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# THE RELATION OF LOGISTICS FLEXIBILITY, SUPPLY CHAIN FLEXIBILITY AND BUSINESS PERFORMANCE IN THAILAND

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## ABSTRACT

Today's business competition is intense, which is caused by many factors that consist of the rapid expansion of online businesses, global sourcing strategies, and faster product delivery. From the factors mentioned above, businesses need to adapt at a both of organizational and supply chain levels. According to business operations, the key to effectively dealing with change is the flexibility of internal processes and supply chains. Therefore, this research aims to examine the effect of logistics and supply chain flexibility on performance of businesses in Thailand

The results showed that logistics and supply chain flexibilities had a positive effect on business performance with the mediation effect of environmental uncertainty. In addition, this research suggests that educational institutions, the companies and related departments should jointly provide training courses on how to improve logistics and supply chain flexibilities under the uncertainty of the current business environment.

**Keywords** Logistics Flexibility, Supply Chain Flexibility, Environmental Uncertainty, Business Performance

## INTRODUCTION

Currently, environmental uncertainty can contribute to business performance. The environmental uncertainty makes firms adopt greater innovativeness and thus perform better. Under the endless changing and uncertain market circumstances, successful companies are likely to develop groundbreaking strategies to satisfy consumer demands and to launch new product (Mee-ngoan et al., 2020). However, managers are difficult to make a decision on growth strategy (Kafetzopoulos et al., 2020). Thailand, therefore, has a small economic growth as well as the population income is classified as upper middle income based on the World Bank's criteria with a gross national income (GNI) per capita of USD 4,125 but not exceeding USD 12,736. According to the latest data in 2020, the country has an average income per capita per year of USD 5,720 (National Statistical Office, 2020). To develop country's competitiveness for moving from middle-income to high-income country, the country must create value for goods and services from the end-to-end to support a wide range of general and specific needs (Goldberg, 2019).

As a result, the government has a policy to create added value and enhance business performance by requiring integrated work for various departments to drive development in the same direction and achieve the vision of the country in terms of stability, wealthy and Sustainability. This will be beneficial to increasing the country's competitiveness and upgrading the quality of life of people in the area, which is in line with the principles of good governance by designating the area of 3 provinces, comprising Chachoengsao, Chonburi and Rayong, to be developed into the Eastern Special Development Zone or Eastern Economic Corridor (EEC) in a concrete manner as soon as possible to be the mainstay of the country's developments of economy and technologies (The Eastern Special Development Zone Policy Office, 2021).

In addition, due to globalization that has changed countries, societies and communities at each level rapidly because the world is connected through the process of free trade, industrial investment, tourism and communication via various media, including the movement of labor and capital which often arises from development in the infrastructure of that country or society (Phrapratanporn et al. 2019; Dabic et al., 2020 ). When businesses in Chachoengsao, Chonburi and Rayong provinces cannot avoid from the effects of globalization, they need to compete with temporarily or long-term foreign businesses (Soonthornpipit et al., 2021). If they have no adjustment to create logistics and supply Chain Flexibilities, they cannot survive in such highly competitive situations (Aziz et al., 2017; Yu et al., 2018; Aunyawong et al., 2020; Ko et al., 2018; Irfan et al., 2019; et al. Maqueira et al., 2020 ). Any changes in technology, competition, demand and supply are business environment uncertainty that is happening in those provinces, which will definitely impact on performance of businesses in the EEC. Therefore, all parties must be aware of and focus on such changes (Hong, Lee, and Zhang, 2018; Chai, et al., 2019; Gilke, 2020). For that reason, the study, aims to examine the moderating role of environmental uncertainty on the effect of logistics and supply chain flexibility on performance of businesses in the EEC, in line with the government's policies and the current situation to achieve the goal of increasing the country's competitiveness.

## OBJECTIVES

1. To study the relationship between logistics flexibility Supply chain flexibility and business results focus on online businesses in Thailand.
2. To develop the causal model of logistics flexibility, supply chain flexibility, and business performance focus on online businesses in Thailand.

## LITERATURE REVIEWS

### **Business Performance**

Business Performance (BP) refers to results or outcomes that are indicators of success. Such outcomes include productivity, profit, service quality, customer or employee satisfaction and quality of work life to build employee engagement with the organization (Lee et al., 2015; Chienwattanasook et al., 2019; Jermittiparsert, 2021). BP is divided into 3 dimensions: Financial Achievement, Operational Excellence, and Marketing Performance, as revealed by Simon, et al. (2015), Al Issa (2020), Kurniawan et al. (2020), and Ilmudeen et al. (2019).

### **Logistics Flexibility**

Tiwari (2015) define Logistics Flexibility (LF) as the supply chain's ability to ensure that there is no disruption to the supply from supplier to end-consumer under uncertain and unstable environments by minimizing the variance between supply and demand without any damages or problems to the supply chain resources and the costs of that supply chain to maintain profitability and responsiveness (Aunyawong et al., 2020). LF was divided into four dimensions: physical supply flexibility, purchasing flexibility, physical distribution flexibility, and demand management flexibility, as suggested by Devaraj et al. (2012), Mason and Nair (2012), Fayezi et al. (2013). Aziz et al. (2017) portrays that LF has a significant effect on a company's performance in terms of adding responsive and quality services. In addition to that, Yu, Luo, Feng, and Liu (2018) depict that flexibility in distribution and raw material procurement had a positive direct effect on the operational performance of food manufacturers in China. LF also allows businesses to deliver on time with complete

transportation documentation, as a result, business and supply chain performance can be improved (Aunyawong et al., 2020). LF in relation to distribution, moreover, affects supply chain flexibility (Singh et al., 2020; Rojo et al., 2016; Luo and Yu, 2016).

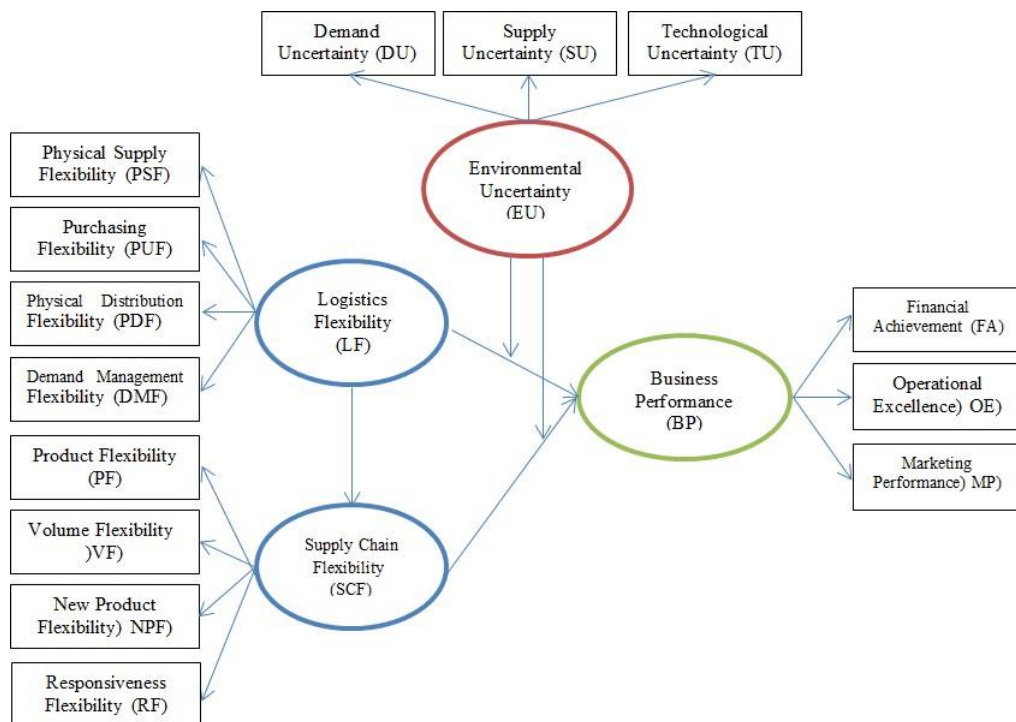
### **Supply Chain Flexibility**

Supply Chain Flexibility (SCF) refers to the quickness of the supply chain in response to changing market conditions (Alamro et al., 2018). In addition, SCF is the ability to adapt to changing circumstances affecting supply chain operations by which leaders, teams and employees in the organization have a joint action plan and operate business for setting strategy and guidelines to minimize potential impacts (Beraha et al., 2018). SCF consists of four components: Product Flexibility, Volume Flexibility, New Product Flexibility, and Responsiveness Flexibility as recommended by Huo et al. (2018), Singh et al., (2020), and Anning-Dorson (2021). Additionally, Ko et al. (2018) found that supplier and logistics flexibilities had a significant positive effect on the manufacturing performance of SMEs. Irfan et al. (2019) found that quantitative supply flexibility is the mediating variable on the effect of process integration on supply chain agility. In addition, Maqueira et al. (2020) found that companies use lean manufacturing to achieve supply chain flexibility, leading to an increase in the efficiency of mass production of niche products and better business performance.

### **Environmental Uncertainty**

Environmental Uncertainty (EU) refers to factors affecting business operations caused by environmental uncertainty, which can be considered into 2 levels: first, the environmental uncertainty at the macro level, such as technological changes, economic conditions, political stability, government policies, social change including the natural environment, and second, the environmental uncertainty at the micro level, such as competitive conditions in the business, tastes and preferences of customers, raw material suppliers, competitors, and alternative goods or services (Boon-itt and Yew Wong, 2011; Wang and Chueh-An Lee, 2013). EU consists of three dimensions: Demand Uncertainty, Supply Uncertainty, and Technological Uncertainty, as conceptualized by Wu (2013), Hong et al. (2018), Chai et al., (2019), and Gilke (2020). The results of most past studies consistently describe that environmental uncertainty is positively affect logistics and supply chain flecibilitues (Yu et al., 2018; Mishra, 2020, Shukor et al., 2020). Environmental uncertainty also drives businesses to produce new products or upgrade existing products to be better to meet market changes according to customer demand by using sensible costs and handling the time commendably (Luo & Yu, 2016; Mishra, & Mishra, 2019; Üstündag & Ungan, 2020). These may lead to business performance improvements.

Waiyawuththanapoom, P. (2020) said Moderating effect of Innovation on the Relationship of Supply Chain Management Practices and Firm Performance : A Study of SMEs. using cross sectional research design, 250 questionnaires were distributed among the supply chain managers of the SMEs by using a convenient sampling technique which yield an 80% response rate. The data was analyzed by using the Structural Equation Modeling (SEM) technique. The findings of the study have shown that all the management practices have a positive and significant relationship with the FP of Indonesia SMEs. Therefore, the current study added a body of literature in the existing empirical findings. The research limitation and future directions are also discussed at the last of the study.



**Figure 1: Conceptual Framework**

## METHODS

Population was 72,629 companies registered in the EEC (Department of Business Development, )2020 The sample consisted of 360 companies in the EEC, calculating from the sample size not less than 20 times the observed variable in the model (14x)20 as suggested by Hair et al., ( )2010 Stratified sampling by provincial area using proportional allocation was used. A questionnaire and interview form was an instrument used as research instrument to collect data. The instrument accuracy was checked for validity and reliability. The validity consisted of content validity using IOC > 0.5 and construct validity using confirmatory factor analysis (CFA), while the reliability was checked for Cronbach's alpha coefficient > 0.8 Cronbach, )1990. The five-point Likert scale questionnaire had 57 items, comprised the 24 logistics flexibility items, as developed from Aunyawong et al. (2020), the 12 supply chain flexibility items, as developed from Mishra (2018), the 12 environmental uncertainty items, as developed from Wong and Boon-itt (2011) and Jilke (2020), and 9 Business Performance items, as developed from Ilmudeen et al. (2019). For quantitative data interpretation, the criteria recommended by Best and Kahn (2006) was used. For data analysis, first, the level of variables in the research were analyzed using descriptive statistics, including mean, standard deviation (S.D.), Skewness (Sk), and Kurtosis (Ku) to measure the normal distribution of data in the analysis of SEM. Second, discriminant validity was tested based on Maximum Shared Variance (MSV) < Average Variance Extracted (AVE) and Average Squared Shared Variance (ASV) < AVE; Also, the latent variable's AVE should be greater than the squared correlation between the latent variable and all other variables. In addition, the convergent validity was tested taking into account that the composite reliability value must be greater than 0.7 and AVE > 0.5 (Fornell & Larcker, 1981). Third, CFA was used to check the construct validity of the questionnaire. Forth, path analysis was used to examine the research hypotheses. Fifth, model fit indicators and the criteria of C.R. or t-value > 1.96 were based on hypothesis proposition by Diamantopoulos and Siguaw (2000).

## RESULTS

### Testing Results of Measurement Model

The results showed that the mean of observed variables was from 4.02 to 4.45, which were at a high level, and had a standard deviation (S.D.) from .55 to .64 by considering the skewness (Sk) with values between -3 and +3 and kurtosis (Ku) of less than 8, indicating a normal distribution (Kline, .)2005 The factor loadings of all variables were positive and significantly different from zero at the .001 level. The variable with the highest factor loading(.921) was Physical Distribution Flexibility (PDF), .9 21 , the variable with the lowest factor loading (.687) was New Product Flexibility (NPF), and R-square was from .471 to .848 , as shown in Table .1

**Table 1:** Testing Results of Measurement Model

Variable	$\bar{x}$	S.D.	Remark	Sk	Ku	b	$\beta$	S.E.	t	R <sup>2</sup>
LF	4.19	.14	High	-	-	-	-	-	-	-
PSF	4.23	.59	High	-.702	.289	.940	.864	.043	21.910***	.747
PUF	4.02	.63	High	-.487	.085	.997	.860	.042	23.536***	.740
PDF	4.15	.59	High	-.740	.857	1.000	.921	-	-	.848
DMF	4.35	.48	High	-.312	.628	.824	.839	.048	22.569***	.719
SCF	4.33	.09	High	-	-	-	-	-	-	-
PF	4.31	.63	High	-.903	1.637	.930	.814	.049	19.019***	.662
VF	4.24	.63	High	-.875	1.443	1.000	.863	-	-	.745
NPF	4.45	.54	High	-.879	1.475	.674	.686	.046	14.653***	.471
RF	4.33	.59	High	-.652	1.420	.780	.730	.060	16.308***	.533
EU	4.23	.01	High	-	-	-	-	-	-	-
DU	4.23	.64	High	-.767	.683	.979	.743	.060	16.270***	.553
SU	4.23	.57	High	-.551	.194	.806	.695	.048	16.659***	.483
TU	4.24	.59	High	-.848	.847	1.000	.831	-	-	.690
BP	4.19	.08	High	-	-	-	-	-	-	-
FA	4.28	.52	High	-.411	1.297	.753	.872	.037	20.205***	.760
OE	4.16	.67	High	-.454	1.905	.931	.834	.040	23.074***	.696
MP	4.14	.70	High	-.580	1.407	1.000	.849	-	-	.720

### Direct and Mediation Effect Analysis

As shown in Table 2 and Figure 2, the results of model's structural validity by analyzing the structural equations found that the model was consistent with the empirical data since the model fit indicators depicted Chi-Square (CMIN) = 40.072, df = 29, p-value = .083 (> .05 level),  $\chi^2/df = 1.382$ , (< 2), as well as GFI = .972, AGFI = .942, TLI = .989, CFI = .994 (>.90), and RMSEA = .007, RMR = .041 (<.05). In addition, the results portrayed that all the variable's factor loadings had a positive value and was statistically different from zero at the .001 level, indicating an acceptance of H1-H3 with statistical significance at the .001 level.

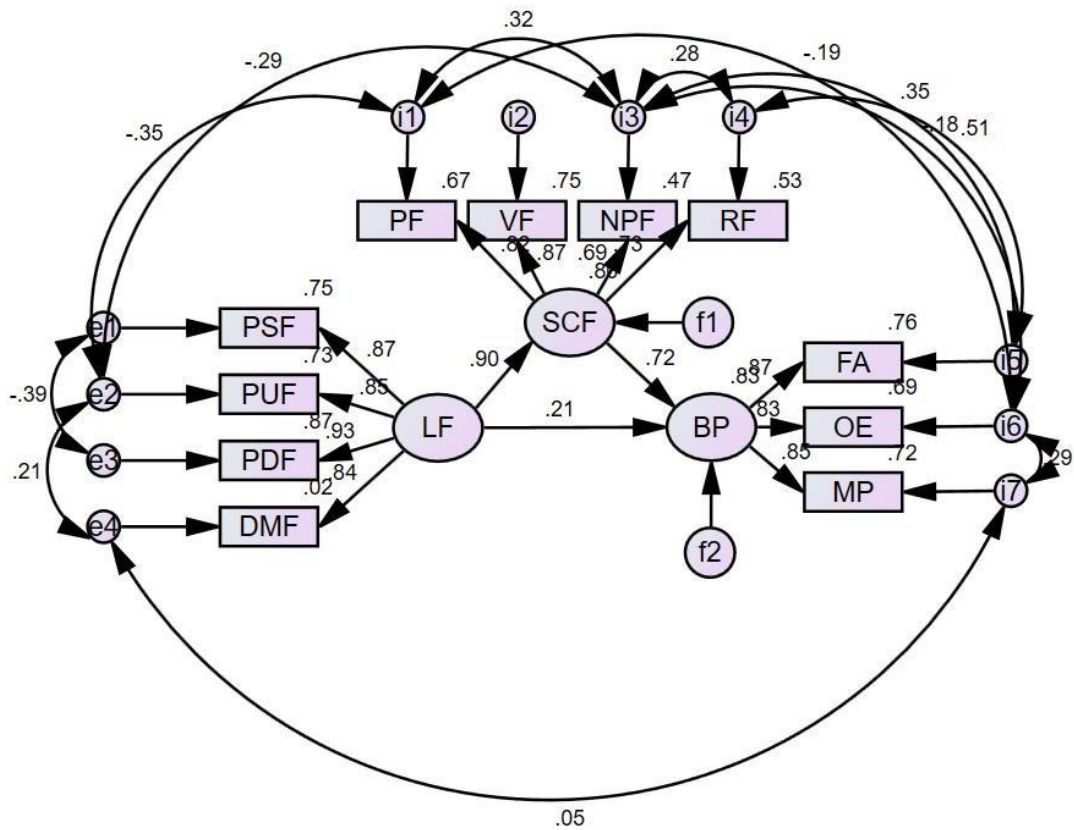


Figure 1: Structural Equation Model

Table 2: Path analysis results

H	Independent Variable	Mediating Variable	Dependent Variable	$\beta$	p-value	S.E.	t-value (C.R.)	R <sup>2</sup>
H1	LF	-	BP	.207	.000	.023	4.979	.720
H2	LF	-	SCF	.896	.000	0.21	5.257	.728
H3	LF	SCF	BP	.186	.000	-	-	-

### Moderation Effect Analysis

As shown in Table 3, the results of model's structural validity by analyzing moderating effect reveal that the moderating effect of environmental instability (EU) on the effect of logistics flexibility (LF) and supply chain flexibility (SCF) on business performance (BP) had positive effect size of .029 and .018, respectively, with statistical significance at the .001 level, plus R-square of .720 and .728, indicating an acceptance of H4 and H5 with statistical significance at the .001 level.

Table 3: Moderating effects of environmental uncertainty on business performance

H	Structural Path		Environmental Uncertainty				
	Independent Variable	Dependent Variable	$\beta$	p-value	S.E.	t-value (C.R.)	R <sup>2</sup>
H4	LF	BP	.029	.000	.023	4.979	.720
H5	SCF	BP	.018	.000	.021	5.257	.728

## CONCLUSION AND FUTURE WORK

According to the present study findings, supply chain flexibility acts as the most significant contributors to business performance, while the effect of logistics flexibility is lower, however, statistically significant. The supply chain flexibility, moreover, has a mediating role, whereas environmental uncertainty has a moderating role in the theoretical model developed. This reflects that the logistics and supply chain flexibilities firms adopt may lead to business performance improvement and higher business performance under high environmental uncertainty. Based on hypothesis testing, the results show that first, logistics flexibility has a direct positive effect on business performance, consistent with Aziz et al. and Yu et al. (2018), which identifies that logistics flexibility has a huge impact on a company's performance in terms of adding responsive and flexible services, and Yu et al. (2018) which depicts that flexibility in distribution and raw material procurement has a significant effect on the operational performance of Chinese food manufacturers. It was also consistent with Aunyawong et al. (2020), which represents that logistics flexibility allows businesses to deliver products on time. Second, the results display that logistics flexibility has a direct positive effect on supply chain flexibility, consistent with Singh et al. (2020), Rojo et al. (2016), and Luo and Yu, (2016) which denote that logistics distribution flexibility distresses logistics flexibility. Third, supply chain flexibility mediates the effect of logistics flexibility on business performance, in line with Ko et al. (2018) which signify that supply chain flexibility, consisting of supplier resilience and logistics flexibility, has an identical positive impact on SMEs' productivity performance, while Irfan et al. (2019) connote that quantitative supply flexibility has a mediating role on the effect of process integration on supply chain agility. In addition, Maqueira et al. (2020) found that companies use lean manufacturing to achieve supply chain flexibility, leading to an increase in the competence of mass production of niche products and improved business performance.

Furthermore, logistics flexibility, forth, the environmental uncertainty moderates the effect of logistics flexibility on business performance, consistent with Yu et al., (2018), Mishra, (2020), and Shukor et al., (2020), which discover that uncertainties of technology, competition and demand and supply force business to increase flexibility in procurement, delivery and distribution. Fifth, environmental uncertainty moderates the effect of supply chain flexibility on business performance, in line with Luo & Yu, (2016), Mishra, & Mishra, (2019), and Üstündag and Ungan (2020) which notice that environmental uncertainty also drives businesses to produce new products or upgrade existing products to be better to meet market changes according to customer demand by using reasonable costs and managing time effectively.

The study recommends that relevant government agencies should jointly provide training for EEC entrepreneurs on flexible logistics and supply chain management under an uncertain business environment because when entrepreneurs have more such knowledge, it inevitably leads to a better business performance. The government, besides, should co-invest with entrepreneurs who need capital assistance, cooperation among various private sectors to help businesses in the EEC and promote the stable country's economy. The further research should be studied on other factors, such as supply chain integration, green supply chain management practices, environmental performance, etc., since these factors could affect business performance.



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