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## INVESTMENT ACTIVITIES IN THE SEGMENT OF THE ELECTRIC VEHICLE VALUE CHAIN IN THE ASEAN REGION

## ІНВЕСТИЦІЙНА ДІЯЛЬНІСТЬ У СЕГМЕНТІ ЛАНЦЮЖКА СТВОРЕННЯ ВАРТОСТІ ЕЛЕКТРОМОБІЛЕЙ У РЕГІОНІ АСЕАН

**Summary.** Introduction. At the present stage, the global automotive industry is undergoing a number of revolutionary structural changes that are changing its appearance. New technologies are being introduced everywhere in the industry, autonomous vehicles are being developed, and a promising segment of the automotive industry – the production of electric vehicles – is expanding. This involves significant investment in major new areas of industrial development, among which the efforts of countries to develop electric vehicle centers stand out, which in recent years has led to a significant increase in investments in the electric vehicle value chain.

**Purpose.** The purpose of the article is to study the features of the investment activities in the segment of the electric vehicle value chain in the ASEAN region.

**Materials and methods.** The study uses an interdisciplinary approach that combines quantitative and qualitative methods of analysis. The empirical basis is provided by statistical data on the volume of foreign direct investment in the electric vehicle value chain segment in the ASEAN region in 2019–2023, obtained from official sources: international statistical bodies and international investment surveys. A synthesis of scientific literature, analytical reports and case studies by international authors was carried out.

**Results.** The results of the study demonstrate that significant changes in the electric vehicle production industry included new categories of investors, new segments of production and distribution chains, further expansion of capacities and intensification of activities in regional production networks. It was found that these events had the greatest consequences for the further growth of FDI flows in the ASEAN region. It was in this region that investors actively invested in the electric vehicle value chain, related research and development, as well as in new infrastructure.

**Prospects.** In the future, it is relevant to conduct in-depth research on the features of investment activity in the segment of the electric vehicle value chain in different regions of the world and develop a forecast for the coming years. Another promising direction is to study the role of leadership of global automotive TNCs in the processes of further development of the electric vehicle market in conditions of global uncertainty and constant growth of world energy prices.

**Key words:** electric vehicle market, investments in electric vehicle production, electric vehicle value chain, ASEAN region.

**Анотація.** Вступ. На сучасному етапі світова автомобільна промисловість зазнає ряду революційних структурних змін, які змінюють її вигляд. У галузі повсюдно впроваджуються нові технології, розробляються автономні автомобілі, розширюється перспективний сегмент автомобілебудування – виробництво електромобілів. Це передбачає значні інвестиційні вкладення у нові напрями промислових розробок, серед яких виділяються зусилля країн щодо розвитку центрів електромобілебудування, що в останні роки призвело до значного збільшення інвестицій у ланцюжок створення вартості електромобілів.

*Мета.* Метою статті є дослідження особливостей реалізації інвестиційної діяльності у сегменті ланцюжка створення вартості електромобілів у регіоні АСЕАН.

*Матеріали і методи.* У дослідженні використано міждисциплінарний підхід, що поєднує кількісні та якісні методи аналізу. Емпіричну базу становлять статистичні дані щодо обсягів прямих іноземних інвестицій у сегменті ланцюжка створення вартості електромобілів у регіоні АСЕАН у 2019–2023 роках, отримані з офіційних джерел: міжнародних органів статистики та міжнародних інвестиційних оглядів. Проведено узагальнення наукової літератури, аналітичних доповідей і кейс-досліджень міжнародних авторів.

*Результати.* Результати дослідження демонструють, що значні зміни у галузі виробництва електромобілів включали нові категорії інвесторів, нові сегменти виробничо-збутових ланцюжків, подальше розширення потужностей та активізацію діяльності у регіональних виробничих мережах. Встановлено, що ці події мали найбільші наслідки подальшого зростання потоків ПІІ у регіоні АСЕАН. Саме в цьому регіоні інвестори активно інвестували у ланцюжок створення вартості електромобілів, пов'язані з цим дослідження та розробки, а також у нову інфраструктуру.

*Перспективи.* У майбутньому актуальним є проведення поглиблених досліджень щодо особливостей інвестиційної діяльності у сегменті ланцюжка створення вартості електромобілів у різних регіонах світу та розробка прогнозу на найближчі роки. Перспективним напрямом також є вивчення ролі лідерства світових автомобільних ТНК у процесах подальшого розвитку ринку електромобілів в умовах глобальної невизначеності і постійного зростання світових цін на енергоресурси.

**Ключові слова:** ринок електромобілів, інвестиції у виробництво електромобілів, ланцюжок створення вартості електромобілів, регіон АСЕАН.

**Statement of the problem.** At the current stage, the world automobile industry is experiencing a number of revolutionary structural changes that are changing its shape. Many global automotive companies have their own digital platforms that significantly change the usual business models and increase the income of the largest automotive multinational corporations (TNCs). In the conditions of digitalization, the structure of production is undergoing significant changes for automobile companies. In the industry, new technologies are being introduced everywhere, autonomous cars are being developed, and such a promising segment of the automotive industry as the production of electric cars, which are replacing cars with traditional types of fuel, is expanding due to the intensive growth of world oil prices. Since the 2000s models combining a traditional internal combustion engine and an electric engine (hybrids) appeared on the world car market.

All this presupposes significant investments in major new directions of industrial development, among which the efforts of countries to develop centers of electric vehicle construction stand out, which in recent years has led to a significant increase in investments in the electric vehicle value chain. Significant changes in this industry included new categories of investors, new segments of production and sales chains, further capacity expansion and activation of activities in regional production networks. These events had the most serious consequences for the further growth of foreign direct investment (FDI) flows in the ASEAN region. It is in this region that investors have been very active, especially in the electric vehicle value chain, including nickel mining and smelting, production of batteries and electric vehicles, related research and development, as well as investments in new infrastructure.

In addition to traditional automotive TNCs, non-automotive companies are entering the electric vehicle industry, which are expanding the sources of attracted

FDI. These include technological TNCs, as well as mining and energy corporations. FDI in various segments of the electric vehicle value chain connects countries, production processes and companies in this region, further strengthening regional production networks and the automotive ecosystem.

**Analysis of recent research and publications.** A significant contribution to the analysis of the current state and development prospects of the electric vehicle markets, the development of charging infrastructure for them and the problem of improving batteries was made by such scientists as Apelt S., Elkamel A., Gül T., Fernandez Pales A., Irle R., Kane M., Katai B., Klippenstein M., Lambert F., Laporte G., Lomborg B., McKerracher K., Pfeiffenberger J., Ravi V., Reka S., Sedghi M., Venugopal P., Viswanathan V., Zhang H. and others [1; 6–11]. At the same time, problems remain unresolved in terms of analyzing the directions and effectiveness of investment activities in this segment of the automotive industry, taking into account regional characteristics.

**Formulation purposes of article (problem).** The purpose of this paper is to study the features of investment activities in the electric vehicle value chain segment in the ASEAN region.

**Presentation of the main research material.** In recent years, many EV manufacturing projects have been very significant in value and are expected to be completed within a few years. The increasing number of investor types and high-value projects are key factors driving the growth of EV-related investments. Considering that most ASEAN member states support the development of a competitive ecosystem by encouraging the adoption of EVs and targeting zero-carbon policies, significant investments in the EV value chain are expected to continue. A favorable environment for automobile manufacturing, established manufacturing networks, and regional market potential and

Table 1

**FDI in Electric Vehicle Production in ASEAN Countries 2019–2023**

Company	Investor country	Project cost (USD mln)	Country of origin	Year of construction start	Investment object
BMW	Germany	16	Thailand	2019	Assembly of batteries for electric vehicles
Contemporary Amperex Technology Limited	China	5200	Indonesia	2021	Plant for the production of batteries for electric vehicles
ENPIus	Republic of Korea	101	Philippines	2021	Plant for the production of electric vehicles and electric SUVs
Evlomo	USA	1060	Thailand	2021	Plant for the production of lithium batteries
FOMM	Japan	31	Thailand	2019	Expansion of the capacity of the plant for the assembly of electric vehicles
Ford	USA	900	Thailand	2022	Automation and expansion of the production of cars, including electric vehicles
Foxconn	Taiwan	8000	Indonesia	2022	Design and production of various components of electric vehicles, two-wheelers and buses; batteries and related devices
Foxconn	Taiwan	1000–2000	Thailand	2022	Electric vehicle production
Kymco	Taiwan	30	Singapore	2020	Investment in the automotive division of Grab Wheels
GWM	China	71	Thailand	2023	Reconstruction of the plant in the province of Rayong for electric vehicle production
Honda Motor	Japan	136	Thailand	2021	Construction of an electric vehicle battery plant in Prachin Buri province
Hyundai Motor	Republic of Korea	1500	Indonesia	2021	Construction of an electric vehicle battery plant
Hyundai Motor and LG Chem	Republic of Korea	1100	Indonesia	2021	Construction of an electric vehicle battery factory in Karawang
Mercedes-Benz	Germany	20	Indonesia	2019	Expanding production of plug-in hybrid electric vehicles
Mitsubishi Motors	Japan	644175	Thailand	2019	Expanding production of all types of electric vehicles (battery hybrid and plug-in hybrid) in 2023
Nissan	Japan	35215	Thailand	2020	Expanding capacity for the production of hybrid vehicles at the plant in Samut Prakan. Construction of a plant for the production of batteries for electric vehicles
SAIC Motor	China	75782	Thailand	2022	Production of batteries for electric vehicles in a joint venture with the Thai multinational conglomerate Charoen Pokphand. Expansion of the network of charging stations for battery and plug-in electric vehicles
Energy Efficiency Services	India	5	Thailand	2020	Investment in SWAG EV, a manufacturer of electric motorcycles and electric bicycles
SK Group	Republic of Korea	553	Malaysia	2021	Production of electrodeposited foil for electric batteries
Toyota Motor	Japan	2000	Indonesia	2023	Design and manufacture of batteries for electric vehicles
Toyota Motor	Japan	65	Malaysia	2021	Expanding production of hybrid electric vehicles
Toyota Motor	Japan	622	Thailand	2019	Production of hybrid electric vehicles
Toyota Motor	Japan	119	Thailand	2019	Expanding production capacity of the Samut Prakan plant and building a factory to assemble batteries for hybrid electric vehicles

Source: [2; 6]

integration are additional reasons for the growth. The growth in EV investment has been driven by moves to establish manufacturing capacities for EVs, including parts and components. With growing global and regional demand for EV batteries, FDI in extractive industries (such as nickel mining) has also grown rapidly in some ASEAN countries. Government support for the EV sector in these countries has also stimulated investment interest, including in EV operation and maintenance infrastructure such as charging stations.

The major investments in EVs from 2019 to 2023 included the construction of EV battery factories and the expansion and upgrading of EV production facilities by traditional automakers, new entrants, and other MNCs in the value chain [2].

Most of the investments in the EV sector since 2019 have been made by Japanese and Korean MNCs building new factories and expanding or upgrading existing production facilities. Some of these companies have multiple investment projects in different ASEAN countries. In 2020, Hyundai (Republic of Korea) opened a \$1.5 bln EV factory in Indonesia and a \$294 mln innovation center in Singapore. In 2021, Toyota (Japan) was involved in three major projects: (a) a \$2 billion EV plant in Indonesia, (b) a \$64 million investment in Malaysia to expand its manufacturing operations and hybrid EV capacity, and (c) a \$386 million investment in EV production at its Chachoengsao plant in Thailand [3].

Most of the investments by major automakers in EV production are made in places where they already have a significant presence in terms of production capacity, relying on synergies of existing relationships, established clusters and expertise. They are upgrading or expanding production lines to accommodate EVs, which require high-tech and more technologically flexible platforms. Mitsubishi and Nissan (Japan), Mercedes-Benz (Germany) in Thailand and Toyota in Malaysia have invested heavily in their existing plants, upgrading and expanding production capacity (Table 1).

New players are also entering the EV value chain, challenging traditional automakers and in some cases partnering with them to produce EVs or investing in EV charging stations. These new market players include electronics manufacturers, technology companies, energy MNCs, industrial companies, and venture capital firms.

In particular, Thailand's largest oil and gas company PTT and Foxconn (Taiwan), a contract electronics

manufacturer, are establishing an open platform for the production of electric vehicles and key components to serve the EV industry in Thailand. Foxconn has also entered into a joint venture agreement with Gogoro (Taiwan), Indika Energy (Indonesia), and Indonesia Battery Corporation (a state-owned company in Indonesia) to develop a wide range of EV products in Indonesia, from EVs, two-wheelers, and buses to battery manufacturing, battery charging or swapping stations, battery recycling, and R&D [5].

Mercedes-Benz (Germany), in partnership with Thailand's Thonburi Automotive Assembly and Thonburi Energy Storage Systems (Thailand), already established a battery assembly plant and expanded plug-in hybrid vehicle manufacturing facility in Thailand in 2019. Enplus (Republic of Korea), a fire truck manufacturer, is opening an electric vehicle manufacturing plant in the Philippines [4].

These new market participants are expanding the value chain by adding more product and service categories, expanding the sources of investment, and strengthening the ecosystem as a whole. Their emergence suggests that, in order to create competitive EV ecosystems, policymakers need to focus on encouraging investment in these categories and segments of the value chain. Importantly for the economies of EV-producing countries, EV production involves additional supply chains of products and related service providers (e.g., EV battery production and supply, as well as electricity supply and distribution). The distribution of EV batteries itself requires the creation of its own ecosystem of charging stations, as well as recycling and disposal of used batteries. And many non-automotive TNCs are involved in these segments of the value chain, contributing not only to technological development in general, but also to the creation of new jobs.

**Conclusions of this research and prospects for further research in this area.** Thus, most of the investments by automotive TNCs in EV production are taking place in the ASEAN region, where they already have a significant presence in terms of production capacity, drawing on synergies of existing linkages, established clusters and expertise. They are upgrading or expanding production lines to accommodate EVs, which require high-tech and more technologically flexible platforms. Many non-automotive TNCs are involved in the value chain segments, contributing not only to the technological development of the ASEAN region as a whole, but also to the creation of new jobs.

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