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EXPLORING THE RELATIONSHIP AMONG FOREIGN DIRECT INVESTMENT, TECHNOLOGY TRANSFER AND ECONOMIC GROWTH: A CASE OF THE LOWER NORTHERN REGION IN THAILAND

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ABSTRACT

Purpose: This article aimed to examine factors determining Foreign Direct Investment (FDI) leading to technology transfer on economic growth in Thailand and to study policies related to foreign investment promotion.

Theoretical framework: The target variables were formed to set up a model specification to estimate the relationship between determinants in terms of technology transfer, FDI, and economic growth of Thailand.

Design/Methodology/Approach: The research scope covered and explored the relevant dataset of each expected variable from 1995 – 2021 and some target companies enquired in 2021. The secondary data included FDI at regional level, Gross provincial products (GPP), the number of establishment enterprises in the province and others.

Findings: The major factors determined FDI included the number of labour, the number of establishments, consumer price index, the value of investment and the number of internet users. These determinants had significant relationship with the GPP. Most entrepreneurs confirmed that technology transfer affected the investment decision.

Research, practical & social implications: The researchers indicated that there was significant relationship among the GPP and other independent variables ;for instance, the number of labour, the number of establishments, the FDI, and the number of internet users. The government plans reflected the investment mechanism and extensively stimulated the region's development.

Originality/Value: The value of this research confirmed that technology adopted increased productivity in the production processes. The government created the investment promotion through the infrastructure and facilities which would support the area-based regional development.

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EXPLORANDO A RELAÇÃO ENTRE INVESTIMENTO ESTRANGEIRO DIRETO, TRANSFERÊNCIA DE TECNOLOGIA E CRESCIMENTO ECONÔMICO: UM CASO DA REGIÃO DO BAIXO NORTE DA TAILÂNDIA

RESUMO

Objetivo: Este artigo teve como objetivo examinar os fatores determinantes do Investimento Estrangeiro Direto (IED) que levam à transferência de tecnologia no crescimento econômico da Tailândia e estudar as políticas relacionadas à promoção do investimento estrangeiro.

Referencial teórico: As variáveis-alvo foram formadas para estabelecer uma especificação de modelo para estimar a relação entre os determinantes em termos de transferência de tecnologia, IDE e crescimento econômico da Tailândia.

Desenho/Metodologia/Abordagem: O escopo da pesquisa cobriu e explorou o conjunto de dados relevante de cada variável esperada de 1995 – 2021 e algumas empresas-alvo investigadas em 2021. Os dados secundários incluíram IDE em nível regional, produtos provinciais brutos (GPP), o número de empresas de estabelecimento na província e outras.

Resultados: Os principais fatores que determinaram o IDE incluíram o número de mão de obra, o número de estabelecimentos, o índice de preços ao consumidor, o valor do investimento e o número de usuários de internet. Esses determinantes tiveram relação significativa com o GPP. A maioria dos empresários confirmou que a transferência de tecnologia afetou a decisão de investimento.

Implicações de pesquisa, práticas e sociais: Os pesquisadores indicaram que havia relação significativa entre o GPP e outras variáveis independentes; por exemplo, o número de mão de obra, o número de estabelecimentos, o IDE e o número de usuários da Internet. Os planos do governo refletiram o mecanismo de investimento e estimularam amplamente o desenvolvimento da região.

Originalidade/Valor: O valor desta pesquisa confirmou que a tecnologia adotada aumentou a produtividade nos processos produtivos. O governo criou a promoção de investimentos por meio de infraestrutura e instalações que apoiariam o desenvolvimento regional baseado na área.

Palavras-chave: Investimento Estrangeiro Direto, Transferência de Tecnologia, Crescimento Econômico, Tailândia, Norte Inferior.

EXPLORANDO LA RELACIÓN ENTRE LA INVERSIÓN EXTRANJERA DIRECTA, LA TRANSFERENCIA DE TECNOLOGÍA Y EL CRECIMIENTO ECONÓMICO: UN CASO DE LA REGIÓN DEL NORTE BAJO EN TAILANDIA

RESUMEN

Propósito: Este artículo tuvo como objetivo examinar los factores que determinan la Inversión Extranjera Directa (IED) que lleva a la transferencia de tecnología sobre el crecimiento económico en Tailandia y estudiar las políticas relacionadas con la promoción de la inversión extranjera.

Marco teórico: Las variables objetivo se formaron para establecer una especificación de modelo para estimar la relación entre los determinantes en términos de transferencia de tecnología, IED y crecimiento económico de Tailandia.

Diseño/Metodología/Enfoque: El alcance de la investigación cubrió y exploró el conjunto de datos relevante de cada variable esperada de 1995 a 2021 y algunas empresas objetivo consultadas en 2021. Los datos secundarios incluyeron IED a nivel regional, productos provinciales brutos (GPP), el número de establecimiento de empresas en la provincia y otros.

Hallazgos: Los principales factores que determinaron la IED incluyeron el número de mano de obra, el número de establecimientos, el índice de precios al consumidor, el valor de la inversión y el número de usuarios de Internet. Estos determinantes tuvieron una relación significativa con el GPP. La mayoría de los empresarios confirmaron que la transferencia de tecnología afectó la decisión de inversión.

Implicaciones de investigación, prácticas y sociales: Los investigadores indicaron que había una relación significativa entre el GPP y otras variables independientes, por ejemplo, el número de mano de obra, el número de establecimientos, la IED y el número de usuarios de Internet. Los planes del gobierno reflejaron el mecanismo de inversión y estimularon ampliamente el desarrollo de la región.

Originalidad/Valor: El valor de esta investigación confirmó que la tecnología adoptada aumentó la productividad en los procesos de producción. El gobierno creó la promoción de inversiones a través de la infraestructura y las instalaciones que apoyarían el desarrollo regional basado en áreas.

Palabras clave: La Inversión Extranjera Directa, Transferencia Tecnológica, Crecimiento Económico, Tailandia, Bajo Norte.

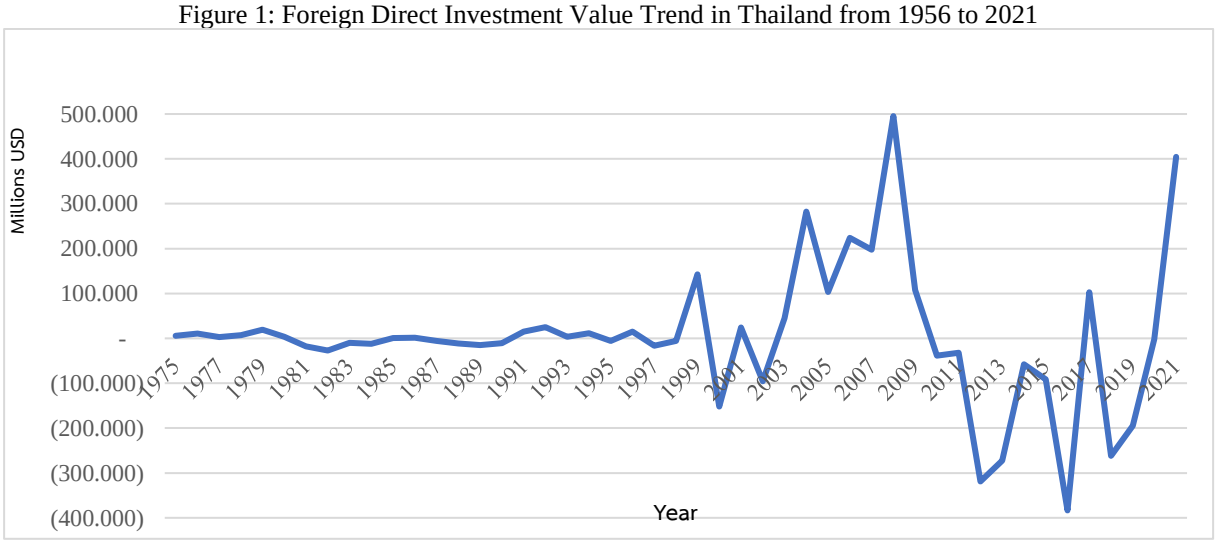
INTRODUCTION

The structure of production in Thailand was developed from state capitalism to free enterprise system and from the production for import substitution to export promotion. Nowadays the structural characteristics of production sectors in Thailand concentrate on a few industries and depend on foreign investment because Thailand is a country with small economy. Therefore, Foreign Direct Investment (FDI) will reduce the gap between domestic savevings and the needs for funding through indirect investment or financial assets such as investment in bonds, bills, equity instruments, debt securities as well as short-term and long-term loans from overseas.

Foreign investment comes together with technological transfer to the local industries, which leads to the increase of the efficiency of funding and labours in Thailand. FDI increases the rapid growth of Thai economy, making it the base of productions for export. Most the industrial products for export are produced by using labours. While commodity in the form of fund or products produced mainly by fund and high technology is imported, Thai business sectors and economic structures have to adjust to increase the potential of the production for economic growth (Chareornporn, 2013).

According to the World Bank's report, the amount of foreign investment increased continuously from 1996 to 2021 (Figure 1) because the country opened to more free markets. Then, Thailand became the production base for export.

Figure 1: Foreign Direct Investment Value Trend in Thailand from 1956 to 2021



Source: World Bank, World Economic Development Indicator and prepared by the authors (2023)

However, Figure 1 showed that after the economy crisis in 1997 because of the value deduction of Thai baht and the termination of terms of stock holding by foreign investors to ask

for foreign investment promotion, foreign direct investment is very essential for Thai economic system because Thailand has to depend on foreign direct investment for economic growth which can lead to improve the economic system for long-term stability and enhance smooth economic activities.

While there is foreign investment coming to Thailand at the nation level, the distribution of local investment plays an also important role in moving the economic system in terms of job creation, income generation, and expanding opportunities including economic stimulus at every level and every area particularly in the regional areas of Thailand either the urban or rural areas.

As for local businesses, businessmen and small and medium entrepreneurs (SME) are directly affected both positively and negatively by direct foreign investment. If there is more direct foreign investment, it will result in economic recovery. This will enhance local businesses to have the ability to increase the economic value of their goods and services as well as distributing prosperity to the regional areas. In addition, digital technology, the internet, and communication play import roles in Thai economic operation.

Therefore, the study of investment operation results toward local business in terms of technology transfer and logistics may affect the regional growth. If direct foreign investment results in technology transfer, and economic growth is beneficial to Thai small and medium entrepreneurs, they can develop and apply technology to expand business opportunities in the future, leading to guidelines to draft policy for foreign investment promotion.

LITERATURE REVIEW

International investment includes tangible asset migration from one country to another. This kind of investment helps create economic wealth for the country receiving it. International investment can be divided into 2 categories: Foreign Direct Investment (FDI) and International Portfolio Investment. International investment plays several roles in a country's development. For example, when there is foreign investment, the country receiving it can increase economic growth resulting in more employment. In addition, there is knowledge and new technology transfer to the country receiving the foreign investment. However, the decision to invest in another country depends on having an advantage over the country receiving it. The main factors for making a decision are the advantage of being the owner, the advantage of usage, and the advantage of the suitable location. The synthesis of different factors related to the decision to invest can be used to explain the motivation to invest by considering the advantages as the main factors for foreign investment.

According to Dunning's concept of "ownership, location, and internalization" or OLI, the change of world's economic and the stream of participatory development create demand conditions, which are the demand for products and services in the country. The demand affecting the company pattern to respond to the needs of the clients is caused by having a more advantage in the competition in terms of both innovation and the ability to compete to have an advantage over other countries. The difference in the quantity of demand of products and services brings about the difference between each nation. In order to keep the companies' and countries' advantages over the other countries, the production factors are better employee skills, and infrastructure such as labour, physical and natural resources, climate, location, and funds. They are factors affecting the industrial competition to make the natural resources an advantage.

Location theory is related to investment supply, that is cost factor and investment demand that is marketing, which are factors affecting production, research, and development. These factors help the investors have an advantage. In fact, location is the factor attracting foreign investors to establish companies in the country because they benefit from several advantages of the location and raw materials or resources that support their businesses. Moreover, the benefits of location affect the investment decision. In terms of motivation, there are main 4 factors. First, the availability and cost of input factor can be guaranteed for the investors to choose the location to invest in by considering different business costs. Second, as for the marketing factor, investors can get the benefit of choosing a location close to the market where they can go the market easily, resulting in the reduction of transportation cost. Third, in terms of the factor of trade barriers, the policy of the country receiving the foreign investment affects the business operation, deciding to choose between investing or exporting. Fourth, the government policy factor highly affects direct investment. In fact, the government can attract domestic investment through the economic stimulation policy including developing important and sufficient infrastructure for business operation.

Maharmah (2023), Mohamed *et.al* (2023) and Sharif (2023) studied the relationship among FDI, macroeconomomic variables and economic growth in the target countries. Some significant variables were investigated. Wattanadumrong, Collins & Snell (2014) indicated the establishment of an extensive and detailed composite dataset to support country-level econometric studies of FDI in Thailand at country-level analysis which has permitted investigation in detail, for the first time, of the key macroeconomic determinants of FDI in Thailand over the period 1970–2004. In particular, the influence of interest rates, exchange

rates, volumes of trade, wage rates and geographical distance on FDI were considered and the results referred that most determinants of FDI inflows are under the host country and its mechanism. GDP and relative market sizes are important determinants of inwards FDI. For the macroeconomic policy were attracted FDI inflows through the promotion incentives given to increase the inward FDI.

The regional level of FDI in Thailand analysis were analyzed by Wattanadumrong et. al. (2010). The determinants of FDI are identified using a unique assembled panel dataset comprising all 76 Thai provinces during the period 1985–2005. The view that foreign investors consider various determinants of location choices in each province (including labour costs, Gross Provincial Products (GPP) per head, areas of industrial estates, communication and transportation issues, population characteristics, educational attainment, population density and distance from the centre of town to the main ports of Thailand) as well as government incentives before deciding to undertake FDI in each region. Our econometric model estimates suggest that government regional policy, and the effect of zoning, however, has a significant and positive effect on regional FDI, drawing FDI to those zones where the greatest incentives are on offer. The other possible determinants of FDI amongst regions are largely shown to be insignificant.

Bootda (2013) studied the factors determining direct foreign investment in the main industries in Thailand aiming at 10 production industries: computer electronics, optical device, chemicals, rubber and plastic, vehicles, trailers and semi-trailers, electrical device, foods, drinks, paper, machinery and tools, and furniture.

The economic factors investigated were export value, goods, GDPs, consumer price index, cost index, labour per production unit, real baht value index, industrial labour productivity, labour index in industry, industrial product index, industrial labour index, and direct foreign investment value in the recent quarter.

Furthermore, Liua and Pang (2006) studied the factors determining the persistence and growth of small and medium entrepreneurs registered in China and found that the number of survival companies increased according to the size of the company, and the growth of the companies decreased according to the age and increased according to the size of the companies.

Also, the efficiency and stability of the operation helps the registered companies have more ability to compete and have better chance to survive and grow. In fact, the types of activities the companies are involved in are the main factor determining important growth.

Sukha (2014) studied the relationship between economic and social factors affecting gross product. This study analyzed the relationship between economic and social factors

affecting consumer index. The relationship was analyzed by using Multiple Linear Regression Equation. The 8 free variations studied were gross national product, demographics, household information, information on provincial gross product, information on the number of registered trucks, information on population income, information on employment, and information on consumer price index.

The above studies indicated the major FDI determinants referred to country-level analysis. A few studies covered the investment target at regional level. However, there are some research works mentioned about the relationship among the FDI, growth and the technology transfer through the relevant variables. To fill this missing gap, the methodology of this research article will be explored.

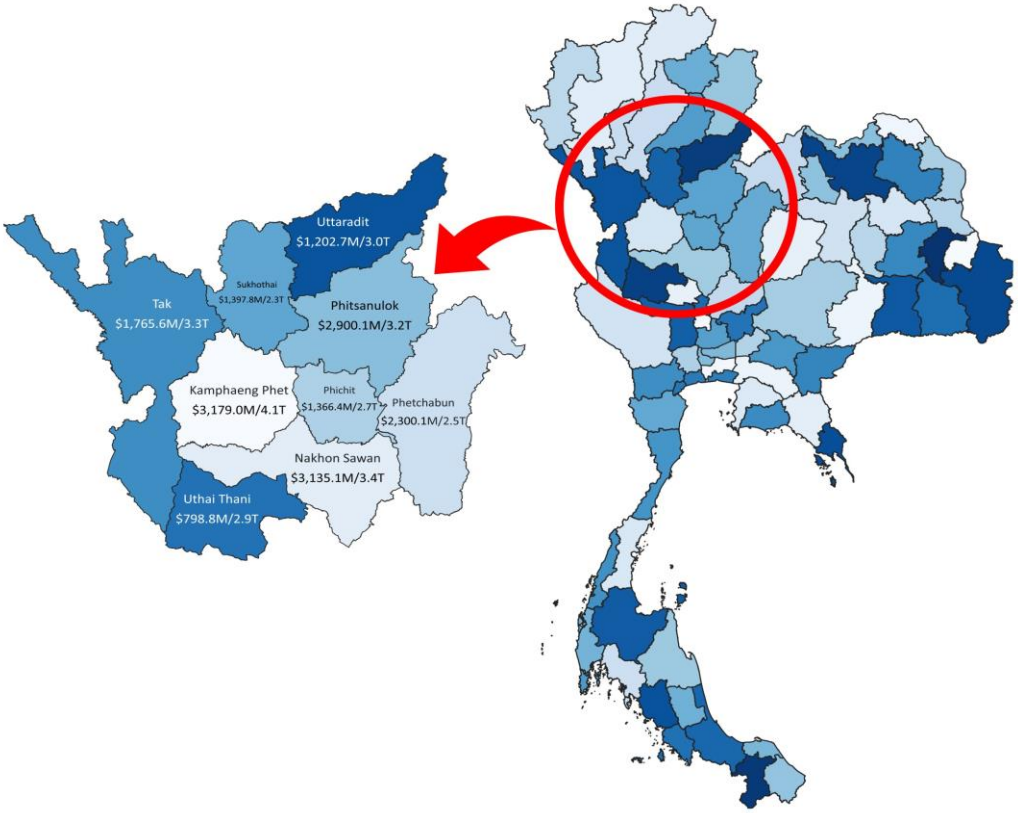
DATA AND METHODOLOGY

This study covers and explores the relevant dataset of each expected variable from 1995 – 2021 and some target companies has been enquired in 2021. The secondary data includes FDI at regional level, Gross provincial products (GPP), the number of establishment enterprises in the province and others. The relationship of target variables was formed to set up a model specification to estimate the relationship between determinants in terms of technology transfer, direct foreign investment, and economic growth of Thailand. The study examined the data for investment, technology usage initiated by direct foreign investment, and foreign investment promotion policy.

This study utilized the sample of information from the Ministry of Commerce, Ministry of Industry and Thai National Bank by studying the data on direct foreign investment coming to Thailand in different dimensions through a macro economy model such as studying commerce, investment, or other dimensions.

The lower north of Thailand, as seen from a map in Figure 2 covers 9 provinces including Tak, Phetchabun, Phitsanulok, Uttaradit, Sukhothai, Kampangphet, Pichit, Nakhonsawan and Uthaitani, respectively.

Figure 2: A map of the lower north of Thailand covering 9 provinces.



Source: Prepared by the authors (2023)

This study applied secondary data at macro level, provincial analytical units, database of government sectors such as Ministry of Commerce, Ministry of Industry, National Statistical Office (NSO), and National Economics and Social Development Council (NESDC). Dataset of each variable was complied as follows including the Gross Provincial Products (GPP), Gross Provincial Product Growth derived from the NESDC from 1995 – 2021. Employment represented by the number of employees registed with the social security office in each province. Estb referred to the establishment of the enterprises registered to strat up the business with the Department of Business Development (DBD) in each province. Thre are two sources of Foreign Direct Investment (FDI). One was from Bank of Thailand, the other wa complied from the Board of Investment. This work obtained the FDI dataset and the number of FDI projects from the BOI. The number of internet user (INT), the number of people who accessed the computer availability in each province (COM) and the number of populations were reported by the National Statistic Office (NSO)

The data from sectors in Thailand were evaluated through a model and analyzed by Ordinary Least Square Method (OLS) to infer assumptions by mean of the analysis of the relationship between interesting variables.

Model Specification

$GPP_{it} = \beta_1 + \beta_2 Employment_{it} + \beta_3 Estb_{it} + \beta_4 FDI_{it} + \beta_5 NFDI_{it} + \beta_6 INT_{it} + \beta_7 COM_{it} + \beta_8 POP_{it}$ +Dummy (1)

Where:

GPP_{it} : Gross Provincial Products by province
$GRGPP_{it}$: Gross Provincial Product Growth
EMP_{it}: The number of Labour of each province
$Estb_{it}$: Establishment of the enterprise regisited in each province annually
FDI_{it}: Inward Foreign Direct Investment Inflows to the province
$NFDI_{it}$: Numner of Foreign Direct Investment Project
INT_{it}: Number of internet users
COM_{it}: Number of people who access the computer availability in each province
POP_{it}: Number of Population in each province whcih ages over 15 years
Dummy: regions including north, central, east, west, northeastern, and south
i = province, t = year

RESULTS AND DISCUSSION

Results of the study of foreign investment promotion policy. The eight-year investment promotion policy (2015-2022) as announced by the Board of Investment (BOI) (2/2014) aimed to promote investment as follows.

1.To promote investment that enhance development in the nation's competitiveness focusing on research and development, innovation creation, creating added value in agricultural sectors, industry, services, as well as SME promotion, including creating fair competition leading to the reduction of economic and social inequality.

2. To promote environmentally friendly activities and those the saves energy or use renewable energy for balanced growth and sustainability in the country.

3. To promote investment pooling in line with the area's potential, which will create strengthen area's value chain added.

4. To promote investment in the southern border provinces in order to enhance local economy for local security.

5. To promote investment in special economic zones particularly in border provinces both within and outside industrial estates in order to create the economic links between neighboring countries and bundle support to ASEAN economic community.

6.To promote Thai investment overseas to improve Thai businessmen competitiveness and increase Thai roles in the international stage.

As for the SME, each project asking for promotion must have capital size (not including price) and working capital at least 500,000 baht. Also, the SME will get benefits from investment promotion covering both production and service sectors. In fact, SME will get exemption on corporate income tax for 8 years, 200% tax exemption of the investment, machinery import duty exemption, and exemption of raw material import duty for export production. The project to strengthen foundation economy links locals with high potential entrepreneurs to raise competitiveness of foundation economy by supporting the following related projects:

In Thailand some of the investment promotion is related to the promotion of domestic industrial estate by spreading the location covering every region. The highest number of industrial estates, 30 industrial estates or 52.63%, is in the east of Thailand, followed by the central region which has 18 industrial estates or 31.58%. A number of industrial estates enhance active local economy. The province that has the most industrial estates is Rayong, with 12 estates, followed by Chonburi, with 10 estates.

Direct Foreign Investment Schedule Toward Technology Transfer and Economic Growth in Thailand

It is obvious that investment promotion links to technology transfer and economic growth in Thailand. It can be seen from provincial gross products. In 2020, the provincial gross products indicate that Bangkok and surrounding provinces had the highest provincial gross products equal to 7,442,417 million baht, followed by the eastern region equal to 2,982,175 million baht, as shown in Table 1.

Table 1 Main statistics affecting economy classified by regions in 2020

Regions	Provincial gross products)million baht(	Provincial gross products per person)baht per person(	Population)people(	Establishment)number of companies(
Northeast	1,590,894	80,127	21,848,228	52,269
North	1,228,307	105,102	12,027,271	55,673
South	1,277,750	136,968	9,467,901	50,538
East	2,982,175	402,678	5,107,898	50,494
West	563,388	155,443	3,824,840	19,917
Central	843,468	214,621	3,010,803	17,533
Bangkok and Surrounding Provinces	7,442,417	329,150	10,899,786	238,629

Source: Office of National Economics and Social Development Council, 2020

In the economic structure of the eastern region (Figure 3), most provinces such as Chonburi, Rayong, Prachinburi, and Chachoengsao, depend on industry as the main locations

of main industries are located on these provinces. The province for service sectors is Nakhon Nayok, while agricultural products are in Chanthaburi and Trad where economic fruits are durian and mangosteen. These provinces have the most establishments and highest gross products of the country, which corresponds to the data about the investment promotion value in Table 2 which explains the provincial economic structure in each region linking to investment promotion value.

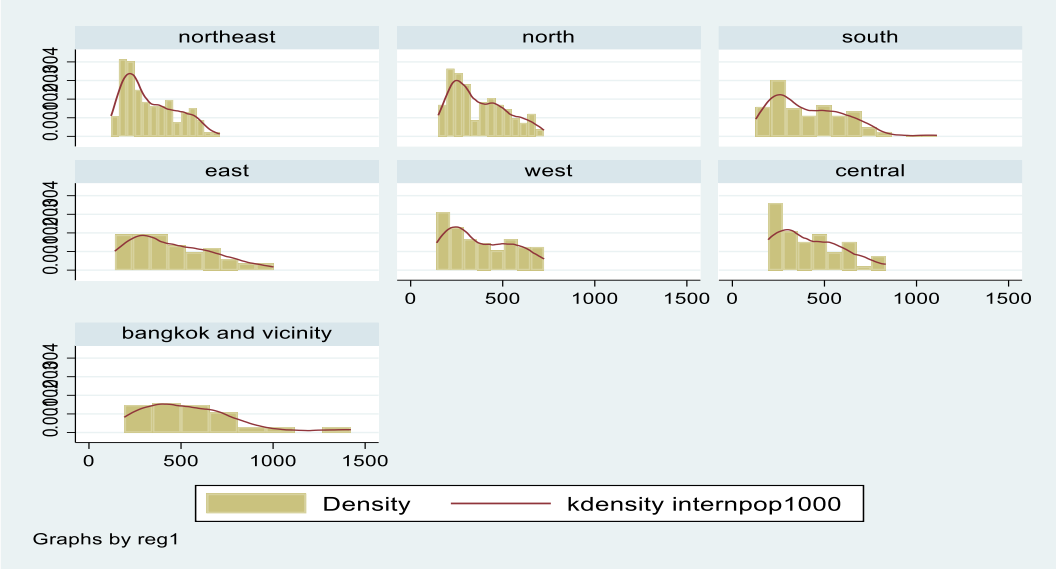
Table 2 Investment promotion value classified by regions from 2010 to 2020

Region	Average	Percentile 10	Percentile 25	Percentile 50	Percentile 75	Percentile 90
Northeast	2,726	39	135	525	1,747	5,223
North	1,616	30	154	568	2,082	4,194
South	3,119	50	229	1,043	4,214	7,848
East	40,633	30	333	7,264	59,882	133,760
West	4,118	95	681	1,471	5,670	10,756
Central	7,754	62	510	2,481	12,355	25,876
Bangkok and Surrounding Provinces	15,017	2,133	4,325	9,664	18,079	26,052
Total	8,804	46	231	1,198	5,470	19,506

Source: Office of the Board of Investment and prepared by the authors (2023)

In addition, there is a link to the businessmen's and people's use of information. The use of information is partly from the prosperity in the area caused by the increase in the number of establishments. The use of information can be divided into 3 types: the use of mobile phones, the use of the internet, and the use of computer as shown in Figure 3

Figure 3 The distribution of the use of the internet classified by regions.



Source: National Statistical Office and prepared by the authors (2023)

Figure 3 illustrates the distribution of the use of the internet. The most intensive use of the internet is in Bangkok and the surrounding provinces, followed by the eastern region, while in the northeastern region and the northern region the use of the internet is concentrated in the main cities of the region.

In Table 3 the results of the estimation of provincial gross products (dependent variables) affirms that the independent variables explaining the determination of provincial gross products are that provincial gross products vary according to the number of labour (B= 0.965), which means that the more the number of labour, the more provincial gross products; and that provincial gross products vary according to investment value (B=1.955), which means investment value positively affects provincial gross products. Also, the consumer price index and the number of people using the internet positively affect the value of provincial gross products at significant statistics.

Table 3 Results of the estimation of regression coefficient of the variable of gross provincial products (GPP)

variable	Coefficient	Std.Err	p-value
Constant	-357124.700	203986.300	0.081*
Number of labour	0.965	0.074	0.000**
Number of establishments	-5.631	2.037	0.006**
Investment)million(	1.955	0.497	0.000**
Consumer price index	3669.755	2090.596	0.080*
Number of projects	310.580	391.144	0.428
Number of the Internet users	0.044	0.019	0.022**
Number of computer users	0.012	0.053	0.829
Population	0.013	0.015	0.380
Regions)dummy variable(			
North	12339.810	4144.515	0.003**
South	26703.320	4721.217	0.000**
East	57688.190	12118.990	0.000**
West	14312.460	5140.562	0.006**
Central	13270.520	9769.970	0.175
Bangkok and surrounding provinces	-2141.454	23642.490	0.928

Number of obs	390
F	336.040
Prob > F	0.000
R-squared	0.950
Root MSE	43068.000

** Significant statistics at 0.05
* Significant statistics at 0.1
Source: Prepared by the authors

CONCLUSION

The determinants of Foreign Direct Investment (FDI) leading to technology transfer and economic growth of the lower northern region in Thailand indicated that the major factors including the number of labour, number of establishments, consumer price index, the value of investment and the number of internet users had significant relationship with the gross

provincial products. The estimation results showed that the north, the south, the east and the west compared to the northeastern as a baseline had relationship with the gross provincial product with strongly significance with R-squared 0.95. The investigation was then carried out by enquiries of the leading companies, especially in the industrial agriculture sectors located in the lower north of the country. The directions of technology factors strongly influenced the development of the companies needing to have rapid adaptation of the entrepreneurs. In particular, the major products are industrial agriculture using raw materials from the local productivities, for example, rice grain, the rice grain processing, the cassava and the cassava processing, cassava flour and cassava starch, sugar cane, and the sugar processing using sugar cane. Cassava is the major energy crop and one of the renewable resources that is utilized for bioethanol production. Cassava starch can be used at large scales to produce ethanol in tropical countries where Thailand is one of the largest cassava producers in the world. The production process of bioethanol depends on the feedstock; it is based on technologies that go from the simple conversion of sugars by fermentation to the multistage conversion of lignocellulosic biomass into ethanol. Both sugarcane and cassava represent major energy plants of the lower northern part of the country.

The growth of many factories especially serves the biotechnology plants in the area.

Thailand economic development moves forwards to the concept of bio-circular-green (BCG) model. The BCG sectoral development fucuses on four sectors including food and agriculture, medical and wellness, bioenergy and tourism and creative economy. The talent and entrepreneur development of startups, innovation-driven enterprises and creative smart farmers/entrepreneurs have been driven. The northern economic corridor (NEC) focuses on food safety and agricultural health standards, agro-industry and food processing, Government promotion, infrastructure and facilities supported entrepreneurs. In addition, National and Development plans of the country issued every five years continuously affected the regional development.

The recommendations for future research studies are as follows: firstly, future research studies could further investigate the model of a knowledge transfer web application platform by assessing the performance in terms of both finance-related issues and non-finance-related issues to find out about large farms' performance outcomes after implementing the knowledge transfer on drone technology. Secondly, the present study analyzed the components of the knowledge transfer of Thai jasmine rice business. An analysis of the personnel system is recommended to bring more clarity to a specific organizational operation. Lastly, the

components of the knowledge transfer on drone technology can be implemented with other agricultural products such as vegetables, fruits, and flowers.

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