

Specialization and Concentration Pattern of Labor in the East Coast Southern Subregion and Some Empirical Effect on Economic Performance

Kiatkajon Chairat*, Phatcharee Prasong** and Arunya Jinachan***

Received August 13th, 2025

Revised September 22nd, 2025

Accepted September 26th, 2025

Abstract

This paper investigates patterns of the externalities related to regional and sectoral concentration in Southern Thailand. It focuses on the East Coast subregion and Nakhon Si Thammarat province. It also estimates how these externalities can enhance economic performance. Data for the paper need to be observed from 15 major sectors. Specialization and concentration index present by Location Quotient, Herfindahl index, and Krugman Dissimilation index. Panel data from 2001-2018 were used to assess for the estimation model. The results show that the service and trade sectors are important, as indicated by the average GPP, changes of GPP, average percentage change, and output per worker in both the province and subregion. The province exhibits a strong concentration in its industry and service/trade sectors, while the subregion is concentrated in the agricultural sector. These results reveal a relative consistency between the Location Quotient, Herfindahl index, and Krugman Dissimilation index. This model estimation presents the significance of capital and labor. However, the limitation of the data that we rely on spans only a short period may the changes in specialization and concentration limit the paper to make definitive about their effects. We suggest a more approach for future research that might involve using quasi-experimental methods or expanding the scope of dependent variables beyond GPP. The policymaker has to still investigate and classify each province and provincial cluster economy in terms of agglomeration economies and externalities in comprehensive all dimensions.

Keywords: Provincial clustering, Regional Economic Activity, Economic growth and development

* Rajamangala University of Technology Srivijaya, Assistant Professors, in a major of logistics management at the Faculty of Management Technology, as corresponding author e-mail: kiatkajon.c@mutsv.ac.th

** Rajamangala University of Technology Srivijaya, lecturer, in a major of accounting at the Faculty of Management Technology, e-mail: phatcharee.p@mutsv.ac.th

*** Rajamangala University of Technology Srivijaya, lecturer, in a major of accounting at the Faculty of Management Technology, e-mail: arunya.j@mutsv.ac.th

รูปแบบความเชี่ยวชาญและการกระจุกตัวของแรงงานในกลุ่มจังหวัดภาคใต้ ผังอ่าวไทย และหลักฐานเชิงประจักษ์บางประการที่มีต่อผลทางเศรษฐกิจ

เกียรติขจร ไชยรัตน์*, พิชรี พระสงฆ์** และ อริญญา จินาชาญ***

รับวันที่ 13 สิงหาคม 2568
แก้ไขวันที่ 22 กันยายน 2568
ตอบรับตีพิมพ์ 26 กันยายน 2568

บทคัดย่อ

บทความฉบับนี้ตรวจสอบรูปแบบความเชี่ยวชาญและการรวมตัวของแรงงานในกลุ่มจังหวัดภูมิภาคฝั่งตะวันออกหรือภาคใต้ชายฝั่งอ่าวไทยและจังหวัดนครศรีธรรมราชซึ่งเป็นจังหวัดหนึ่งในกลุ่มจังหวัดดังกล่าว รวมทั้งแสดงผลเชิงประจักษ์จากความเชี่ยวชาญและการรวมตัวที่มีต่อผลทางเศรษฐกิจ ข้อมูลที่ใช้เป็นข้อมูลจาก 15 กิจกรรมทางเศรษฐกิจ นำมาวิเคราะห์หาดัชนีความเชี่ยวชาญและการกระจุกตัวของแรงงาน แสดงโดยค่าดัชนีสัดส่วนกิจกรรมทางเศรษฐกิจตามที่ตั้ง ดัชนีเฮอร์ฟิנדาล์ และดัชนีความไม่เหมือนกันของครูกแมน ขณะเดียวกันข้อมูลดังกล่าวจะนำมาใช้ในการวิเคราะห์แบบจำลองเพื่อการประมาณค่าที่มีต่อผลทางเศรษฐกิจ ผลจากการวิจัยแสดงให้เห็นว่า โครงสร้างทางเศรษฐกิจโดยเฉพาะภาคการบริการและการค้ามีความสำคัญ ซึ่งพิจารณาจากมูลค่าเฉลี่ย การเปลี่ยนแปลงเปอร์เซ็นต์เฉลี่ยการเปลี่ยนแปลง และผลผลิตต่อแรงงานทั้งในระดับกลุ่มจังหวัดและจังหวัดนครศรีธรรมราช ทั้งนี้จังหวัดนครศรีธรรมราชแสดงให้เห็นถึงความเข้มข้นของแรงงานในภาคอุตสาหกรรมและภาคบริการและการค้า ในขณะที่ระดับกลุ่มจังหวัดมีความเข้มข้นของแรงงานในภาคเกษตร ซึ่งผลการวิเคราะห์แสดงให้เห็นความสอดคล้องในทิศทางเดียวกับค่าดัชนีสัดส่วนกิจกรรมทางเศรษฐกิจตามที่ตั้ง ดัชนีเฮอร์ฟิנדาล์ และดัชนีความไม่เหมือนกันของครูกแมน ผลการประมาณค่าแบบจำลองแสดงให้เห็นถึงความสำคัญของทุนและแรงงาน แม้ว่าผลจากแบบจำลองแสดงถึงตัวแปรความเชี่ยวชาญและการรวมตัวจะไม่มีนัยสำคัญต่อเศรษฐกิจ แต่ผู้กำหนดนโยบายยังคงต้องตรวจสอบและจำแนกแต่ละจังหวัดและกลุ่มจังหวัดในแง่ของเศรษฐกิจแบบรวมกลุ่มและผลกระทบภายนอกในทุกมิติอย่างครอบคลุม

คำสำคัญ: รายได้ส่วนบุคคล, หนี้ครัวเรือน, การวิเคราะห์ประสิทธิภาพที่สำคัญเมทริกซ์ (IPA), ประเทศไทย

* คณะเทคโนโลยีการจัดการ, มหาวิทยาลัยเทคโนโลยีราชมงคลศรีวิชัย วิทยาเขตนครศรีธรรมราช, e-mail: kiatkajon.c@rmutsv.ac.th

** คณะเทคโนโลยีการจัดการ, มหาวิทยาลัยเทคโนโลยีราชมงคลศรีวิชัย วิทยาเขตนครศรีธรรมราช, e-mail: phatcharee.p@rmutsv.ac.th

*** คณะเทคโนโลยีการจัดการ, มหาวิทยาลัยเทคโนโลยีราชมงคลศรีวิชัย วิทยาเขตนครศรีธรรมราช, e-mail: arunya.j@rmutsv.ac.th

1. Introduction

Thailand's economic development strategy has focused on spatial decentralization to distribute economic activity and resources more evenly. This approach was a key part of the National Economic and Social Development Plan. The Thai Cabinet developed a plan to implement strategic provinces within the framework of provincial clusters in the ninth plan (2002–2006). A provincial cluster is defined as a group of provinces linked by economic production, intra-provincial trade, and investment. The plan includes specific agendas that foster cooperation among the provinces in the cluster to promote economic and social development through collective participation.

The Office of the National Economic and Social Development Board (NESDB) established 18 provincial clusters, including three in the Southern region. One notable cluster is the East Coast Southern subregion, which includes Chumphon, Surat Thani, Nakhon Si Thammarat, Phatthalung, and Songkhla provinces.

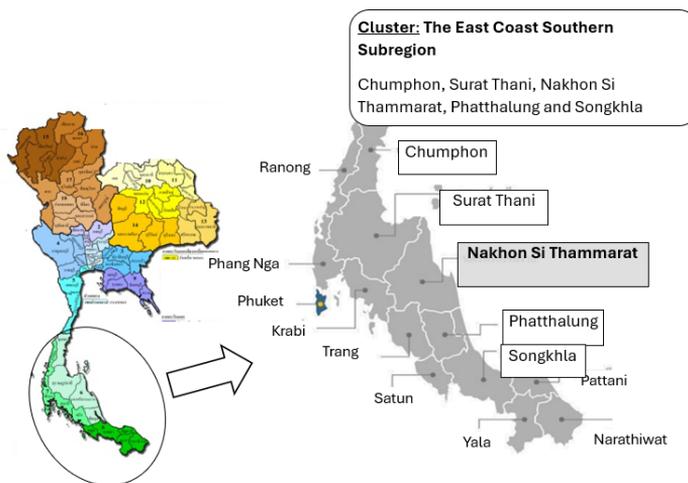


Fig. 1. Map of Thailand

Source: Author's Compilation

Fig. 2. Map of the East Coast subregion

In the economic context, the definition of a cluster emphasizes three key aspects: proximity of territory, agglomeration economies resulting from linkages, relationships, or networks, and advantages from externalities associated with economic activities or industries. These externalities can include labor pooling, which provides access to skilled labor, and reduced supply costs, commonly associated with agglomeration economies.

The agglomeration of economic activities within a given spatial proximity can be analyzed through various lenses, such as specialization, concentration, diversity, and urbanization economies. The concepts of regional economic analysis highlight how externalities impact local, regional, and national economies. The New Economic Geography (NEG) theory illustrates how agglomeration economies influence economic performance, while the Endogenous Growth Theory explains the role of economies of scale in shaping economic outcomes.

Some literature and empirical studies have examined regional specialization and sectoral concentration, but there are few studies in Thailand on these topics, particularly regarding provincial clusters. This study aims to explore specialization and concentration patterns within the East Coast Southern subregion and assess their impact on local economic performance. Understanding these dynamics will help policymakers design effective strategies and programs to enhance economic performance at both provincial and cluster levels.

2. Literature Review

2.1 Regional Specialization and Concentration of Economic Activity

Regional specialization and sectoral concentration are key concepts in location and trade theory. The literature primarily examines production structures categorized by sector and region. Aiginger (2006) notes that specialization and concentration are two perspectives on the same phenomenon, each providing insights into production dynamics but differing in focus.

Specialization arises from differences in employment or value added within specific territories, such as countries, regions, or provinces. It reaches its highest point (complete specialization) when one sector dominates all employment or value added in a unit, while it is lowest (no specialization) when all sectors share equally.

Concentration measures the variation in the distribution of sectors within a territory. It is at its maximum (complete concentration) when all employment or value added in one sector is confined to a single geographic unit and at its lowest (no concentration) when resources are evenly distributed among many units. Concentration reflects the clustering of economic activities in specific locations, often driven by resource endowments and the presence of suppliers and buyers.

Both specialization and concentration are associated with agglomeration economies. Higher specialization can lead to increased concentration and vice versa. However, Aiginger et al. (2006) argue that these two aspects of production may diverge when measured accurately. The indices of specialization and concentration can be quantified using various methods, often through measures of a territory's share in value added, employment, or exports. Common indices include the Location Quotient, Balassa, Herfindahl-Hirschman, Krugman, and Locational Gini.

2.2 Agglomeration Economies as Externalities for Territory

“Agglomeration economies” often overlap with concepts like industrial districts, industry clusters, and economic linkages, reflecting the external benefits that enhance regional economic performance. Externalities can occur within or between industries, as discussed by Meade (1952), Scitovsky (1954), and Stewart and Ghani (1991). They can be divided into real externalities (technology) and pecuniary externalities (money). Real externalities involve technological and production environments, with Meade characterizing them as functions that incorporate outputs from other firms. Stewart and Ghani identify these as drivers of economic growth through factors like evolving attitudes, human capital, and technological advancements. Pecuniary externalities occur through economic interactions and knowledge diffusion, fostering technological change and local specialization.

The literature on regional specialization often references comparative advantage theory (Ricardo, 1817) and endowment theory (Heckscher, 1919; Ohlin, 1933). Models focusing on product differentiation and economies of scale emphasize intra-industry trade over inter-industry trade, as noted by Marshall (1920) and further developed by Krugman (1991). Krugman highlights the importance of spatial concentration in industry location decisions, considering economic scale, transportation costs, and local demand.

The Core-Periphery model differentiates between well-connected Core regions and more isolated Periphery regions, emphasizing how location and specialization are influenced by mobile factors. Resource endowments can enhance a region's attractiveness for manufacturing, leading to economies of scale and driving agglomeration. Krugman (1991) introduced centripetal forces (e.g., increasing returns to scale, localization economies) and centrifugal forces (e.g., scarcity of immobile factors, congestion costs) that influence location choices. Fujita, Krugman, and Venables (1999) expanded this framework to include agglomerating forces (e.g., economies of scale) and deagglomerating forces (e.g., trade costs).

Debate continues regarding the relationship between regional size and productive specialization. Fujita et al. (1999) and Fujita and Thisse (2002) argue that larger regions can support greater specialization, while Ezcurra et al. (2006) suggest that larger regions may exhibit lower specialization due to increased heterogeneity. Thus, clustering can produce both positive and negative externalities, such as heightened competition for land and labor and increased congestion costs.

2.3 Economic Development demonstrate by Agglomeration Economies

Agglomeration economies, externalities, and specialization play crucial roles in driving local economic growth. Agglomeration economies refer to the benefits firms and individuals experience when located close to one another, such as reduced transportation costs, easier access to suppliers and customers, and a shared labor pool (Fujita, Krugman, & Venables, 1999). These benefits lead to increased efficiency, knowledge spillovers, and access to specialized labor, all of which enhance productivity and innovation (Glaeser, 1999). These theories emphasize the impact of technology, education, human capital, innovation, and R&D on economic growth.

Externalities, particularly positive ones, further amplify these effects by facilitating knowledge spillover (sharing) and networking opportunities among clustered firms (Marshall, 1920). Specialization, where regions or firms focus on producing specific goods or services, enhances competitiveness and allows for better resource allocation, enabling firms to leverage their strengths (Ricardo, 1817). Scale economies, or the cost advantages realized as production increases, interact with human capital and technology to enhance these growth dynamics (Solow, 1956). A skilled workforce boosts productivity and supports the adoption of advanced technologies, while

larger firms can invest in innovation that drives efficiency. Thus, specialization and concentration can significantly impact local economic growth through these externalities. Together, these interconnected factors create a robust framework for fostering local economic growth, highlighting the importance of clustering, innovation, and specialization in sustainable development. Therefore, this study aims to illustrate how specialization and concentration within provincial clusters can leverage economic activity from externalities to influence economic performance.

3. Data Collection and Methodology

3.1 Data

This paper utilizes secondary data from 2001-2018, including Gross Provincial Product (GPP) across 15 major sectors, capital, labor, and indices of specialization and concentration concerning employment in economic sectors. Data on economic activities in these years were used because some activity sectors were adjusted by the National Economic and Social Development Office (NESD) and the National Statistical Office (NSO) in 2019 and used in the following years. The focus is on the East Coast Southern subregion of Thailand, particularly Nakhon Si Thammarat province. and indices of specialization and concentration. The focus is on the Economic Structure of the East Coast Southern subregion (the Southern Gulf of Thailand) and Nakhon Si Thammarat province, particularly within the agricultural, industrial, and service sectors.

Specialization and concentration pattern are measured using Location Quotient (LQ_{ij}) Herfindahl index (H_j^C and H_j^S) and Krugman Dissimilation Index (K_j^C and K_j^S) which computed a number of labor from major sectors. The LQ_{ij} , K_j^C and K_j^S index are treated as independent variables to assess the impact of specialization and concentration on regional economic performance, utilizing panel data. Sectoral concentration and regional specialization are evaluated based on employment figures, incorporating both static and dynamic analyses by comparing indicators across different years.

Usually, the empirical studies in Thailand processed in this field employ indexes such as the Location Quotient, Herfindahl Index and others. This analysis continues that tradition by employing these established indicators alongside the Krugman Dissimilation Index (K_j^C and K_j^S).

3.2 Specialization and Concentration Index

1) Location Quotient (LQ)

The Location Quotient (LQ) assesses industry concentration by comparing the employment share of a sector in a region to its share in a larger reference area. LQ identifies leading sectors within a region. An LQ greater than one indicates that a sector is a basic industry significant to the economic base in an area that calculated as follows:

$$LQ_{ij} = S_j/X_j = (x_{pj}/x_p)/(x_{rj}/x_r)$$

Where: S_j - share of sector j in province p ; X_j - share of sector j in aggregate level;

x_{pj} - employment in the sector; j in province p ;

x_p - total employment in province p ;

x_{rj} - employment in sector; j in region r ;

x_r - total employment in region r ;

2) Herfindahl-Hirschman Index

The Herfindahl-Hirschman index (HD) measures both of concentration (H_j^C) and specialization (H_i^S) and computed as follows:

$$H_j^C = \sum_{i=1}^n (g_{ij}^C)^2 \quad \text{and} \quad H_i^S = \sum_{j=1}^m (g_{ij}^S)^2$$

$$g_{ij}^C = x_{ij} / \sum_{i=1}^n x_{ij} = x_{ij} / x_j \quad \text{and} \quad g_{ij}^S = x_{ij} / \sum_{j=1}^m x_{ij} = x_{ij} / x_i$$

Where: H_j^C - the Herfindahl index for concentration;

H_i^S - the Herfindahl index for specialization;

i - region; j - sector; x - employment;

x_{ij} - employment in sector j in region i

x_j - total employment in sector j ;

x_i - total employment in region i ;

g_{ij}^C - share of region i in the total national value of sector j ;

g_{ij}^S - share of sector j in the total value of region i ;

The Herfindahl index expresses increasing with greater specialization and concentration, reaching a maximum of 1 when a sector is entirely concentrated in one region, or a region is specialized in a single sector. It reaches its minimum of $1/n$ and $1/m$, respectively, when

employment is evenly distributed. Note that the Herfindahl Index may be biased toward larger regions due to its absolute measure.

3) Krugman Dissimilation Index

The Krugman Dissimilarity index (KD) measures either concentration (K_j^C) and specialization (K_i^S) using formula of the spatial imbalance measure which compares the sectoral or regional distribution of the economic activities to the overall average distribution of the aggregate of economic activities.

$$K_j^C = \sum_{i=1}^n |g_{ij}^C - g_i| \quad \text{and} \quad K_i^S = \sum_{j=1}^m |g_{ij}^S - g_j|$$

$$g_i = X_i / X \quad \quad \quad g_j = X_j / X$$

Where: X stands for the total (region) employment;

The Krugman Dissimilarity index ranges from 0 to 2, with 0 indicating identical economic sector structures and 2 indicating completely different structures.

3.3 Model Specification

The Solow Model (1957), a foundational model in economic growth theory, utilizes an aggregate Cobb-Douglas production function and emphasizes the roles of savings and investment. This model assumes perfect competition and economies of scale, attributing output growth to capital accumulation and technological progress. Although it highlighted capital accumulation and technological progress, it did not fully integrate technology as an explanatory variable.

The New Growth Theory, proposed by Romer (1986), Lucas (1988), and Grossman and Helpman (1991), shifted focus to technological progress as an endogenous growth determinant and introduced variables (e.g., education, human capital, and R&D), which influence technological advancement and economic growth.

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} \quad 0 < \alpha, \beta < 1 \quad \text{---- (A)}$$

Where Y_{it} , K_{it} and L_{it} , and A_{it} are the total product, capital, labor and level of technology of province i at time t .

As mentioned above, externalities are the important key component (as explanatory variable in this paper) that illustrate the operation of the economic activities and their effects on local economic growth, using panel data from the years 2001-2018. Therefore, the model incorporates specialization and concentration indices focusing on the LQ_{ij} , K^C and K^S to assess within the Cobb-Douglas production function framework. Therefore, this paper applies five models to assess the impact of specialization and concentration on economic performance.

Model 1: The model without specialization and concentration index

$$Y_{it} = K_{it}^{\alpha} L_{it}^{\beta} \quad ; \quad 0 < \alpha, \beta < 1 \quad (1)$$

Model 2: The model with Location Quotient index (LQ_{it})

$$Y_{it} = K_{it}^{\alpha} L_{it}^{\beta} LQ_{it}^{\gamma} \quad ; \quad 0 < \alpha, \beta, \gamma < 1 \quad (2)$$

Model 3: the model with Krugman Dissimilation: concentration index (K_{it}^C)

$$Y_{it} = K_{it}^{\alpha} L_{it}^{\beta} K_{it}^{C\gamma} \quad ; \quad 0 < \alpha, \beta, \gamma < 1 \quad (3)$$

Model 4: The model with Krugman Dissimilation: specialization index (K_{it}^S)

$$Y_{it} = K_{it}^{\alpha} L_{it}^{\beta} K_{it}^{S\gamma} \quad ; \quad 0 < \alpha, \beta, \gamma < 1 \quad (4)$$

Model 5: The model with specialization/concentration index (LQ_{it} , K_{it}^C and K_{it}^S)

$$Y_{it} = K_{it}^{\alpha} L_{it}^{\beta} LQ_{it}^{\gamma} K_{it}^{C\delta} K_{it}^{S\theta} \quad ; \quad 0 < \alpha, \beta, \gamma, \delta, \theta < 1 \quad (5)$$

Where: Y_{it} is denotes as total product of province i at time t .

K_{it} and L_{it} are denote as the capital and labor of province i at time t .

LQ_{ij} , K_{ij}^C , K_{ij}^S are the Location Quotient and Krugman Dissimilation: concentration and specialization index of province i at time t .

α , β , γ , δ and θ are share of capital, Location Quotient and Krugman Dissimilation: concentration and specialization index of production.

4. Finding of the Results

4.1 Economics Structures of the East Coast Southern Subregion (the Southern Gulf of Thailand as provincial cluster) and Nakhon Si Thammarat Province

Table 1 present the economics structures of average GPP, change between 2001-2018, and percentage change in GPP and labor force across different economic sectors for the East Coast Southern Subregion and Nakhon Si Thammarat Province.

Table 1. Economics Structures

Province / Economic Sector	Average GPP (Million Baht)	Change	Average % Change	Average Labor force	Change	Average % Change
Nakhon Si Thammarat						
- Agricultural	34,933.84	23,040	5.29	437,880.50	-66,825	0.81
- Industry	35,022.54	11,797	3.23	122,306.28	47,957	3.12
- Service /Trade	55,594.78	49,529	5.30	330,625.06	64,099	1.21
Avg. Aggregate	125,551.16	84,366	4.56	890,811.83	45,231	0.87
GPP per Capita	84,367.89	57,188	4.76			
Agri. per worker	79,779.39					
Indus. per worker	286,351.12					
Serv. per worker	168,150.53					
Population (1,000)	1,492.45	-37.50	-0.16			
East Coast Southern Subregion						
- Agricultural	48,334.10	100,152	6.13	1,055,607	-49,379	0.44
- Industry	134,325.33	99,958	5.60	247,066	122,656	2.48
- Service /Trade	256,680.20	271,284	6.39	724,417	141,020	1.39
Avg. Aggregate	439,339.64	471,394	6.04	2,027,090	214,297	0.81
GPP per Capita	108,208.48	83,513	5.36			
Agri. per worker	45,787.97					
Indus. per worker	543,681.97					
Serv. per worker	354,326.58					
Population (1,000)	4,946.24	552.48	0.65			
Southern Region						
- Agricultural	278,420.25	57,266	5.31	2,248,092.56	-16,083	0.40
- Industry	171,326.89	125,853	5.42	664,761.56	194,553	1.27
- Service /Trade	520,534.48	635,623	7.30	1,952,484.50	548,374	1.52
Avg. Aggregate	970,281.62	918,742	6.39	4,865,338.61	726,844	0.86
GPP per Capita	107,922.92	89,131	5.55			
Agri. per worker	123,847.33					
Indus. per worker	257,726.83					
Serv. per worker	266,601.08					
Population (1,000)	8,898.03	1,204.71	0.80			

Source: Author's Compilation

The indicators of employment growth and GPP per Worker indicate a structural shift from agriculture toward industry and services. In Nakhon Si Thammarat, industrial employment grew by 3.12% and service employment by 1.21%, while agricultural labor declined by 0.81%. In the East Coast Southern Subregion, labor shifts were slightly lower that reflecting ongoing structural transformation. High GPP per worker in industry and services (up to 543,681.97 Baht) contrasts sharply with low agricultural productivity (45,787.97 Baht), emphasizing the need for labor reallocation to higher-productivity sectors.

The overall present, the service and trade sectors exhibit the highest values for average GPP, changes, average percentage change and GPP per worker, while the agricultural sector shows the lowest values. Notably, although the agricultural sector employs the most labor, it has the lowest percentage change. This indicates a need for revisions and improvements in productivity and labor structure within the agricultural sector.

4.2 Location Quotient patterns of province and subregion

Table 2. Location Quotient (LQ) based on employment data

Economic Sector	Nakhon Si Thammarat				East Coast Southern Subregion			
	2002	2007	2012	2017	2002	2007	2012	2017
Agriculture	0.88	0.95	0.93	0.96	1.08	1.11	1.15	1.14
-Agriculture, Hunting and Forestry /Fishing	0.87	0.95	0.93	0.95	1.08	1.11	1.16	1.14
- Mining and Quarrying	2.15	1.35	0.28	1.46	1.62	1.37	0.16	1.27
Industry	1.19	1.12	1.15	1.12	0.90	0.86	0.89	0.95
-Manufacturing	1.09	1.01	0.90	1.06	0.78	0.76	0.70	0.90
-Electricity, Gas and Water Supply	1.05	0.27	1.61	0.88	0.91	0.93	1.26	0.81
-Construction	1.32	1.28	1.28	1.20	1.08	1.01	1.05	1.05
Service	1.12	1.04	1.06	1.01	0.93	0.91	0.85	0.88
-Wholesale /Retail Trade; Repair of Motor Vehicles	1.06	1.11	1.09	1.06	0.93	0.99	0.91	0.95
-Hotels and Restaurants	1.09	0.97	0.98	0.96	1.00	0.93	0.95	0.91
-Transport, Storage /Communications	1.30	0.73	1.11	0.87	0.52	0.54	0.42	0.48
-Financial Intermediation	1.01	1.06	1.56	0.80	0.87	1.02	0.98	0.96
-Real Estate, Renting and Business Activities	1.24	0.98	1.83	0.21	1.02	0.82	1.00	0.69
-Public Administration and Defence Compulsory Social Security	1.32	0.84	0.78	0.94	1.05	0.89	0.79	0.85
-Education	1.11	1.28	1.05	1.18	0.98	0.80	0.67	0.77
-Health and Social Work	1.13	1.07	1.25	0.59	1.01	0.89	0.82	0.82
-Other Community, Social and Personal Services Activities	1.01	0.93	1.11	1.26	1.13	0.97	0.92	1.17
-Personal /Household Goods	1.72	0.50	1.13	1.11	0.54	0.52	0.96	0.72

Source: Author's Compilation

The Location Quotient (LQ) indicates that the industry, as well as the service and trade sectors, in Nakhon Si Thammarat Province, have values exceeding one, highlighting their importance as a base sector for the subregion. In contrast, agriculture is recognized as the base sector for the Southern region.

Both Nakhon Si Thammarat and the subregion show LQ values greater than one in subsectors like Mining and Quarrying, Construction, and Other Community, Social, and Personal Services Activities. In Nakhon Si Thammarat, subsectors such as Mining & Quarrying, Construction, and selected services (Community, Social, and Personal Services) demonstrate $LQ > 1$. This suggests that these activities not only fulfil local needs but also support other regions that reflecting specialized high-productivity clusters. In the East Coast Southern Subregion, agriculture remains dominant ($LQ > 1$), while industrial and service sectors show moderate specialization, suggesting potential for industrial and service cluster development.

4.3 The concentration of economic activities pattern in Nakhon Si Thammarat and the East Coast Southern Subregion

1) Concentration of economic activities pattern in Nakhon Si Thammarat

The degree of concentration K_j^c indicates that the industry and service/trade sectors in Nakhon Si Thammarat province exhibit higher concentration compared to the agricultural sector.

In Nakhon Si Thammarat, among subsectors, mining and quarrying, construction, other community/social and personal services activities, and education also show notable degrees of concentration that indicating concentrated, high-productivity clusters. In East Coast Southern Subregion, industrial and service sectors also show moderate specialization, suggesting potential for cluster development.

Among subsectors, mining and quarrying, construction, other community/social and personal services activities, and education also show notable degrees of concentration. These findings align with the patterns observed in LQ, reflecting a similar degree of concentration across these sectors.

Table 3. Concentration based on employment data in Nakhon Si Thammarat

Economic Sector	Herfindahl Index				Krugman Dissimilarity Index			
	2002	2007	2012	2017	2002	2007	2012	2017
Agriculture	0.162	0.169	0.177	0.164	0.055	0.022	0.031	0.019
-Agriculture, Hunting and Forestry /Fishing	0.160	0.168	0.177	0.163	0.058	0.023	0.030	0.020
- Mining and Quarrying	0.970	0.343	0.016	0.385	0.527	0.153	0.324	0.197
Industry	0.298	0.236	0.269	0.225	0.088	0.054	0.068	0.050
-Manufacturing	0.250	0.190	0.165	0.204	0.042	0.004	0.045	0.027
-Electricity, Gas and Water Supply	0.231	0.014	0.525	0.139	0.023	0.314	0.274	0.051
-Construction	0.366	0.307	0.333	0.260	0.147	0.122	0.126	0.086
Service	0.262	0.201	0.229	0.185	0.055	0.016	0.027	0.006
-Wholesale /Retail Trade; Repair of Motor Vehicles	0.237	0.231	0.242	0.202	0.030	0.048	0.041	0.025
-Hotels and Restaurants	0.251	0.178	0.196	0.166	0.043	0.011	0.008	0.017
-Transport, Storage /Communications	0.355	0.100	0.250	0.135	0.138	0.116	0.049	0.057
-Financial Intermediation	0.215	0.209	0.495	0.114	0.006	0.024	0.252	0.086
-Real Estate, Renting and Business Activities	0.322	0.178	0.681	0.008	0.110	0.011	0.374	0.337
-Public Administration and Defence Compulsory Social Security	0.368	0.132	0.123	0.159	0.149	0.069	0.100	0.026
-Education	0.258	0.305	0.226	0.251	0.050	0.119	0.024	0.076
-Health and Social Work	0.268	0.212	0.317	0.062	0.060	0.028	0.112	0.176
-Other Community, Social and Personal Services Activities	0.212	0.162	0.250	0.286	0.002	0.031	0.049	0.111
-Personal /Household Goods	0.619	0.046	0.258	0.223	0.329	0.217	0.056	0.048

Source: Author's Compilation

2) Concentration of economic activities in the East Coast Southern Subregion

The degree of concentration K_j^C in the subregion shows that the industry and service/trade sectors are more concentrated than the agricultural sector. However, in the Southern region, agriculture exhibits a higher concentration than both the industry and service/trade sectors. Concentration patterns in the subsectors align closely with those in the province. An increase in concentration correlates with greater dissimilarities in both the province and subregion, as indicated by the Krugman Dissimilarity index. These results are consistent with findings from the Location Quotient, Herfindahl Index, and Krugman Dissimilarity index.

Table 4. Concentration based on employment data in the East Coast Southern Subregion

Economic Sector	Herfindahl Index				Krugman Dissimilarity Index			
	2002	2007	2012	2017	2002	2007	2012	2017
Agriculture	0.213	0.218	0.237	0.212	0.035	0.047	0.063	0.057
-Agriculture, Hunting and Forestry /Fishing	0.212	0.218	0.240	0.212	0.035	0.047	0.066	0.056
- Mining and Quarrying	0.474	0.332	0.004	0.263	0.263	0.156	0.357	0.109
Industry	0.145	0.131	0.143	0.149	0.044	0.058	0.046	0.018
-Manufacturing	0.111	0.101	0.089	0.131	0.093	0.101	0.126	0.042
-Electricity, Gas and Water Supply	0.151	0.154	0.285	0.107	0.036	0.027	0.110	0.077
-Construction	0.213	0.181	0.197	0.181	0.036	0.006	0.021	0.021
Service	0.155	0.146	0.130	0.126	0.031	0.038	0.062	0.049
-Wholesale /Retail Trade; Repair of Motor Vehicles	0.157	0.174	0.150	0.147	0.029	0.002	0.037	0.020
-Hotels and Restaurants	0.183	0.154	0.161	0.134	0.002	0.027	0.022	0.038
-Transport, Storage /Communications	0.049	0.051	0.032	0.037	0.204	0.193	0.245	0.211
-Financial Intermediation	0.138	0.185	0.172	0.150	0.055	0.010	0.009	0.017
-Real Estate, Renting and Business Activities	0.188	0.119	0.180	0.079	0.008	0.075	0.001	0.124
-Public Administration and Defence Compulsory Social Security	0.201	0.141	0.113	0.117	0.022	0.044	0.088	0.061
-Education	0.172	0.114	0.080	0.096	0.010	0.083	0.141	0.094
-Health and Social Work	0.184	0.140	0.120	0.110	0.004	0.045	0.077	0.073
-Other Community, Social and Personal Services Activities	0.233	0.168	0.151	0.224	0.057	0.011	0.035	0.069
-Personal /Household Goods	0.053	0.048	0.166	0.085	0.195	0.202	0.016	0.113

Source: Author's Compilation

The results of concentration suggest that high output is not solely dependent on labor concentration that may aligns with contemporary of cluster. Therefore, moderate concentration with high productivity in industrial and service sectors indicates that efficiency-driven clusters gains arise from knowledge spillovers, agglomeration economies, and human capital.

Agriculture, despite $LQ > 1$ in the subregion, exhibits low productivity. This indicates labor intensive and low capital activities. Therefore, this sector needs to reinforcing for technological improvement, innovation, and skills development to enhance regional economic performance.

4.4 Sectoral specialization of the Nakhon Si Thammarat and subregions

The analysis reveals that sectoral specialization peaked in 2012 (HI values = 0.309 in the province, 0.341 in the subregion). The Herfindahl Index shows a declined in sectoral specialization in 2017 compared to 2012. This trend is consistent in both the province and the subregion. As specialization declined, the Krugman Dissimilarity Index also decreased (KD values = 0.081–0.133) in both areas, potentially indicating increased divergence in economic activity structures among the regions. This result suggests more balanced distribution of labor and decreased over-concentration.

Table 5. Specialization based on employment data

Province /Subregion	Herfindahl Index				Krugman Dissimilarity Index			
	2002	2007	2012	2017	2002	2007	2012	2017
- Nakhon Si Thammarat	0.263	0.295	0.309	0.260	0.135	0.086	0.100	0.081
- the East Coast Southern Subregion	0.323	0.316	0.341	0.276	0.100	0.109	0.156	0.133

Source: Author's Compilation

4.5 Effect of specialization and concentration on economic performance

Table 6 presents the estimated effects of specialization and concentration variables on economic performance in models (1) through (5). All models are appropriate with fixed effects (FE). The use of FE models with clustered standard errors by province ensures that these findings are robust, controlling for time-invariant unobserved heterogeneity and within-province correlation. Hausman tests ($p < 0.01$) reject Random Effects (RE), validating the choice of FE. FE model emphasizes that unobserved regional heterogeneity, such as geography, institutional quality, and resource endowment which plays a significant role. These time-invariant factors may overshadow the measurable effects of specialization and concentration, reinforcing the conclusion that agglomeration alone cannot account for economic growth in the subregion.

The results indicate that the estimated coefficients for capital and labor are significant at the 1% level across all models, emphasizing their role in driving economic growth in the East Coast Southern Subregion. The elasticity of capital suggests that investment remains central to the growth process in the subregion, while labor contributes in a complementary but less intensive. This finding aligns with the neoclassical and endogenous growth literature, which posits that human and physical capital accumulation as primary drive economic performance (Mankiw, Romer, & Weil, 1992).

In the case of models (2), (3) and (4) which examine the effect of specialization and concentration variables within a provincial cluster, the LQ, K^C and K^S variables are not significant influencing economic performance. Furthermore, the model (5) similarly indicates the specialization and concentration variables do not affect economic performance. However, the result presence specialization and concentration variables are not significant in this paper.

Table 6. The result of effect of specialization and concentration on economic performance

Variable / Model	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	-6.240* (0.000)	-6.231* (0.000)	-6.232* (0.000)	-6.253* (0.000)	-6.581* (0.000)
lnK	1.150* (0.000)	1.150* (0.000)	1.147* (0.000)	1.151* (0.000)	1.160* (0.000)
lnL	0.294* (0.004)	0.292 (0.011)	0.296* (0.004)	0.294* (0.004)	0.308* (0.009)
LQ		0.013 (0.965)			0.049 (0.872)
K^C			0.236 (0.783)		1.945 (0.393)
K^S				-0.048 (0.951)	-1.642 (0.420)
Adjust-R²	0.7171	0.7187	0.7167	0.7171	0.7224
F-statistic (Prob.)	280.56* (0.000)	183.23* (0.000)	183.54* (0.000)	183.24* (0.000)	107.22* (0.000)
Hausman's Spec. Test Chi2 (Prob.)	480.36* (0.000)	410.74* (0.000)	421.37* (0.000)	382.35* (0.000)	341.71* (0.000)

Remark: * denote significance levels at 1%.

5. Conclusion and Recommendations

This research examines the regional specialization (area) and sectoral concentration patterns in the East Coast subregion and Nakhon Si Thammarat province and estimates the empirical of effect on the local economic performance.

The results indicate that the service and trade sectors are significant, as evidenced by high average GPP, percentage changes, and contributions per worker. These findings emphasize agriculture sector continues to underpin the regional economy. The GPP and labor distribution suggest that agriculture remains the structural base of the Southern region, whereas industry and services have increasingly, highlighting the transitional nature of structural change to contributed to the provincial economy. Therefore, the agricultural sector underperforms, highlighting a need for improvements in labor productivity and structural adjustments.

The degree of concentration reveals that the industry and service/trade sectors in Nakhon Si Thammarat province and the East Coast Southern subregion are particularly strong in the agricultural sector, as well as in mining and quarrying, construction, other community/social and personal services, and education subsectors. The results present concentration and specialization indices indicate dynamic but declining specialization, suggesting that diversification rather than narrow specialization is shaping the regional economy. These findings show a concentration pattern that aligns with the Location Quotient (LQ) results, demonstrating consistency with the findings from the Herfindahl Index and Krugman Dissimilarity index.

Model estimates reveal that capital and labor significantly contribute to economic growth in the East Coast Southern Subregion. The model estimates the effect of specialization and concentration variables of provincial cluster, which LQ, K^C and K^S variables are not significant on economic performance. The insignificance of these variables can be interpreted in several ways. First, the region's industrial base remains relatively fragmented, with agriculture and low-technology sectors still dominating. The scale of industrial and service agglomerations may be insufficient to generate externalities such as knowledge spillovers or cost-reducing linkages. Second, structural imbalances, including uneven infrastructure development and labor market rigidities, may dilute the potential spillovers of localized clustering (Duranton & Puga, 2004).

Moreover, the Krugman Dissimilarity Index results reveal that divergence in sectoral structures persists across provinces within the subregion, suggesting that integration is incomplete. This finding resonates with literature on peripheral economies, where clustering effects are often weaker compared to urban cores (Brühlhart, 2001; Fujita, Krugman, & Venables, 1999). In Thailand, such patterns have been observed with Bangkok and surrounding regions benefiting more from agglomeration economies compared to the other region (Warr & Kohpaiboon, 2017).

Even though, specialization and concentration variables were not statistically significant, policymakers should still examine provincial economies, considering agglomeration economies and externalities comprehensively. Chairat (2015) presented the estimation results of the variable of the Total Factor Productivity (TFP) augmented with labor of provincial cluster impact on the growth rate of output, while Chairat (2020) identified significant effects of spatial concentration in the industrial and service sectors, particularly in hotels and restaurants, on economic growth. These findings underscore to recommend the externalities of the service

sector in the South of Thailand play an important role in the mechanism of the economic sectors in the cluster that impact on economic growth.

However, the limitation of the data that we rely on spans only a short period (2001–2018), during which changes in specialization and concentration are relatively minor.

The specialization and concentration do not have a meaningful impact on GPP, but this conclusion is not fully convincing in term of theory. Therefore, the period analyzed limits the paper's ability to make definitive about their effects. We suggest for future research which a more approach that might involve using quasi-experimental methods or expanding the scope of dependent variables beyond GPP. For example, GPP growth, employment changes, or quality of life metrics could have provided a more nuanced picture of the regional or provincial clustering economic performance.

However, agglomeration economies have different characteristics, are difficult to capture in different economic contexts and measured directly. Indicators related to specialization, concentration, diversity, and urbanization are often debated. Therefore, the government policy or policy must recognize these diverse economic characteristics and tailor interventions accordingly. Government policy must address the specific needs of different provinces and provincial clusters, developing targeted strategies to optimize economic performance. The policymakers should investigate to classify each province and provincial cluster economies and support the program to implement different strategies/approaches. Therefore, future research should focus on understanding the economic patterns of individual provinces and clusters to determine their impact on local economic performance and guide the development of effective strategies.

Authors Note: We are pleased to thank editors and reviewers for their comments and suggestions on this article. This research was funded by the Rajamangala University of Technology Srivijaya, Thailand for the project grant.

References

- Aiginger, K., & Rossi-Hansberg, E. (2006). Specialization and concentration: a note on theory and evidence, *Empirica*, 33(3), 255-266.
- Brühlhart, M. (2001). Evolving geographical concentration of European manufacturing industries. *Weltwirtschaftliches Archiv*, 137(2), 215–243.
- Chairat, K., Santipolavut, S., & Sukharomana, S. (2015). Provincial Clustering: Effects on Empirical Economic Development in Southern Thailand, *Applied Econometrics and International Development*, 15(1), 161-175.
- Chairat, K., & Pechsong, P. (2020). Effects on Empirical Economic Performance in Provincial Cluster of the Southern Shore of the Gulf of Thailand, *Regional Science Inquiry*, 12(2), 113-121.
- Duranton, G., & Puga, D. (2004). Micro-foundations of urban agglomeration economies. In J. V. Henderson & J. F. Thisse (Eds.), *Handbook of regional and urban economics* (Vol. 4, pp. 2063–2117). Elsevier.
- Ezcurra, R., Pascual, P., & Rapun, M. (2006). Regional Specialization in the European Union, *Regional Studies*, 40(6), 601-616.
- Fujita, M., Krugman, P., & Venables, A. J. (1999). *The Spatial Economy: Cities, Regions and International Trade*. MIT Press.
- Glaeser, E. L. (1999). Learning in Cities. *Journal of Urban Economics*, 46(2), 254-277.
- Heckscher, E. (1919). The Effect of Foreign Trade on Distribution of Income, *Economisk Tidskrift*, 21, 1-32.
- Krugman, P. (1991). *Geography and trade*. MIT Press.
- Krugman, P. (1991). Increasing Returns and Economic Geography, *Journal of Political Economic*, 99(3), 483-499.
- Krugman, P. (1995). *Development, Geography and Economic Theory*. MIT Press.
- Lucas, R. E. (1988). On the Mechanics of Economic Development. *Journal of Monetary Economics* 22(1), 3-42.
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The Quarterly Journal of Economics*, 107(2), 407–437.

- Marshall, A. (1920). *Principles of Economics* (8th ed.). Macmillan.
- Meade, J. E. (1952). External Economies and Diseconomies in a Competitive Situation, *The Economic Journal*, 62(245), 54-67.
- Ohlin, B. (1933). *Interregional and International Trade*. Harvard University Press.
- Porter, M. E. (1998). Clusters and the new economics of competition. *Harvard Business Review*, 76(6), 77–90.
- Ricardo, D. (1817). *On the Principles of Political Economy and Taxation*. John Murray.
- Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94(5), 1002-1037.
- Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy* 98(5), S71-S102.
- Scitovsky, T. (1954). Two concepts of external economies. *Journal of Political Economy*, 62(2), 143-151.
- Solow, R. M. (1956). A Contribution to the Theory of Economic Growth. *Quarterly Journal of Economics*, 70(1), 65–94.
- Solow, R. M. (1957). Technical Change and the Aggregate Production Function. *Review of Economics and Statistics*, 39(3), 312-320.
- Stewart, F., & Ghani, E. (1991), How significant are externalities for development?. *World Development*, 19(6), 569-94.
- Warr, P., & Kohpaiboon, A. (2017). Thailand's economic performance: Agricultural, industrial, and regional dimensions. *Asian Economic Policy Review*, 12(1), 70–90.