Thailand Automotive Industry: Development and Challenges

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Abstract

Thailand's automotive industry began in the early 1960s and has since become the largest automotive producer in Southeast Asia. The growth of Thailand's automotive industry is primarily attributed to foreign direct investments (FDI) and the relocation of production facilities from Japan. Thailand's investment policies, including strategies like tax reductions, have successfully attracted foreign investments.

The automotive industry is undergoing a significant transformation worldwide, with a growing emphasis on electric vehicles (EVs) and advanced technologies. As a result, tax reduction policies may no longer be sufficient to support Thailand's automotive industrial development. Instead, it is crucial to focus on innovation and technology to adapt to this changing landscape. To maintain its competitive edge in the automotive industry, the Thai government needs to reconsider its investment and industry development policies in light of this transition.

This paper examines the recent developments in Thailand's automotive industry, with a specific emphasis on the car sector. It analyzes the policies introduced and implemented in response to global trends. Results, the success of Thailand's ambitious EV program depends on how these challenges—high competition in the EV market in the region, lack of its own production technology, scarcity of local minerals for battery production, and unclear regulations—can be overcome.

Keywords: Automotive parts and Components, Electric Vehicles, Thailand EVs project, Thailand Automotive Industry

Introduction

Thailand's automotive industry began in the early 1960s. With its strategic location and robust government support, Thailand has since become the largest automotive producer in Southeast Asia and was ranked 11th in the world and is called the Detroit of Asia (Thailand Board of Investment, 2022). The automotive industry has long served as one of Thailand's pivotal industries, the rise of the automotive industry not only boots Thailand's economy but also plays an important role in fostering infrastructure development. In 2022, Thailand's automotive sector contributed approximately 10.0% to GDP and employed over 550,000 people. The country hosts most major global car brands, with Japanese car manufacturers leading the market, followed by Chinese carmakers. Recently, there were 21 car manufacturers with 30 plants operating in Thailand (Krungsri Research, 2023). Toyota Motor Thailand is the largest car 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 with 288,809 units, followed by Isuzu at 25% with 212,491 units (Thailand Automotive Institute, 2023).

In the past, the automotive industry and auto parts industry played a significant role in boosting Thailand's economy. Its growth primarily stemmed from direct investments (FDI) and the relocation of production facilities from Japan. This was, in part, a result of Thailand's investment policies, which included strategies like tax reductions to attract foreign investments, trade liberalization, and incentive policies, and the establishment of special economic zones (Natsuda K. and Thoburn J., 2011). However, it is worth noting that the relocation of production bases to Thailand during that period occurred after the Plaza Accord Agreement[1] in 1985, which strengthened the Japanese Yen and led to Japan losing its competitiveness, prompting the shift of production bases to Thailand (KKP Research, 2022).

When the global automotive industry is transitioning into a new era, particularly with the shift towards electric vehicles (EVs) with advanced technologies, tax reduction policies may no longer be effective for Thailand's automotive industrial development. Instead, innovation and technology must be developed to adapt to this transformation. This transformation towards electric vehicles (EVs) could potentially hinder Thailand from becoming a production hub for electric vehicles in the region, much like it has been for internal combustion engine vehicles in the past.

[1] *The Plaza Accord, signed in 1985, was an agreement between the G-5 countries, which included France, Germany, the United States, the United Kingdom, and Japan. Its aim was to influence exchange rates by devaluing the U.S. dollar in comparison to the Japanese yen and the German Deutsche mark.*

This paper aims to examine the recent development of the Thailand automotive sector, with a specific emphasis on the car industry. It examines the policies that have been introduced and implemented to develop the industry in response to global trends like the growing popularity of electric cars (EVs) and gain a competitive advantage in the region. It explores the impact of the industrial policies on the transformation of the automotive industry, as well as how private sectors respond to these policies. This paper also provides an overview of the automotive industry in Thailand. It discusses some of the general trends in production, sales, exports, supply chains and the competition within the industry and in the region. The final section concludes with a discussion on the challenges encountered by the automotive industry, especially under the impact of the Thailand Industry 4.0 framework. The data and related information for this study were collected from reliable sources, including government agencies, private firms, and academic papers.

An overview of the automotive industry in Thailand

1. Industrial upgrading in Thailand's automotive industry

In the last decade, there has been a shift in the geographical location of automotive production, with a move from developed to developing countries. This change is driven by the quest for lower production costs and a response to the increasing local demand (Athukorala P. and Archanun K., 2010: Natsuda K. and Thoburn J., 2011). The Thai automotive industry commenced its journey in the last six decades, with the repair of imported completely built-up vehicles (CBU) and the establishment of the first automobile assembly plant in 1961 (Thailand Automotive Institute, 2022), supported by a government that recognized the industry's significance in economic development. The automotive sector is renowned for its capacity to connect with various other industries. Initially, the government pursued a policy focused on domestic production to reduce imports (Import Substitution Industrialization-ISI), thereby fostering economic growth and advancements in labor skills and technology. The Thai government offered investment packages to attract foreign direct investment (FDI) in the automotive industry, providing both tax and non-tax incentives, including corporate income tax exemptions, import duty exemptions, and land ownership rights.

In the first stage, the industry began with the assembly of imported completely knock-down (CKD) kits by foreign carmakers. This was followed by the localization of component production, starting with the original equipment manufacturing (OEM) of lower value-added parts in the 1960s and progressing to higher value-added parts with higher local procurement in the 1980s and 1990s (Natsuda K., and Thoburn J., 2011: Patarapong I., 2021).

Since the 2000s, foreign car manufacturers have been increasingly using Thailand for advanced technological operations, including advanced process engineering, product development and design as well as established regional research center. In 2022, there were 21 carmakers with 30 plants operating in Thailand with total production capacity of 4.1 million units per year (Thailand Automotive Institute, 2023). 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%.

Table 1 Industrial upgrading and developing focus in Thailand's automotive industry

Stage	Production Activity
1	Repairing imported completely built-up (CBU) vehicles
2	Assembling of imported completely knock down (CDK) kits
3	Producing automotive components, based on original equipment manufacturing (OEM) of lower value-added parts
4	Producing automotive components, based on original equipment manufacturing (OEM) of higher value-added parts
5	Establishing research and development center (R&D). Shifting production towards Electric Vehicles (EVs)
Year	**Developing focus**
1960s	Promotion of local product to substitute import
1980	Promotion of local product to export
2005	1-tonnage truck pickup promotion scheme
2007-2013	Eco-Car1, Eco-Car 2 promotion scheme
2017-Present	EVs production and sales scheme

Source: Natsuda and Thoborn, 2011: Patarapong, 2021, Board of Investment (BOI)

2. Car production, sales and export

The Thai automotive industry continues to be a mainstay of Thailand's economy. In 2022, Thailand's automotive industry was the largest export sector, with an export value of US$20 billion according to the Thailand Ministry of Commerce. Thailand is in a superb location for automotive production due to its strategic location at the center of Southeast Asia, strongest supporting industry in the region, excellent infrastructure, and strong government support. (ASEAN UP, 2016). Recently, Thailand was the largest car production center in Southeast Asia and 10th in global and 5th in Asia (by volume) with a total production capacity of 4.1 million units per year (TAI, 2023).

Car production, sales, and exports are linked with a country's economic growth, government policies, and global economy. Hence, as shown in Figure 1, when the Covid-19 crisis impacted the global economy in late 2019, car production experienced a sharp decline. As the crisis improved, production gradually rebounded. The Thai automotive industry experienced historic growth during 2012 and 2013. In both of these years, Thailand produced over two million vehicles due to the success of Thailand's Eco Cars Project and the first-car-buyer tax rebate program (1st Car Scheme), marking a new chapter in the history of the Thai automotive industry. In 2022, the distribution of car production in Thailand was 31.5% of passenger cars and 68.5% of commercial cars.

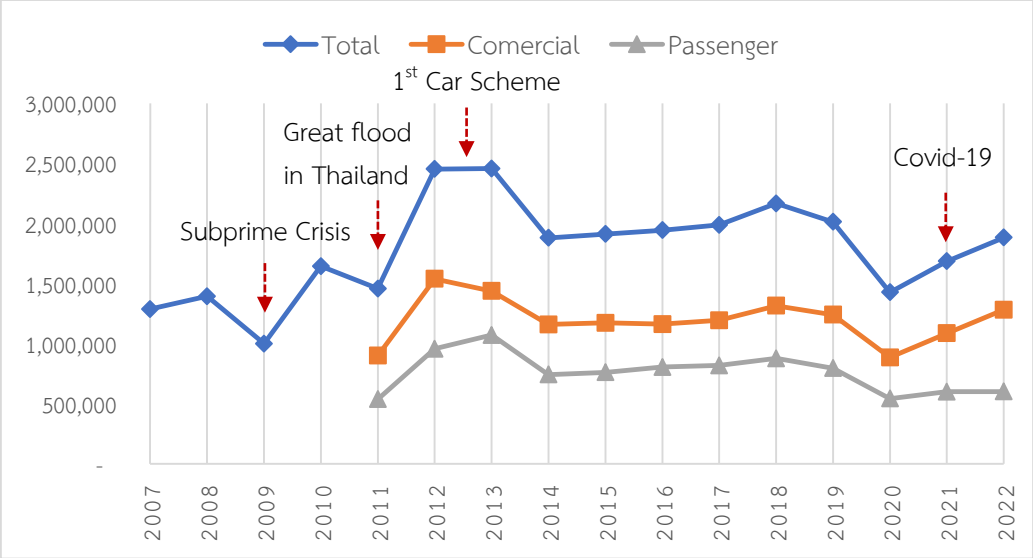

Figure 1 Total car production in Thailand, 2007-2022
Source: Thailand Automotive Institute

Table 2 Number of car assemblers and total production capacity, as of 2022

Categories	Thailand's automotive industry
Car assembles	21 companies *(30 production plants)*
Total industry production capacity	4.1 million units/years
Production capability of the leading assembly	Toyota Motor (760,000 units/year)
Total vehicles production in 2022	1.88 million units
Product champion	Commercial cars *(1-ton- pick-up)*
Top production by brand	Toyota *(659,262 units)*

Source: The Federation of Thai Industry (FTI)

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 25 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. In terms of production, total car production in 2022 was at 1.88 million units, an 11.73% increase from the previous as Thailand's economy recovered from the pandemic and thanks to the availability of auto parts (Krungsri Research, 2023).

In 2022, according to the Thailand Ministry of Commerce, Thailand produced a total of 1,883,515 units of cars, the production increased by 12 percent from the previous year, attributed to the gradual recovery from the outbreak of Covid-19. This positive trend was influenced by China's decision to open the country, leading to increased trade and tourism globally, including in Thailand. The recovery trend was further supported by the resolution of issues such as semiconductor shortages and container shortages for sea shipping. Consequently, economic activities and consumer demand/purchasing power, both within the country and in Thailand's crucial export markets, have begun to exhibit positive signs and show robust recovery. Out of the total production 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. The automotive market is split into two categories, see Table 3, 1) Passenger cars: which accounted for 32% of total production, and, 2) Commercial cars: which contributed for 68% to total production.

Cheaper and simpler cars are naturally preferred. Outstanding is the popularity of 1-ton-pickups, holding a share of over half on production, sales, and exports. This makes Thailand the world's second biggest market for such vehicles, after the United States. Their popularity has been explained as a result of government tax policies as well as a need for multi-purpose vehicles. Almost 0.85 million units were sold to the domestic market in 2022, a rise of 11.9% from the previous year. Domestic sales were boosted by the easing of Covid-19 restrictions, enabling economic activity to return to normal. Out of 0.85 million domestic sales, 495,137 units, or 58.2%, were commercial cars, while 354,251 units, or 41.8%, were passenger cars. Regarding the market share of domestic sales, as illustrated in Table 4, Isuzu leads in the commercial car segment with a 45.18% market share, followed by Toyota at 25%, Ford at 8.17%, and Mitsubishi at 5.57%. In the passenger car category, Toyota holds the top position with a 30.19% market share, followed by Honda at 23.80%, BMW/Benz/Volvo/Audi at

9.15%, Mazda at 8.66%, and MG at 7.11%. These market shares indicate the popularity of Japanese car brands among Thai car buyers.

Table 3 Proportion of Thai cars production, sales and exports by type in 2022

Type	Production (Units)	Domestic sales (Units)	Exports (Units)
Commercial cars	1,282,676 (68%) *(Pickups = 1,242,658)*	495,137 (58.2%) *(Pickups = 454,875)*	717,200 (72%) *(Pickups = 627,560)*
Passenger cars	600,839 (32%)	354,251 (41.8%)	283,056 (28%)
Total	1,883,515	849,388	1,000,256

Source: The Federation of Thai Industry (FTI), Thailand Automotive Institute

Non-Japanese carmakers have been making efforts to set up and expand their production base in Thailand. BMW, Mercedes Benz, Volvo, and Audi, for instance, are maintaining their presence in the market by being concerned with producing high-end cars. Chinese car manufacturers, MG and GWM, for example, have also entered Thailand's automotive market but are facing a huge challenge in finding a target.

Table 4 Share of domestic car sales market in 2022.

Commercial cars		Passenger cars		New registered EV cars	
Brands	*Share (%)*	*Brands*	*Share (%)*	*Brands*	*Share (%)*
Isuzu	45.18	Toyota	30.19	GWM	39.96
Toyota	38.14	Honda	23.80	MG	33.05
Ford	8.71	Benz, BMW	9.15	Volvo	6.41
Mitsubishi	5.56	Mazda	8.66	Tesla	4.41
Nissan	1.37	MG	7.11	BYD	3.87
MG	0.66	Mitsubishi	6.15	BMW	3.26
Mazda	0.39	Suzuki	4.80	Porsche	3.02
Tata	0.01	Nissan	4.55	Mini	2.33

Source: Krungsri Research

Table 5 Thai new registered passenger EV cars.

Year	Domestic sales		Share of EVs (%)
	ICE	*EVs*	
2016	564,854	9,578	1.67
2017	653,429	11,963	1.80
2018	694,036	20,024	2.80
2019	739,213	27,074	3.53
2020	557,868	29,556	5.03
2021	511,139	43,328	7.81
2022	569,491	84,384	12.91

Source: Krungsri Research

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. With regards to exports, commercial cars (CVs) accounted for 72% (see Table 3) and 28% for passenger cars. The total number of cars exported in 2022 was 1,000,256 units, out of this number, 627,560 were 1-ton-pickup cars. Australia is the largest export destination for Thailand's automotive industry, followed by ASEAN nations such as Indonesia, Malaysia, Vietnam, Middle East countries, and Japan. As Australia is Thailand's largest car export destination, it imported roughly 274,675 units (5,200.6 million USD) in 2022, exports to Australia are a direct consequence of the 2005 Thailand-Australia Free Trade Agreement (Natsuda and Thoburn, 2011).

Thailand exports automotive products worth 18,807.6 million US dollars. The top five important automotive export markets by value for Thailand are (1) Australia, accounting for 5,200.6 million USD (28.10 % of automotive exports from Thailand to the world); (2) Philippines 1,661.6 million USD (8.84%); (3) Vietnam 1,211 million USD (6.78%); (4) Saudi Arabia 794 million USD (5.19%); and (5) New Zealand 838.2 million USD (4.46%).

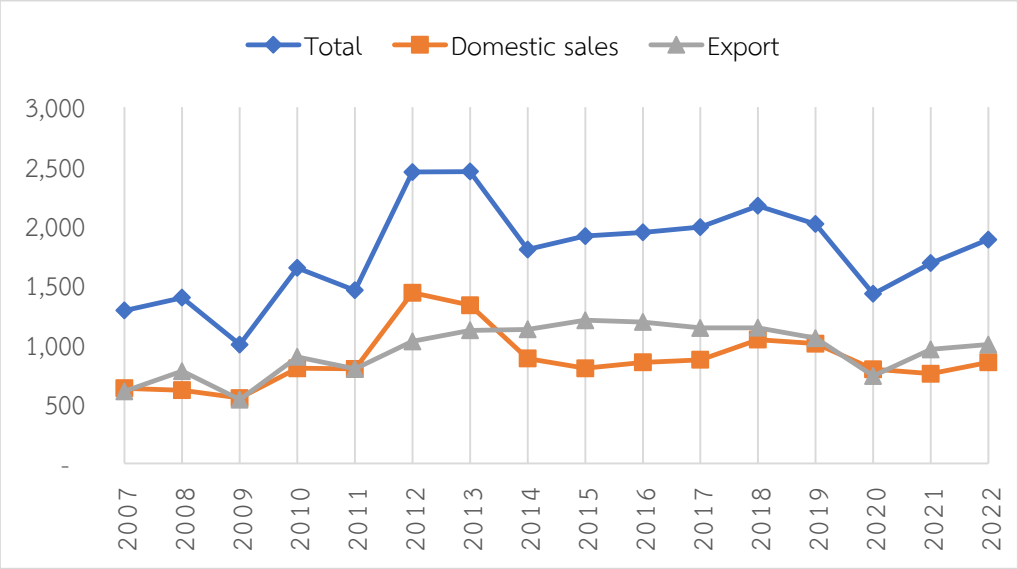

Figure 2 Total car production, sales and exports of Thailand, 2007-2022
Source: The Federation of Thai Industry (FTI), Thailand Automotive Institute

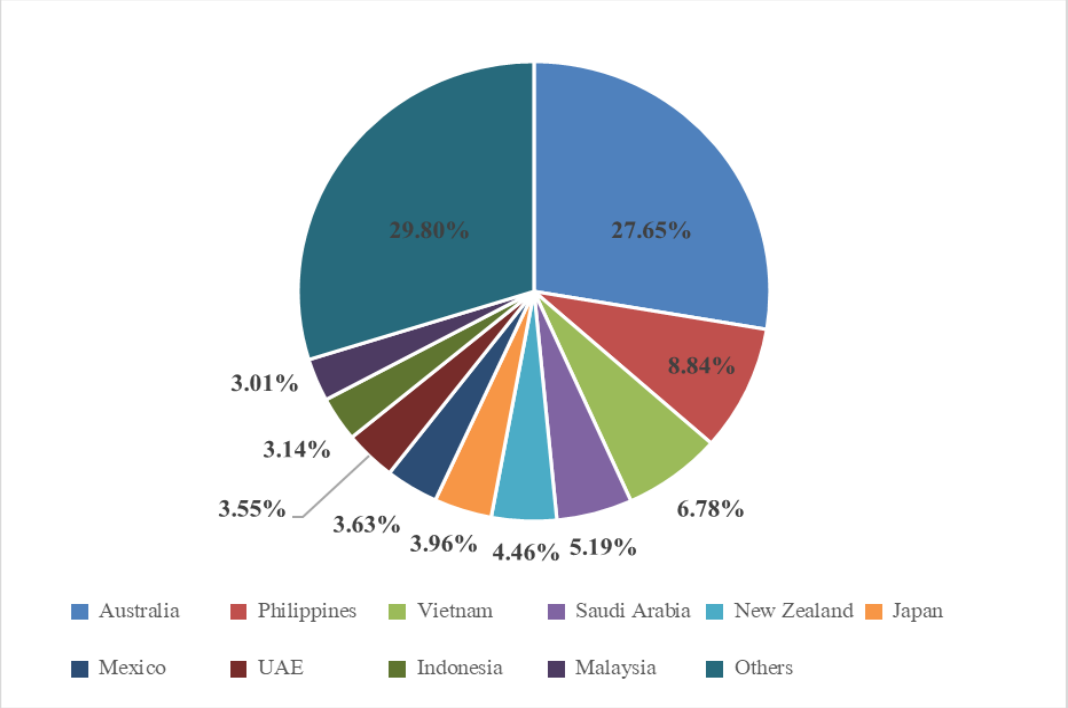

Figure 3 Thailand automotive exports value in 2022, by destination
Source: Ministry of Commerce of Thailand, Thailand, The customs department

3. Industry production capacity, supplier, and industry cluster

Thailand is the largest car production center in Southeast Asia and ranks 11th global with a total industry production capacity of over 4.1 million units per year. Nevertheless, with its current robust growth, Thailand is poised to expand its production capacity significantly, potentially maintaining its position in the Southeast Asia region and becoming the world's top ten car producers shortly.

The country hosts most major global car brands, with Japanese automakers leading the market, followed by Chinese companies. In 2022, According to the Thailand Automotive Institute and The Thai Automotive Industry Association, there were 21 car manufacturers with 30 production plants operating in Thailand. Toyota Motor Thailand is the largest manufacturer, with a total production capacity of 760,000 units per year, followed by Mitsubishi Motors Thailand with a total production capacity of 420,000 units per year, Honda Automobile Thailand with 420,000 units per year, Isuzu Motor Thailand with 385,000 units per year, Nissan Motor Thailand with 220,000 units per year, Ford Thailand with 150,000 units per year and Suzuki Motor Thailand with 100,000 units per year.

Table 6 Number of car assemblers and total production capacity, as of 2022

Categories	Thailand automotive industry
Car assembles	30 plants (21 firms)
Total industry production capacity	4.1 million units/years
Total production in	1.88 million units
Production capability of the leading assembly	Toyota Motor (760,000 units/year)
Total production of the leading assembly in	659,262 units
Product champion	Commercial cars (1-ton- pick-up)

Source: The Federation of Thai Industry (FTI)

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.

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. The automotive parts and components sector is vital to the success of Thailand's automotive industry. In 2021, around 2,200 automotive suppliers operate in the country (see Figure 4). Tier 1 suppliers, primarily producing high-tech automotive parts, are mostly non-local, with Japanese firms like Denso, Toyota Boshoku, Yazaki, Hitachi, Panasonic, JTEKT, Sumitomo, and AISIN Seiki leading the way. Notably, non-Japanese Tier-1 suppliers from Europe, the US, and China, such as Robert Bosch, Magna International, Continental, ZF, Magna, Faurecia, and Lear, 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.

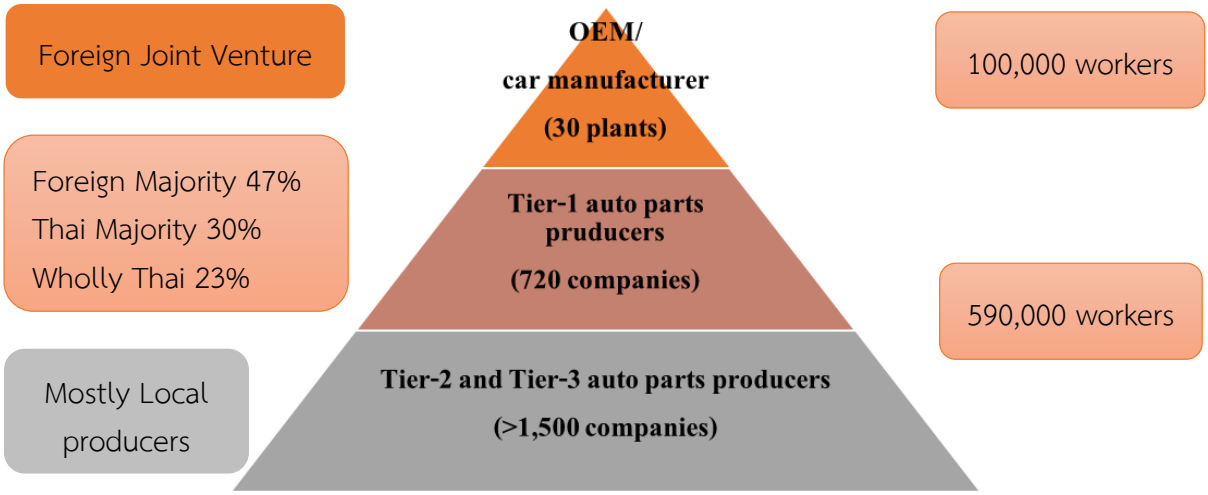

Figure 4 Structure of Thailand's automotive industry
Source: Thailand Automotive Association, Krungsri Research (2021)

In addition to possessing a robust supply chain, Thailand's automotive industry receives substantial support from the government and non-government institutions such as educational institutions, financial institutions, and various automotive-related associations. The government and Board of Investment (BOI) issues policies to promote and support the industry, educational institutions produce skilled workers for the industrial sector and transfer technological knowledge, financial institutions provide crucial financial support, and the

Automotive Association such as Thailand Automotive Institute (TAI), Thai Automotive Industry Association (TAIA), Electric Vehicle Association of Thailand (EVAT), and Thai Auto Parts Manufacturers Association (TAPMA) facilitate collaboration within the industry while advocating for policies with the government. In terms of workforce, Thailand has an abundance of skilled labor. In 2022, there were more than 690,000 workers in the automotive industry, covering every stage of production in Thailand's automotive sector. With 29 universities and other institutes offering automotive and mechanical engineering programs, it is forecasted that in 2021, 61% of the workforce in the Thai automotive industry will consist of high-skilled labor with a vocational diploma or above, 27% with a bachelor's degree in engineering, and 5% with a master's degree or above. Many auto assemblers in Thailand, such as Isuzu, Toyota, and Honda, have their employee training programs, contributing to the improvement of competitiveness and efficiency (EEC Development Project, 2021).

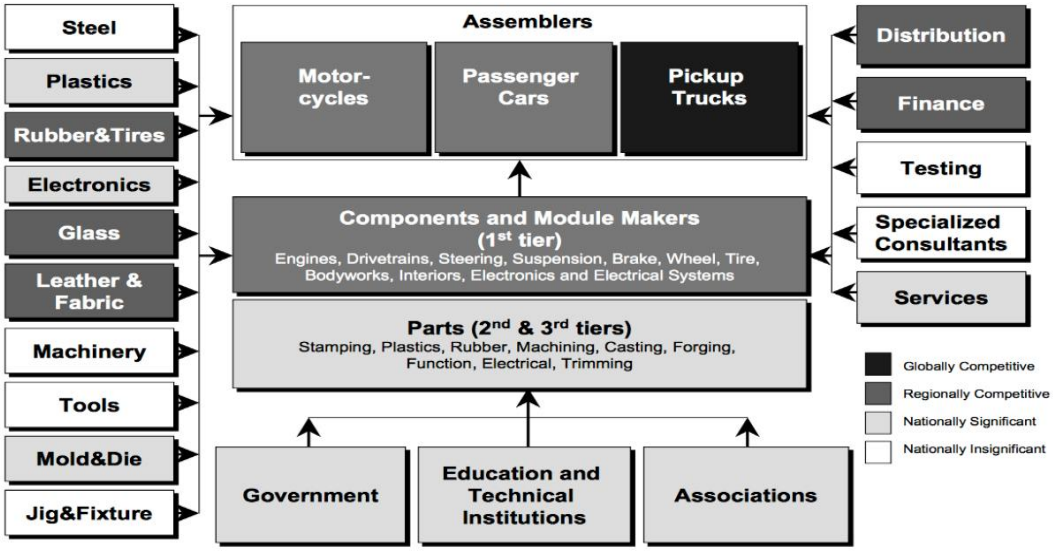

Figure 5 The Thai automotive cluster and supporting industries
Source: Sasin Graduate School of Business: Department of Trade Negotiations

Thailand is internationally recognized for its high-quality vehicles and auto parts, a result of robust supporting industries that encompass plastic, tires, oil and gas, lubrication oil, electronics, machinery, and more. Automotive electronics, specifically, is a focal point and is supported as the 'Smart Electronics' hub in the country. With over 1,700 suppliers across all supporting industries contributing to the completion of the country's supply chain, Thailand stands out as the ideal location for automotive production worldwide. The collaborative

efforts and support from these diverse entities collectively contribute to promoting the sustainable growth of the automotive industry in Thailand.

Apart from auto parts manufacturing and other supporting industries, as the trend in car production shifts from Internal Combustion Engines (ICE) to Electric Vehicles (EVs), the importance of EV charging stations is becoming evident. According to data reported by Thairath Money, Thailand now has 1,664 stations nationwide, representing an increase of nearly 200% from the previous year (855 stations). With good support from the government and an increasingly positive attitude from consumers towards using electric cars, it is anticipated that more charging stations will be opened in the future.

Government policies

One of the most important contributory factors behind the development of the automotive industry relates to specific economic and industrial policies (Thoburn and Natsuda 2018; Negara and Hidayat 2022). In the past, the automotive industry and auto parts industry played a significant role in boosting Thailand's economy. Its growth primarily stemmed from direct investments (FDI) and the relocation of production facilities from Japan. This was, in part, a result of Thailand's economic policies, which included strategies for tax reductions to attract foreign investments, trade liberalization, and incentive policies, including the establishment of special economic zones. Table 7 shows some of the general tax and non-tax incentives available to foreign investors in the automotive industry.

Table 7 Tax and non-tax incentives offered by the Thai government

Tax incentives – eligible activities	**Incentives**	
	CIT exemption	Exemption of import duty
- Research and development in the automotive industry and automotive training centers	8 years	Yes
- Manufacture of vehicle parts using high-technology - Manufacture of automotive parts for safety parts and energy-saving parts - Manufacture of Parts for Hybrid, Electric Vehicle (EV) and Plug-in Hybrid Electric Vehicles (PHEV) Automobile	8 years	Yes
- Manufacture of automotive engines	5 years	Yes

Tax incentives – eligible activities	Incentives	
	CIT exemption	Exemption of import duty
- Manufacture of Fuel System Parts - Manufacture of Transmission System Parts - Manufacture of Turbocharger		
- Assembling of Engine - Manufacturing of Fuel Pipe/ Tube - Manufacture of Steering System Parts - Manufacture of Cooling System Parts - Manufacture of Exhaust System Parts	3 years	Yes
- Manufacture of General Automobile	-	Yes
Non-tax incentives		
1. Permit to bring in expatriates 2. Permit to own land 3. No restriction on foreign currency. 4. 100% ownership 5. Work permit and Visa facilitation 6. No export requirements		

Source: Board of Investment of Thailand

When the global automotive industry is transitioning into a new era, particularly with the shift towards electric vehicles (EVs) with advanced technologies, tax reduction policies may no longer be effective for Thailand's automotive industrial development. Instead, innovation and technology must be developed to adapt to this transformation. By these production and consumption trends, 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 reach the plan, the Thai government has passed several EV-related regulations that aim to stimulate EV production and market growth and has launched the national EV strategic roadmap.

The national EV strategic roadmap is made up of three-phase action plans. Under phase 1 (2021-2022), the government will promote electric motorcycles and develop infrastructure for the EV 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 by 2030. In this phase, the government expects to produce 720,000 EV cars and pick-ups and 675,000 EV motorcycles. To support this, the government has

implemented a number of measures aimed at ensuring the rapid mass adoption of electric vehicles (EVs) and the achievement of these goals (Krungsri Research, 2023).

1. To make the use of EVs more convenient, the government is encouraging public and private sector entities to expand access to EV charging stations. Data from The Electric Vehicle Association of Thailand as of December 2022 shows that, at that point, there were 1,239 charging stations in the country with a total of 3,739 chargers available. These were divided between 2,404 standard alternating current units and 1,342 fast direct current chargers.

2. For 2022 and 2023, import duties on fully assembled Battery Electric vehicles (BEVs) have been reduced to 40% for manufacturers participating in the government's BEV promotion scheme. Under this program, manufacturers can import and distribute BEVs to the Thai market at a discounted rate before offsetting this by increasing their Thailand-based production of EVs, in accordance with the program's specifications.

3. From February 2022 – December 31, 2025, the government will provide subsidies worth THB 70,000-150,000 per vehicle for BEV autos and pickups that are manufactured in Thailand.

Table 8 The 30@30 Electric Vehicles (EVs) promotion scheme

Year	Promotion scheme
Phase 1 (2021-2022)	Pilot scheme for promoting EV motorcycles and developing the national infrastructure needed to support greater use of EVs.
Phase 2 (2023-2025)	By 2025, target domestic production of 225,000 EV cars and pickups. Also, target manufacturers of batteries to support domestic EV production.
Phase 3 (2026-2030)	Pursue the 30@30 policy of 30% of domestic production of cars and pickups being of EVs, or a total of 725,000 cars and 675,000 motorcycles. Continue to support domestic EV production.

Source: Thailand Board of Investment (BOI), Krungsri Research

To support the production and use of EVs and BEVs and to reach the 30@30 goal, the Thai government offers tax and non-tax incentives to EVs and BEV producers including Exemption on CIT, exemption of import duties on raw materials used in R&D, exemption of import duties on machinery, exemption import duties on raw materials, and non-tax incentives. The details of these incentives are shown in table 8.

Table 9 Incentives for Electric Vehicles (EVs) promotion scheme by BOI

Manufacturers of	Tax-incentives
BEVs, PHEVs, HEVs and BEV platforms	1. Total investment capital of over 5 billion Baht - HEV: No CIT exemption - PHEV: 3 years CIT exemption - BEV: 8 years CIT exemption *** 1 to 5 years CIT exemption in case of R&D* 2. Total investment capital of less than 5 billion Baht - HEV: No CIT exemption - PHEV: 3 years CIT exemption - BEV: 3 years CIT exemption *** 1 to 5 years CIT exemption in case of R&D*
Battery Electric Buses and Truck and Platforms	3 years CIT exemption
EV Key Parts including Electric Battery	1. 17 Key parts for EVs - 8 years CIT exemption 2. Pack assembly (Battery) - 5 years CIT exemption 3. Module or CTP (Battery) - 8 years CIT exemption 4. Cell production (Battery) - 8 years CIT exemption
Charging Stations	1. At least 40 chargers, 25% of which are fast chargers - 5 years CIT exemption 2. Other cases - 3 years CIT exemption
Battery Swapping Station	5 years CIT exemption

Source: Thailand Board of Investment (BOI)

The Ministry of Finance also provides EV subsidy package and tax incentives including 70,000 Thai Baht/unit cash subsidy for EV passenger cars with a battery capacity of 10-30kWh, 150,000 Thai Baht/unit with a battery capacity of more than 30kWh and 150,000 Thai Baht/unit for EV commercial cars (1-ton-Pick-up).

Private sector response to the new policy

In 2017, Thailand's Board of Investment (BOI) introduced the Electric Vehicle and Hybrid Incentive Program, which provides incentives to manufacturers incorporating domestically produced batteries and components in their vehicles. Participants in this initiative enjoyed

significant reductions in excise taxes and exemptions from corporate income tax for up to eight years. As a result, the program successfully attracted investments totaling more than 80,208.60 million Baht (US$2.8 billion). All the major players from Japan and Europe engaged in this program including Toyota, Honda, Nissan, Mitsubishi, Benz, and BMW. it's noteworthy that, their car makers are primarily involved in Thailand's automotive market through Internal Combustion Engine (ICE) vehicles. However, during the initial stage of the program, their production focus shifted mainly to hybrids and plug-in hybrids (PHEVs).

In 2020, the BOI shifted its attention to Battery Electric Vehicle (BEV) technology, announcing increased incentives for BEV project investments. These incentives attracted heavyweight Chinese automakers, and by the end of 2022, Chinese brands such as BYD, GWM, and MG, had come to dominate the BEV segment (Raghav Bharadwaj, 2023). The progress of BOI-approved investment projects on EVs can be seen in Tables 10 and 11.

Table 10 BOI approved investment projects on EVs, as of 2022

EVs investment projects	HEV	PHEV	BEV	Total
Projects approval	7 Projects	8 Projects	15 Projects	30 Projects
Investment (Million Baht)	38,623.9	11,665.6	27,745.2	80,208.60
Car makers	7 makers	9 makers	15 makers	18 makers*

Source: Thailand Automotive Institute

Note 1 maker can make more than 1 type of EVs*

In terms of the domestic market for EVs, in 2022, two years after this shift, EV car sales reached 21,000 units, PHEVs dominate the market and the producers are mostly Japanese and European companies that were shifting from ICE to EV technology. Earlier in 2023, when Chinese carmaker BYD entered the market, it became the top-selling brand for EVs. Chinese carmakers play an important role in accelerating the adaptation of EVs and EV technology with the launch of the BEV model. Recently, Chinese EV brands have been the main players in the country, Chinese EV makers were able to offer low-priced EVs by availing the incentives offered by Thailand's government. The Japanese and European brands are also competing with Chinese brands in Thailand. For example, Mercedes-Benz chose Thailand as the manufacturing hub for the electric Mercedes-EQS. The company also selected Thailand as one of its seven global locations for producing high-performing Li-ion batteries. BMW achieved early success in the Thai EV market with its strategy focused on charging stations. As of 2022, the company holds almost one-third of the total EV market share in Thailand. BMW experienced early success in the Thai EV market by focusing on charging stations in its strategy.

As of 2022, the company commands nearly one-third of the total EV market share in Thailand (Raghav Bharadwaj, 2023). Major carmakers, such as Toyota, the largest in the country, and Mitsubishi, the first to export from Thailand, along with several other major auto brands, have also declared investments in the Thai EV sector.

Table 11 Some of the approved investment projects on EV parts and components

Parts and components	No. of projects	Investment (MB.)	No. of entities
Traction motor	7 projects	2,586.0	7 entities
Battery management system	3 projects	237.6	3 entities
On-board charger	2 projects	644.0	2 entities
Charging devices	2 projects	157.0	2 entities
DC/DC converter	2 projects	1,169.7	2 entities
High-voltage Harness	3 projects	118.2	3 entities
Air conditioning system	2 projects	557.3	1 entity
Battery cooling system	1 project	93.7	1 entity
Total	*17 projects*	*5,980.4*	*15 entities*

(Source: Thailand Automotive Institute)

Note 1 maker can make more than 1 type of EV's parts*

Table 12 BOI promoted projects on Electric Battery

Projects	Battery for Electric Vehicle (xEV)	High-Density Battery
Manufacturers	1. DTS Draexlmaier Automotive System 2. Toyota Motor Thailand 3. Honda Automotive Thailand 4. Thonburi Energy 5. SAIC Motor-CP 6. Mine Mobility Corporation 7. MMTH Engine 8. Nissan Powertrain 9. GWM 10. BYD 11. Vitchukhanee 12. Raja Cycle 13. Somboon Tron Energy	1. Amita Technology 2. Beta Energy Solution 3. Nouvo Plus 4. Graphene Globe 5. BEV Technology 6. Garguar E Power 7. Transpower Technologu 8. Honglin Technology
Total projects	30 projects / 21 entities	
Investment values	19,027.8 million Baht	

(Source: Thailand Automotive Institute)

Note 1 maker can make more than 1 type of EV's parts*

Competition in the region

Indonesia, the second-largest car production center in Southeast Asia and 17th in global, has traditionally been overshadowed by Thailand which ranked 11th in the world. 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.

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, 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 and 17.4% for commercial cars in Indonesia, while Thailand had 31.5% for passenger cars and 68.5% for commercial cars.

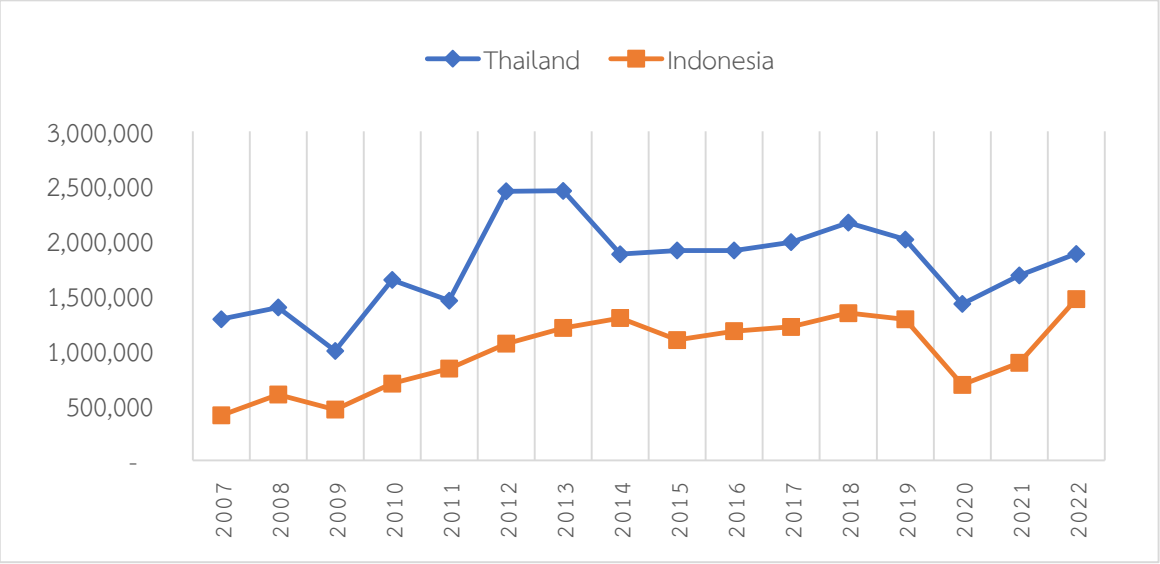

Figure 6 Total car production in Thailand and Indonesia
Source: Association of Indonesian Automotive Industries, Thailand Automotive Institute

Thailand and Indonesia exhibit 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 12 and 13. 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 13 Number of car assemblers and total production capacity, as of 2022

Country/Categories	Thailand	Indonesia
Car assembles	30 plants (25 firms)	22 plants (22 firms)
Total production capacity	4.1 million units/years	2.35 million units/year
Production capability of the leading assembly	Toyota Motor Thailand (760,000 units/year)	Toyota Motor Indonesia (661,000 units/years)
Product champion	Commercial cars (Pickups)	Passenger cars (SUV, MPV)

Source: Association of Indonesian Automotive Industries, The Federation of Thai Industry

Table 14 Car production and the proportion of sales and export volumes in 2022.

Industry performances	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, the Middle East, and Japan	ASEAN, Japan, Middle East, and South America

(Source: Association of Indonesian Automotive Industries, The Federation of Thai Industry)

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 Regulation (so-called LCGC) was introduced to the automotive market. With this regulation, the government will grant tax incentives to those automotive manufacturers that meet requirements of fuel efficiency targets. This regulation

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.

Table 15 Tax and non-tax incentives offered by the Indonesian government

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)

The primary incentive behind the transition to electric vehicles (EVs) is the abundant availability of domestic raw materials crucial for the production of the most essential EV component: the battery pack. Indonesia possesses the world's largest nickel reserves, accounting for approximately 22% of the total. Additionally, the country has access to cobalt, which enhances the lifespan of EV batteries, and bauxite, utilized in aluminum production—an essential element for EV manufacturing. Having a reliable supply of various components for EV battery production ensures a steady source of raw materials, potentially contributing to cost reduction. Under the EV development plan, the government has set a major target—to start producing EVs by 2021, with 35 percent local content in 2022 and increasing it to 80 percent by 2030.

Developing the EV industry is part of a bigger national industrial policy that is stated in the Making Indonesia 4.0 roadmap. the plan aims to achieve the export of domestically manufactured EVs by 2030. Indonesia aspires not only to enter the EV industry but also to emerge as one of the leading global producers of lithium batteries. The Indonesian government is proactively inviting foreign investors to participate in the electric vehicle (EV)

industry. Recognizing the nation's limited expertise in this field, Foreign Direct Investment (FDI) in lithium battery production is considered the key solution to bridge the current technological gap. Indonesia has extended invitations to several Chinese battery manufacturers to contribute to the development of the lithium battery industry in Morowali, Central Sulawesi (Negara and Hidayat, 2022).

Indonesia has ambitious EV growth plans as it competes with Thailand to establish a robust EV industry as an alternative to China, the world's largest producer and achieve its ambitious target of having 2.5 million EV users by 2025. In the future, the Indonesian government hopes to have a complete industrial chain, encompassing not only battery production but also vehicle manufacturing and vehicle components. Therefore, Thailand's automotive industry must face challenges in this sector and be prepared for this competition.

Conclusion

When the industry is shifting from Internal Combustion Engine (ICE) to electric vehicles (EVs), the 30@30 project of the Thai government aims to achieve a 30% vehicle ratio of EVs to its total automotive production by 2030. Incentives such as subsidies and tax exemptions are being offered to EV producers, however, the Thailand EV market currently appears to be unable to unlock its full potential.

Although Thailand's EV policy is one of the most ambitious and proactive frameworks, it may not be sufficient to achieve national EV goals due to challenges that adversely impact the Thai EV market.

1. Non comprehensive EV policy and regulatory challenges: Thailand, once a production base for Internal Combustion Engine (ICE) cars, lacks a clear roadmap and action plan for transitioning to electric vehicles (EV). Thailand is losing its comparative advantage in the automotive industry, as evidenced by a decline in market share in the passenger car segment to Indonesia. The 30@30 project is divided into three phases. Phase 1 (2021-2022) focuses on improving infrastructure for electric vehicles, including the construction of battery charging stations. Currently, the project is in Phase 2 (2023-2025), with the main goal of producing and selling 225,000 electric cars by 2025. However, it is evident that as of 2022, there were only 84,384 registered electric cars, with 15,000 imported from China. This data suggests that the EV producers in Thailand have not fully adapted to the changes yet, and achieving the goal of producing and selling 225,000 cars by 2025 may face challenges.

2. The private sector's response has been relatively slow. The leading Japanese car brand, holding a market share of more than 80 percent as the primary automobile

manufacturer in Thailand, specializes in the production of combustion engines. However, as the industry transitions to EVs, it has been observed that these manufacturers have been slow to adapt to the changing trends. This is evident in the limited number of investment projects in EV production, with most initiatives coming from manufacturers in China and Europe, such as MG, BYD, GWM, and Volvo. These companies have relatively lower production capacity, capturing only about 20% of the market share in overall car production. The slow adjustment by Japanese manufacturers may jeopardize the competitive potential of the Thai automobile industry.

3. Lack of local minerals: the automotive supply chain has shifted, with battery production playing an important role in EV manufacturing. Thailand cannot compete for two main reasons: 1) it lacks its production technology, while China has made significant advancements, and 2) Indonesia may attract more Foreign Direct Investment (FDI) due to its larger market size and being one of the world's significant sources of nickel.

4. Competition in the Southeast Asia region is growing: with Indonesia aiming to become the largest EV production hub in the region and attract foreign investors to its EV industry.

All the aforementioned challenges will ultimately impact the overall development of the automotive industry. The success of Thailand's ambitious EV program depends on how these challenges—high competition in the EV market in the region, lack of its own production technology, scarcity of local minerals for battery production, and unclear regulations—can be overcome.

Discussion and recommendations

The automotive industry plays a crucial role in Thailand's economic development. With the shift in production trends towards electric vehicles (EVs), Thailand, previously excelling in internal combustion engine (ICE) production, must swiftly adapt to this new trend. Slow adjustment may impact not only on the automotive industry but also on the overall economy, impacting production, consumption, exports, and employment. The necessary adaptation entails the entire industry, prompting the government to implement development and investment promotion policies. Particularly, there is a focus on investing in technology development and innovation, as Thailand has historically heavily relied on Japanese technological advancements and lacks its production technology. In the future, if Japan or car assemblers from other countries relocate their production bases or cease operations, the country's automotive industry and economy could confront serious challenges."

Because the automotive industry is expansive, with numerous stakeholders associated with it, especially within each tier of the supply chain, this study specifically explored the automobile manufacturing sector, with a focus on the manufacturers themselves. Therefore, for future studies, researchers should also investigate the development and adaptation of manufacturers in the automotive parts manufacturing industry. This approach will lead to comprehensive results that encompass the entirety of the industry. "In terms of competition within the region, this study exclusively analyzed Indonesia, as it boasts the second-largest automobile production base in the ASEAN region after Thailand. However, other countries in the ASEAN region, such as Vietnam, Malaysia, and the Philippines, serve as production bases for both local and foreign car brands, actively developing their automotive industries. Therefore, the researcher may need to analyze the potential of these countries as well.

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