit:* total tax revenue of province i at time t.

are unobserved errors of specific characteristic in each provinces and observed error terms of the models.

First, can re-write:, transformed lagged dependent variable on the right hand side, which correlates with transformed error term (), this issue represents the auto-correlation phenomenon. In addition, Rgdp*cit* also correlates with error term Uit-1 (Baltagi, 2005) [26]. Second, on the right hand side of the equations appears the dependent variable with first lag indicating the endogenous phenomenon too. Arrellano and Bond (1991), Baltagi (2005), d’Agostino, Dunne, and Pieroni (2012), and Sasaki (2015) indicated that a dynamic panel data technique can help the endogenous growth model be more consistent than the fixed effect model [27][26][28][29]. Furthermore, Barro (1990), Acemoglu, Johnson, and Robinson (2001) revealed that endogenous variables always appear in growth models that make OLS regression biased, and using an exogenous instrument could help regressors fix this issue [30][31]. In addition, Windmeijer (2005) noted that the two-step GMM procedure obtains consistent and efficient parameters of estimation [32]. Due to endogenous problem of dynamic panel data as well as unbalanced data with “large N and small T”, this study utilized a two-step system generalised method of moments estimation (SGMM) for a dynamic unbalanced panel data of 60 provinces in 9 years from 2006 to 2014. This method can get a smaller bias than the fixed effect method and it is a suitable test following Hansen (1982), Hsiao (2003), Baltagi (2005) and Wooldridge (2010) [33][34][26][35].

To get the second research objective, this research develops the following equations:

Where:

TaxrevStructjit denotes the structure of total tax revenue (see Table A2: List of structure of tax revenue); PVCijit are components of provincial competitiveness index that starts at PCI1it and finishes at PCI10it (see Table A3: List of components of provincial competitiveness index).

Xit represents the control vectors such as: the student ratio and poverty rate.

includes dummy variables (high provincial competitiveness index, which obtains the weighted provincial competitiveness index being higher than 50 points in general and the remaining index that is under 50 points is a dummy variable of low provincial competitiveness index).

These equations provide the base for analysing the growth effect of tax revenue, the general provincial competitiveness index and its subsection. To ensure the robustness of these models, this work applies the Arrelanno Bond test (AR2) to determine the rejection of null hypotheses saying auto-correlation exists in the model and the Hansen test to collect the evidence of rejecting endogenous phenomenon.

1. **Empirical results**
   1. **The Granger causality test**

Before running the Granger (1969) test, this work performs the unit root test with Dickey and Fuller (1979) and Phillips and Perron (1988) verification and collects the results as in Table 2 [21][36][37].

**Table 2: Unit root test results**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Lags** | **Variables** | **Dickey-Fuller (F-values)** | | | | **Phillip & Perron (F-value)** | | | |
| **Non-trend** | | **Trend** | | **Non-trend** | | **Trend** | |
| 1 | Rgdpc | 168.716 | 0.002\*\*\* | 158.229 | 0.011\*\* | 267.131 | 0.000\*\*\* | 1227.550 | 0.000\*\*\* |
| 2 | Rgdpc | 63.788 | 1.000 | 347.018 | 0.000\*\*\* | 265.744 | 0.000\*\*\* | 1192.703 | 0.000\*\*\* |
| 1 | Taxrev | 105.591 | 0.823 | 189.751 | 0.000\*\*\* | 539.200 | 0.000\*\*\* | 2022.335 | 0.000\*\*\* |
| 2 | Taxrev | 309.899 | 0.000\*\*\* | 436.632 | 0.000\*\*\* | 538.793 | 0.000\*\*\* | 1969.797 | 0.000\*\*\* |
| 1 | PVCi | 146.923 | 0.048\*\* | 182.845 | 0.000\*\*\* | 364.813 | 0.000\*\*\* | 426.360 | 0.000\*\*\* |
| 2 | PVCi | 1048.619 | 0.000\*\*\* | 664.582 | 0.000\*\*\* | 414.225 | 0.000\*\*\* | 594.155 | 0.000\*\*\* |

*\*\*\*, \*\** and \*stand for significance at 1%, 5% and 10% respectively.

Luckily, all variables are stationary at lag 1 or 2, so that this paper collects the value of k = 1 and 2 for computation later. To investigate the causal linkage among these variables, this study continues doing pair-wise Granger regression and gets the following findings (see Table 3).

Table 3: The pair wise Granger regression results

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| H0: Taxrev does not Granger cause Rgdpc | **Obs.** | **F - Stat** | **Prob.** | H0: Rgdpc does not Granger cause Taxrev | **Obs.** | **F - Stat** | **Prob.** |
| ***Taxrev🡪Rgdpc*** | 480 | 0.298 | 0.000\*\*\* | ***Rgdpc 🡪 Taxrev*** | 480 | 0.483 | 0.000\*\*\* |
| H0: PVCi does not Granger cause Rgdpc | **Obs.** | **F - Stat** | **Prob.** | H0: Rgdpc does not Granger cause PVCi | **Obs.** | **F - Stat** | **Prob.** |
| ***PVCi🡪Rgdpc*** | 480 | 1.801 | 0.000\*\*\* | ***Rgdpc 🡪 PVCi*** | 480 | 0.032 | 0.000\*\*\* |
| *\*\*\*, \*\** and \* stand for significance at 1%, 5% and 10% respectively. | | | | | | | |

Table 3 shows the P-value always smaller than significance at 1%, so that we can reject the null hypotheses. The finding confirms the existence of bi-direction of causal linkage among tax revenue, the provincial competitiveness index, and economic growth. The result implies that the local policy makers should be careful during the time of planning policy as well as conducting an effective taxation system.

To measure the degree of growth effect of governance, this study performs a two-step system generalized method of moments estimation for a dynamic panel data of 60 provinces and finds out the impact results as below (see Table 4). Nevertheless, to ensure the robustness of estimation, this study also conducts the linear correlation test with the null hypothesis of that being between the dependent variable and control variables in a non-linear relationship. The results show the evidence to reject the null hypothesis and indicate that estimation results are robust (see Appendix 2).

Table 4: GDP per capita effect of tax revenue and provincial competitiveness

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
|  | **Rgdpc** | **Rgdpc** | **Rgdpc** | **Rgdpc** | **Rgdpc** |
| L.Rgdpc(-1) | -0.916\*\*\* | -0.909\*\*\* | -0.952\*\*\* | -0.927\*\*\* | -0.927\*\*\* |
|  | (-202.94) | (-115.39) | (-82.66) | (-98.22) | (-98.23) |
| Taxrev | 0.250\*\*\* | 0.087\*\*\* | 0.364\*\*\* | 0.088\*\*\* | 0.086\*\*\* |
|  | (29.94) | (4.07) | (11.18) | (3.75) | (3.65) |
| PVCi | 1.255\*\*\* | 1.187\*\*\* | 2.289\*\*\* |  |  |
|  | (14.94) | (11.24) | (5.38) |  |  |
| Stdrate | -0.041\*\*\* | -0.10\*\*\* | -0.049\*\* | -0.090\*\*\* | -0.090\*\*\* |
|  | (-7.58) | (-9.93) | (-2.87) | (-11.37) | (-11.35) |
| Povrate | -2.136\*\*\* | -1.404\*\*\* | -2.068\*\*\* | -1.466\*\*\* | -1.462\*\*\* |
|  | (-20.45) | (-12.30) | (-10.94) | (-11.44) | (-11.40) |
| FDITaxrev |  | 0.007\*\*\* |  | 0.008\*\*\* | 0.008\*\*\* |
|  |  | (12.77) |  | (11.15) | (11.22) |
| ENVTaxrev |  | 0.088\*\*\* |  | 0.081\*\*\* | 0.081\*\*\* |
|  |  | (5.62) |  | (6.12) | (6.10) |
| ASSTaxrev |  | 0.068\*\*\* |  | 0.059\*\*\* | 0.060\*\*\* |
|  |  | (4.89) |  | (4.55) | (4.60) |
| PINTaxrev |  | 0.000 |  | 0.0008\*\*\* | 0.0008\*\*\* |
|  |  | (1.29) |  | (4.21) | (4.23) |
| PCI1 |  |  | -2.510\*\*\* |  |  |
|  |  |  | (-3.58) |  |  |
| PCI2 |  |  | 5.476\*\*\* |  |  |
|  |  |  | (3.78) |  |  |
| PCI3 |  |  | -3.093 |  |  |
|  |  |  | (-0.92) |  |  |
| PCI4 |  |  | -2.291 |  |  |
|  |  |  | (-1.35) |  |  |
| PCI5 |  |  | -2.102\* |  |  |
|  |  |  | (-2.86) |  |  |
| PCI6 |  |  | -2.363\*\*\* |  |  |
|  |  |  | (-4.48) |  |  |
| PCI7 |  |  | -1.275 |  |  |
|  |  |  | (-0.79) |  |  |
| PCI8 |  |  | -0.416 |  |  |
|  |  |  | (-0.33) |  |  |
| PCI9 |  |  | -6.358\*\*\* |  |  |
|  |  |  | (-4.87) |  |  |
| PCI10 |  |  | -3.193\*\*\* |  |  |
|  |  |  | (-7.63) |  |  |
| HigPVCi |  |  |  | 26.71\*\*\* |  |
|  |  |  |  | (8.25) |  |
| LowPVCi |  |  |  |  | -26.66\*\*\* |
|  |  |  |  |  | (-8.23) |
| year | 11.27\*\*\* | 11.52\*\*\* | 9.640\*\*\* | 11.01\*\*\* | 11.06\*\*\* |
|  | (45.66) | (26.69) | (11.60) | (31.50) | (31.56) |
| \_cons | -21924.4\*\*\* | -22407.4\*\*\* | -18885.1\*\*\* | -21279.5\*\*\* | -21336.0\*\*\* |
|  | (-46.24) | (-27.38) | (-11.77) | (-32.45) | (-32.45) |
| N. of obs. | 479 | 454 | 471 | 454 | 454 |
| N. of instruments | 53 | 53 | 52 | 53 | 53 |
| N. of groups | 60 | 60 | 60 | 60 | 60 |
| AR(2) test | 0.623 | 0.206 | 0.818 | 0.342 | 0.342 |
| Hansen test | 0.138 | 0.104 | 0.306 | 0.122 | 0.122 |

*z* statistics in parentheses \* p < 0.01, \*\* p < 0.05, \*\*\* p < 0.001

Table 4 shows that tax revenue and the general provincial competitiveness weighted index always have a significantly positive impact on economic growth at 1%. However, components of tax revenue affect growth diversely. The amount of tax collection from FDI firms, payment fees for purchasing oil for environment protection, and tax revenue of assets have a significantly positive impact on growth, while personal income tax revenue does not in model 2 but it positively relates to growth when dummy variables appear only. The wealthiest point is when the high provincial competitiveness index (the PVCi is higher than 50 points (the mean point of index)) has a significantly positive impact on the growth of the economy, while a low index (the PVCi is under 50 points (the mean point of index)) has an opposite effect. Second, the impact of sub-provincial competitiveness indicators on growth is complicated. The “easy access to land” affects economic growth positively. This is similar to the result of Phan (2013), whilst others negatively relate to growth [6]. For instance, a low entry cost for starting up business, an unfair competitive environment (Policy bias), sound labor training policy, and effective legal procedures for dispute resolution increasing will reduce economic growth. The findings suggest to provincial policy makers the important role of improving the general provincial competitiveness index as well as the role of collecting tax effectively. In addition, the student rate and poverty rate always are harmful for growth implying that local government should plan appropriate policies to reduce the poverty rate and to develop variety of career chances, so that high school students have a greater option for their career development instead of trying to apply to universities or colleges.

1. **Conclusion and implication**

Running the Granger causality test for a panel data of 60 provinces in Vietnam from 2006-2014 we found that between provincial governance and economic growth a bi-directional causality linkage exists. The result indicates that governance plays a crucial role in raising economic outcomes at the provincial level.

Second, using a two-step system generalised method of moments estimation for a dynamic panel data, this research emphasises the role of tax revenue and a general provincial competitiveness index in promoting economic growth, especially the diverse effects of components of tax revenue and sub-provincial competitiveness indicators on growth. The results suggest to policy makers that in order to develop their economies, they should focus on setting an appropriate taxation system in their areas.

Furthermore, the paper documents that the student rate and poverty rate are two harmful variables for social development. The findings denote that provincial governments should focus on promoting career chances as well as reducing the poverty rate in order to raise the economy in their areas. Finally, the convergence appearing in all models indicating that the poor provinces should tend to grow faster than the rich provinces to catch up to the rich provinces in the future (Barro, 1991; Spence, 2011) [12][38].

This study contributes to a narrow literature on the linkage among tax revenue, provincial competitiveness, and economic growth at a provincial level. The report highlights the role of governance at the provincial level in setting up an effective taxation system as well as the promotion of a fair competitive environment in their area.

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**Appendix 1**

Table A1: The list of research province

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Province** | **ID** | **Province** | **ID** | **Province** | **ID** | **Province** | **ID** |
| An Giang | 1 | Dong Nai | 16 | Kon Tum | 31 | Quang Ninh | 46 |
| Bac Giang | 2 | Dong Thap | 17 | Lai Chau | 32 | Quang Tri | 47 |
| Bac Kan | 3 | Gia Lai | 18 | Lam Dong | 33 | Soc Trang | 48 |
| Bac Lieu | 4 | Ha Giang | 19 | Lang Son | 34 | Son La | 49 |
| Ben Tre | 5 | Ha Nam | 20 | Lao Cai | 35 | Tay Ninh | 50 |
| Binh Dinh | 6 | Ha Noi | 21 | Long An | 36 | Thai Binh | 51 |
| Binh Duong | 7 | Ha Tinh | 22 | Nam Dinh | 37 | Thai Nguyen | 52 |
| Binh Phuoc | 8 | Hai Duong | 23 | Nghe An | 38 | Thanh Hoa | 53 |
| Binh Thuan | 9 | Hai Phong | 24 | Ninh Binh | 39 | Tien Giang | 54 |
| BRVT | 10 | Hau Giang | 25 | Ninh Thuan | 40 | Tra Vinh | 55 |
| Ca Mau | 11 | HCMC | 26 | Phu Tho | 41 | TT-Hue | 56 |
| Can Tho | 12 | Hoa Binh | 27 | Phu Yen | 42 | Tuyen Quang | 57 |
| Cao Bang | 13 | Hung Yen | 28 | Quang Binh | 43 | Vinh Long | 58 |
| Da Nang | 14 | Khanh Hoa | 29 | Quang Nam | 44 | Vinh Phuc | 59 |
| Dak Lak | 15 | Kien Giang | 30 | Quang Ngai | 45 | Yen Bai | 60 |

Table A2: List of structure of tax revenue

|  |  |
| --- | --- |
| **Coding** | **Meaning** |
| Taxrev | Total tax revenue (Billion Vietnam dong) |
| FDITaxrev | Tax revenue from FDI firms (Billion Vietnam dong) |
| PINTaxrev | Personal income tax collection (Billion Vietnam dong) |
| EVNTaxrev | Oil fee for protecting environment (Billion Vietnam dong) |
| ASSTaxrev | Tax revenue from assets (for example car or land, etc.) (Billion Vietnam dong) |

Table A3: List of sub-provincial competitiveness index

|  |  |  |  |
| --- | --- | --- | --- |
| **Coding** | **Meaning** | **Coding** | **Meaning** |
| PCI1 = Ent | Low entry cost for business star up | PCI6 = Plb | Policy bias (support state firms more than private) |
| PCI2 =LRgt | Easy access to land | PCI7 = Pro | Proactive and creative provincial leadership |
| PCI3 =Tran | Transparent business environment | PCI8 = Bss | High quality business support service |
| PCI4 = Inc | Minimal informal charge | PCI9 = Lbt | Sound labor training policy |
| PCI5 = Rec | Limited time for bureaucratic procedures | PCI10 = Lin | Fair and effective legal procedures for dispute resolution |

**Appendix 2**

Results of linear correlation test

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Rgdpc* | **Coef.** | **Std. Err.** | **t** | **P > t** | **[95% Conf.** | **Interval]** |
| *Rgdpc* -1 | -0.178 | 0.031 | -5.670 | 0.000 | -0.240 | -0.116 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Rgdpc* | Coef. | Std. Err. | t | P > t | [95% Conf. | Interval] |
| PVCi(\_nl\_1) | 0.448 | 0.153 | 2.920 | 0.004 | 0.146 | 0.749 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Rgdpc* | Coef. | Std. Err. | t | P > t | [95% Conf. | Interval] |
| Stdrate (\_nl\_1) | 0.430 | 0.019 | 23.160 | 0.000 | 0.393 | 0.466 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Rgdpc* | Coef. | Std. Err. | t | P > t | [95% Conf. | Interval] |
| Povrate (\_nl\_1) | 0.144 | 0.013 | 10.800 | 0.000 | 0.118 | 0.171 |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *Rgdpc* | Coef. | Std. Err. | t | P > t | [95% Conf. | Interval] |
| *Taxrev* (\_nl\_1) | -0.185 | 0.032 | -5.730 | 0.000 | -0.248 | -0.121 |