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Integrating of PLS-SEM and the Importance Performance Matrix Analysis to Exploring the Role of Provincial Competitiveness Index to Growth

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Abstract. Provincial competitiveness was one of the engines of growth under the institutional theory. The Vietnam Provincial Competitiveness Index (PCI) has been surveyed since 2005 to reflect the perceptions of local business environments, categorized into 10 sub-indices with 128 indicators. The current PCI has challenged the governance due to its broad construction. This study aimed to reconstruct the indicators in each PCI sub-index to be more specific for improving governance. The paper further explored the importance-of performance of both the PCI sub-index and its indicators to the provincial growth in Vietnam. Secondary data of 63 provinces during the period of 2017-2020 have been used with the employment of Exploratory Factor Analysis (EFA), Partial Least Square Structural Equation Model (PLS-SEM), and the extension of the importance-performance matrix analysis (IPMA). Our results showed the reliability and validity of 21 measured items under 5 PCI sub-indices. The findings confirmed the positive impact of the PCI index on growth. Moreover, the highest importance but lowest performance of SLO (law and order) was implied. SLA (land access and security of tenure), on the contrary, peaked the performance with the lowest importance. The importance of STC (time costs and regulatory compliance), SPA (proactive provincial leadership), and SLP (labor quality) has been ranked with the former sharing the highest priority while similar performance of the four sub-indices has been found. The results implied that the provincial authorities should prioritize their efforts to improve governance based on the importance-performance analysis of PCI sub-indices. Moreover, the importance and performance of each sub-index indicator reflected the great governance improvement with an average performance of 50%. However, special

attention should be focused on vocational training, effective state officials, and legal support to the business due to their high importance but low performance.

Keywords: Exploratory factor analysis (EFA), importance-performance matrix, Partial Least Square (PLS), Structural Equation Model (SEM), provincial competitiveness index (PCI), Vietnam

1. Introduction

The 21st century has witnessed an increasing global integration and competition for economic development (Lévy, 2005). Macro competitiveness, especially the business environment, a key driver of growth has gotten great attention from the practitioner as well as a researcher (Ketels, 2013). The business environment index becomes promising as a tool for evaluation and comparison of national competitiveness and private sector business (Bland and Vaz, 2017). The economic governance approach is emphasized in the competitiveness index in Asian countries and Vietnam is not an exception (Merchant-Vega and Malesky, 2011). The core value of this approach is to explore the role of economic governance in the growth and development of the private sector at sub-national levels (provinces/cities), given initialtial endowments.

The Vietnam Provincial Competitiveness Index (PCI) was initially initiated in 2005 based on 100-point scale questionnaires surveying the perceptions of local business environments grouped into factors that determine the private sector growth and prosperity (Malesky, 2010). Vietnam is among the countries which engage and sustain the survey annually to commit to the economic governance approach for sustainability. Based on the PCI data, a plethora of research on the national and subnational competitiveness as well as its role in economic achievements has been conducted (Viet, 2013). However, the studies have entirely relied on the available grouped factors of PCI, while their indicators have been modified to timely reflect the actual governance profile. The consequence was the broad construction of PCI, which challenged governance improvement. In addition, the importance-performance matrix of each factor to the economic outcome has not been profoundly studied, leading to the vague interpretation of the role of the PCI components.

We filled the current research gaps by applying the EFA and PLS-SEM to explore the proper group of indicators for factors composing the PCI. We further demonstrated the importance and performance of each factor to the subnational growth via the importance-performance matrix analysis (IPMA). We contributed

to the literature in three ways. Firstly, we proposed the reduction of the Vietnam PCI index into 21 measured items under 5 PCI sub-indices for specific governance. Secondly, we fothe emprempiricaldence about the role of reconstructed PCI in provincial growth in Vietnam. Finally, we further explored the importance of-performance of PCI sub-indices and their indicators. It was found that law and order (SLO) was not well governance though it shared the highest importance in PCI. On the contrary, land access and security of tenure (SLA) were much improved in the recent year though its least weight in the PCI. The similar performance of time costs and regulatory compliance (STC), proactive and provincial leadership (SPA), and labor quality (SLP) have been explored though their importance has been ranked respectively. The findings implied that the provincial authorities should prioritize their efforts to improve the governance based on the importance-performance analysis of PCI sub-indices.

The remainder of the paper is structured as follows. Section 2 provides the literature review to explain the model and methodology employed in section 3. Section 4 describes the empirical results and discusses the PCI profiles of Vietnam. The path analysis and IPMA results are also presented and discussed. The final section concludes with some remarks.

2. Literature Review

The notion of the business environment index has been defined in various ways. Therefore, diversified approaches to exploring the role of this index in growth have been found in the literature. Subnational Competitiveness has been analyzed and ranked in many countries such as Regional Economic Performance Indicators in the UK, Provincial Competitiveness Index in Viet Nam, Philippines Cities Competitiveness Index, and Myanmar Business Environment Index. Drawing on 91 indicators from The Asia Competitiveness Institute and Asian Institute of Management's surveys and interviews, some studies highlighted the high level of competitiveness in urban provinces (Tan and Amri, 2013; Bautista, 2010) while others found out the positive impact of provincial governance and business environment on growth (Viet, 2013).

Villamejor-Mendoza (2020) used the CMCI (Cities and Municipalities Competitiveness Index, similar to the PCI for Vietnam) for the Philippines to confirm the positive correlation between CMCI and human development index (HDI). The economic growth theories and empirical studies have demonstrated

human capital as an essential driver for economic growth (Barro and Sala-i-Martin 2003, Barro 2003, Sala-i-Martin 1997, Hanck 2016). The findings implied the indirect impact of the province's competitiveness on economic growth via human capital enhancement. Similarly, Aquino (2019), in examing the impact of sub-component indices in the CMCI 2018 for the Philippines, found a significant role of the Government Efficiency sub-index on the decision to select the business location by firms, implying the indirect effect of local governance to economic growth. Therefore, human capital and leadership components in the competitiveness index are essential factors for economic growth.

In Vietnam, the Provincial Competitiveness Index has been used to examine the impacts of provincial institutions on business formalization. The dataset started in 2006 and has undergone various revisions, with the latest version in 2017. Currently, the PCI has comprised ten sub-indices, reflecting economic governance areas: (1) entry costs; (2) land access and security of tenure; (3) transparency; (4) time costs; (5) informal charges; (6) policy bias; (7) proactivity leadership; (8) business support services; (9) labor quality; and (10) law and order (Malesky et al, 2018).

Lien (2017) applied the Granger test to the panel data of 60 provinces and cities in Vietnam from 2006 to 2014 and found the positive and significant impact of the competitive index on economic growth. The impact of local competitiveness goes beyond economic growth, and improves the welfare of local people via the increase in wages in the labor market (Doan, Tran, & Nguyen, 2018). A better competitive environment would attract more firms and create more demand for labor, resulting in the rise of the wage as per the law of supply and demand. Nam & Tram (2021) also found that provinces with better competitiveness would motivate the firms' R&D activities. Using the production function approach with local governance (measured by PCI ranking) as an input, Thanh, Hart & Canh (2020) examined the impact of local governance on the economic growth from 2006 to 2015 for 62 provinces and cities (Dak Nong has been left out due to missing data). The results revealed the significant impact of PCI ranking on the local economic growth. Provinces with low ranking have lower growth while those with high PCI ranking experienced a better growth rate. The impact of specific aspects in governance was further examined using three sub-indices: Informal Charges, Transparency, and Policy Bias. Transparency promoted economic growth, while Informal Charges and Policy Bias hindered local growth. Moreover, the moderation (interaction) effect of these sub-indices on the impacts of government expenditure and private investment on growth was also found.

Transparency boosted the effectiveness, while Informal Charges and Policy Bias reduced the effectiveness of government expenditure and private investment in promoting economic growth. Similar findings were presented by Hung et al. (2020), using the PCI 2006-2019 and two sub-indices, Transparency and Informal Charges, in the simultaneous equation estimation.

Thanh and Canh (2020) found a similar impact on local governance using the overall PCI index for the same period, 2006-2016 but the role of sub-indices was not analyzed. PCI index significantly increased the effectiveness of fiscal decentralization regarding economic growth; however, no impact was confirmed with low governance (PCI under average). Thanh and Hoai (2020) investigated the period 2005-2013 for 63 provinces with local governance measured by both the PCI index and sub-indices (separately). The results showed that the overall PCI index positively impacted economic growth. The moderation effect of the overall PCI index on the impact of private investment on economic growth was also found. For sub-indices, the impacts were diverse in terms of magnitude and direction of effects, depending on the specification of the estimation models.

The impact of local governance on economic growth through different channels has also been found. Ha & Frommel (2021) estimated the impact of PCI on corruption, and then the impact of corruption on business growth was explored. Corruption led to higher business growth in the state-owned-enterprise sector (SOE) but hindered the private (both domestic and foreign) sector. On the other hand, provinces with better governance capacity (higher PCI) were shown to have lower corruption in the SOE sector; however, this relation did not exist for the private sector, which would imply the negligible impact of PCI on the business growth. However, Nhan & Tung (2017), in investigating the impact of PCI on the growth of firms' net income in two years, 2012 and 2013, separately, found consistent impacts of PCI.

In short, based on PCI data, good governance, characterized by different attributes in previous studies played a critical role in improving the impact of government governance on economic growth in Vietnamese provinces (Thanh, Hart, and Canh, 2020). A significant relationship between business environment and growth through its interactions with private or public sector investment was empirically confirmed (Busse and Hefeker, 2007; Malesky, Dulay and Keesecker, 2019; Malesky, Pham and Phan, 2018). Improving the business environment was decisive for the inflow of investments, creating the conditions for long-term economic growth, and increasing the competitiveness of the country (Fabus, 2018). PCI components were further used to explain why

provinces outperformed others in private sector economic growth, job creation, and development. However, the effects of the PCI index were likely to vary across different contexts and are influenced by many factors in subnational growth (McCulloch, Malesky and Duc, 2013). The improvement in provincial institutions, especially in the predicable government policies makes investors more likely to select the higher growth-oriented path of formality (Malesky and Taussig, 2009).

Most of the previous studies on the business environment and growth have been conducted and empirically supported the significant impact of PCI on economic development and growth. However, some arguments on whether economic growth provided the resources and generated demand for a better quality business environment or PCI drove GDP and promoted development (Malesky and Pham, 2020). Moreover, another research trend with new approaches to reexamine the current PCI's construction, role and usage has emerged (Tung,2014; Hoi, Nam & Tuan,2017). Although the current PCI system (including the overall PCI index and sub-indices) has undeniable significant and essential contributions to the policy-making process in provinces, it also has limitations that may lead to bias in the evaluation and development policy. This calls for new studies to explore the structure of the current PCI index. In addition, research on the competitiveness and local governance usually pays attention to the current competitiveness, either nationwide or provincials, using the overall PCI index, or at most by using the sub-indices level. Not many studies go further to the indicators' level to see the indicators' roles on local economic achievement, and focusing on the importance and performance at the indicator level to explain different provincial governance capacities.

3. Research Methodology

3.1. The Research model of the study

This study focused on exploring the PCI components as well as their roles in the provincial growth. The factors of PCI have been therefore investigated through EFA before applying PLS-SEM. Based on the literature review in section 1, the impact of PCI on growth has been modeled with five dimensions SLO (law and order), STC (time costs and regulatory compliance), SPA (Proactivity of provincial leadership), SLP (labor quality), SLA (land access and security of tenure) as indicated in Fig. 1.

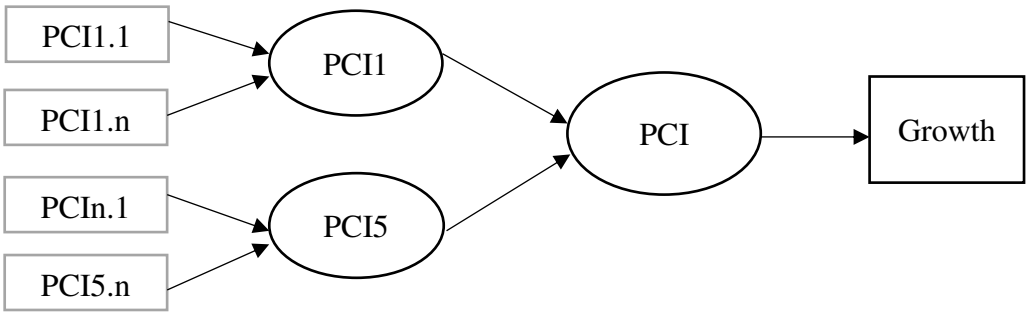

Fig. 1: Modelling the role of PCI in growth.

3.2. Research Method

In this study, the underlying structure of the 5 dimensions of PCI was studied for further analysis of its roles in growth. EFA is a proper technique for exploring observed data in the PCI construct (Bryant and Yarnold, 1995). However, PCI dimension reduction may encounter the researcher's subjectiveness (Maskey and Nguyen, 2018). Therefore, logic and careful justification were required during the analysis. The structural Equation Model (SEM) was a multivariate technique combining both factor analysis (measurement model) and regression (structural model). SEM has been considered an advanced statistical method for data analysis in complicated models of the latent and measured variables (Kim, Kim, Hong, & Ko, 2019; Mutahar et al., 2021; Sarstedt, Hair Jr, & Ringle, 2022). Two methods: covariance-based techniques (CB-SEM) and variance-based partial least squares (PLS-SEM) are taken into consideration when conducting SEM. PLS-SEM becomes an optimal alternative for researchers when dealing with i) non-normality data set ii) small sample size demand and iii) the combination of both formative and reflective measurement models. PLS-SEM is dominant to CB-SEM in dealing with skewness and kurtosis which have been normally found in the data with self-perception and attitude-based questionnaires (Hair, Ringle and Sarstedt, 2012).

PLS-SEM model has been evaluated in two steps: 1) measurement model and 2) structural model (Nguyen, Luan, & Khoa, 2021). The assessment of the formative measurement model in this study involves the statistical significance

and relevance of the indicator weights (Hair et al., 2017). Upon reaching the satisfactory evaluation of the measurement model, structural analysis with bootstrapping has been assessed. The coefficients for the relationships between the constructs were estimated in this step. IPMA is a novel approach in PLS-SEM to illustrate the predecessor constructs' importance and performance to the target construct (Ringle & Sarstedt, 2016). The IPMA combines total effects (importance) and performance of latent variable scores to be rescaled on a range of [0,100]. The IPMA results imply the priority of improving the constructs with high importance but low performance for the target construct. In this study, five dimensions of PCI importance and performance for the growth have been investigated in 5 steps: i) check pre-conditions for IPMA, ii) computation of performance values by rescaling indicator scores on a range [0,100], iii) computation of the importance values (total effects), iv) importance-performance map creation and v) extension of the IPMA on the indicator level.

4. Research Results

The PCI measures economic governance in 63 provinces in Vietnam since 2005 by surveying local and foreign businesses. The index was initially initiated with 9 sub-indices by a team of international and national experts with the support of USAID and has undergone several revisions until the latest version of 2017, which comprises 10 sub-indices.

Each year PCI reaches about 13,000 domestic, and private enterprises across the country that respond to the PCI survey, making it the largest business survey representing the voice of firms on the local business environment and the quality of economic governance in Vietnam. The Foreign Invested Enterprises (FIEs) survey component receives feedback from an additional 2,000 foreign firms, representing a significant number of foreign firms operating in Vietnam. The annual PCI survey findings provide insights for policy formulation. PCI is the first-ever index to provide assessments of the private sector on how the Government performs. Over 2015-2020, the PCI questionnaires have been modified to become a trusted diagnostic tool widely used by government leaders to identify problems and implement strategies to improve economic governance to foster a more business-friendly environment for private sector development. The period of 2017-2020 has witnessed stable survey questionnaires. Therefore, the PCI data of this period are used (sample size of 252 enterprises) to re-structure its dimensions and analyze the importance-performance of each dimension to

provincial growth in Vietnam. The measured items are rescaled from 1 (lowest performance) to 10 (highest performance).

Measurement reliability has been verified by the employment of Cronbach's alpha and item-to-total correlation. A high alpha coefficient indicates a strong correlation between observed items and vice versa. The latter parameter identifies measured items for exclusion if supported by the theory and such an elimination may considerably increase the alpha coefficient of the factor. The rule of thumb for low alpha and item-to-total correlation is 0.7 and 0.5 respectively (Hair, Sarstedt, Ringle, and Gudergan, 2017). Twenty-one measured items under 5 factors arise after verifying measurement reliability in this study. All item-to-total correlations exceed 0.5. The alpha of these factors as indicated in Tab. 1 ranges from 759 to 0.905, exceeding the threshold level of 0.7, implying high internal reliability of the factors

Table 1: Cronbach's alpha.

No.	Description	Measurement items	Cronbach's alpha
1	SLO (law and order)	07	0.905
2	STC (time costs and regulatory compliance)	05	0.885
3	SPA (proactivity of provincial leadership)	04	0.845
4	SLP (labor quality)	03	0.789
5	SLA (land access and security of tenure)	02	0.759

The Kaiser-Meyer-Olkin (KMO) is used to confirm the satisfaction of data requirements for EFA analysis. Rule of thumb indicates adequacy of the sample size when the KMO is within the range of [0,1]. The evaluation thresholds proposed by Kaiser (1974) are from excellent (0.9) to 0.5 (miserable). Besides, Barlett's test of sphericity is applied to statistically test for the correlation of the observed items. The EFA results in this study with KMO =0.877 and a % cumulative variance of 71.854 implies the appropriateness for the next analysis step of PLS-SEM.

SmartPLS version 3 has been used to estimate the model with formative modes. Weights are used to identify the indicator's contribution in this case. Finally, bootstrapping analysis with the initial model used as an input is estimated to ensure stable results. The results in Table 2 show the weights calculated in the model contribute significantly to the integrated index with a total of five

dimensions. The robustness of the index has been confirmed with bootstrapping. Law and order (SLO) have the strongest effect on the index, followed by time costs and regulatory compliance (STC) and proactive provincial leadership (SPA). Land access and security of tenure (SLA) and labor quality (SLP) share a lesser weight. The results indicate the priority order of policy to improve the five dimensions of PCI.

Table 2: Bootstrapping test of the formative model.

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
SLA	0.066	0.064	0.019	3.488	0.001
SLO	0.451	0.450	0.027	16.965	0.000
SLP	0.195	0.191	0.016	12.171	0.000
SPA	0.267	0.265	0.016	17.042	0.000
STC	0.327	0.323	0.022	15.077	0.000

Table 3: Results of formative models.

Factor	Weight	Measured items	Weights
SLA	0.066	available land (sla5)	0.410
		land clearance progress (sla6)	0.733
SLO	0.451	The legal system will uphold firms' property rights and contracts (slo1)	0.043
		Provincial court judges economic cases by the law (slo5)	0.251
		Judgment by the court is fair (slo6)	0.162
		Provincial courts resolve economic cases quickly (slo7)	0.109
		Court judgments are enforced quickly (slo8)	0.058

Factor	Weight	Measured items	Weights
		Provincial legal assisting agencies support business quickly (slo9)	0.345
		Formal and informal costs are acceptable (Slo10)	0.250
SLP	0.195	Good general education in the province (slp1)	0.057
		Good vocational training in the province (slp2)	0.851
		Overall satisfaction with labor (slp8)	0.197
SPA	0.267	The authority is flexible within the legal framework to create a favorable business environment (spa1)	0.231
		The authority is very proactive and creative in solving new problems (spa2)	0.352
		The attitude of the provincial government toward the private sector is positive (spa3)	0.288
		Provincial authorities handle timely firm's difficulties raised in dialogues (spa7)	0.339
STC	0.327	Officials are effective (stc2)	0.490
		Officials are friendly (stc3)	0.125
		Firms don't have to travel many trips to obtain stamps and signatures (stc4)	0.173
		Paperwork is simple (stc5)	0.095
		The time to do administrative procedures is shorter than the regulations specified (stc7)	0.072

Fig. 2 of the path analysis confirms the positive impact of PCI in general with a significant of 5%. Further analysis of each PCI factor has been performed with significant results in Table 4.

Table 4: Results of total effects.

	Coefficient	P Values	Confidence interval	
			2.5%	97.5%
PCI -> LnRealGDP	0.203	0.016	0.044	0.357
SLA -> LnRealGDP	0.013	0.104	0.002	0.032
SLA -> PCI	0.066	0.001	0.030	0.100
SLO -> LnRealGDP	0.092	0.012	0.021	0.156
SLO -> PCI	0.451	0.000	0.398	0.502
SLP -> LnRealGDP	0.040	0.026	0.007	0.073
SLP -> PCI	0.195	0.000	0.159	0.223
SPA -> LnRealGDP	0.054	0.019	0.011	0.097
SPA -> PCI	0.267	0.000	0.236	0.295
STC -> LnRealGDP	0.067	0.009	0.015	0.110
STC -> PCI	0.327	0.000	0.276	0.365

Our findings are consistent with previous studies on the soft advantages of PCI in promoting the development among provinces (Thanh, Hart & Canh, 2021; Hung et al., 2020; Thanh & Canh, 2020; Thanh & Hoai, 2020) However, the results' interpretation should be cautioned. Quan (2014) demonstrated no evidence of the PCI ranking and the development of enterprises when analyzing the data for the years 2006-2011 because PCI did not provide sufficient provincial economic governance. Therefore, we further explored the importance and performance of PCI sub-indices as well as their indicators.

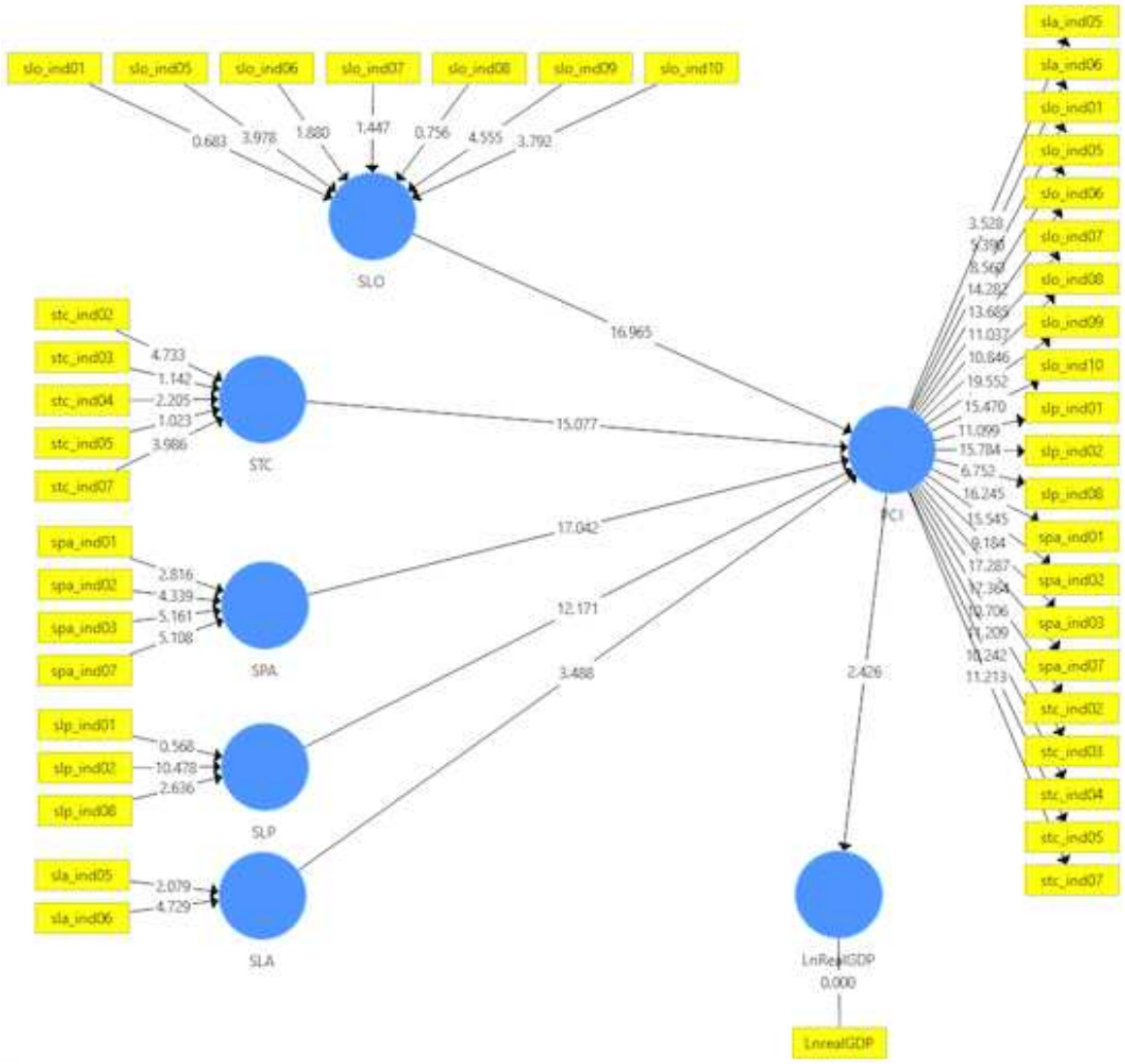

Fig. 2. Roles of PCI to provincial growth: Evidence from Vietnam

Rescaling of the latent variables scores in the range of [0,100] has been conducted as per the formula (1). The same direction of all indicators with positive outer weights has been confirmed before the IPMA procedure.

$$\text{esaled} = \frac{E[\text{Xij}] - \min[\text{Xi}]}{\max[\text{Xi}] - \min[\text{Xi}]} * 100 \quad (1)$$

where:

X_i is the i^{th} indicator in the PLS-SEM path model

$E[\text{Xij}]$ is the i's actual score of respondent j.

$\text{Min}[X_{ij}]$ and $\max[X_{ij}]$ are the indicator's minimum and maximum values.

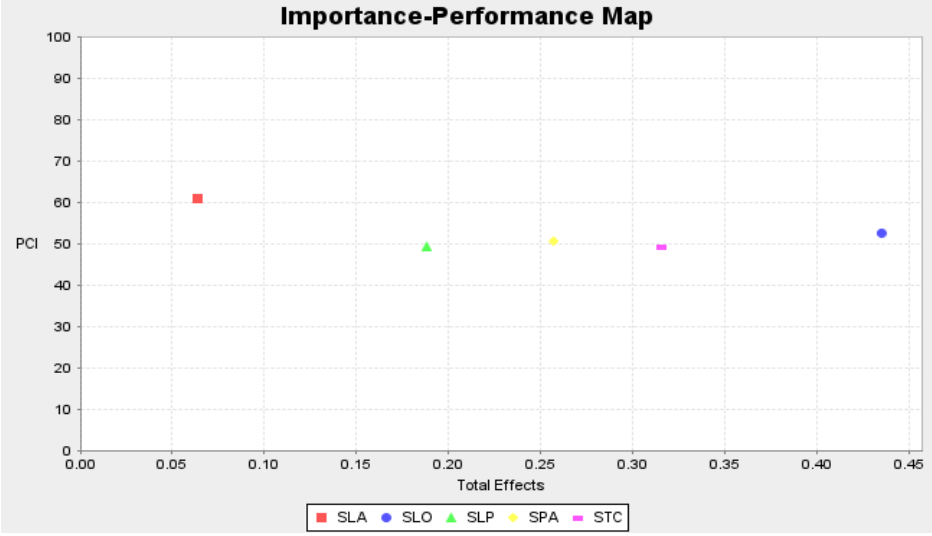

Fig. 3: Importance-performance of PCI sub-indices

Fig. 3 and 4 provided general pictures of the importance-performance of PCI sub-indices and their indicators. Figure 3 implied the high importance but low-performance SLO (law and order). The importance of STC (time costs and regulatory compliance), SPA (proactive provincial leadership), and SLP (labor quality) has been ranked with the former sharing the highest priority while similar performance of the four sub-indices was found. SLA (land access and security of tenure) peaked the performance with the lowest importance. With such findings, we contributed to the literature theoretically and practically in three ways. Firstly, the PCI has been reduced to key sub-indices and indicators respectively. Secondly, we demonstrated the actual achievement of provincial authorities in improving the institution on the development path. Finally, IPMA is a novel approach to exploring the role of Vietnam PCI in its provincial development.

The importance and performance of each sub-index indicator were referred to in Figure 4. In general, these indicators have been greatly improved with an average performance of 50%. However, special attention should be focused on vocational training (Slp02), effective state officials (Stc02), and legal support to the business (Slo09) due to their high importance but low performance. Though the Vietnamese labor quality was improved with the increase in the human development index (HDI) and human capital index (HCI) (UN, 2020). In 2019, HDI reached 0.704 and ranked 117th compared to the score of 0.617 and 127th in 2012. A similar profile was found with HCI with a score of 0.69 (in 2020) compared to 0.64 (in 2012). However, a severe skill mismatch was reported by employers (Mori, 2021). The 2021 PCI report also raised the concern of FDI

employers in recruiting technicians, and vocationally trained laborers (Malesky and Mosley, 2021). Therefore, much more effort should be placed on vocational schools. In addition, the connection between employers and employees should be tightened via the proactive role of job placement centers (Ha and Huyen, 2021).

Besides vocational training, the findings required performance improvement on effective state officials and legal business support. Relating to the effectiveness of state officials, administrative procedures need to be changed with the orientation to saving time, and changing the attitude and behavior of officials and staff when dealing with businesses. In terms of legal support, provincial leaders should concentrate on reviewing and modifying institutions and laws because they are the framework for business activities. The application of information technology was also urgent to facilitate governance.

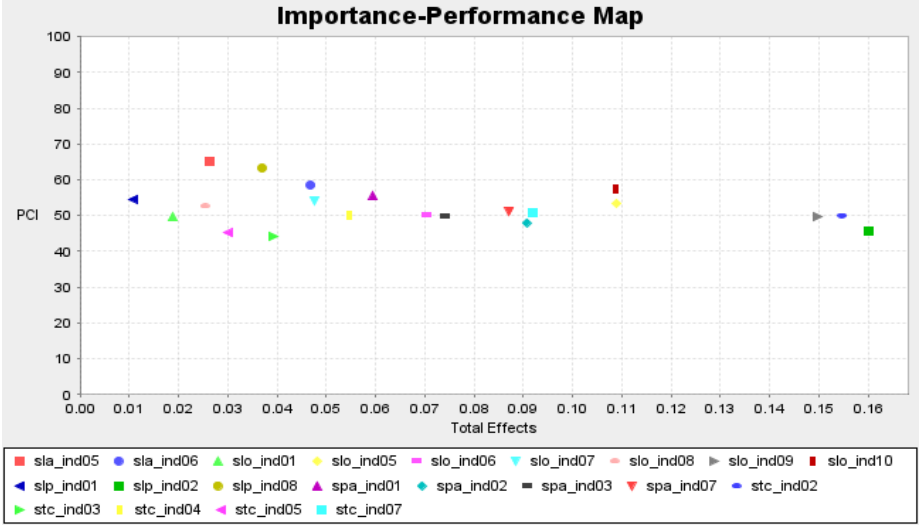

Fig. 4: Importance-performance of PCI indicators

5. Conclusion

The institution was theoretically and empirically emphasized as the key driver of growth (Acemoglu and Robinson, 2008). The findings from this study confirmed the role of PCI in provincial growth in Vietnam. In addition, the employment of EFA, PLS-SEM, and IPMA has shed the light on the structures of PCI indicators, sub-indices as well as their role (importance) and performance in the growth model.

Our results confirmed the positive impact of the PCI index on growth. Moreover, the highest importance but lowest performance of SLO (law and order) was

found. In the contrast, SLA (land access and security of tenure) peaked the performance with the lowest importance. This implied the request for further improvement on SLO by the provincial authority. The performance of SLA milestoned the government efforts in land management. The order of importance of STC (time costs and regulatory compliance), SPA (proactive provincial leadership), and SLP (labor quality) has also been disclosed. In addition, the similar performance of the four sub-indices indicated the priority of improving STC, SPA, and SLP under the scarce resources constraint for optimal governance. The importance and performance of each sub-index indicator reflected the great improvement with an average performance of 50%. Policies on vocational training (Slp02), effective state officials (Stc02), and legal support to the business (Slo09) have been proposed to eliminate the adversity to growth due to their high importance but low performance.

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