วารสารวิชาการคณะมนุษยศาสตร์และสังคมศาสตร์ มหาวิทยาลัยสงขลานครินทร์
Journal of Humanities and Social Sciences Prince of Songkla University

การวิเคราะห์ปัจจัยที่ตั้งอุตสาหกรรม: การศึกษาเปรียบเทียบระหว่างอุตสาหกรรมยานยนต์ในประเทศไทยและประเทศอินโดนีเซีย

INDUSTRIAL LOCATION FACTORS ANALYSIS: A COMPARISON OF THE AUTOMOTIVE INDUSTRY IN THAILAND AND INDONESIA

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Received: Nov 11, 2023
Revised: Feb 7, 2024
Accepted: May 5, 2024
Available: Jun 24, 2024

บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อศึกษาศักยภาพในการเป็นที่ตั้งฐานการผลิตรถยนต์ของประเทศไทยและประเทศอินโดนีเซียโดยใช้ปัจจัยที่ตั้งทางอุตสาหกรรมเพื่อทำการวิเคราะห์เชิงเปรียบเทียบ ผลการศึกษาพบว่าประเทศไทยมีศักยภาพสูงกว่าประเทศอินโดนีเซียในด้านปัจจัยระดับประเทศ (Country-Level Factors) เนื่องจากมีสภาพแวดล้อมที่เอื้อต่อการลงทุนในอุตสาหกรรมการผลิตรถยนต์ ได้แก่ สิทธิประโยชน์ทางด้านภาษี นโยบายการสนับสนุนจากภาครัฐ การสนับสนุนจากภาคการเงิน และการพัฒนาทางด้านสาธารณูปโภคพื้นฐานที่ช่วยสนับสนุนการลงทุน ในทางกลับกัน ภาวะเศรษฐกิจภายในประเทศและปัญหาทางการเมืองนับเป็นปัจจัยที่ส่งผลกระทบด้านลบต่อสภาพแวดล้อมการลงทุนและศักยภาพในการเป็นฐานการผลิตรถยนต์ของประเทศไทย ประเทศอินโดนีเซียมีศักยภาพสูงในด้านปัจจัยระดับอุตสาหกรรม (Industry-Level Factors) ที่เอื้อประโยชน์ต่อการลงทุน เช่น การมีตลาดภายในประเทศที่ใหญ่ การขยายตัวทางเศรษฐกิจที่ส่งผลให้ชนชั้นกลางมีรายได้เพิ่มขึ้น อัตราการขยายตัวของอุตสาหกรรม การแข่งขันในอุตสาหกรรมค่อนข้างต่ำ รวมถึงค่าใช้จ่ายด้านแรงงานที่ค่อนข้างถูก อย่างไรก็ตาม การขาดแคลนผู้ผลิตชิ้นส่วนสำหรับอุตสาหกรรมการผลิตรถยนต์ซึ่งเป็นหนึ่ง

ในกลไกสำคัญในการขับเคลื่อนอุตสาหกรรม และการพัฒนาทางด้านสาธารณูปโภคพื้นฐานโดยเฉพาะอย่างยิ่งด้านการขนส่งก็ถือเป็นความท้าทายในการพัฒนาอุตสาหกรรมและการเพิ่มศักยภาพในการเป็นฐานการผลิตรถยนต์ของอินโดนีเซียเมื่อต้องแข่งขันกับประเทศไทย

คำสำคัญ: ปัจจัยที่ตั้งทางอุตสาหกรรม อุตสาหกรรมยานยนต์ การผลิตรถยนต์

Abstract

This study utilizes industrial location factors to conduct a comparative analysis of the automotive industry, specifically focusing on the car manufacturing sector, in Thailand and Indonesia, two prominent car production hubs in Southeast Asia. The factors are categorized into country-level and industry-level factors to determine the superior potential between the two countries. The findings indicate that Thailand demonstrates higher potential than Indonesia in terms of country-level factors, suggesting a more favorable investment environment for car manufacturers. Thailand benefits from generous tax incentives, strong government and financial sector support, and well-developed infrastructure, all of which create a conducive environment for automotive industry investment. However, Thailand faces challenges in economic conditions and government stability compared to Indonesia. Indonesia performs well in terms of industry-level factors, attributed to factors such as substantial domestic demand, growing middle-class income, expanding industrial capacity and production, a relatively low number of competitors, and a plentiful and cost-effective workforce. Nevertheless, Indonesia's automotive industry faces a significant challenge due to a shortage of suppliers.

Keywords: industrial location factors, automotive industry, car manufacturing

Introduction

Making a decision on location for the production facility is an increasingly important key consideration for both national and international firms. The optimal location not only offers a competitive advantage but also contributes to the success of an enterprise (MacCarthy & Atthirawong, 2016, p.794). A wide range of factors may potentially influence firms in deciding to build their production facilities overseas. When looking at international location facilities from a broad perspective, there are two main parties involved (Kalantari, 2013, p.3). First, manufacturing firms are trying to find the optimal alternative to locate their facilities. Second, host countries' governments are trying to improve investment packages to attract more foreign investors. Therefore, a set of industrial location factors that are generally used by top organizational decision-makers for facility locations can be beneficial for both of these entries.

Recently, the automotive industry has become a multi-location industry with the pace of this transformation from largely domestic manufacturing to international manufacturing for increasingly global markets. Today's economic crisis, which affected sales and profits, seemed to speed up this transformation as manufacturers found a way to increase their sales revenues and to reduce the operation costs. Canup (2007) stated that automotive assemblers have an advantage which is the ability to have multiple production facilities. This advantage allows them to specialize production plants for specific vehicles or platforms and to locate their plants where they can derive the greatest benefits.

In ASEAN, the automotive market is a dominant industry for both original equipment manufacturers (OEMs) and auto parts suppliers, serving as a major assembly hub. This is driven by the rapidly growing consumer market and comparatively low labor costs. In 2021, ASEAN ranked as the world's seventh-largest automotive producer, with a total production of 3.53 million units (Tham Siew Yean, 2022). Thailand and Indonesia,

played a significant role, contributing around two-thirds of this production. Thailand led in 2021 with approximately 1.68 million units (Thailand Automotive Institute, 2023) followed by Indonesia with 1.12 million units (GAIKINDO, 2023). The production gap between these two hubs is expected to decrease in the coming years. Indonesia aims to become the largest automotive production hub in ASEAN, and it has demonstrated this ambition through trends in vehicle production, policies, infrastructure improvements, and capacity expansion, surpassing Thailand since 2013.

The governments of Thailand and Indonesia need to transform their countries into world-class production hubs for the automotive industry and establish themselves as key players in the ASEAN region. Each country offers significant potential to the industry as well as to attract foreign car manufacturers to invest in the countries. Nonetheless, according to the Industrial location theory. several factors may influence manufacturing firms when planning to build new facilities and deciding to locate their production facilities across national boundaries.

Research objectives

This study aims to address the following research questions:

1. Within the context of location factors specific to the automotive industry, which of the two countries will demonstrate superior potential?
2. With a focus on car manufacturing, which country provides the optimal location for establishing production facilities?

Literature Review

Schmener (1982) studied the key factors affecting manufacturing location decisions, finding a wide range of factors influencing the final decision on location selection. The impact of these factors on location decisions varies depending on the industry in which manufacturing occurs. Location factors should be considered not only

based on industry type but also on the type of new plant and the life cycle of final products. The study of Shigeru and Tadayuki (1995) pointed out that when Japanese manufacturing firms plan to set up new plants overseas, the decision-making on location occurs in two stages, The first stage involves selecting countries, while the second stage involves selecting the specific location within the chosen country. Key consideration at each stage include labor, market, transportation, financial incentives, living conditions, host country incentives, environment, and land availability.

Others who studied industrial location factors include MacCarthy and Atthirawong (2003), and Masood (2007) listed ten important factors in the questionnaires for the study of location analysis and site selection decisions of firms in industrial parks in Dubai. Badri's ten factors included taxes, government, proximity to the raw materials, water system, industrial site, environmental and climate, basic facilities, labor, labor cost, and financial service. The questionnaires were sent to the firm's executives. The results of this study, showed that executives were concerned about the availability of waterways, airways, and pipeline facilities, and climate. Roland and Dierdonck (2002) studied the potential drivers for establishing a plant overseas. They listed seven important location factors that define the location advantage and bring opportunities to manufacturer when setting up plant abroad. The location factors for this study were familiar to Badri's factors but Vereecke and Dierdonck emphasized proximity to the market and competition. MacCarthy and Atthirawong (2003) investigated the importance of major factors and identified the sub-factors that may potentially influence overseas location decisions. The list of major factors and sub-factors is shown in the table below.

Table 1: Major criteria and sub-factors affecting international location decisions.

Factors	sub-factors
Costs	Fixed costs, transportation costs, labor costs, land costs, construction costs, R&D costs, etc.
Labor Characteristics	Quality of labor force, availability of labor force, unemployment rate, labor union, attitude towards work, labor turnover, etc.
Infrastructure	Existence of modes of transportation and quality of utilities.
Proximity to suppliers	Quality of suppliers; competition for suppliers, speed and responsiveness of suppliers, etc.
Proximity to markets/customers	Size of the market, responsiveness, and delivery time to the market.
Proximity to the parent company's facility	close to the parent company
Proximity to competition	Location of competitors
Quality of life	Quality of environment, community attitudes towards industry; climate, schools, churches, hospitals, recreational opportunities; education system; crime rate, and standard of living.
Legal and regulatory framework	Compensation laws; insurance laws; environmental regulations; industrial relations laws; legal systems; requirements for setting up local corporations; etc.
Social and cultural factors	Culture, language, norms
Government and political factors	Government stability, government attitude to inward investment.

Table 1: Major criteria and sub-factors affecting international location decisions. (Cont.)

Factors	sub-factors
Characteristic of the specific location	Availability of space for future expansion, physical conditions, and attitude of locals to a location.
Economics factors	Tax structure; financial incentives; custom duties; tariffs; inflation; strength of currency against US dollar; interest rates/exchange controls and GDP/GNP growth, income per capita.

Source: MacCarthy and Atthirawong (2003)

Sinha (2018) studied facility location decisions in the automotive industry. highlighting that specific location factors can be divided into two groups. First, the dominant factors, derived from competitive priorities, these factors include; favorable labor climate, proximity to customers, proximity to suppliers and markets, and utilities and tax costs. Second, the general location factors include infrastructure availability, labor and wages, capital, government policies, climate conditions, and supporting industry. Decision on the location of a firm in the automotive industry is a long-term investment, therefore, decision-makers must select a site that will perform well not only in the current situation but also in the long term. The study conducted by Levente et al (2019) listed factors similar to those identified by Sinha for firms in the automotive industry when deciding on new locations. Levente et al explored regional-level location factors for car manufacturing companies, reviewing the literature on location decisions in general, particularly in the automotive industry. The results of their analysis show that the most influential location factor for car manufacturing are related to infrastructural development, government policies, and other competitiveness factors, such as the innovation capabilities of the host country, labor market efficiency, and availability of suppliers. The primary objective for car manufacturers in establishing facilities in new

locations is to enhance profitability by increasing sales volumes and reducing production costs. Since every location has unique potential, evaluating each location's characteristics will help decision-makers make the optimal option for the business. Based on the insight from these literature reviews, it can be seen that despite the passage of time, traditional factors such as government policies, infrastructure, suppliers, labor, and markets continue to play important roles in the decision-making process for businesses when selecting a location for their operations.

Research Methodology

To obtain the most precise information about the automotive industry, particularly in the car manufacturing sector in Thailand and Indonesia, this study is divided into four stages. Each stage applied different methods and referred to different studies. *The first stage*, reviewed important industrial location factors from various studies and identified ten crucial industrial location factors. In addition to these ten factors, there is one important factor that should be considered; the government policy regarding the automotive industry. Since this factor is a quantitative factor, and there is no index available for comparison, therefore, it was described in the results section without being compared.

Table 2: Lists of industrial location factors in the automotive industry from various studies.

MacCarthy and Atthirawong (2003)	Masood A. Badri (2008)	Aman R. Sinha (2018)	Levente et al. (2019)
1. Labor	1. Labor	1. Labor	1. Labor
2. Market	2. Market	2. Market	2. Market
3. Infrastructure	3. Transportation	3. Infrastructure	3. Infrastructure

Table 2: Lists of industrial location factors in the automotive industry from various studies. (Cont.)

MacCarthy and Atthirawong (2003)	Masood A. Badri (2008)	Aman R. Sinha (2018)	Levente et al. (2019)
4. Economic environment	4. Economic factors	4. Government policy	4. Quality of institutions
5. Quality of life	5. Community	5. Tax	5. Tax and incentive
6. Government and political	6. Government attitude	6. Capital	6. Macroeconomic stability
7. Legal and regulation	7. Political	7. Supporting industry	7. Suppliers
8. Characteristic of location	8. Competition	8. Climate conditions	8. Technology and innovation
9. Suppliers	9. Suppliers	9. Suppliers	9. Competition
10. Social and culture	10. Tax and incentive	10. Utilities costs	10 Supporting industries
11. Competition	11. Competition		11. Distance to parent company
12. Operation cost	12. Climate		
13. Proximity to parent company's facilities	13. Utilities		

Source: MacCarthy and Atthirawong (2003), Masood A. Badri (2008), Aman R. Sinha (2018), Levente et al. (2019)

Table 3: Compilation of 10 key factors influencing industrial location in this research.

Industrial location factors	Factors
Country level	1. Political Environment 2. Economic environment 3. Financial 4. Tax and incentive 5. Infrastructure 6. Labor
Industry level	1. Industrial production capacity 2. Markets 3. Competition 4. Supply chain

Source: MacCarthy and Atthirawong (2003), Masood A. Badri (2008), Aman R. Sinha (2018), Levente et al. (2019)

The second and third stages grouped the ten key factors into two categories: country-level factors and industry-level factors. Country-level factors or macro-level factors refer to the broad, overarching conditions and characteristics of a country. Industry-level factors or micro-level factors referred to the specific characteristics and conditions within the automotive industry, particularly in the car manufacturing sector. Then specified sub-factors for each of the main factors. *The last stage* collected the data for each factor from reliable sources and compared each factor between the two countries.

Table 4: Comparison factors between Thailand and Indonesia in the automotive industry.

Levels	Factors	Index/data
Country-level	1. Political Environment	- Political stability index - Corruption index Government effective index

Table 4: Comparison factors between Thailand and Indonesia in the automotive industry. (Cont.)

Levels	Factors	Index/data
Country-level	2. Economic environment	- Economic growth rate - Inflation rate - Trade agreements - Ease of doing business
	3. Financial	- Real interest rate - Bank credit to the private sector
	4. Tax and incentive	- Corporate tax - Import/Export duty
	5. Infrastructure	- Hard infrastructure - Country's location - Logistic Performance Index
	6. Labor	- Labor force - Wage rate
Industry-level	1. Industrial capacity	- Car production capacity and quantity
	2. Markets	- Domestic sales - Export
	3. Competition	- Number of manufacturers
	4. Supply chain	- Availability of suppliers

Source: Rakkarn Jirasak (2023)

Research Findings

Government Scheme, Government scheme refers to the government plan and vision related to the automotive industry of each country.

- Thailand

The Thai government plans to become a Southeast Asian production hub for electric vehicles (EVs) and aims to have electric vehicles (EVs) account for 30% of its automotive production by 2030. To achieve this plan, the Thai government has passed several EVs-related regulations to stimulate EVs production and market growth and has launched the national EVs strategic roadmap.

The national EVs strategic roadmap was made up of three-phase action plans. Under phase 1 (2021-2022), the government promoted electric motorcycles and developed infrastructure for the EVs nationwide. From 2023 to 2025 the phase is planned to start, expected to produce 225,000 units of electric cars, 360,000 units of electric motorcycles, and 18,000 units of electric trucks/buses. In the last phase which will run from 2026 to 2030, the government plans to adopt a “30@30” policy to achieve a 30% vehicle ratio of EVs to its total automotive production. In this phase, the government expects to produce 720,000 of EV cars and pick-ups and 675,000 EV motorcycles.

- Indonesia

The Indonesian government is aiming to transform Indonesia into a global production base for car manufacturing and wants to see all the world's major car manufacturers set up their factories in the country as it aims to overcome Thailand as the biggest car production base in the Southeast Asia region. In the long term, the government aims to shift Indonesia into an independent car manufacturing country that delivers completely built units (CBU) of which all components are produced domestically.

In 2013, the Low-Cost Green Car project (so-called LCGC) was introduced to the automotive market[1]. With this project, the government granted tax incentives to those automotive manufacturers that meet the requirements of fuel efficiency targets. This project was one of the government's strategies aimed at curbing costly fuel imports amid rising domestic fuel consumption. The introduction of LCGC was intended to encourage local car buyers to afford their first car and to encourage car makers to use eco-friendly machines as Indonesia has pledged itself to be a net-zero country by 2060[2].

4.1 Country-level factors

4.1.1 Political environment

The political Environment refers to the actions taken by the host country's government, which potentially affect the daily business activities. This factor included three indexes, political stability, control of corruption, and government effectiveness.

Table 5, table 6, and table 7 show the political stability, control of corruption, and government effectiveness indicators in percentile rank (0-100). It indicates the rank of the country among all countries in the world; 100 corresponds to a high rank (low corruption).

[1] Kemenperin.go.id, "menatap kebijakan mobil murah," accessed from http://kemenperin.go.id/artikel/7185/Menatap-Kebijakan-Mobil-Murah, retrieved on 20 November 2022

[2] PwC Indonesia, "Current industry expectation and anticipated challenges for future development" accessed from https://www.pwc.com/id/en/media-centre/press-release/2022.html, retrieved on 20 November 2022

- **Political stability**

Table 5: Political stability indicator in percentile rank of Thailand and Indonesia

Year/Country	2015	2016	2017	2018	2019	2020	2021	2022
Thailand	14.8	14.3	19.0	19.3	27.8	25.9	25.5	29.2
Indonesia	24.3	32.4	28.1	26.4	26.9	28.3	27.4	31.6

Source: The World Bank (2023)

- **Control of corruption**

Table 6: Control of corruption indicator in percentile rank of Thailand and Indonesia

Year/Country	2015	2016	2017	2018	2019	2020	2021	2022
Thailand	35.2	39.0	41.4	39.0	35.7	35.2	34.8	35.8
Indonesia	36.7	38.1	45.2	44.3	35.2	36.7	36.7	37.7

Source: The World Bank (2023)

- **Government effectiveness**

Table 7: Government effectiveness of Thailand and Indonesia

Year/Country	2015	2016	2017	2018	2019	2020	2021	2022
Thailand	63.3	64.3	64.8	61.9	63.3	61.0	59.0	58.0
Indonesia	42.9	50.0	53.3	59.0	59.5	63.8	64.8	66.0

Source: The World Bank (2023)

When considering the last five years (2018-2022) Indonesia was ranked higher than Thailand for all 3 indexes; political stability, control of corruption, and government effectiveness. This indicated that the political environment or the quality of institutions of Indonesia seems to be more stable and has higher quality than those of Thailand.

4.1.2 Economic environment

The economic environment refers to the external factors of the industry that will influence the operation of firms and either directly or indirectly affect the entire economy of the country. In this study, four economic factors will be studied: economic growth rate, inflation rate, number of FTAs, and ease of doing business.

Table 8: Economic environment factors of Thailand and Indonesia in 2022

Index/Country	Economic growth rate	Inflation rate	FTAs (Agreements)	Ease of doing business (World ranking)
Thailand	2.3%	0.93%	39	21
Indonesia	4.4%	4.15%	45	73

Source: ASEAN Statistical Yearbook (2023), Asian Development Bank (2023)

In 2022, Indonesia outpaced Thailand in economic growth, recording a rate of 4.4%, and has 41 Free Trade Agreements with trade partners worldwide. However, it also faced a high inflation rate of 4.15%, which could impede investment and weaken purchasing power. Thailand has made significant progress in simplifying business establishment processes and introducing an efficient online registration system that reduces time, costs, and paperwork. While Indonesia has taken steps to streamline its business registration, it still contends with a more bureaucratic system compared to some other regions.

4.1.3 Financial

The real interest rate and bank credit to the private sector are considered as financial factors for this study. Bank credit to the private sector involves financial

resources provided to the private sector by depository corporations, excluding central banks.

Indonesia is contending not only with a high inflation rate but also with elevated interest rates. Between 2012 and 2021, the average interest rate in Indonesia was 4.59%, while in Thailand, it stood at 2.81%. A higher real interest rate can have diverse economic consequences, including increased borrowing costs, a preference among consumers to save to accrue interest payments rather than spend, and a likelihood of reduced consumption and investment in the economy.

Table 9: Real interest and bank credit to the private sector in the percentage of GDP of Thailand and Indonesia in 2022

Index/Country	Real interest rate	Bank credit to private sector (% of GDP)
Thailand	2.81	112
Indonesia	4.59	31.9

Source: The World Bank (2023)

4.1.4 Tax and Incentive

Tax incentive refers to deductions, exemptions, or exclusions from money owed in taxes to the government. Tax incentives are offered by the government to help individuals or businesses do certain activities. To develop the country's competitiveness both Thai and Indonesian governments offer some tax and non-tax incentives to encourage foreign investment in the automotive industry especially for R&D as both countries aim to turn their car manufacturing sector from internal combustion engine (ICE) to electric vehicle (EV), targeting on Chinses and Japanese carmakers.

To attract more foreign investors, Thailand offers 8 years corporate tax exemption for R&D activities and auto parts producing within automotive industry while Indonesia offers 300% of the total costs for R&D activity as a corporate tax exemption

and offers 6 years tax exemption in auto parts manufacturing activities. Some other general incentives available to foreign investors are as follows;

Table 10: Tax and non-tax incentives offered by the Thai government in 2022

Tax incentives – eligible activities	Incentives	
	Corporate Income Tax exemption	Exemption of import duty
1. Research and development in the automotive industry	8 years	Yes
2. Manufacture of General Automotive	No	Yes
3. Assembling of Engines	3 years	Yes
4. Manufacture of Automotive Parts	8 years	Yes
5. Manufacture of Automotive Engines	5 Years	Yes

Source: Board of Investment of Thailand (2023)

Table 11: Tax and non-tax incentives offered by the Indonesian government in 2022

Tax incentives – eligible activities	Incentives	
	Corporate Income Tax exemption	Exemption of import duty
1. Research and development in the automotive industry	300% of the total costs for research activities	Yes
2. Manufacture of General Automotive	30% of investment value (reduction for 6 years, 5% each year)	Yes
3. Assembling of Engines		Yes
4. Manufacture of Automotive Parts		Yes
5. Manufacture of Automotive Engines		Yes

Source: Investment Coordinating Board of Indonesia (2019)

Thailand and Indonesia tried to attract foreign investment in the automotive sector and should be noted that their incentive programs could develop over time to compete on the global stage.

4.1.5 Infrastructure

- ***Thailand***

Since mid-2014, as Thailand's political environment stabilized, the government swiftly focused on reinvigorating economic growth. To address stalled infrastructure projects, they prioritized increasing public investment in infrastructure. In July 2014, they approved the Infrastructure Development Plan 2015-2022 with a budget of US$75 billion (THB 2.4 trillion), allocating over 70% to transform Thailand's transportation system. This includes expanding the railway network to reduce reliance on road transportation, a key part of enhancing transport efficiency.

- ***Indonesia***

Indonesia's government, under President Joko Widodo's leadership, is accelerating its infrastructure development program, a key feature of his administration, despite budget constraints. The aim is to build ports, roads, railways, and more to drive economic growth. Projects include the Trans Java toll network, a high-speed Jakarta-Bandung railway, and a 720-kilometer Jakarta-Surabaya railway, with Japanese investors involved in the latter.

Table 12: A comparison of hard infrastructure quality between Thailand and Indonesia

Index	Ranking in the world	
	Thailand	Indonesia
Transportation (in 2019)	56	59
1. Road quality	56	59
Transportation (in 2019)	56	59
2. Railroad infrastructure quality	75	18
3. Port infrastructure quality	73	64
4. Air transport quality	53	57
Energy (in 2021)		
1. Electricity production capacity	26	19
Communication (in 2016)		
1. Internet bandwidth and mobile network	48	112
Logistic Performance Index (in 2023)	34	61
Innovation, Research, and Development of Technology	43	74

Source: The World Bank (2023), The Global Economy Data Report (2023)

When evaluating the geographical positioning of each country, Thailand possesses a distinctive advantage due to its mainland location situated at the heart of the ASEAN region. This strategic placement grants it convenient access to all major ports within the region. Conversely, Indonesia, being an island nation without land borders with neighboring countries, may face transportation and logistical cost challenges. Indonesia's logistic development has faced challenges due to its geographical diversity and decentralized governance structure. This has led to disparities in infrastructure quality between different regions.

4.1.6 Labor

One crucial aspect a company considers when establishing a new facility abroad is its workforce. In this study, the labor force, skilled labor availability, and wage rates will be examined.

Table 13: Labor force and wage rate of Thailand and Indonesia in 2022

Index	Thailand	Indonesia
Labor force	40,237,746	137,260,837
Number of workforces in the automotive industry[3]	890,000	505,000
Average education level of labor in the automotive industry	Vocational	Vocational
Minimum wage rate in the automotive industry (US$)	417.19/month	367.10/month

Source: The World Bank (2023), Investment Coordinating Board of Indonesia, Board of Investment of Thailand (2023)

Thailand is experiencing a diminishment of its competitive advantages within the realm of manufacturing sectors, primarily attributable to an escalation in wage rates, the minimum wage in the automotive industry in Thailand in 2022 was US$ 417.19 per month. Conversely, Indonesia has emerged as an increasingly attractive destination for labor-intensive manufacturing enterprises, owing to its substantial labor force and cost-effective labor resources, the minimum wage rate in the automotive industry in Indonesia in 2022 was US$ 367.10 per month. Labor costs constitute a significant proportion of the manufacturing industry. Lower wages enable the producers to produce products at a lower cost, enhancing their competitiveness in the market by offering more competitively priced products. This could potentially position Indonesia as a more cost-

[3] Employment in car manufacturing industry and Tier 1,2 and 3 Auto parts industry

competitive location compared to Thailand in the automotive industry, especially in the car manufacturing sector.

4.2 Industry-level factor

4.2.1 Industrial capacity

In 2022, Indonesia, the second-largest car production center in Southeast Asia and 17th in global with the total production capacity of 2.35 million units per year, has traditionally been overshadowed by Thailand which ranked 11th in the world with its production capacity of 4.1 million units per year (BOI, 2022). Nevertheless, with its current robust growth, Indonesia is poised to expand its production capacity significantly, potentially surpassing Thailand to become the largest automotive production hub in Southeast Asia shortly.

Table 14: Number of car assemblers and total production capacity, as of 2022

Country/Categories	Thailand	Indonesia
Car assembles	30 plants (21 firms)	22 plants (22 firms)
Total production capacity	4.1 million units/years	2.35 million units/year
No. of Car production	1.88 million units	1.47 million units
The manufacturing capability of the leading assembly	Toyota Motor Thailand (760,000 units/year)	Toyota Motor Indonesia (661,000 units/years)
Product champion	Commercial cars (1-ton- pick-up)	Passenger cars (SUV, MPV)

Source: GAIKINDO (2023), The Federation of Thai Industry (2023)

In 2019, before the onset of the COVID-19 pandemic, Indonesia had a production capacity of roughly 1.3 million units, while Thailand's capacity was at 2.0

million units. In 2022, following the COVID-19 pandemic, Indonesia produced a total of 1.47 million cars, placing it 12th in global car production rankings. In comparison, Thailand produced 1.88 million cars, securing the 11th spot worldwide. Looking at both the rankings and total car production figures, as shown in figure 1, it becomes evident that the production capacity gap between Thailand and Indonesia has significantly narrowed.

In 2022, the distribution of car production in Indonesia and Thailand was 86.2% for passenger cars (e.g., SUV, MPV) and 17.4% for commercial cars in Indonesia, while Thailand had 31.5% for passenger cars and 68.5% for commercial cars (e.g., 1-ton pickup).

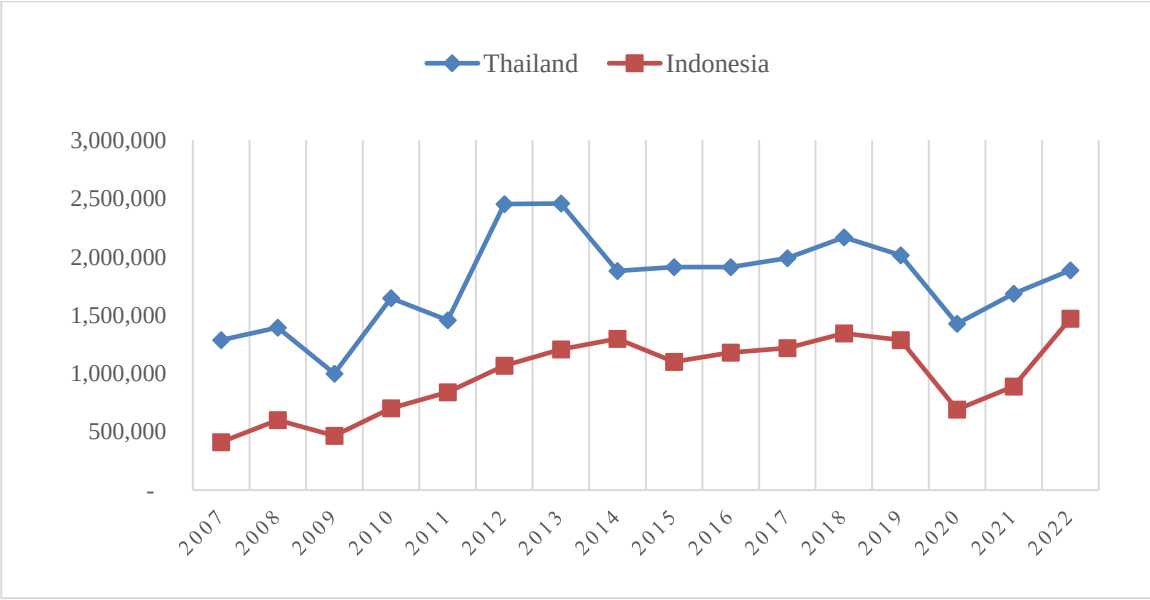

Figure 1: Total car production in Thailand and Indonesia

Source: GAIKINDO (2023), Thailand Automotive Institute (2023)

4.2.2 Market

This factor considered both domestic sales and export volumes. Thailand and Indonesia exhibited distinct market structures in their automotive industries, with

Thailand primarily focused on international markets and Indonesia catering to the domestic market, as evident in Tables 15 and 16. In 2022, Thailand produced a total of 1,883,515 units of cars. Out of this output, 1,000,256 units, accounting for 55% of the total, were exported, while 849,388 units, or 45% of the total, were sold domestically. In contrast, Indonesia's total car production for the same year amounted to 1,470,146 units. Out of this production, 1,048,040 units, constituting 71% of the total, were intended for the domestic market, and 473,602 units, equivalent to 29% of the total, were exported.

Table 15: Car production, sales, and export, *(in 1,000 units)*

Year	Thailand			Indonesia		
	Total production	Domestic sales	Export	Total production	Domestic sales	Export
2015	1,913	799.63	1,205	1,099	1,013	208
2016	1,944	850.66	1,189	1,178	1,063	194
2017	1,989	871.65	1,140	1,218	1,077	231
2018	2,168	1,041.71	1,141	1,344	1,151	265
2019	2,014	1,007.55	1,054	1,287	1,030	332
2020	1,427	792.15	736	690	532	232
2021	1,686	754.25	959	890	887	295
2022	1,883	849.39	1,000	1,470	1,048	473

Source: GAIKINDO (2023), Thailand Automotive Institute (2023)

Table 16: Car production and the proportion of sales and export volumes in 2022.

	Thailand	Indonesia
Car production	1,883,515 units	1,470,146 units
Product Champion	1-ton-pick-up	SUV, MPV
Domestic sales	849,388 (45%)	1,048,040 (more than 71%)
Car export	1,000,256 (55%)	473,602 (29%)
Major Export destinations	ASEAN, Australia Middle East, and Japan	ASEAN, Japan, Middle East, and South America
Top production by brand	Toyota	Toyota
Top export by brand	Toyota	Daihatsu

Source: GAIKINDO (2023), Thailand Automotive Institute (2023)

4.2.3 Competition

Thailand's automotive sector contributed approximately 6.4% to GDP in 2019 and employed over 550,000 people. The country hosts most major global car brands, with Japanese automakers leading the market, followed by Chinese companies. In 2022, there were 21 car manufacturers with 30 plants operating in Thailand. Toyota Motor Thailand is the largest manufacturer, with a production capacity of 760,000 units per year, followed by Mitsubishi Motors Thailand with a capacity of 420,000 units per year. In terms of domestic sales, Toyota leads with a 34% market share, followed by Isuzu at 25%.

Indonesia's automotive industry is primarily controlled by large conglomerates involved in producing CBUs, CKDs, and components/parts. Japanese companies, with their long-standing presence in Indonesia, hold approximately 90% of the market for domestic passenger cars and commercial vehicle sales. In 2021, 22 car

assemblers operated in the country, with PT ASTRA International, a major Indonesian conglomerate, leading the market. PT ASTRA has exclusive production and distribution rights for various brands, while Indomobil Group is involved with Suzuki and Nissan. For domestic sales, Toyota is the market leader with a 31.6% share, followed by Daihatsu at 19.3% and Honda at 12.5%.

Table 17: Share of domestic sales in 2022.

Thailand			Indonesia		
Brands	*Market share (%)*	*Domestic sales (units)*	*Brands*	*Market share (%)*	*Domestic sales (units)*
Toyota	34.0	288,809	Toyota	31.6	331,410
Isuzu	25.0	212,491	Daihatsu	19.3	202,665
Honda	9.8	82,842	Honda	12.5	131,280
Mitsubishi	5.9	50,385	Mitsubishi	9.5	99,051
Ford	5.1	43,628	Suzuki	8.6	90,408

Source: GAIKINDO (2023), Thailand Automotive Institute (2023)

4.2.4 Supply chain

A supply chain encompasses the entire system of producing and delivering a product or service, starting from the initial stage of sourcing raw materials to the final delivery of the product or service to end-users. For this study, a supply chain essentially represents a sequence of connections between automotive manufacturers and suppliers in each tier.

Suppliers are a critical factor for every business, and in the automotive industry, suppliers are categorized within their supply chain as Tier 1, Tier 2, and Tier 3. Figure 2 illustrates the general structure of the automotive industry.

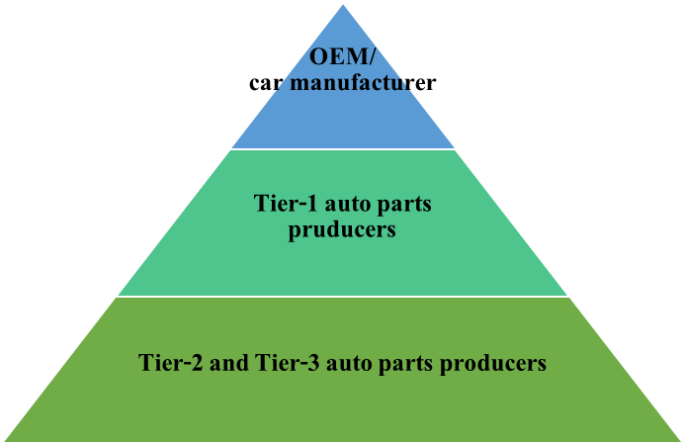

Figure 2: structure of the automotive industry.

Source: ASEAN UP (2022)

In the automotive industry, there are three tiers of suppliers. Tier 1 suppliers provide parts directly to car manufacturers. Tier 2 suppliers provide components to Tier 1 suppliers, and Tier 3 suppliers supply raw materials and smaller parts to Tier 2 suppliers. Effective interactions between these tiers are vital for a smooth supply chain, as issues at one tier can impact the other tiers, potentially affecting automotive production.

In Thailand, the automotive parts and components sector is vital to the success of the automotive industry. The Thailand Automotive Institute reported that in 2021, around 2,200 automotive suppliers operated in the country. Tier 1 suppliers, primarily producing high-tech automotive parts, are mostly non-local, with Japanese firms like DENSO, TOYOTA BOSHOKU, YAZAKI, and AISIN leading the way. Notably, non-Japanese Tier 1 suppliers from Europe, the US, and China, such as Robert Bosch, Magna International, Continental, and Johnson, have recently established operations in Thailand. There are a total of 720 Tier-1 suppliers, with the top 100 global OEMs' suppliers also present. Tier 2 and Tier 3 suppliers exceed 1,500 firms, with most being

local companies. Thailand boasts a robust supply chain network, supporting upper-tier automotive production.

Thailand		Indonesia
30 plants with over 100,000 workers		22 plants with over 75,000 workers
720 companies with over 450,000 workers (in Tier1,2)		550 companies with over 430,000 workers (in Tier 1,2)
Less than 1,500 companies		Less than 1,000 companies

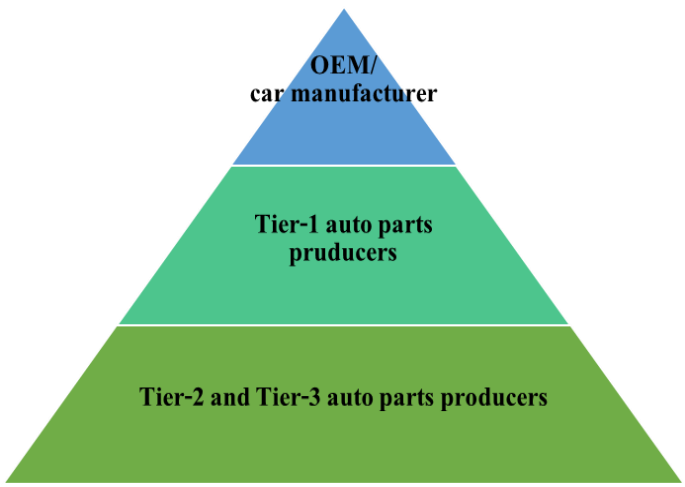

Figure 3: Structure of Thailand and Indonesia's automotive industry.

Source: Siwage and Agus (2021), Thailand Automotive Association (2023), Krungsri Research (2021)

In Indonesia, the growth of the middle-class population has driven rapid expansion in the automotive industry, supported by stable economic growth and government policies, especially during the commodity boom period (2006–15). In 2021, there were approximately 550 Tier-1 automotive suppliers, with most being local companies like PT AT Indonesia, PT Astra Daihatsu Motors, PT Toyota MFG, and PT Dharma Polimental. Tier 2 and Tier 3 suppliers exceeded 1,000 companies, with the

majority also being local firms such as PT Gajah Tunggal TBK, PT Multistrada Arah Sarana TBK, ASTRA Otoparts, and PT Indo Kordsa.

The automotive industry in Thailand and Indonesia is growing stronger, driven by the rapid growth of middle-class income and government policies supporting the automotive industry. However, the structure of automotive suppliers differs between the two countries. In Thailand, the majority of Tier 1 suppliers are foreign companies, while in Indonesia, the majority are local firms.

Table 18: Location of car manufacturers and auto parts firms.

Countries	Locations
Thailand	1. Bangkok 2. Ayudhaya 3. Chonburi 4. Pathumthani 5. Samutprakarn 6. Prachinburi 7. Chachoengsao 8. Rayong
Indonesia	1. West Java (Center of the automotive industry) 2. Jakarta 3. Banten 4. East Java 5. Central Java

Source: Thailand automotive institute (2023), Indonesian Investment Center (2022)

The favorable locations for the car and car components manufacturing firms in Thailand and Indonesia, both countries exhibit similar characteristics by concentrating their manufacturing activities in the same area, often close to major shipping ports. In Thailand, the focal point is predominantly in the central and eastern regions, strategically situated near the significant Laem Chabang Port. Similarly, in Indonesia, the concentration is observed in the Java Island area, strategically located near Jakarta's Tanjung Priok Port, the largest port in the country.

Conclusion

This study has conducted an extensive analysis of the automotive industrial environments, particularly in the car manufacturing sector in both Thailand and Indonesia. It consists of ten industrial location factors and one additional supporting

factor that is deemed important for the automotive industry. This study aims to analyze and compare the potential of both countries.

The study has found that Thailand has a higher potential than Indonesia in terms of country-level factors. This indicates that, in general, Thailand provides a better environment for automotive manufacturers and automotive-related firms to invest in due to generous tax incentives, a strong government scheme, robust support from the financial sector, and high-quality hard infrastructure. On the other hand, Thailand performs less well in industry-level conditions as well as the political environment compared to Indonesia. This is mainly because Indonesia has a large domestic demand, a rising middle-class income, an increase in industrial capacity and production, and fewer competitors in the current Indonesian market and importantly, Indonesia has an abundant and cost-effective workforce.

Table 19: Advantages and disadvantages of the automotive industry in Thailand and Indonesia.

Countries	Advantages	Disadvantage
Thailand	- *Infrastructure*; Thailand has consistently improved its physical infrastructure, especially for logistic infrastructure. - *Tax and incentive*; offers generous tax incentives to foreign car manufacturers.	- *Market*; insufficient domestic demand compares to that of Indonesia. It focuses on exports that might be affected by the world economic crisis, war, or pandemic. - *Competition*: high competition within the industry due to a large number of manufacturers.

Table 19: Advantages and disadvantages of the automotive industry in Thailand and Indonesia. (Cont.)

Countries	Advantages	Disadvantage
Thailand	- *Economic environment*; low inflation rate, has significant progress in simplifying business establishment processes. - *Financial*; low real interest rate, well-developed financial system - *Government policy*; strong support from the government to encourage FDI and the development of the industry. - *Suppliers*; more than 60% of the world's largest auto part suppliers have their production hub in Thailand. - *Industrial capacity*; has high production capacity and became the largest car manufacturer in Southeast Asia.	- *Political environment*; political unrest and higher corruption rate. Political unrest can have significant and negative effects on FDI in a country. - *Labor*; high wage rate, insufficient labor force. - *Economic environment*; low economic growth rate which might affect to the purchasing power. Has fewer FTAs than Indonesia, and Thailand may have restricted access to the markets of countries with which it does not have FTAs. This potentially limited opportunities for exports and economic growth.
Indonesia	- *Marker*; huge domestic demand, a rise in middle-class income. - *Labor*; has a large labor force, and low labor cost.	- *Infrastructure*; at the moment the status of physical infrastructure development in logistics is less developed than that of Thailand.

Table 19: Advantages and disadvantages of the automotive industry in Thailand and Indonesia. (Cont.)

Countries	Advantages	Disadvantage
Indonesia	- *Production capacity*; has an increase in production capacity - *Political environment*; has a stable and efficient government - *Economic environment*; a high GDP growth rate leads to a rise in GDP per capita. Has 48 FTAs which are beneficial to exports. - *Tax and incentive*; offers generous tax incentives to attract FDI in the automotive industry, particularly in the car manufacturing sector. - *Infrastructure*; the government has planned to develop its physical infrastructure, especially for logistics. - *Competition*; there are relatively few manufacturers in the car manufacturing sector.	- *Economic environment*; a high inflation rate which might affect to the purchasing power. Has a low Ease of Doing Business score which means that foreign investors may face more obstacles and challenges when setting up business in the country. - *Supplier*; relatively fewer suppliers than those of Thailand and the majority of the suppliers are local firms. - *Industrial capacity*; the production capacity is still lower than the production capacity of Thailand. - *Labor*; while boasting a substantial labor market, Indonesia faces a shortage of skilled workers in the automotive industry.

Source: Rakkarn Jirasak (2023)

Thailand and Indonesia are both involved in the ASEAN, which aims to increase trade flow among its members, it is important to note that in recent years, Indonesia has lagged behind Thailand in terms of providing greater infrastructure for the automotive industry and more attractive tax incentives. In the automotive industry, the relationship between these two countries is often described as competitive, but it should instead be characterized as a partnership.

In terms of production and market, Thailand primarily focuses on the production of commercial vehicles, with 55% of the total production is exported. At the same time, Indonesia places a stronger emphasis on passenger cars, with 72% of the total production went to domestic sales. By 2022, Indonesia had become one of Thailand's closest trade partners in this industry. Thailand excels in supply chain aspects, such as suppliers and supporting industries. In contrast, Indonesia has a competitive edge in production due to its abundant and cost-effective workforce and significant domestic demand. In the long term, the creation of the ASEAN Economic Community (AEC) will further enhance the transfer of goods and services between ASEAN partners, potentially transforming the ASEAN region into one of the highest-growth markets for both automotive production and consumption in Asia.

To become world-class car manufacturing country, both Thailand and Indonesia need to expedite enhancements in their economic and infrastructure frameworks. In Thailand, a crucial step involves increasing the workforce within the industrial sector. Achieving government stability is paramount for increasing foreign investments. Simultaneously, fostering economic growth is necessary, resulting in increased income levels and purchasing power. In Indonesia, in addition to improving infrastructure and updating investment regulations and processes, there must be a concerted effort to improve the skill sets of labor in the automotive industry. Creating incentives for global suppliers to establish facilities within the country is equally vital, as these suppliers play a pivotal role in advancing the automotive industry and attracting global car

manufacturers. Importantly, there is a noticeable shift in the car production trend, transitioning from internal combustion engines (ICE) to electric vehicles (EVs). Therefore, in addition to improving and developing various factors, the imperative for Thailand and Indonesia lies in the advancement of technology, fostering innovation, and investing in human resources. This strategic focus is vital to not only keep pace with the evolving industry landscape but also to enhance competitiveness and position both countries as world-leading car manufacturing hubs.

References

ASEAN Secretariat. (2023). *ASEAN Statistical Yearbook 2023*. https://www.aseanstats.org/wp-content/uploads/2023/12/ASYB-2023-v1.pdf

Asean Up. (2022). Thailand automotive industry overview [Market analysis]. http://aseanup.com/thailand-automotive-industry-overview/

Asian Development Bank. (2023). *FTA by economy*. https://aric.adb.org/fta-country

BOI. (2015). *Thailand: Global Green Automotive Production Hub*. https://www.slideshare.net/boinyc/thailand-global-green-automotive-production-base

Board of Investment of Thailand. (2022). *Thailand Automotive Industry Situation from ICE to Next generation Vehicle.* https://www.boi.go.th/upload/content/20230706%20EN%20TAI_.pdf

Board of Investment of Thailand. (2023). *Electric vehicle industry.* https://www.boi.go.th/upload/content/Smart_EV.pdf

Entrepreneur. (2022). *How to Find a Manufacturer or Supplier.* https://www.entrepreneur.com/article/66028

GAIKINDO. (2015). *Indonesia's automotive industry: Incentive for the automotive industry*. http://www.gaikindo.or.id/en/gaikindo-ingin-agar-presiden-terbitkan-insentif-bagi-industri-otomotif/

Gaikindo. (2023). *Indonesian automotive data*. https://www.gaikindo.or.id/indonesian-automobile-industry-data/

Global Economy. (2021). *Political stability report.* http://www.theglobaleconomy.com

Hurley, P.H. (1959). The Automotive Industry: A Study in Industrial Location. Land Economics*. Journal of Planning, Housing, and Public Utilities*. *35*(1). 1-14.

Indonesia Investment Center. (2022). *Automotive Manufacturing of Indonesia*. http://www.indonesiainvestments.com/business/industries-sectors/automotive-industry/item6047

Investment Coordinating Board of Indonesia. (2019). *Government policy on future automotive technology*. https://www.gaikindo.or.id/wp-content/uploads/2019/07/01.-Dirjen-Ilmate_-Sesi-Siang-GOVERNMENT-POLICY-ON-FUTURE-AUTOMOTIVE-TECHNOLOGY-GIIAS-Conference-240719.pdf

Ipsos. (2019). *Opportunities & Challenges in Indonesia's Automotive Industry*. https://www.ipsos.com/en/opportunities-and-challenges-indonesias-automotive-industry

Julius, S., & Nunnenkamp, P. (2002). *Globalization of the automotive industry traditional location under pressure?* [Kiel Working Paper No. 1093]. Keil Institute of World Economics.

Kalantari, Amir Hossein. (2013). *Facility Location Selection for Global Manufacturing*. [Master of Science in Engineering]. The University of Wisconsin-Milwaukee.

Kemenperin. (2013). *menatap kebijakan mobil murah*. http://kemenperin.go.id/artikel/7185/Menatap-Kebijakan-Mobil-Murah

KPMG. (2014). *Indonesia's Automotive Industry*. https://www.kpmg.com

Krungsri Research. (2021). *Industry Outlook 2019-2021: Auto Parts Industry*. https://www.krungsri.com/en/research/industry/industry-outlook/hi-tech-industries/auto-parts/io/auto-parts-19

Levente, S., Csiki, Otto., & Horvath, R. (2019). A Study of Regional-Level Location Factors of Car Manufacturing Companies in the EU. *Acta Oeconomica. 69*. 13-39.

Lloy, R. (1945). Two Approaches to Industrial Location Analysis. *The Journal of Land & Public Utility Economics. 21*(1). 23-33.

MacCarthy, B., & Arttjirawong, W. (2003). Factors affecting location decisions in international operations – a Delphi study. *International Journal of Operations & Production Management. 23*(1). 794-818.

MacCormack, A.D., Lawrence J.N., & Donal, R. (1994). The new dynamics of global manufacturing site location. Sloan Management. *MIT Sloan Management Review*. *35*(4). 69-80.

Malcolm, K. (1921). The Annals of the American Academy of Political and Social Science. *The Revival of American Business*. *97*. 83-92.

Mark, W. (2013). *Special report on Site location factors for automotive suppliers in the US*. http://businessfacilities.com/2013/07/special-report-site-location-factors-for-automotive-suppliers

Masood, B. (2007). Dimensions of Industrial Location Factors: Review and Exploration. *Journal of Business and Public Affairs. 1*(2). 1-27.

Masood, B. (1995). Decision support models for the location of firms in industrial sites. *International Journal of Operations & Production Management*. *15*. 50-62.

Nikkei Asian Review. (2016). *Thailand targets competitive infrastructure with $50bn plan.* http://asia.nikkei.com/Politics-Economy/Policy-Politics/Thailand-targets-competitive-infrastructure-with-50bn-plan

Otto, C., Reka, H., & Levente, S., (2019). A Study of Regional-level Location Factors of Car Manufacturing companies in the EU. *Acta Oeconomica*. *69*(S2). 13-39.

PwC Indonesia. (2022). *Current industry expectation and anticipated challenges for future development.* https://www.pwc.com/id/en/media-centre/press-release/2022.html

Raj, S., & Aman. (2018). Facility location decisions in the automobile industry. *International Research Journal of Engineering and Technology*. *5*(5). 730-735.

Roland, A. V., & Dierdonck, Van. (2002). The strategic role of the plant: testing Ferdows's model. *International Journal of Operations & Production Management*. *22*. 492-514.

Schmenne, Roger W. r. (1994). Service Firm Location Decisions: Some Midwestern Evidence. *International Journal of Service Industry Management. 5*(3). 35-56.

Shigeru, Y., & Tadayuki, M. (1995). Design of a decision support system for oversea location in the EC. *International Journal of Production Economics.*41. 411-418.

Siwage, N., & Agus, H. (2021). Indonesia's Automotive Industry Recent Trends and Challenges. *Journal of Southeast Asian Economies*. *38*(2). 166-186.

Svitlana, Checher. (2008). *Pre-study of the important factors for the factory Start-Up abroad* [Master of Production and Logistics Management Thesis]. Institution for Innovation, Design and Production Development, Malardalen University.

Techakanont, Kriengkrai. (2011). *Thailand Automotive Parts Industry" in Intermediate Goods Trade in East Asia: Economic Deepening Through FTAs/EPAs*. [BRC Research Report No.5]. Bangkok Research Center-IDE-JTRO.

Thailand Automotive Institute. (2012). *Master Plan for Automotive Industry 2012-2016.* https://www.thaiauto.or.th/2012/backoffice/file_upload/research/11125561430391.pdf

Thai Automotive Institute. (2023). *Thailand auto manufacturer information.* https://data.thaiauto.or.th/auto/auto-manufacturer/auto-value-chain/auto-manufacturer- 19.html

Thai Automotive Institute. (2023). *Automotive data*. https://data.thaiauto.or.th/

Tham, S, Y. (2022). Mapping the Surge in EV Production in Southeast Asia. In *ISEAS Perspective 2022*. https://www.iseas.edu.sg/wp-content/uploads/2022/10/ISEAS_Perspective_2022_112.pdf

The Federation of Thai Industry. (2023). *Thai automotive statistics 2023*. https://fti.or.th/automotivestatistics_th/

The World Bank. (2023). *World Governance Indicators*. http://lpi.worldbank.org/

World Economic Forum. (2023). *Human Capital Index*. https://datacatalog.worldbank.org/search/dataset/0038030/Human-Capital-Index