Investigating the Impact of Supply Chain Agility, Government Regulations and Supply Chain Efficiency on Business Performance: Mediating Role of Cost Leadership

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Abstract- **This study focuses on the effect of supply chain agility, efficiency and government regulations on the business performance of firms. It also focuses on the adaptation abilities of firms because of changing environment effecting their supply chain performance through its cost leadership strategy. Survey approach in the form of questionnaires have been adopted to collect data from the manufacturing firms in Thailand. Purposive sampling technique is used to select sample. The constructs were sent through mails and direct contact with firms. Incomplete items were removed leaving the sample size of 272. The collected information is then analyzed by adopting SPSS and AMOS. This study clearly depicts that there exist a significant progressive association between SC agility and SC efficiency on the performance of firms in Thailand. It also generates that strict government regulations decreases the supply chain and business performance. Moreover, cost leadership strategy also played an imperative role and showed significance mediation relation between this emerging collaboration and relationship. This research provides theoretical and managerial implications. It is an additional count in the literature related to supply chain practices and regulations or guidelines affecting such performance. It also provide strategic techniques to align firms supply chain management practices with rapidly changing industrial policies. It is considered to be a new study as it helps firms integrated in supply chain practices to focus on their strategies and policies in order to attain competitive edge globally.**

Keywords: *supply chain agility, government regulations, supply chain efficiency, cost leadership, business performance, Thailand*
Paper type: *Research paper*

1. Introduction

Supply chain management (SCM) has played a significant role in meeting the needs of end consumers by integrating business practices and collaborating with the value chain partners and suppliers. An integrated or all-in-one supply chains are essential to enhance the business performance by satisfying consumer needs and arising demands through coping and removing uncertainties. While those firms having poor relations or businesses with non-integrated supply chains or processes show poor performance and do not focus to tackle such uncertainties resulting in failure [1]. In today's competitive economy, firms are required to meet the increasing demands in shorter time spans by the coordination of its supply with changing demands. However, to meet such requirements of the demanding population in the market, a firm should adopt responsive supply chain practices [2]. Such practices require planned movements in the form of high speed and low product cycle times also referred as agility [2]. The term agility is the capacity of a business to hold its information systems and structures in accordance with the mind sets of the people [3]. Agility usually refers to the corporation and use of market based knowledge to obtain profitability in case of unstable market situations [4]. Supply chains in an organization must be truly agile and is closely related with the efficiency level. With the dynamic evolvement of supply chain practices, it has become a challenge for organizations to maintain effectiveness and coordination in their systems. Because of this, it is not possible for firms to work independently. The products developed by the firms have to pass through various stages before it reaches to the end consumer in the form of value added products [5]. Agile firms are considered as masters in coping market turbulence. This needs some special competences different from lean thinking approach [6]. Studies indicate that agility is developed from leanness therefore, in order to achieve levels of agility, a firm has to become lean by adopting such practices in its operations that reduces its wastes. So it is assumed that both agility and leanness are

not mutually exclusive, in fact they are complementary (Haseeb et al., 2019). Therefore both can be adopted in practice [7].

Table 1. Lean vs. Agile Supply

Attributes	**Lean supply**	**Agile supply**
Products	Commodities	Fashion goods
Market demand	Predictable	Volatile
Product life cycle	Long	Short
Product variety	Low	High
Profit margin	Low	High
Customer driver	Cost	Availability

Source: Christopher, M., & Towill, D. R. (2002)

With the emergence of outsourcing, globalization and decline in supply base, there is also an increase in risk and uncertainties associated because of the various changing regulations. Because of this supply chains efficiency is considered to be more disrupted because of these changes or regulation [8]. Efficiency in supply chains have proven to be most reliable in providing high quality products at a very low cost. Supply chain efficiency focuses on the utilization of combined efforts of all the people in the supply chain in order to produce cost-effective and competitive products [9]. Cost leadership in any organization is often related to the efficiency of that organization. It is considered to be the main source of attaining competitive edge by the firms by showing a low cost strategy in the market. Cost leadership allow firms to reduce controlling costs and wastes by enhancing efficiency levels as a result productivity. Cost leadership and efficiency in the supply chain systems together emphasize on the requirements of fast handling processes of products in order to save time and to obtain advantage [10]. However, in order to maintain these agility and efficiency strategies, organizations have to deal with some uncertainties and regulations as well. These limitations or regulations can be imposed by certain legislative authorities or government. Such changes include variations in trades, regulations by government and adoption of well-equipped and vast infrastructures. These challenges have shifted the way from traditional supply chain practices to new levels [11].

With the adoption of sustainability practices in the supply chain management, organizations are practicing more social responsibilities towards economies. These social contributions not only enhance their financial performance but also increases their value internationally. Since governments are focusing more now on sustainable supply chain practices and developing regulations and laws in countries to maintain such sustainability practices at all levels of firms [12]. Studies indicate that these governmental regulations have significant impact on supply chain efficiencies. It not only allow firms to focus on their cost effective products but also restrict them to use sustainable resources. This not only enhances their internal processes but also produce effects on the overall industry factors. Such regulations can emphasize firms to maintain their processes agile and effective to meet the consumer demands, however on the other hand, regulations related to price control variability, inflation, implementation of taxes unavailability of storage facilities, compulsion on imports etc. sometimes negatively affect the supply chain practices allowing the firms to stop their production and hence affecting performance levels [13]. Therefore, this study aims to focus on the supply chain performance through various perspectives including supply chain agility, government regulations and supply chain efficiency on the business performance of those firms integrated with supply chain practices. Moreover, it also considers the importance of producing cost efficient products through cost leadership strategies and its mediation role between supply chain and business performance.

Structure of the remaining research is as follows; next section provides review of literature on the impact of supply chain agility, efficiency practices, and legislative regulations on the business performance through cost leadership strategies. Section 3 discusses research design and methods adopted to collect data. Section 4 analyses the collected information in order to generate final results. Last section provides discussion and conclusion about the whole research. It also provides some theoretical and managerial implications along with some limitations and future possibilities.

2. Literature Review

2.1. Business performance

Adoption of appropriate tools to measure performance of firms in supply chain has remained a major hurdle to effectively measure the supply chain practices and their effectiveness [14]. With the emerging trends of supply chain practices, various methodologies have been adopted or identified performance. These study models usually use cost [15], variations in product demand [16],

fill rate [17], inventory levels [18], stock out profits [19] and system capacity [20] to see optimization levels in supply chains. Most of the studies focus on the isolated systems including production-distribution, supply-production, or inventory distribution and their impact on performance. However, some also investigated the supply chain strategic issues such as cost-effectiveness, flow of products etc., and operations on performance [21]. Lack of measurement tools to accurately measure supply chain impact on business performance is mainly because of the reason that it not only has to look upon few members of the supply chain but in fact require complete knowledge of the whole effective supply chain practices [22]. This is mainly required because each member has adopted different strategy and one's strategic decision can have opposite impact on the other's decision. Therefore, in order to completely understand the possible impact and role of supply chain performance on overall business performance of firms, this study considers supply chain agility, efficiency and government regulations on business performance of manufacturing firms of Thailand through cost differentiation strategies.

2.2. Supply chain Agility

Supply chain agility has remained under consideration in literature. Various studies have been conducted on the role of supply chain agility. This term has been used and its impact has been considered with respect to products, capabilities, workforce, agile enterprises, and environment. [23-25]. It has been defined by early adopters as an exceptional system having internal capabilities in order to meet the changing demands with flexibility and speed. These internal capabilities usually consist of human resources, management, soft and durable technologies, communication systems and information technologies [26]. A study conducted on supply chain agility proposed that agile firms can better satisfy their end consumers, utilize less product cycle time, produce new innovative products and show flexibility with their partners [27]. However, in perspective of manufacturing industry, agility is considered to be closely related with the successful adoption and implementation of procedures that provide competitive position such as flexibility, speed, pro activeness, quality as well as profitability. These practices can be adopted by firms when they have integrated their best practices and reusable resources in their business environment to enhance knowledge sharing as well as for providing such unique products or services that are required must in an uncertain or rapidly changing market conditions [28-30]. Therefore, this study focuses on the firms indulged in agile practices in their supply chains and its impact on performance. Thus, we hypothesize;

H1: *Supply chain agility has significant positive impact on business performance*

2.3. Government regulations

Government regulations play a significant role in the supply chain management practices of firms. The purpose of such regulations is either to provide protection to the people or environment. Government usually set regulations to protect rights of employees, protecting environment, and also make organizations to be held accountable for its operations and its impact on society. Either it is related with protecting environment, or providing health and safety, or consuming goods, government laws have a strong influence. These rules encourage sustainable eco-friendly policies and its promotions [31]. Certain policies developed by governments may have positive or negative impact. For instance, regulations related to sustainable supply chain practices or green supply chain have positive impact on organizational operations. Such regulations allow organizations to focus more on their social and environmental factors and adopt CSR policies [32]. However, some regulations including price control policies, inflation rate, implementation of taxes, insufficient storage facilities, compulsion to imports etc. are the key elements that create hindrance in the supply chain practices. Mixed results have been found regarding the impact of such regulations [9]. Few studies focus on the green management practices and found a positive effect whereas most of them focus on various other factors and found a negative impact on supply chain and business performance [9, 33]. Therefore, this study also take into account some governmental regulations and its impact on business performance of Thailand supply chain manufacturing firms. Therefore, it is hypothesized;

H2: *Government regulations has significant negative impact on business performance*

2.4. Supply chain efficiency

With the advancement in competitive environment, efficiency levels have played a fundamental role in supply chain management. Effective and efficient supply chain practices has allowed firms to focus on their integration processes, value maximization strategies, improvement in products, reduction in product cycle time and responsiveness [34]. Numerous studies have raised the concern that unwanted inventory or products are responsible for decreasing responsiveness and increasing costs and are consider to be the major barriers. Studies indicate that efficiency reduces the operational costs of firms by reducing extra operational factors and lead time [35]. Other studies conducted on manufacturing strategies such as making to stock or from stock and make to order and their impact on

performance depicts that reduces the problems by adding value, eliminating wastes and enhancing responsiveness [36]. Studies conducted on supply chain efficiency also proposed that flexibility, profitability, waste reduction and reliability are the major attributes if efficiency in supply chains. These attributes can be evaluated by implementing various factors in supply chains such as reduction in lead times, fast delivery, reducing inventory related costs, dealing well with sudden external changes in order to enhance profits [37, 38]. Therefore, this study focuses on the value addition and contributions made by the supply chain efficiency on business performance and thus hypothesized as;

H3: *Supply chain efficiency has significant positive impact on business performance*

2.5. Cost leadership

Cost leadership strategy is adopted by the firms when the goal is to lower down the costs associated with the products in order to provide products or services at relatively low costs by maintain its quality in the market in order to obtain advantage. It is quite opposite to the differentiation strategy where a firm focuses on the high value [39]. Usually cost leadership strategies are adopted by firms when they want to increase their customer base and volume by turning into low cost provider or manufacturer. Studies indicate that cost leadership is often motivated by firm' size, scope, efficiency, scale and experience. It focuses on the adoption of such strategies that help firms to attain scale of production, synergies, clear scope and other economic approaches such as good purchasing methods. It also focuses on the production of high standard products by using advance, integrated supply chain practices and technologies [40]. Few studies related to the efficiency of cost leadership strategies indicate that firms are focusing on these practices in order to increase their market share as a result, business performance of firms' also increases. Increase in business performance is achieved by providing superior services to its customers in the form of better quality products [41]. A study conducted on Walmart clearly depicts firms that have achieved success all over the world work on this cost effective strategies. Such companies emphasize their integrated business levels to cut down costs at every possible point of production and provide low cost, high quality products to its customers. Such firms are considered to be most effective in terms of competition by coping all the barriers affecting the performance of firms [42]. So, it is hypothesized;

H4: *Cost leadership strategies positively and significantly mediates between supply chain agility, government regulations and supply chain efficiency and business performance*

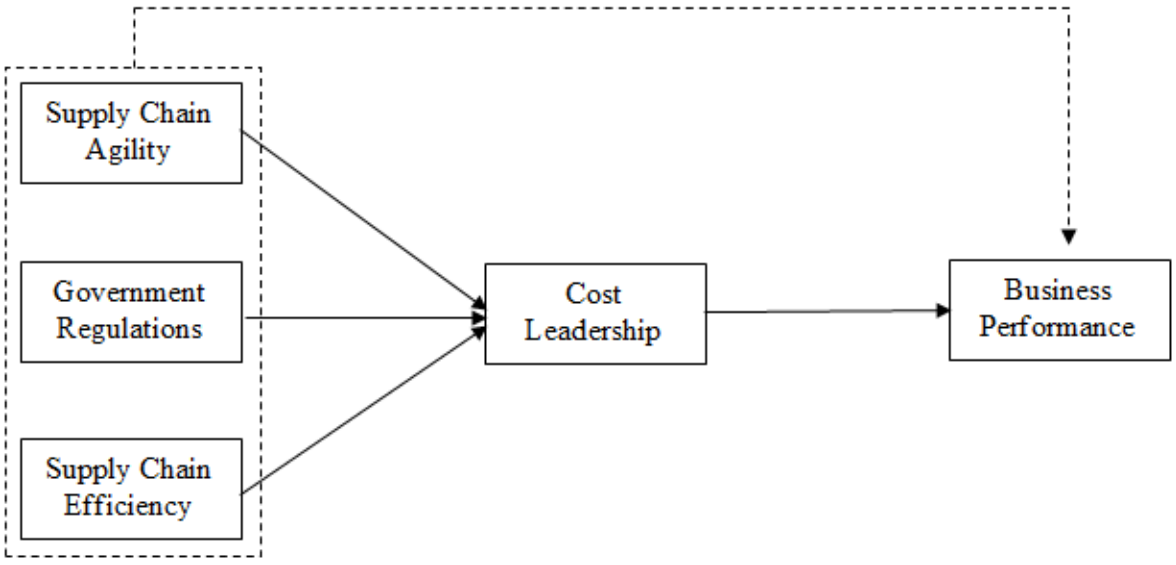

Figure 1. Theoretical Framework

3. Methodology

3.1. Measures

This research adopted survey methods to collect data from the manufacturing firms in Thailand. Questionnaires were developed for conducting this survey. The items for developing the questionnaire were adapted from the prior researches related to supply chain performance and its efficiency on business performance of firms. The questionnaire

was divided into two parts. First part considered general information related to respondents and the firm. It included their designations, experience, firm size, age, revenue generated and other related information. Those firms are targeted more that have more than 7 years age and earning more than 1 million through its supply chain operations in order to ensure the reliability of the firms in supply chain practices through cost efficient procedures. Whereas the second part considered all the items to measure supply chain (SC) agility, government regulations, supply chain efficiency, cost leadership and business performance. However, to develop those constructs, past studies were taken in consideration. To measure SC agility, SC efficiency, cost leadership and business performance, constructs have been adapted from the study of [9]. Whereas, to measure impact of government regulations on performance, items are selected from the studies of [9, 33, 43].

3.2. Research method

This study adopted purposing sampling technique to collect data from the manufacturing firms of Thailand. Information related to these firms are collected from online sources in order to contact with the respective firms. Then these firms are contacted in order to gain permission or prior approval from the key representatives of the manufacturing firms. Important information was also been discussed with those representatives regarding purpose and time limitations. Then the questionnaires as adapted from past researches was sent through mail to the firms along with the cover letter explaining the main idea and main objective of this research. Some firms because of their nearness were also contacted by the researcher himself. These firms were directly contacted and the researcher handed over questionnaires to the key mangers by himself. The targeted respondents were the managers, representatives and personal that were considered to be closely related with the supply chain practices. Then after the given limit, questionnaires were started to return back. Out of all questionnaires that were sent either through mail or direct contact. Then these constructs were passed through rigorous testing and reviewed. During this process, some constructs that were incomplete or having missing information were eliminated leaving the size of sample to 272.

4. Results and Findings

Approximately 300 questionnaires were distributed through different sources to respondents who are working in manufacturing sector of Thailand, the 290 questionnaires are received back and 272 are usable. So, the overall total complete and usable responses were 272. The table 1 shows that there were total 99 female respondents and 173 were males.

Table 1. Demographic Characteristics (N=272)

Profile	Category	Frequency	Percentage
Gender	Male	173	63.6
	Female	99	36.4
Age	21-30 Y	91	33.5
	31-40 Y	117	43.0
	41-50 Y	44	16.2
	Above 50 Y	20	7.4
Education	Under-Graduate	106	39.0
	Graduate	114	41.9
	Master	52	19.1

However, equivalence had not been attained regarding the gender of respondents, the above-mentioned table shows that there are 91 respondents having age 21-30 years, 117 respondents having age 31 to 40 years, 44 respondents having 41-50 years age and 20 respondents having age above 50 years. Same as there demographic variable education shows that 106 respondents are under graduate, 114 respondents have graduation degree and 52 respondents have master's degree.

4.1. Data Suitability

To check the suitability of the data KMO test was run by using SPSS, the finding of the test showing that data is excellent and further analysis can be performed.

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.926
Bartlett's Test of Sphericity	Approx. Chi-Square	10037.774
	df	231
	Sig.	.000

4.2. Confirmatory factor Analyses

The test of confirmatory factor analysis is used to identify other model of this study is good fit or not. There are 4 to 5 indicators which proved the model fitness and their threshold and observed values are below;

Table 3. CFA

Indicators	CMIN/DF	GFI	IFI	CFI	RMESA
Threshold range	<3	>.80	>.90	>.90	<.08
Observed values	2.423	.810	.927	.927	.068

The finding of above table presenting that all values are under the threshold range, which means that the model of the study is good fit.

4.3. Convergent Validity and discriminant validity

The convergent validity is the reliability of the internal consistency whereas, discriminant validity is the strength of the construct more with itself rather others.

Table 4. convergent and discriminant validity

	CR	**AVE**	**MSV**	**CL**	**SCA**	**SCE**	**GR**	**BP**
CL	0.962	0.926	0.837	**0.963**				
SCA	0.913	0.838	0.311	0.557	**0.916**			
SCE	0.929	0.886	0.267	0.501	0.446	**0.942**		
GR	0.919	0.903	0.251	0.501	0.368	0.423	**0.950**	
BP	0.901	0.894	0.837	0.915	0.558	0.517	0.497	**0.946**

The finding showing that CR for each construct is greater than .70 and AVE is greater than MSV, which prove the convergent validity, whereas, other columns prove the discriminant validity of each variable by showing more strength with itself.

4.4. Structural Equation Modeling (SEM):

This tool is basically the mixture of factor analysis and multiple regression analysis, and it is run to test the hypotheses of the study, in order to check the impact of one construct on others, the path analysis SEM was used.

Table 5. Structural Equation Modeling

Total effect	GR	SCE	SCA	CL
CL	-.278**	.233***	.321***	.000
BP	-.263**	.261***	.319***	.953**
Direct effect	GR	SCE	SCA	CL
CL	-.278***	.233**	.321**	.000
BP	-.002	.039*	.013*	.953**
Indirect effect	GR	SCE	SCA	CL
CL	.000	.000	.000	.000
BP	.265**	.222**	.306**	.000

Note: ** p < 0.01, ** p < 0.05, *** p < .00.*

Results of As SEM showing that supply chain agility has 32% positive impact on cost leadership and 31% on business performance. Supply chain efficiency has positive and significant impact on business performance by 26.1%, whereas, the impact of government regulation on business performance is negative. same as the indirect effect of supply chain agility is 30.6% supply chain efficiency has 22.2% indirect effect on business performance and government regulation has 26.5% indirect impact on business performance. The following figure shows the screenshot of the SEM while running in AMOS, furthermore, this figure shows the standardized impact of each construct on anther.

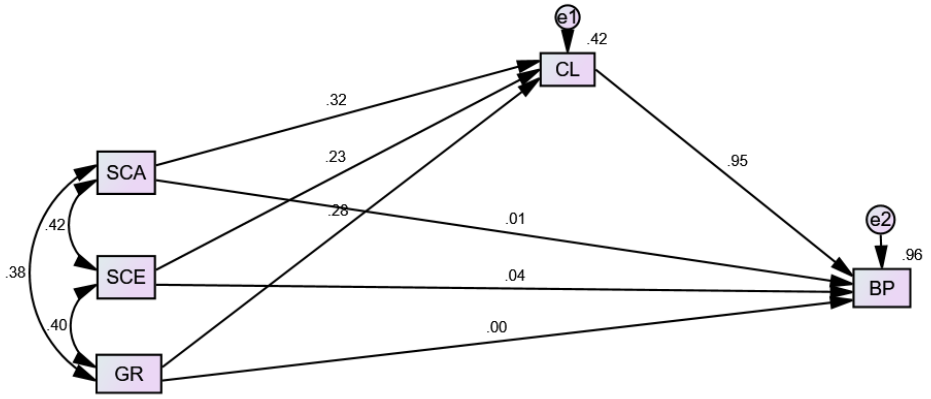

Figure 1. SEM

5. Conclusion

This study aims to investigate the relationship between supply chain agility, government regulations and supply chain efficiency on business performance of manufacturing firms in Thailand. It also signifies the mediating role of cost leadership strategies adopted by firms in order to attain competitive advantage. The data collected for these firms is obtained using survey methods and through questionnaires adapted by past studies. The data collected is then analyzed by SPSS and AMOS. The results of this study clearly indicates that firms having integrated supply chains have influence on overall performance. Such firms can better cope with the changing external environment or strict regulations. These regulations may include legislative or government regulations or instruction to run business in an effective way that not only meet the demands of end consumers but also consider best in providing positive outcomes for the nation. These regulations may include social, environmental, economic or international requirements such as duty taxes, imports or exports regulation. Supply chain agility and efficiency are considered to be the most fundamental attributes of supply chain firms because these attributes are directly affected by the sudden change in policies or decision related to increasing or decreasing demands. These attributes allow firms to cope with the sudden changes speedily by efficiently availing all the available resources and working well with all the members of the supply chain. Moreover, it also allow firms to maintain their costs and become cost effective in the eye of customers in order to obtain competitive edge over competitors. The results of this study clearly indicates that supply chain agility and efficiency have significant positive impact on performance. It means that efficient agile firms that rapidly cope with the emerging market trends or demands are more prone to high profitability levels. The findings of this research also advocate that some government regulations in the form of price control, compulsion on imports, imposition of taxes, duties and tariffs etc. not only creates inverse effect on the supply chain practices by slowing down their operations but also reduces over all business performance of manufacturing firms. Moreover, it also signifies that firms adopting effective cost leadership strategies in their policies and procedures have strong mediating impact between inflexible regulations, efficient and agile supply chain practices and business performance.

Several contributions are considered to be made by this research. Theoretically, it is considered to be an addition in supply chain literature related to know the impact of cost effective supply chain practices such as agility and efficiency as well as government regulations on the business performance of manufacturing firms in Thailand. Practically, it allow managers or supply chain firms to effectively adopt supply chain strategies by speeding up their processes and lowering their cycles to meet the rapid demands in order to attain competitive edge. It also allow them to effectually deal with the sudden changes or regulations made by the government and try to use such regulations in increasing their performance.

Despite of contributions in existing literature, this study also has some curbs. This study focuses on the manufacturing firms of Thailand only and that may lower down the generalizability impact over findings related to other regions or population having different characteristics. Therefore, future studies can be conducted in other contexts such as other sectors or regions or cross-examination between different countries. This study focuses on the one external factor and its impact on performance such as regulations, other external variables such as reduction in barriers to international trades; progressive IT or some environmental factors can also be included to check their influence on supply chain and business performance. As it is cross sectional study, therefore, longitudinal analysis can be adopted in future.

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