THE IMPACT OF THE COVID-19 PANDEMIC ON SUPPLY CHAIN PERFORMANCE OF THE AUTO PARTS INDUSTRIES OF THAILAND
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Keywords: the COVID-19 pandemic, supply chain performance, automotive parts industries, Thailand
Abstract: This research aims to analyse the impact of the COVID-19 Pandemic on Supply Chain Performance of the Auto Parts Industries of Thailand. The primary data collected from an online questionnaire sent to 400 samples obtained by a stratified sampling method selected from tier 1, tier 2, and tier 3 auto parts manufacturers. The structural equation model applied for analysis. The results showed that the COVID-19 Pandemic, Environment performance, Negative performance, and operation performance affected supply chain performance. For suggestions from this research, first of all, the company's knowledge of internal management. And government involvement has a direct impact on the performance of the auto parts supply chain. The government's participation as factors of external influence also has an immediate effect on supply chain management. Company practices show that governments have played an essential role in promoting the auto parts industry's survival since its upstream. Midstream and downstream pressure has an indirect effect on corporate and consumer of supply chain management practices.

1 Introduction

The COVID-19 epidemic spread throughout the world has had a severe impact. To change the business environment, organizations across the globe need to adapt radically. By emphasizing the importance of being able to respond, adjust, and set up a crisis. Management mechanisms in a business environment are brimming with uncertainty due to severe limitations and blocking. Many urgent situations where gaining immediate attention; in the early stages of the epidemic, many companies began to shift towards in "recovery mode," companies have started planning long-term in difficult corporate recovery. In contrast, companies want to strengthen their operations and business flexibility. And risk management is more apparent than ever [1].

The COVID-19 Pandemic has affected the Thai automobile industry in various aspects, such as the cause of the economic recession both in Thailand and globally, which is a significant factor affecting automobile orders from both the domestic and export markets. It has resulted in the volume of automobile production in Thailand. This year to the lowest point in more than nine years, with the Kasikorn Research Center preliminary estimates from the perspective of the current epidemic situation that the quantity The production of automobiles in 2020 could shrink significantly by 21 to 25 percent, or produce just 1,520,000 to 1,590,000 cars, with this drop expected as a result of potentially much lower exports. It reached 750,000 to 780,000, shrinking 26 to 29 percent from 1,054,103 previously exported in 2019, while domestic sales are at risk of falling to 800,000 to 820,000 vehicles. 19 to 21 percent from 1,007,552 cars in the previous year and the auto industry's recovery to normal again is expected from mid-2021 to or early 2022 after the global economy will gradually recover in 2021 [2].

The global auto parts industry relies on manufacturing and supplies in China, Southeast Asia, and Thailand for low cost; however, in recent years, overall global developments have forced these companies to Rethink the supply chain and its stability and reliability for the uncertain future. It involved not only the COVID-19 Pandemic but also other external factors such as the trade war. Rules and regulations risk from natural disasters, including the environment or green logistics, etc.

For the above reasons, the researchers wanted to study and analyse the Impact of the COVID-19 Pandemic on Supply Chain Performance of the Automotive Parts Industries of Thailand.

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2   Literature review
2.1   *The COVID-19 Pandemic*

The COVID-19 pandemic is an ongoing global pandemic of coronavirus disease 2019 (COVID-19). Caused by severe acute respiratory syndrome coronavirus 2 (SARS CoV 2). [3] The outbreak was identified in December 2019 in Wuhan, China. The World Health Organization declared the outbreak a Public Health Emergency of International Concern on 30 January 2020 and a pandemic on 11 March. [4]. As of 26 August 2020, more than 24 million cases of COVID-19 have reported in more than 188 countries and territories, resulting in more than 821,000 deaths; more than 15.6 million people have recovered [5].

The crisis has also highlighted the critical problem in the current model of manufacturing processes that are too dependent on a single production base. As a result, carmakers and parts manufacturers may consider modifying them for more flexibility in the future by diversifying risks in the acquisition of auto parts in the supply chain. The approach that expects vehicle manufacturers and parts manufacturers to adopt from now on may divide into two categories: reducing the Just in Time production system. At the same time, the other one focuses on reducing dependence on the base. It is a single production by shifting the production base to the country that is the region's strategic production base. The strategy is expected to lead to a more precise direction for the output of the supply chain, such as sharing platforms for each model of cars and parts, both within the same brand and between companies. And consolidating certain types of jobs in different tiers into the same company group especially, joining the same business segment as Tier 1 manufacturers, shortening the production supply chain [2].

2.2   *Supply Chain Performance*

Supply chain performance efficiency refers to supply chain activities that extend to meet end-customer needs, including product availability, on-time delivery, and inventory and all required production capacity in the supply chain. It responsively delivers performance, Supply chain efficiencies across corporate boundaries as they include base materials, components, sub-assemblies, and finished products, and distributed through multiple channels to end customers. It also crosses traditional corporate functions such as purchasing, manufacturing, distribution, marketing and sales, and research and development. It is victorious in a new environment; the supply chain needs constant improvement. To achieve this, we need performance measures, or "metrics," that support the advancement of global supply chain efficiency rather than company-specific or function-specific metrics. It impedes the improvement of the entire network. The component of supply chain efficiency assesses by environmental management performance. Positive economic performance Negative economic operation and operation performance [7]. Impact of the COVID-19 Pandemic severe impact on supply chain performance of auto parts supply chain. But be prepared to deal with it properly, in particular, supports domestic parts manufacturers to use more automation in their production processes. Environmental production concern Actions that enable cost reductions in the supply chain will increase the opportunity to compete with other production-based countries, especially with the expanding electric car industry.

2.3   *Environment performance*

Environment refers to centralized operations that accumulate expertise in each green activity, where each action has its specialized role in handling damaged returns and stock returns—the end of product life or the destruction of products (end of life). The discarded (discarded) products from downstream members of the supply chain [8]. Which are activities that involve the recycling and restoration of the product, and you another benefit, product chain activity, in this model, both forward logistics and reverse logistics, are considered part of the chain. Green supplies both upstream, midstream, and downstream activities are essential in building green logistics. However, all of these activities have to lead to the practice that goes into the green standard in three levels: First level, all departments, and activities in the supply chain have to move towards the green standard. The second level should create a collaborative network between departments in the organization to design greens to create a green supply chain across the organization. And the third level, expanding operations to production green and making the most of reverse logistics to achieve efficiency and effectiveness in the reverse mechanism. Environment performance is a factor affecting Supply Chain Performance [9,10].

2.4   *Negative performance*

Negative performance defines as the impact on the supply chain to create an increase in investment. Growth in investment, increasing operating costs increasing costs for purchasing environmentally friendly raw materials. Because of the negative economic performance because of this, it reduces market share and creates market opportunities [11]. The cynical interpretation reflects the increase in the cost of purchasing materials. It increased energy consumption waste materials and negative waste disposal agreement lower economic efficiency. It can see from the rise of the expenses associated with the investment. And the purchase of materials incompatible with the environment [12]. The delivery was not on time. Increasing inventory levels, increasing scrap rates, lack of promoting product quality. Growing product lines and inefficient use of capacity [13]. In terms of environmental performance, there have been many experimental studies. The lack of focus on supply chains [14].

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2.5 Operation performance

Operations performance in the supply chain performance is operations within the organization that impact the SCM guidelines on SCP. Govindan et al. [15] studied the relationship between SCM practices affecting supply chain performance in the automotive industry. The results of the research revealed "internal management support," "purchasing," and "internal management support". Also, the ISO 14001 certification" is an essential SCM practice, and factors affect the adoption and use of green supply. Some aspects factors in the handling of SCP in the electrical and electronic industries in Taiwan. It found that SCM's critical success factors were the division of activities into upstream, midstream, and downstream activities, which show outside. Environmental factors customer pressure regulatory pressure, government support, and environmental uncertainty. It is of the utmost importance to implement environmentally friendly practices as part of operations within the supply chain performance. The results of the literature review could create a conceptual framework for this research as follows:
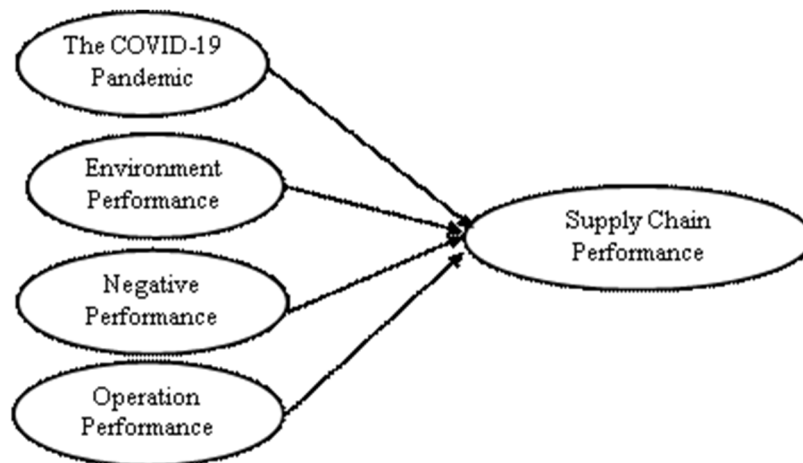

Figure 1 Research conceptual framework
Source: Updated from Aalirezaei et al. [7]; Zhu, Sarkis and Lai, [8]; Govindan et al. [15]

3 Research Methodology

Regarding the quantitative research method, the survey method applies by creating a questionnaire focusing on the design of research tools with suitable criteria for accurate measurement, possessing both validity and reliability in terms of content, approaches, and concepts. For this research, a questionnaire with validity and reliability according to the criteria and concepts constructed. The questionnaire survey was thoroughly designed under the advice of three academics experts. Before collecting the data, the questionnaire tested to determine what needs to be measured before issuing the survey and before receiving data, reliability testing applying Cronbach's Alpha test statistics to check whether their liability meets the criteria specified (Alpha value is lower than 0.60). If not, more questions added, and some may be cut and tested repeatedly until the questionnaire was accurate and reliable. Online surveys and postal questionnaires were sent directly to respondents from the sample's proportion randomized systematically—the values of the reliability coefficient of gauges used in this research. Cronbach's Alpha coefficient measuring the reliability or internal consistency of the meters gained the amount between .814 and .810; meanwhile, the 16 questions gained the Cronbach's coefficient at .822, expressing a high-reliability level.

Population and sample

The population is the auto parts industry in Thailand. Several car automotive assembler 18 companies, motorcycle automotive assembler eight companies, 1,700 companies in tier 2 and tier 3 auto parts manufacturer, and 709 companies tier 1 auto parts manufacturer [16]. The sample group stratified sampling from the auto parts industry in Thailand will be sampled. It is a group of automotive components Industrial groups of parts manufacturers, level 1 (tier 1), level 2, 3 (tier 2, 3), and sampling from industries with locations in each region (northern, central, eastern, western, and southern regions). Interviewed the manager of operations, logistics, and supply chain, a critical position that can provide excellent information and footprint on the auto parts industry's supply chain management. And complete as a junior executive and have a unique operational understanding. Method for selecting samples was based on probability principles (Non-Probability Sampling) by stratified sampling from the auto parts industries in Thailand; without any selection rules at 400.

4 Research Result

To answer the question of the research, the study and analysis of the impact of the COVID-19 Pandemic on supply chain performance of the autoparts industries of Thailand conducted. For exploratory factor analysis

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(EFA), the Common Factor Analysis, Principal Axis Factoring (PAF) method applied.

Table 1 Kaiser-Meyer-Olkin (KMO) and Barlett's Test of Sphericity

Kaiser-Meyer-Olkin (KMO)	0.781
Barlett's Test of Sphericity	
ApproximateChi-Square	317.579
df	194
Significant	.000

From Table 1: Kaiser-Meyer-Olkin (KMO) and Barlett's Test of Sphericity. KMO is 0.781 and Sig = .000 < 0.05, where 0 < KMO < 1 was close to 1, meaning all variables were related to factors using for further factor analysis. Common elements could explain the relationship between variables at a reasonable level [17].

Table 2 Statistical values for evaluating the structural validity of the empirical model

Index value	Benchmark	Statistical values obtained from analysis
p-value	Greater than or equal to 0.05	.081
$\chi^2 = 317.579$ df.=194 χ^2/df. = 1.637	Should not exceed 2.0	1.637
CMIN/DF	Less than 2.0	1.637
GFI	More than 0.95	.951
TLI	More than 0.95	.962
AGFI	More than 0.95	.950
CFI	More than 0.95	.950
RMSEA	Less than 0.05	.050

From Table 2, the values χ^2= 317.579 df. =194, the values of χ^2/df. = 1.637, p-value = .081 and CMIN / DF = 1.637, which was less than 2.0, had a good level of consistency (Schumacker & Lomax, 2010), meaning that the structural equation model was in harmony with empirical data In addition, GFI = .951, TLI = .962, AGFI = .950 and CFI = .950 were greater than 0.95. All values showed a good level of consistency and found that RMSEA = .050 and PCLOSE or p-value = 0.000. The assumption was that RMSEA was less than 0.05 [18]. In conclusion, the index values check the consistency between the model and the empirical data was following the standard criteria and at a good level of conformity.

Table 3HOELTER

Model	HOELTER 0.5	HOELTER 0.1
Default model	215	218

From Table 3, the HOELTER 0.5 value was at 215, which was more than 200, indicating that the sample set in this study was well suited.

The Regression Weights showed regression coefficients. From the hypothesis testing of every correlation coefficient, all p-value = P = ***, which was less than 0.05 when studying all factor weight. It found that from the test of factor weight, every factor is non-zero, with every CR value greater than 1.96, and checking the statistic values from Table 2-3 together with the analysis of the factor weight. In conclusion, the model in figure 2 had been in harmony with empirical data at the significance level of 0.05, is shown in figure 2.

From the Figure 2. The confirmatory component analysis of the measurement model based on the Standardized Regression Weights showed that:

The weight of the standard factors in Figure 2 shows that the weighting factors included the COVID-19 Pandemic, Environment performance, Negative performance and operation performance. When considering from the highest to the lowest, Environment performance gained the most senior level at .37, followed by Negative performance (.47), the COVID-19 Pandemic (.37), and Operation performance (.27), simultaneously.

The weight of Environment performance of the variables could be observed in 3 levels from the highest to the lowest as follows: green activity (.90); green supplies (.88); green logistics (.84).

The weight of Negative performance of the variables could be observed in 3 ranks from the highest to the lowest as follows: reduce market share (.89); increase cost (.81); increase energy (.73)

The weight of the COVID-19 Pandemic of 3 observable variables could be ranked from the highest to the lowest as follows ongoing global pandemic (.89); reduction of the just-in-time (.85); diversifying risk (.76)

The weight of Operation performance of the variables can be observed in 4 numbers from the highest to the lowest as follows: the possibility of internal management support (.92); relation between SCM (.87); operation within organization (.79); environment uncertainly (.73).

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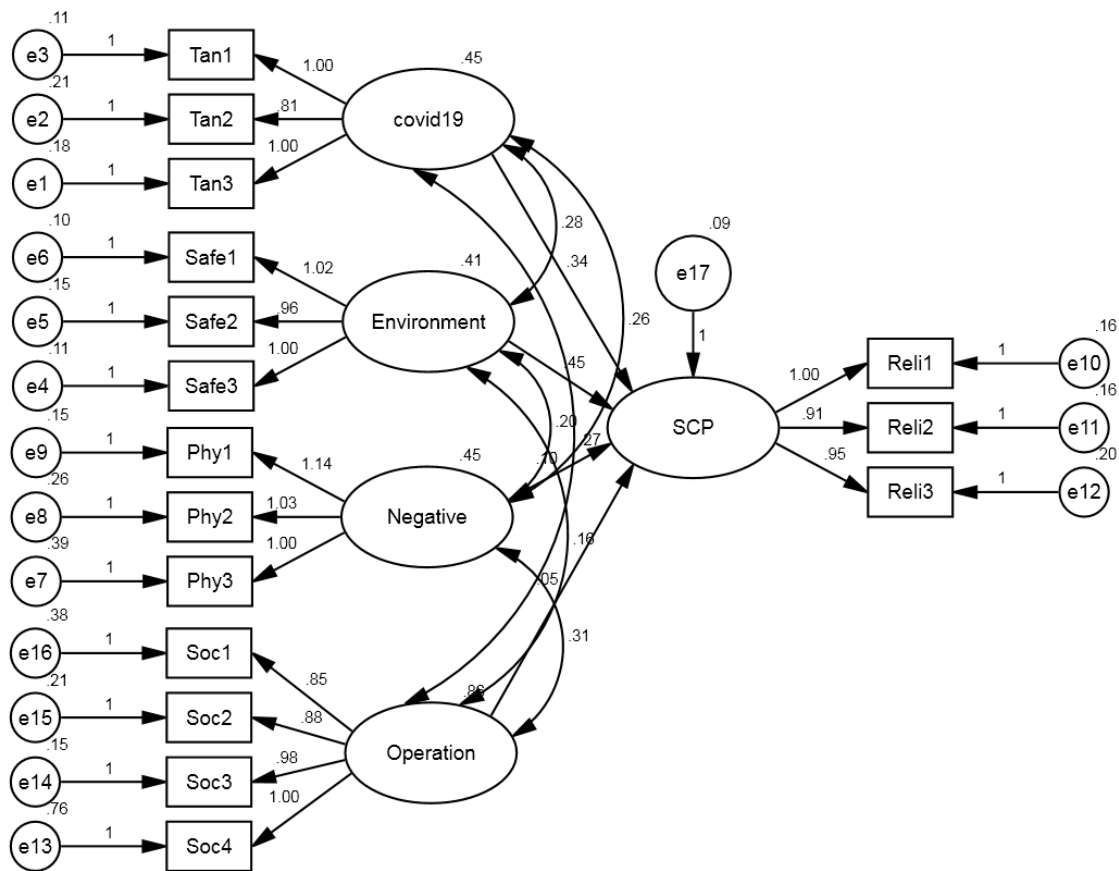
$\chi^2 = 317.579\ df. = 194$, $\chi^2/df. = 1.637$, p-value = .081, CMIN / DF = 1.637, GFI = .951, TLI = .962, AGFI = .950, CFI = .950, RMSEA = .050, at significant level .05

Figure 2. The structural equation model of The Impact of the COVID‑19 Pandemic on Supply Chain Performance of the Auto Parts Industries of Thailand

Table 4 Test results for the path coefficient of The Impact of the COVID-19 Pandemic on Supply Chain Performance of the Auto Parts Industries of Thailand. And checking the consistency of the model and the empirical data

Cause variable	Effect variable	Estimate	S.E.	Z-test	p	R^2
X1 = The COVID-19 Pandemic	Y = Supply Chain Performance	.342	.055	6.199	.000	.75
X2 = Environment performance		.448	.051	8.771	.000	
X3 = Negative performance		.099	.047	2.100	.036	
X4 =Operation performance		.051	.029	1.776	.050	

From the Table 4. The effects of checking the consistency of the model and the empirical data developed were inharmonious with the data. The conclusion of the coefficient testing of the structure equation model found that:

The weighting factors included the COVID-19 Pandemic, Environment performance and Negative performance and Operation performance. When considering from the highest to the lowest, Environment performance gained the most senior level at .37, followed by Negative performance (.47), The COVID-19 Pandemic (.37), and Operation performance (.27), simultaneously.

When considering the R^2 value from Table 4, it found that the COVID-19 Pandemic, Environment performance, Negative performance and Operation performance could predict Supply Chain Performance at 75%.

When considering the harmonization and empirical data, it found that the ratio between R^2 and the degrees of freedom was 1.637, which was less than 2; the index of harmony (CFI) was .951, which was higher than 0.95 indexes. The suitability measurement (TLI) was .962,

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which was higher than 0.95. The revised Harmony Index (AGFI) was .950, which was higher than .95, and the Estimation Index of Estimates parameter value (RMSEA) was .050, which was less than 0.05 (Wanichbuncha, 2013).

Therefore, it could conclude that The Impact of the COVID-19 Epidemic on Supply Chain Performance of the Auto Parts Industries of Thailand was consistent with the empirical data.

5   Discussion and Findings

The COVID-19 Pandemic is the ongoing global pandemic of the 2019 coronavirus (COVID-19).   The crisis highlights a critical issue in the manufacturing process model in the auto parts supply chain severely. It is to aggravate the auto parts industries' situation in recent times, which has faced an economic slump around the world. However, factors affecting the supply chain are that the Thai auto parts industry relies too much on a manufacturing base in China, a vast production base. As a result, automakers and parts manufacturers may consider future flexibility modifications by diversifying the risk of purchasing auto parts in the supply chain. The approach that automakers and parts manufacturers expected to adopt from now on could divide into two categories: just-in-time production cuts. Simultaneously, the other focused on reducing dependency on bases—single production by relocating production base to the country of the regional strategic manufacturing base.

The strategy is expected to lead to a more precise direction for supply chain manufacturing, such as sharing platforms for individual cars and parts, both within the same brand and between companies and the inclusion of certain types of work in different tiers. The same group of companies, especially joining the same business as 1 tier manufacturers, shortened their production supply chains. Also, supply chain performance factors that expand to meet end-customer needs include product availability, on-time delivery, and all required inventory and capacity in the supply chain. To deliver performance in a way that meets supply chain performance across the enterprise's boundaries as it includes base materials, components, sub-assemblies, and finished products and is distributed across multiple channels to end customers. It also crosses traditional corporate functions such as purchasing, manufacturing, distribution, marketing and sales, and research and development. It is victorious in a new environment; the supply chain needs constant improvement.

The negative economic performance is consistent with Aalirezaie et al. [7] research, together with the impact factors of the COVID-19 Pandemic severely affecting the auto parts industry in supply chain performance. Environmental performance factors are green manufacturing activities, damaged return management, stock returns, product returns, product expiration, or product destruction. The end of life and discarded product from downstream members of the supply chain, in line with

Schmacker & Lomax [19] research activities related to product recycling and restoration. And another benefit, the product chain activities in this model, both forward and reverse logistics, are factors that affect the supply chain of the auto parts industry in the world. Thailand. It is consistent with the Sarkis study [8]. Environmental supply chain management, both upstream, midstream, and downstream activities are essential in building green logistics. However, all of these activities must lead to green practice at three levels: first level, all departments, and activities in the supply chain must move towards a green standard. The second level should create a collaborative network between departments within the organization to design greens to create a supply chain across the organization. And the third level extends operations to production and makes the most of reverse logistics to achieve efficiency and effectiveness in the traction mechanism. Environmental efficiency is a factor that affects supply chain performance. This research is consistent with Nylund, [9]; Zhan and Liu [10].

6   Concluding remarks

The impact of the COVID-19 Pandemic on the company's internal performance, negative from the decline in production capacity and sales. Environmentally friendly production factors Economic globalization ecological issues and corporate social responsibility. These factors affect the performance of the auto parts supply chain. For suggestions from this research, first of all, the company's knowledge of internal management. And government involvement has a direct impact on the performance of the auto parts supply chain. The government's participation as factors of external influence also has an immediate effect on supply chain management. Company practices show that governments have played an essential role in promoting the auto parts industry's survival since its upstream. Midstream and downstream pressure has an indirect effect on corporate and consumer of supply chain management practices. Government involvement factors have a significant impact on the industry. By policy measures on tax deductions. Its suspension of payments by banks to sustain internal operations. Compensation to employees when the government has announced that the company will stop working and work from home. The issuance of subsidy policy to support organizations in operating their supply chain during the time the company confronts the COVID-19 Pandemic. It affects the operations within the company and the auto parts industry as a whole.

7   The future direction of research

Future research should study the impact of the COVID-19 epidemic on delivering value to customers in the auto parts supply chain, and supply chain risk management of the auto parts industry in Thailand.

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