

Review Article

Factors Influencing Automotive Investment in Three ASEAN Countries

Thy Hy^{1,*} , Lyhour Hin² , Sophea Nhean¹ , Bandith Seng³ 

¹Faculty of Agricultural Economics and Rural Development, Royal University of Agriculture, Phnom Penh, Cambodia

²Faculty of Agricultural Biosystems Engineering, Royal University of Agriculture, Phnom Penh, Cambodia

³Skills Development Fund, Phnom Penh, Cambodia

Abstract

The automotive sector is considered vital for promoting the economy. Likewise, Cambodia also prioritizes this sector. Moreover, Cambodia aims to become a production hub to export automotive parts to both regional and global markets. However, Cambodia has very few automotive assembly industries due to many complicating factors. What factors influences automotive investment? And how about those factors in Cambodia compared to Indonesia and Thailand? Thus, this study seeks to (1) explore a comprehensive understanding of factors affecting automotive investment and (2) provide implications to address these key factors of Cambodia compared to Indonesia and Thailand. For the methods of this study, the first stage is to write codes in R program for extracting journal articles related to factor affecting automotive industry, by selecting only title, doi, and issued. We found that a total of 95 journal articles related to the study were retrieved using the rcrossref, tidyr, dplyr, and rstatix packages in the R-program and RStudio version 4.4.1. After screening with the selection criteria, 26 studies were identified. Finally, 11 of the 26 papers were evaluated for eligibility and were analyzed to identify key factors affecting automotive investment. The second stage is to group and collect the existing data for each factor from reliable sources in order to compare these factors in the three ASEAN countries. The study was conducted for six months from July to December 2024. The findings showed that a promising landscape of Cambodia for automotive investment has such as a strong political stability, a high economic growth rate, tax incentives, a young workforce, attractive labor costs, growing industrial capacity, rising domestic demand, and a stable business environment. However, Cambodia must address infrastructure and bureaucratic challenges. The infrastructure of Cambodia is in developing stage, compared to Indonesia and Thailand. Bureaucratic inefficiencies are able to hinder business operations, making it difficult for companies to navigate regulatory processes efficiently. The following solutions are proposed to the Royal Government of Cambodia such as (1) prioritize strategic investments in infrastructure projects and continue its efforts on upgrading infrastructure, including transportation, digital connectivity, and utilities; (2) streamline bureaucratic processes in order to reduce complexity and length of administrative processes; and (3) adopt digital solutions and simplify regulatory frameworks. The integration of digital solutions into regulatory and business operations can improve transparency, reduce corruption, and increase efficiency.

Keywords

Automotive Sector, Automotive Investment, Automotive Industry, ASEAN Countries, Factor Analysis, Affecting Factors

*Corresponding author: hthy@rua.edu.kh (Thy Hy)

Received: 29 July 2025; **Accepted:** 12 August 2025; **Published:** 28 August 2025



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1. Introduction

The automotive sector is an important driver to push global economic growth, employing over 50 million people around the world [1] and sharing around 3% (USD 3 trillion in 2022) to the world's gross domestic product (GDP) [2]. Likewise, Cambodia has prioritized its automotive sector in “*Cambodia's Automotive and Electronics Sectors Development Roadmap in 2022*” for becoming a hub for exporting automotive parts to both regional and global markets [3].

However, Cambodia's automotive sector is at the beginning stages [3]. Cambodia had only six automotive assembly industries up to 2024, operating in the country [4]. The expectation of Cambodia on market unit sales for passenger cars is to reach 1,060 vehicles (USD 23.9 million) in 2025 [5]. This underdevelopment is compounded by several factors that hinder further investment and growth in the sector.

This study seeks to explore and analyze the key factors influencing automotive investment in Cambodia, then comparing them to Indonesia and Thailand as these two ASEAN countries are passenger car production hubs in Southeast Asia [6]. The objectives are to (1) determine the key factors affecting automotive investment; and (2) provide implications to address critical factors of Cambodia compared to Indonesia, and Thailand. The findings of this study are expected to provide added value and insights to stakeholders into areas of improvement that could help Cambodia as a key actor in the global automotive market.

Literature reviews: The main activity of the automotive sector is vehicle assembly [7]. Automotive industries are considered as one of contributors in developing economics growth [8, 9]. Location is very important [10]. The location selection is a strategic decision [11]. Manufacturing firms look for international location facilities [12]. Stakeholders are interested in factors influencing where firms locate their activities [13]. Macro and micro factors influence foreign direct investment (FDI) location selection [14]. FDI can push remarkable economic growth, even in developing countries [15]. According to the study of Sturgeon, Biesebroeck, and Gereffi, the trend of production sites for the mass production of specific vehicle models is moved close to the assembly plants for logistical advantages of delivery time, economies of scale, and labor cost savings [16]. Moreover, the study of Kim stated that laws and policies, economic growth, production factors, reform and opening policies, potential market, a low-cost workforce, and tax benefits are factors to affect location decisions [17]. The establishment of numerous special economic zones and development zones of the government provides benefits on foreign companies [18]. Economic reforms, labor law revision, entry into the world trade organization, regional income, production costs, infrastructure, skilled labor, and the number of economic zones, are related to FDI distribution [19-21]. Five main factors influence international location decisions: costs, infrastructure, labor characteristics, political aspects, and economic factors [22]. Furthermore, the study of

Sinha categorized automotive facility location factors into dominant (labor climate, proximity to markets) and general (infrastructure, capital, government policies) categories [23], while the study of Csiki, Horvath, and Szász emphasized infrastructure, government policies, innovation, and labor [24]. The study of Widyarini, Sunardi, and Conggo also mentioned the critical role of human capital or skilled labor [25]. Additionally, the study of Gumilang and the study of Hsieh and Zhang revealed the importance of supply chain in automotive investment [26, 27].

The study of Gabriel, Da Gama Cerqueira, and Ribeiro stated that the location of automotive investment is considered by robust input-supply networks by reinforcing the integration with broader economic activities across regions [7]. Due to the study of Dawal and Taha, well-designed work environments and structured job responsibilities may serve as indicators of operational efficiency, workforce stability, and production quality for strengthening a country's attractiveness for foreign direct investment in automotive manufacturing [8]. According to the United Nations Conference on Trade and Development (UNCTAD) and the ASEAN secretariat, the key factors affecting automotive investment that mentioned in a special ASEAN investment report 2023 are such as regional integration and supply-chain restructuring, support for the energy transition and EV ecosystem, favorable investment environment and incentives, natural resource and input advantages, and economic resilience amid global shocks [28]. Moreover, some researchers also mentioned location-related factors such proximity to suppliers [29, 30], labor costs [31, 32], infrastructure [29, 33, 34], and taxes [29, 30, 34, 35].

Due to the identified factors in the literature reviews, the specific factors chosen for this study are such as political environment, economic environment, financial environment, tax and incentives, infrastructure, labor, industrial capacity, markets, competition, and supply chain [36].

2. Materials and Methods

The study depended largely upon literature review using various available sources such as crossref in R Studio to select reliable documents. The study period was six months, from July to December 2024. This study was focused on Cambodia with comparison to Indonesia and Thailand.

2.1. Data Collection

The research methodology used in this study employed a machine learning reviewing technique, consisting of two stages.

- *Stage 1:* By writing codes in R program for extracting journal articles related to factor affecting automotive industry, a total of 95 journal articles related to the study were retrieved using the rcrossref [37], tidyr [38], dplyr [39], and rstatix [40]

packages in the R-program and RStudio version 4.4.1. The selection criteria were: (1) papers published in an indexed journal between 2003 and 2024; (2) papers approved after a peer-review process; and (3) papers that addressed an issue about factors affecting automotive investment. 26 studies were identified after screening. 11 of the 26 papers were

evaluated for eligibility. Digital objective identifiers (DOI) of the most related articles were used to download files using Google Scholar. Finally, a total of 11 articles were analyzed. [Table 1](#) illustrates a flowchart depicting the study selection process.

Table 1. Flowchart Depicting the Study Selection Process.

Process	Description	Number of Papers
Identification	Record identified by using the rccrossref, tidyr, dplyr, and rstatix packages in the R-program and the RStudio.	95
Screening	Papers approved after a peer-review process and papers published in an indexed journal issued between 2003 and 2024.	60
	Papers that had title on factors affecting something in automotive industry.	48
	Papers that addressed factors affecting automotive industry.	26
Eligibility	Full text assessed for eligibility	11
Included	Studies included.	11

These 11 articles have DOI number such as (1). 10.7166/31-4-2445, (2). 10.17261/pressacademia.2023.1748, (3). 10.21076/vizyoner.1467990, (4). 10.1088/1742-6596/1779/1/012081, (5). 10.18356/26d1a858-en, (6). 10.1108/01443570310481568, (7). 10.1016/j.eastsj.2022.100055, (8). 10.55677/ijssers/v04i5y2024-11, (9). 10.1504/ijkms.2023.127320, (10). 10.11113/jt.v44.354, and (11). 10.1111/rsp3.12190.

- *Stage 2:* The identified factors are categorized into macro and micro level factors. Macro-level factors focus on country-level factors such as politics, economy, finance, tax and incentive, infrastructure, and labor, while micro-level factors

focus on industry-level factors such as industrial capacity, competition, markets, and supply chain [36]. [Table 2](#) mentioned sources of collected data for selected key factors in this study.

Table 2. Sources of collected data for selected key factors.

No.	Key Factors	Sources of Collected Data
<i>Macro-level factors</i>		
1	Political environment	World Bank (2023)
2	Economic environment	Asian Development Bank (2023); ASEAN Secretariat (2023); International Monetary Fund (2023); World Bank (2023)
3	Financial environment	World Bank (2023)
4	Tax and incentive	Council for the Development of Cambodia [CDC]
5	Infrastructure	CDC; Ministry of Foreign Affairs and International Cooperation of Cambodia (2024); World Bank (2023)
6	Labor	Asian Development Bank (2023); ASEAN Secretariat (2023); CDC; World Bank (2023)
<i>Micro-level factors</i>		
7	Industrial capacity	Royal Government of Cambodia [RGC] (2022)
8	Markets	CDC and Department of Foreign Affairs and Trade of Australian government [DFAT] (2023); International Organization of Motor Vehicle Manufacturers [OICA] (2019)
9	Competition	Ministry of Industry, Science, Technology and Innovation [MISTI] (2024); Rakkam (2024)

No.	Key Factors	Sources of Collected Data
10	Supply chain	Rakkarn (2024); RGC (2022)

However, systematic reviews easily carry biases [14]. The systematic review of this study had a limited number of databases for the identification of suitable studies. This study also mentioned only articles written in English. Thus, the bias in the results of this study are evident.

2.2. Data Analysis and Interpretation

According to the macro and micro level factors, the data of Cambodia, Indonesia, and Thailand obtained from the review were both qualitative and quantitative. Qualitative data were interpreted using a qualitative approach, while quantitative data were analyzed based on descriptive statistics by using Microsoft Excel.

3. Results

After literature reviews, key affecting factors were classified as follows:

- *Macro-level factors*: such as political environment (including political stability index, corruption index, and government effective index), economic environment (including economic growth rate, inflation rate, trade agreements, and ease of doing business), financial environment (including real interest rate, and bank credit to the private sector), tax and

incentives (including corporate tax, and import/export duty), infrastructure (including hard infrastructure, country's location, and logistics performance index), and labor (including labor force, and wage rate).

- *Micro-level factors*: such as industrial capacity (including car production capacity and quantity), markets (including domestic sales and export), competition (including number of manufacturers), and supply chain (including availability of suppliers).

3.1. Macro Level Factors

- *Political Environment*: According to the World Bank, Cambodia has a 44.81% percentile rank for political stability, higher than Indonesia (31.60%) and Thailand (29.20%). It is great for long-term investment and business environment. For control of corruption indicator, Cambodia is far behind with 9.91% percentile rank, compared to Indonesia (37.70%) and Thailand (35.80%). It is an important issue in Cambodia that may affect to investors, especially FDI. For government effectiveness, Cambodia has a 36.79% percentile rank, behind Indonesia (66.00%) and Thailand (58.00%) [41]. Table 3 shows the political environment of Cambodia, Indonesia, and Thailand in 2022.

Table 3. Political environment of Cambodia, Indonesia, and Thailand in 2022.

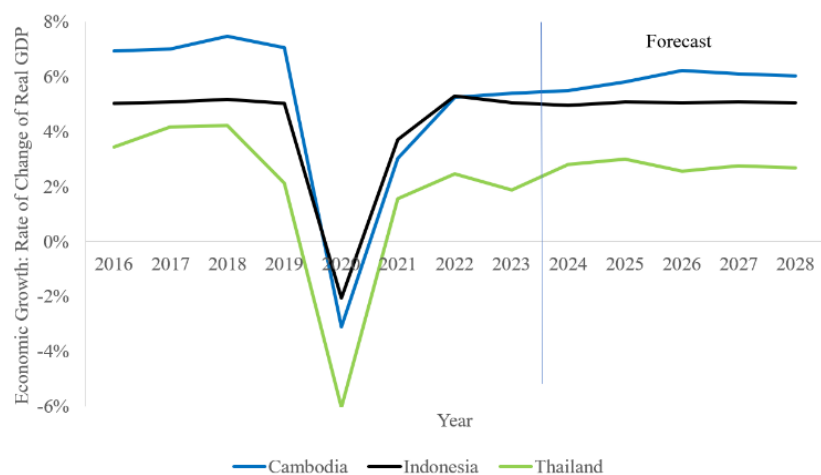
Description	Cambodia	Indonesia	Thailand
Political stability indicator in percentile rank	44.81%	31.60%	29.20%
Control of corruption indicator in percentile rank	9.91%	37.70%	35.80%
Government effectiveness in percentile rank	36.79%	66.00%	58.00%

Source: [41]

- *Economic Environment*: Cambodia's economic growth rate is 5.40% in 2023, compared to Indonesia (5.05%) and Thailand (1.88%) [41]. Cambodia is showing a strong economic expansion for investment. Figure 1 presents economic growth of Cambodia, Indonesia, and Thailand.

For Inflation Rate in 2023 is shown in Figure 2 for Cambodia, Indonesia, and Thailand. Cambodia's inflation rate is 2.10%, outperforming Indonesia (3.70%) and closely following Thailand (1.20%). Cambodia's low inflation shows a

stable macroeconomic environment for investors and businesses because the currency is tied to USD and USD is stable. For trade agreements in 2022, Cambodia has 19 trade agreements, fewer than Indonesia (45) and Thailand (39). For ease of doing business (rank in 2019), Cambodia ranks 144th, far behind Indonesia (73) and Thailand (21) as shown table 4 on economic environment. Cambodia acknowledges this in its business environment and is working to simplify regulations and improve it.

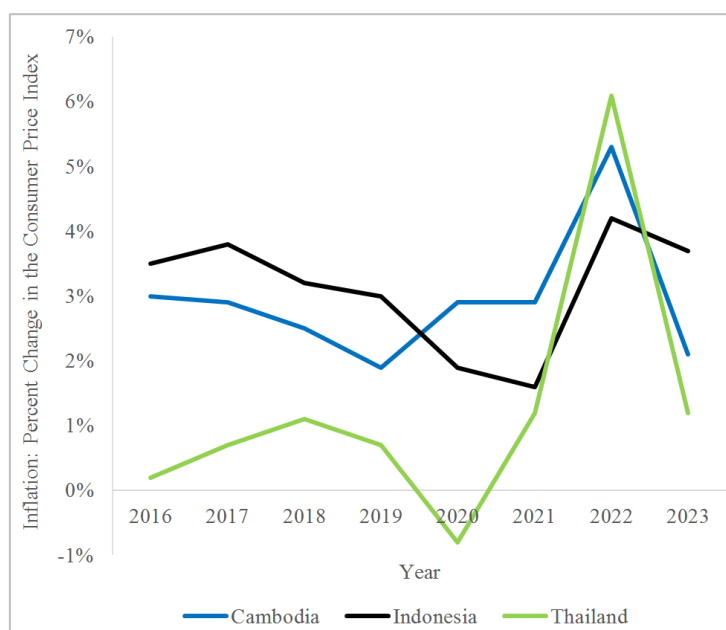


Source: [41, 42]

Figure 1. Economic Growth of Cambodia, Indonesia, and Thailand.**Table 4.** Economic Environment of Cambodia, Indonesia, and Thailand.

Description	Cambodia	Indonesia	Thailand
Economic growth rate in 2023	5.40%	5.05%	1.88%
Inflation rate in 2023	2.10%	3.70%	1.20%
Trade agreements in 2022	19	45	39
Ease of doing business (rank in 2019 among 190)	144	73	21

Source: [41, 43, 44]



Source: [41]

Figure 2. Inflation of Cambodia, Indonesia, and Thailand.

- *Financial Environment*: According to the World Bank, Cambodia's real interest rate in 2022 (2.48%) is lower than Indonesia (4.59%) and Thailand (2.81%). This encourages private sector investment. Cambodia stands out with highest domestic credit to the private sector (% of GDP in 2022) at 180.00%, higher than Thailand (156.30%) and Indonesia (35.30%) [41]. This reflects Cambodia's robust financial support for investment. Table 5 states financial environment of Cambodia, Indonesia, and Thailand in 2022.

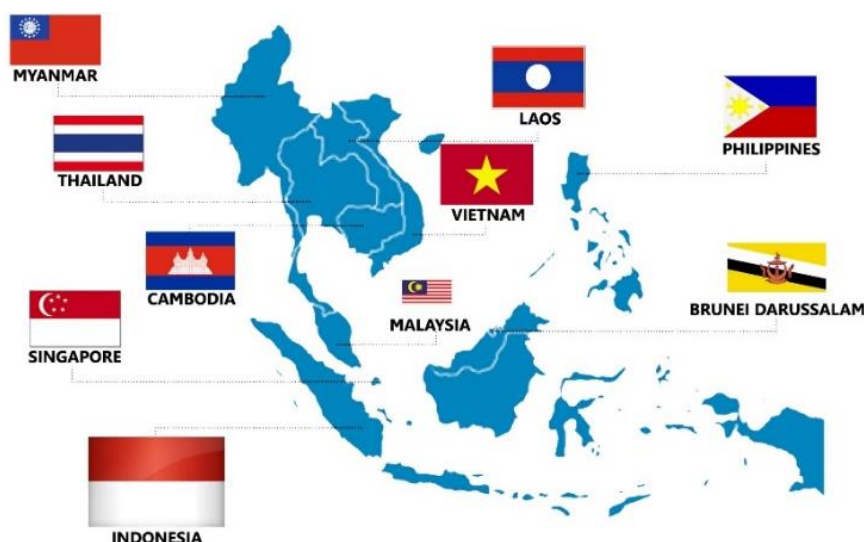
Table 5. Financial Environment of Cambodia, Indonesia, and Thailand in 2022.

Description	Cambodia	Indonesia	Thailand
Real interest rate	2.48%	4.59%	2.81%
Domestic credit to the private sector in the percentage of GDP	180.00%	35.30%	156.30%

Source: [41]

- *Tax and Incentive Environment*: Both Thai and Indonesian governments offer tax and non-tax incentives to encourage foreign investment in the automotive industry. Likewise, according to the Council for the Development of Cambodia (CDC), investors benefit from generous incentives for *Qualified Investment Projects*, including up to 9 years of income tax exemptions or special depreciation; export tax exemptions; full import duty tax exemptions on construction materials; equipment; and production inputs; value-added tax exemption for local production inputs; and 150% tax deduction for research and development, innovation, training, employee welfare facilities and services, and upgrading machinery. Investors benefit from value-added tax (VAT) exemptions and simplified regulations within Special Economic Zones (SEZs) [45]. These incentives position Cambodia as a highly attractive destination for automotive investment.

- *Infrastructure*: Cambodia plays a vital role in the Southern Economic Corridor project, connecting Thailand, Vietnam, and Myanmar. Phnom Penh is located on the trade route between Bangkok and Ho Chi Minh City. Figure 3 shows the map of ASEAN member states.



Source: [46]

Figure 3. Map of ASEAN member states.

Table 6. Infrastructure of Cambodia, Indonesia, and Thailand.

Description	Cambodia	Indonesia	Thailand
Infrastructure score in 2023	2.1	2.9	3.7
Logistic Performance Index (LPI) score in 2023	2.4	3.0	3.5

Source: [41]

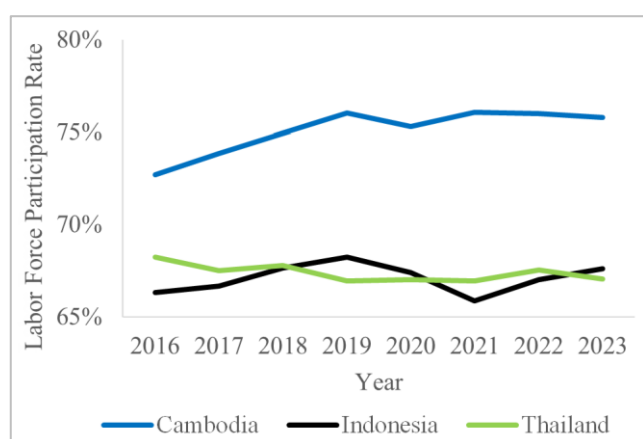
Note: a score ranging from 1 to 5, with higher scores indicating better performance.

Cambodia has 17 airports and the Sihanoukville SEZ provides access to key international trade hubs via road, rail, sea, and air. Cambodia shares borders with Thailand, Vietnam, and Laos, offering proximity to significant regional markets. The country has Phnom Penh-Sihanoukville Expressway (USD 1.9 billion) and USD 150 million road development project in Siem Reap [45]. However, Cambodia's infrastructure score and logistics performance index score remains lower than Indonesia and Thailand [41]. Table 6 presents the infrastructure of Cambodia, Indonesia, and Thailand.

Table 7. Labor Force of Cambodia, Indonesia, and Thailand.

Description	Cambodia	Indonesia	Thailand
Population in 2022 (million)	16.6	275.8	69.9
Population growth rate in 2022 (%)	1.4	1.2	0.2
Number of labor force in 2022 (million)	9.1	143.7	39.9
Labor force participation rate in 2019 (%)	69.3	67.5	67.5
Employment in industry:% of total employment in 2019	27.9	22.4	22.8
Minimum wage in 2021 (USD)	192	270	262

Source: [43, 44]



Source: [41]

Figure 4. Labor Force Participation Rate of Cambodia, Indonesia, and Thailand.

- *Labor*: According to the CDC, Cambodia's population is

young and dynamic, with over 60% of its 16.6 million people under the age of 35. The literacy rate has surged, nearing 90% in 2019, while employment in secondary and tertiary industries has grown by 1.6 times since 2008. Cambodia offers one of the most competitive wage levels compared to Indonesia and Thailand [45]. Figure 4 illustrates labor force participation rate of Cambodia, Indonesia, and Thailand and Table 7 shows labor force of Cambodia, Indonesia, and Thailand.

3.2. Micro-level Factors

- *Industrial Capacity*: Cambodia's automotive industry is in its early stages compared to Indonesia and Thailand. Current production is modest, focusing mainly on vehicle assembly from imported kits, with major players like Cambodia Auto Industries, Kia Motors, and Toyota contributing to the sector's development [3].

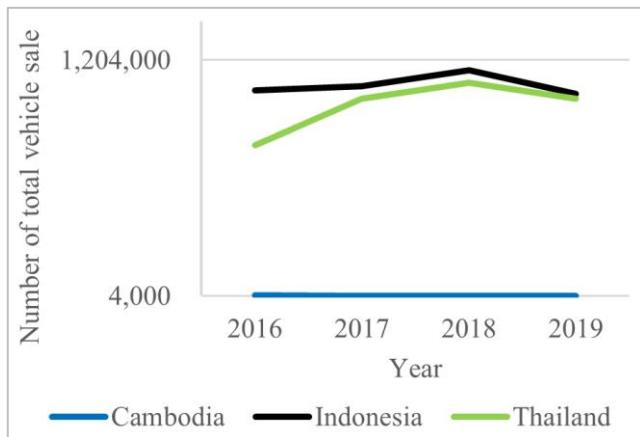
- *Markets*: The CDC and the Department of Foreign Affairs and Trade of Australian government (DFAT) showed that Cambodia's automotive sector is expanding rapidly, with significant investments reaching USD 1.38 billion between 2020 and 2022. Japan, Korea, and China are the leading investors, while key export markets include Thailand and Japan [47].

Table 8. New Vehicle Sales of Cambodia, Indonesia, and Thailand in 2019.

Description	Cambodia	Indonesia	Thailand
New passenger car sales (a)	1,275	785,539	468,638
New commercial vehicle sales (b)	3,292	4,947	538,914
Total new vehicle sales (a + b)	4,567	30,486	1,007,552

Source: [48]

Automotive component exports totaled USD 484.78 million, growing 10% annually. While currently small compared to Indonesia and Thailand, the market is poised for expansion due to rising domestic demand, government support, and growing consumer incomes. Table 8 presents new vehicle sales of Cambodia, Indonesia, and Thailand in 2019. While Cambodia's automotive industry is growing, its scale is still relatively small compared to Indonesia and Thailand. Figure 5 shows total vehicle sales of Cambodia, Indonesia, and Thailand.



Source: [48]

Figure 5. Total Vehicle Sale of Cambodia, Indonesia, and Thailand.

- *Competition:* According to the MISTI, the automotive industry in Cambodia is still in early stages with 6 automotive assembly industries [4] compared to 22 in Indonesia and 30 in Thailand [36]. Even if it is in its nascent stages, it shows good opportunities for investors to look for the industries' establishment.

- *Supply Chain:* The automotive sector of Cambodia has limited an efficient supply chain compared to Indonesia and Thailand [36]. This issue can cause to increase production costs and more times spent for parts and materials. The RGC informs that Cambodia can solve this challenge by making collaborations with regional suppliers and international manufacturers. Cambodia can get advanced technologies and expertise through making partnerships with established companies [3].

4. Discussion

Based on the literature reviews, it was found that there are ten affecting factors on automotive investment. Six factors such as political environment, economic environment, financial environment, tax and incentive, infrastructure, and labor are in the macro-level factors. Other four factors such as industrial capacity, markets, competition, and supply chain are in the micro-level factors. These factors can be considered as key affecting factors because it can cover both industry-level factors and country-level factors. These specific factors chosen for this study are in line with the study of Rakkarn who found the same ten factors influencing automotive industrial location in Thailand and using it for a comparison of the automotive industry in Thailand and Indonesia [36]. Moreover, these specific factors are also similar to the study of Arifin, Priadana, and Sunar who found that nine operational variables such as automotive exports, automotive imports, logistics performance index, exchange rate, tax ratio, total factor productivity, inflation, infrastructure automotive industry, and foreign direct investment are factors affecting the in-

creasing competitiveness of the automotive industry sector in promoting sustainable Indonesian economic growth [49].

To provide implications to address critical factors of Cambodia compared to Indonesia, and Thailand, the findings based on reliable sources showed that Cambodia has a higher percentile rank for political stability, a higher economic growth rate, a highest domestic credit to the private sector, the most competitive wage levels, and lower real interest rate than Indonesia and Thailand. Furthermore, Cambodia's inflation rate is outperforming Indonesia and closely following Thailand. Moreover, Cambodian, Indonesian, and Thai governments offer tax and non-tax incentives to encourage foreign investment in the automotive industry. But Cambodia also has some challenges to be addressed, especially infrastructure and bureaucratic challenges, compared to Indonesia and Thailand.

According to a special ASEAN investment report 2023, Cambodia is a newcomer in the automotive and EV sector. Cambodia has had government-led subsidies and charging infrastructure policies in 2023-2024 with the purpose to attract private investment and prepare future participation in the automotive value chain. For Indonesia, has emerged as a key EV hub, drawing substantial greenfield foreign direct investment (FDI) in battery and EV manufacturing, particularly leveraging its nickel and cobalt resources. With major commitments, there are Mitsubishi's USD 667 million investment (2023-2025) and Hyundai's USD 1 billion EV plant. Anyways, Thailand is building its strong automotive base. Thailand is accelerating into EV production through generous incentives, streamlined investment approvals, and high-profile projects. There are such as BYD's USD 491 million EV factory and BMW's planned regional EV headquarters in 2024. Thailand is positioning the country as a leading EV manufacturing and export center in ASEAN [28].

However, systematic reviews easily carry biases [14]. The systematic review of this study had a limited number of databases for the identification of suitable studies. This study also mentioned only articles written in English. Thus, the bias in the results of this study are evident. After the next five years, it is recommended that future researchers explore and conduct research again to identify factors affecting automotive investment in Cambodia.

5. Conclusions

The primary aim of this research was to determine the key factors affecting automotive investment from various studies and provide implications to address critical factors of Cambodia compared to Indonesia, and Thailand, by collecting the existing data for each factor from reliable sources.

The results revealed that the infrastructure of Cambodia was in developing stage, compared to Indonesia and Thailand as shown the logistics performance index and infrastructure scores. This showed gaps, which had a negative impact on the speed and cost-effectiveness of supply chains. It was also found that bureaucratic inefficiencies were able to

hinder business operations, making it difficult for companies to navigate regulatory processes efficiently. However, at the same time, Cambodia had good opportunities for automotive investment, including strong political stability, a high economic growth rate, a young workforce, stable business environment, growing network of trade agreements, numerous tax incentives, and growing industrial capacity.

Practically, this study suggests as follows:

1. The Royal Government of Cambodia should prioritize strategic investments in infrastructure. It should continue its efforts on upgrading infrastructure, including transportation, digital connectivity, and utilities. If the government invests highways, ports, and rail networks, the flow of goods will improve, transportation costs will reduce, and supply chain efficiency will increase.
2. The Royal Government of Cambodia should streamline bureaucratic processes in order to reduce complexity and length of administrative processes. It is very important for improving Cambodia's ease of doing business ranking.
3. The Royal Government of Cambodia should adopt digital solutions and simplify regulatory frameworks. The integration of digital solutions into regulatory and business operations can improve transparency, reduce corruption, and increase efficiency.

Abbreviations

ASEAN	Association of Southeast Asian Nations
CDC	Council for the Development of Cambodia
DFAT	Department of Foreign Affairs and Trade of Australian Government
DOI	Digital Objective Identifiers
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
LPI	Logistic Performance Index
MISTI	Ministry of Industry, Science, Technology and Innovation
OICA	International Organization of Motor Vehicle Manufacturers
RGC	Royal Government of Cambodia
SEZ	Special Economic Zone
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollar
VAT	Value-added Tax

Acknowledgments

The author is grateful for constant technical support and advice from the Faculty of Agricultural Economics and Rural Development, Royal University of Agriculture, Cambodia. Moreover, it is also appreciative for the involvement of Ms.

Terra Michaels, a native English speaker for her support to correct the English language of this study.

Author Contributions

Thy Hy: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Visualization, Writing - original draft, Writing - review & editing.

Lyhour Hin: Conceptualization, Formal analysis, Methodology, Software, Supervision, Validation, Writing - review & Editing.

Sophea Nhean: Conceptualization, Methodology, Supervision, Validation, Review, and editing.

Bandith Seng: Conceptualization, Methodology, Supervision, Validation, Review, and editing.

Availability of Data and Materials

The data and materials are available from the corresponding author upon reasonable request.

Ethical Approval and Consent to Participate

The authors declared that the ethics committee approval was not applicable to this study, as it is a review of existing literature and does not involve human participation.

Funding

This work is not supported by any external funding.

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography



Thy Hy is a Cambodian professional with over 20 years of expertise in development management, socio-economic research, and capacity-building initiatives. He holds two bachelors' degree (*Development Economics and Management*) from the Royal University of Law and Economics, Cambodia and a master's degree (*Management*) from the National University of Management, Cambodia. Currently, he is a Ph.D. candidate in Economics and Development Management at the Royal University of Agriculture, Cambodia. He has successfully led numerous high-impact projects aimed at strengthening skills development, fostering economic growth, and empowering communities. His career spans leadership roles, including his previous position as a Deputy CEO of the Skills Development Fund (SDF), where he spearheaded strategic planning, project oversight, and capacity-building programs. His current position is a Deputy CEO of the Innovative Services, Engineering, and Advisory (iSEA), where he designs the institutional development plan and provides consultancy services to clients based on his expertise.



Lyhour Hin is a dedicated researcher and lecturer at Royal University of Agriculture (RUA), Cambodia, with extensive experience in teaching and research. He earned a Ph.D. in agricultural science from RUA. He teaches renewable energy, applied R for statistics, and scientific writing; supervises graduate research; and leads projects on commercial biogas technology, solar irrigation, solar dryer, conservation agriculture, and smart farm machinery. He has published about 20 papers in reputable journals such as the American Society of Agricultural and Biological Engineers and Multidisciplinary Digital Publishing Institute. He is not only an editorial board member for several journals such as Asian Journal of Agriculture and Rural Development and Trends in Horticulture, but also serves as a reviewer for multiple journals, including Research on World Agricultural Economy and Advances in Modern Agriculture. He has written two textbooks: Fundamentals of R Application for Statistics and Graphics and Fundamentals of Renewable Energy.



Sophea Nhean is a senior official of the Ministry of Agriculture Forestry and Fisheries (MAFF). Also, he is a researcher and lecture at Faculty of Agricultural Economic and Rural Development, Royal University of Agriculture (RUA), Cambodia. He is a horticulturalist and agronomist. He graduated Ph.D. degree in Agricultural Science from Khon Kaen University (KKU), Thailand in 2019. His research expertise and experience mainly focused on plant ecophysiology, cropping system, farming system (soil-plant- atmosphere interaction) related to agri-tech and innovation, environment, climate change adaptation, and agricultural value chain. In addition, he has more than 10 years of experience on extension and technologies transfer to farmers and communities. He has led and participated in many projects related to value chain, postharvest, crop production, and extension services. Moreover, he supervised bachelor, master, and Ph.D. students.



Bandith Seng is an accomplished environmental scientist and project management specialist with a Ph.D. from Okayama University, Japan. With over nine years of experience, he excels in policy research, monitoring and evaluation, and stakeholder engagement. Currently, as National Research Coordinator for ADB's Skills for Competitiveness Project, he leads TVET policy studies, evaluates training programs, and ensures compliance in procurement and contract management. Previously, as a National Expert with UNDP Cambodia, he developed waste management strategies and training materials. His diverse background includes roles in environmental impact assessment, socio-economic research, and teaching. Fluent in Khmer and English, he has also contributed as a translator for UN initiatives. Bandith's expertise spans gender inclusion, leadership, and project management, supported by professional training from institutions like NUS Business School and ITCILO. A collaborative and analytical professional, he is committed to sustainable development and skills enhancement in Cambodia.

Research Field

Thy Hy: skills and education, automotive sector, economic development, water supply, and sanitation.

Lyhour Hin: Digital agriculture, conservation agriculture, renewable energy, data analytics using R.

Sophea Nhean: plant ecophysiology, cropping system, agri-tech and innovation, environment, climate change adaptation, and agricultural value chain.

Bandith Seng: policy research, monitoring and evaluation, stakeholder engagement, environmental impact assessment, and socio-economic research.