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The Impact of Green Supply Chain Management Practices on Return on Equity: A Comparative Study between the United States and China

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Abstract

The primary aim of this study is to assess the relationship between Green Supply Chain Management (GSCM) practices and the Return on Equity (ROE) of industrial sector firms in the United States and China during the implications of the US-China Trade War. Principal Component Analysis and Random Effects Regression Analysis are employed to empirically test the impact of four Green Supply Chain Management practices which are: Internal Environmental Management, Green Purchasing, Eco Design, and Customer Cooperation on ROE. A sample of 50 firms in the US and 50 firms in China is employed to test the hypothesized relationships. Findings suggest that there is a significant positive relationship between Eco Design and ROE in both countries. However, a significant negative relationship between Internal Environmental Management and ROE is concluded in China only. This research contributes to identifying out and classifying the reported practices of the Green Pillar in firms' Environmental, Social and Governance (ESG) reports under their related Green Supply Chain Management practices to provide a theoretical framework and facilitate future research. This paper proposes that policy makers, managers, and practitioners should accept sustainability as a strategic priority prior to implementing Green Supply Chain Management and suggests that firms should be confident of the long-term profitability of implementing Green Supply Chain Management practices.

Keywords: Sustainability, Green Supply Chain Management, ESG, Trade War, US, China, Profitability.

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1. Introduction

Human beings are currently faced with the inevitable dilemma of environmental contamination. The rapid expansion of numerous sectors and industries has resulted in more complex supply chains (Metwaly, Lootah, & Albaz, 2024). However, focusing on rapid economic expansion to achieve economic development has negative implications in terms of environmental degradation and resource waste (Petljak, Zulauf, Štulec, Seuring, & Wagner, 2018). Traditional Supply Chain Management (SCM) activities are to blame for the mismanagement of natural resources, putting their negative consequences at the top of the global risk list. As a result, the introduction of the Green Supply Chain Management perspective has become a thriving and promising trend in terms of being environmentally responsible while seeking economic success.

Accordingly, it is critical to emphasize that encouraging companies around the world to apply proper and adequate Green Supply Chain Management Practices will help in reducing the negative impact their supply chains have on the environment, as well as controlling risks, meeting market expectations, and complying with rules and regulations. Global corporations should adopt Green Supply Chain Management as part of their involvement in implementing the United Nations' 17 Sustainable Development Goals (SDGs) (Hafez & Elakkad, 2020). In addition, sustainability has become an international interest especially due to economic crises and climate challenges (Hafez & Moawad, 2024). As a result, if the Green Supply Chain Management culture is widely implemented, current demands will be addressed without depriving future generations of their needs.

Regretfully, several global firms, particularly in the industrial sector, are dubious of implementing Green Supply Chain Management practices because they perceive such activities as threats to their profitability rather than an added value. This is the case because some global companies are dubious of the benefits of implementing Green Supply Chain Management practices, considering them as burdens (Hashmi & Akram, 2021); (Mamdouh, Kadry, & El Ahmady, 2018). As a result, a great obstacle facing researchers in the field of sustainability is the failure of firms around the globe to develop a solid Green Supply Chain Management culture. As a result of the serious Covid-19 pandemic implications, this has been widely regarded as a key challenge to the advancement of sustainability and the achievement of SDGs.

Despite academics' diligent research attempts to discover whether Green Supply Chain Management practices may boost firm profitability, no consistent result has been achieved (Qin, 2019). Most of the published research has concentrated on the factors that encourage or discourage the adoption of Green Supply Chain Management practices rather than the implications of adopting such practices. This has brought attention to the difficulties of implementing Green Supply Chain Management practices rather than the benefits. Few studies have looked at the impact of Sustainable Supply Chain Management practices, as opposed to a more specialized Green Supply Chain Management approach, on overall firm

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success, rather than its financial performance specifically (Miroshnychenko, Barontini, & Testa, 2017). Also, previous studies did not examine the relationship over long periods of time, limiting the generalizability of the findings ((Abbas & Hussien, 2021).

Additionally, the majority of researchers in this field have tested the impact of "perceived" Green Supply Chain Management practices on the "perceived" financial performance through surveys and questionnaires, however, the impact of "actual" Green Supply Chain Management reported practices on the "actual" financial performance has not been tackled yet. This study contributes to identifying out and classifying the reported practices of the Green Pillar in ESG reports under their related Green Supply Chain Management practices to investigate the impact of individual Green Supply Chain Management practices on ROE in one of the most contaminating sectors which is the industrial sector, while holding a comparative study between the United States and China to tackle this issue in both developed and developing countries.

2. Research Objectives

- To critically review the literature concerning Green Supply Chain Management practices, firm profitability indicators and the US-China trade war sustainability implications.
- To analyze the ESG secondary data disclosures and assess the reporting extensiveness of Industrial firms in the United States versus China.
- To statistically test the hypotheses and reach a conclusion on the impact of Green Supply Chain Management practices on ROE in industrial sector firms of the United States and China.

3. Literature Review

3.1 Green Supply Chain Management

Green Supply Chain Management refers to the practice of incorporating environmental concerns into SCM practices, such as product design, selection and purchase of raw materials, manufacturing processes, delivery of finished goods, and product obsolescence management. Green Supply Chain Management can also be described as the process of adopting activities that are favorable to the environment while simultaneously retaining the conventional SCM activities (Petljak, 2019); (Seuring & Müller, 2008).

Throughout the course of Supply Chain Management history, theory-building efforts in this field, in general, and in Green Supply Chain Management, particularly, have remained relatively sparse (Miroshnychenko, Barontini, & Testa, 2017). On the other hand, there are perspectives and hypotheses in the field of business that have attempted to investigate the idea of responsible Supply Chain Management. These hypotheses are referred to as the theory of Corporate Social Responsibility (CSR) and the theory of Sustainable Supply Network Management (SSNM). The CSR theory posits that business entities have economic, legal, and ecological responsibilities. Therefore, it follows that Green Supply Chain

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Management is an important application of CSR theory (Dyllick & Hockerts, 2002). Secondly, the SSNM theory presents the tools and tactics of accumulating, evaluating, and sharing the information regarding environmental practices along the supply chain members, which is considered a root of Green Supply Chain Management practices today (Marques, 2019).

As a result of Green Supply Chain Management being a relatively emerging trend, it is defined in a variety of ways and is influenced by many aspects and variables (Petljak, 2019). According to Zhu et al. (2008), the factors that influence Green Supply Chain Management may be broken down into five primary practices: Internal Environmental Management (IEM), Green Purchasing (GP), Environmental Customer Cooperation (CC), and Eco Design (ED) and Investment Recovery (IR). According to (Wong, Wong, & Boon-Itt, 2015), although the analysis of literature identifies the concepts of Green Supply Chain Management, few articles define it from an integration perspective. The concept of Integrated Environmental Management has been the basis on which Internal Environmental Management (IEM) practice of Green Supply Chain Management was built.

IEM is an integrated management system that comprises environmental goals, performance, and responsibilities into codes of behavior, business decisions, and human resource decisions to collectively achieve sustainability goals (Gond, Grubnic, Herzig, & Moon, 2012). Green Purchasing (GP) is the process of purchasing materials, goods, utilities, and services while adhering to environmental best practices. GP refers to the adoption of environmentally responsible practices in commercial activities (Min & Galle, 2001). Environmental CC is integrated with Green Supply Chain Management when customers have multiple purchasing options and convince firms to act pro-environmentally. The ED takes environmental factors into account at every stage of the product creation process. The end goal is to create goods that have the smallest possible negative impact on the environment (MacDonald & She, 2015), Lastly, the process of recouping the value of assets that have reached the end of their useful lives or have been underused is referred to as IR. Professionals in the field of IR work to locate, recycle, sell, or get rid of any surplus assets that are produced by a company as it pursues its fundamental line of business (Ahi & Searcy, 2013).

Predecessor researchers have conducted research on the many aspects of Green Supply Chain Management and determined distinct measurements for each of those aspects. One example of a measure that constitutes IEM is management's dedication to Green Supply Chain Management as well as the organization’s acquisition of the International Organization for Standardization - ISO 14001 certification. GP could be evaluated based on the presence of ISO 14001 certification held by suppliers as well as eco-labeling on products that are purchased. Environmental CC can be evaluated based on the level of cooperation shown by customers regarding environmentally friendly packaging and the promotion of designs that do not harm the environment. The effectiveness of ED can be measured by the level of reducing the consumed hazardous materials. Measures of IR include the recovery of assets

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through the sale of scrap. Considering this, Green Supply Chain Management places an emphasis not only on guaranteeing the long-term viability of products and natural resources, but also on the minimization of waste, often known as "Muda" (Mamdouh et al., 2018; (Vachon & Klassen, 2006).

Green Supply Chain Management practices have gained a great deal of popularity among researchers and industry professionals due to the external pressures from stakeholders regarding the impact supply chains have on the environment, and society (AKA & ABERE, 2023). As an independent factor, Green Supply Chain Management practices influence a variety of factors, and this effect may be viewed from varying perspectives including operational performance (as measured by productivity), financial/economic performance (as measured by profitability), or environmental performance of businesses (as pollution).

3.2 The causality between Green Supply Chain Management practices and financial performance

Research carried out in this field of study has uncovered seemingly paradoxical links between the implementation of Green Supply Chain Management practices and a company's overall financial performance. Generally, firms embrace Green Supply Chain Management practices with the intention of acting responsibly towards the environment without sacrificing profitability, which is hopefully represented in increased revenues and decreased costs (Qin, 2019); (Zhang & Yang, 2016). However, research literature places the conclusions of earlier research into two opposing views; one view believes that Green Supply Chain Management practices have a positive effect on a company's financial performance (including ROE), while the other view believes that this relationship is of an opposite impact.

Supporters of the first interpretation concluded that Green Supply Chain Management practices should be regarded as an additional expense for businesses and, as a result, should have a detrimental effect on financial performance. The argument is on the additional financial burden that organizations face because of the costs associated with Green Supply Chain Management practices as compared to firms which do not incorporate this strategy into their SCM practices (Choi & Hwang, 2015). In other words, the argument is based on the concern that Green Supply Chain Management practices may hinder a firm's strategic decision-making. For example, a company may choose not to supply certain products, such as pesticides, to markets because doing so would conflict with its green philosophy of supply chain, and as a result, it may lose business. Other environmentally friendly practices include establishing environmentally friendly policies and green culture, cleaner production practices, green design, green production, and green decomposition techniques which may be costly to businesses.

(Khan & Qianli, 2017) argue that ED has a detrimental effect on firm’s financial performance where Green Supply Chain Management practices cannot be successfully applied in manufacturing companies without first greening and re-engineering every process. This results in increased expenditure, which in turn affects short-term profitability. However,

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criticism on the research scope can be briefly discussed by pointing out that the research sample solely consisted of industrial enterprises from Pakistan and that questionnaires were the only method utilized to collect data at a single point in time. This has been further confirmed in Bahrain by (Jassim, Al-Mubarak, & Hamdan, 2020), highlighting that there is an inverse relationship between GP and ROE.

In developed countries, (Miroshnychenko, Barontini, & Testa, 2017) argue that implementing Green Supply Chain Management practices of IEM, GP, CC, ED, and IR has a complex effect on profitability. Some ED practices as waste reduction and green transportation have a lowering cost effect that simultaneously raises net income, and consequently ROE. Contrastingly, IEM practices as obtaining an ISO 14001 certificate or having green packaging have a negative effect on profit margin. According to (Horbach, Rammer, & Rennings, 2012), practices of Green Supply Chain Management have a significant and unavoidable impact on re-engineering the processes that already exist which ultimately results in increased costs.

On the other hand, proponents of the positive relationship view have made dedicated efforts to arrive at this result. (Petljak, Zulauf, Štulec, Seuring, & Wagner, 2018) argue that ED and GP lead to a rise in revenues while simultaneously reducing expenses. In a similar vein, (Aroonsrimorakot & Laiphrakpam, 2017) reached the same result. Also, Green Supply Chain Management practices have a favorable impact on ROE through the reduction of waste and generating savings in Brazil and China (Chavez, Yu, Feng, & Wiengarten, 2016); (Vanalle, Ganga, Godinho Filho, & Lucato, 2017).

As stated by (Zhu, Geng, Fujita, & Hashimoto, 2010), the primary emphasis for IR is placed on the incorporation of items and materials that can be recycled or reused. As a result, IR positively impacts financial performance. (Ameer & Othman, 2012) highlight significantly higher sales growth, income before taxation, and income from operations as a result of Green Supply Chain Management adoption. According to (Schmidt, Foerstl, & Schaltenbrand, 2017), it is becoming increasingly vital for businesses in developed economies to fulfil the expectations of customers regarding the use of environmentally friendly practices in the workplace. This can lead to an increase in sales. The public reputation of a brand can benefit from the proactive environmentalism of firms, which can also lead to new market opportunities and improved earnings.

2.3 The US-China Trade War Role in Sustainability

The US-China Trade War, also known as the Sino-US Trade War, has been recognized as one of the major threats to sustainability. According to (Hou, O'Connor, Sonne, & Ok, 2019), international trade conflicts, such as the one currently raging between the United States and China since 2018, are considered major challenges for global sustainability. Trade wars could cause policy delays and stop countries from sharing new technologies that are crucial for greenhouse emissions reduction (Du, et al., 2020). Since the US and China are the two

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biggest carbon emitters in the world, the trade war made it harder for them to work together on research and share technologies for addressing climate change. Furthermore, trade wars make it harder for countries to trust each other and work together. Consequently, less-than-ideal climate policy solutions are offered and less funds for governments are available to fight climate change (Cooperman, Khuntia, Ning, & Tinianow, 2020).

Thus, focusing on the US and China as the contexts of this study serves in shading light on the current Green Supply Chain Management practices adopted by both countries in an attempt to spread sustainability awareness despite challenges and compare sustainability implications in both countries. To summarize, preliminary research and investigation have been reviewed to investigate the relationship that exists between Green Supply Chain Management practices and financial performance. Yet the academic community has not arrived at a consensus about the significance and direction of relationship between each Green Supply Chain Management practice and ROE.

2.4 Research Hypotheses

In the light of the above discussion, the research hypotheses could be developed as follows:

Hypothesis for US Model

- H1a: There is a significant impact of Internal Environmental Management (IEM) on the Return on Equity (ROE) of the industrial sector firms in the US.
- H2a: There is a significant impact of Green Purchasing (GP) on the Return on Equity (ROE) of the industrial sector firms in the US.
- H3a: There is a significant impact of Customer Cooperation (CC) on the Return on Equity (ROE) of the industrial sector firms in the US.
- H4a: There is a significant impact Eco Design (ED) on the Return on Equity (ROE) of the industrial sector firms in US from 2018 to 2020.
- Hypotheses for China Model
- H1b: There is a significant impact of Internal Environmental Management (IEM) on the Return on Equity (ROE) of the industrial sector firms in China.
- H2b: There is a significant impact of Green Purchasing (GP) on the Return on Equity (ROE) of the industrial sector firms in China.
- H3b: There is a significant impact of Customer Cooperation (CC) on the Return on Equity (ROE) of the industrial sector firms in China.
- H4b: There is a significant impact Eco Design (ED) on the Return on Equity (ROE) of the industrial sector firms in China.

3. Research Design

3.1 Data and Sampling

To determine and classify the Green Supply Chain Management practices, the Environmental, Social, and Governance (ESG) Index tables for the firms under-study were

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collected from Refinitiv Eikon Financial Analysis and Trading Software. Furthermore, historical financial performance indicators were retrieved from historical financial statements published in annual reports available on company websites. Data was collected for the period from 2018 to 2020.

The study population includes all listed industrial sector firms in the US and China till 2020 on Refinitiv Eikon. Due to the lack of ESG disclosures for the years under-study in China, only 50 Chinese industrial sector firms were eligible of being studied. Consequently, Stratified Sampling technique is adopted to sub-populate the sample of the US to match the sample of China regarding the number of the sampled firms and the industry of each for fair comparison. Thus, reducing the sample size to 50 firms per country and 100 firms in-total under-study as demonstrated by Table 1. Also, Table 1 shows that Construction and Engineering industrial sector has the highest number of observations.

Table 1: Sample Companies by TRBC classification of industrial sector.

Industrial Sector TRBC Classification	Frequency	Percentage
1- Construction and Engineering	34	34%
2- Heavy Machinery and Vehicles	12	12%
3- Aerospace and Defense	12	12%
4- Airlines	8	8%
5- Industrial Machinery and Equipment	8	8%
6- Electrical Components and Equipment	8	8%
7- Courier, Postal, Air Freight and Land-based Logistics	6	6%
8- Ground Freight and Logistics	4	4%
9- Marine Freight and Logistics	2	2%
10- Environmental Services and Equipment	2	2%
11- Employment Services	2	2%
12- Diversified Industrial Goods Wholesale	2	2%
Total	100	100%

3.2 Variables identification and measurement

3.2 Data Collection Methods and Used Measures

In general, Green Supply Chain Management can be evaluated using the five variables employed by Zhu et al. (2008) and Mamdouh et al. (2018). On reviewing the ESG tables retrieved from Refinitiv Eikon for the 100 firms under-study in the US and China, the measures/indicators of the Environmental pillar referring to the Green Supply Chain Management practices were found to be uncategorized in terms of relating each measure to a particular practice of the five main Green Supply Chain Management practices. This could be justified by the lack of uniformity in the financial reports terms as highlighted by (Albaz, Melegy, Alhijris, & Metwaly, 2022). Therefore, 13 commonly disclosed measures from the Environmental pillar of the ESG Index tables for the hundred firms were chosen to ensure consistency and fairness in comparison. These 13 measures were all binary values and related

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only to the four practices of Green Supply Chain Management of IEM, GP, ED and CC while IR could not be represented by any of these common measures. Thus, it was excluded earlier from the research scope, questions and hypotheses. A judgmental approach was adopted to relate these measures to each of the four Green Supply Chain Management practices.

Accordingly, out of these 13 measures, 7 measures were employed to resemble the IEM practice. These 7 measures are: Resource Reduction Policy, Policy Water Efficiency, Policy Energy Efficiency, Policy emissions, Policy Sustainable Packaging, Environment Management Team and ISO 14000 or EMS acquisition. Moreover, GP was measured by one indicator only which is Environmental Materials Sourcing. Similarly, CC was measured by Product Environmental Responsible Use. Lastly, the remaining 4 measures of Renewable Energy Use, Green Buildings, Environmental Products and Noise Reduction were highly relating to ED practice and were employed to measure it. Table 2 illustrates the independent and dependent variables alongside their measurement, acronyms and expected impact of the independent variables of IEM, GP, ED, and CC on the dependent variable ROE.

Table 2: List of variables' measurements, acronyms and expected impact on ROE

	Variable	Measurement	Acronym	Expected Impact on ROE
Dependent Variable	Return On Equity	ROE= Net Income/Total Equity	ROE	
Independent Variable (Green Supply Chain Management Practices)	Internal Environmental Management	Resource Reduction Policy	IEM	"+ve"
		Policy Water Efficiency		"+ve"
		Policy Energy Efficiency		"+ve"
		Policy Emissions		"+ve"
		Policy Sustainable Packaging		"+ve/-ve"
		Environment Management Team		"+ve/-ve"
		ISO 14000 or EMS		"+ve/-ve"
	Green Purchasing	Environmental Materials Sourcing	GP	"+ve/-ve"
	Eco Design	Renewable Energy Use	ED	"+ve/-ve"
		Green Buildings		"+ve/-ve"
		Environmental Products		"+ve/-ve"
		Noise Reduction		"+ve/-ve"
	Customer Cooperation	Product Environmental Responsible Use	CC	"+ve/-ve"

Consequently, SPSS Statistical Analysis Software is used to combine the 7 measures of IEM practice using Principal Component Analysis "PCA" into one index called "IEM" that will be considered the final independent variable to be analyzed in the statistical models with

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the "ROE" as the dependent variable. Similarly, the 4 measures of ED Practices are also combined using the same technique into one index called "ED" that acts as an independent variable. For the other two practices of GP and CC, since each practice of them is represented by one measure only, they are directly considered independent variables of "GP" and "CC" respectively. This methodology is consistent with that utilized by earlier researchers (Lassala, Apetrei, & Sapena, 2017); (Weber, 2017); (Zyadat, 2017).

Various tests are conducted on Stata® Statistics Software and SPSS Statistical Analysis Software to ensure that a panel data set matches the collected data. Shapiro's test was conducted to test for normality in the ROE variable where normality assumption is rejected and ROE data is not normally distributed which is justifiable due to the inclusion of the year 2020 in the study where economic fluctuations and instability of trends prevailed as a result of the unprecedented Covid-19 pandemic (Altig, et al., 2020). Breusch-Pagan test is employed to test for data homogeneity in both models, where the data is homogeneous. Vector Inflation Factor test is run to test for multicollinearity, where the VIF is less than 5 and tolerance is greater than 0.1 with no multicollinearity problem for both models.

EViews Software is used to run three models for the regression of the panel data set. These three models are: random effect, fixed effect and pooled effect regression models. After running the three models for both panel data sets for US and China, Hausman test indicates that the Random Effects Model should be used for both panel data sets.

3.3 Research Model

To study the impact of Green Supply Chain Management practices on ROE using the two models of US and China, the multiple linear regression model is constructed below. Refer to Table 2 for variables measurement and definitions.

$$ROE_{it} = \alpha_0 + \beta_1 IEM_{it} + \beta_2 GP_{it} + \beta_3 ED_{it} + \beta_4 CC_{it} + \varepsilon$$

4. Results and Discussion

4.1 Descriptive Analysis

For descriptive analysis purposes, the Principal Component Analysis "PCA" on SPSS is used to furtherly combine the four Green Supply Chain Management practices into one index representing the Green Supply Chain Management annual score for each firm in the three years. Accordingly, the highest annual Green Supply Chain Management score in the US model is 1.45178 for Lockheed Martin Corp, from the Aerospace and Defense industry, ranking the first in 2018, 2019 and 2020. Furthermore, the lowest was -1.56187 for Concrete Pumping Holdings Inc. from Construction & Engineering industry, throughout the three years as well.

For China model, China Southern Airlines CO LTD, from the airlines industry, rank the first in 2018 with a Green Supply Chain Management score of 1.35666. Moreover, CRRC Corp. LTD, from the Heavy Machinery & Vehicles industry, occupy the first rank in both years 2019 and 2020 with an annual Green Supply Chain Management score of 1.56194.

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Moreover, Chaozhou Three-circle Group CO LTD, from the Electrical Components and Equipment industry, has the lowest annual Green Supply Chain Management score of -1.50433 for the years 2018, 2019 and 2020.

4.2 Regression Results and Findings

Table 3 and Table 4 present the regression results for US and China models, respectively. Regarding the significance of independent variables' impact on the dependent variable of ROE in the US model, only ED shows a significant positive impact on ROE with a P-value of 0.009 which is significant at 95% since it less than 0.05. Furthermore, the P-values of IEM, GP and CC pointed to an insignificant relationship between these variables and ROE for the selected 50 American firms in the industrial sector. On the other hand, in China model, the P-value of IEM is 0.026 which is significant at 95% since it is less than 0.05, thus, there is a significant negative relationship between IEM and ROE. Similarly, the P-value of the ED is 0.08 which is significant at 90% since it is less than 0.1, thus, there is a significant positive relationship between ED and ROE. Furthermore, the P-values of GP and CC point to an insignificant impact of GP and CC on ROE for the selected 50 Chinese firms in the industrial sector.

Table 3: US Model Regression Results

ROE	Coef.	Std. Error	z	Sig.
(Constant)	0.269	0.439	0.61	0.541
IEM	-0.275	0.249	-1.10	0.270
GP	-0.493	0.449	-1.10	0.272
CC	-0.056	0.539	-0.05	0.962
ED	0.739	0.283	2.661	0.009*

*Significant at the 0.10 level

Table 4: China Model Regression Results

ROE	Coef.	Std. Error	z	Sig.
(Constant)	0.143	0.019	7.39	0.000
IEM	-0.029	0.013	-2.23	0.026*
GP	-0.037	0.026	-1.46	0.143
CC	-0.011	0.025	-0.43	0.666
ED	0.027	0.016	1.71	0.086*

*Significant at the 0.10 level

The US Model exhibits a behavior of not rejecting the hypothesis *H4a* regarding the significance of relationship between the independent variable of ED and ROE, thus, a conclusion that there is a significant positive relationship between ED and ROE in the context of Industrial sector firms in the United States is reached. This conclusion is in-line with the findings of predecessor researchers (Claver, Lopez, Molina, & Tari, 2007); (Miroshnychenko, Barontini, & Testa, 2017); (Petljak, Zulauf, Štulec, Seuring, & Wagner, 2018). However, it contradicts the findings of (Khan & Qianli, 2017).

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Furthermore, the hypotheses for the impact of the independent variables of IEM, GP and CC on ROE; *H1a*, *H2a* and *H3a* are rejected. This implies that there is no significant relationship between these three Green Supply Chain Management practices and ROE. This conclusion contradicts the findings of previous researchers (Horbach, Rammer, & Rennings, 2012); Miroshnychenko et al., 2017; (Petljak, Zulauf, Štulec, Seuring, & Wagner, 2018); (Sheth & Sharma, 1997); (Zhu, Q.; Sarkis, J.; Lai, K. H., 2008) who pointed to the existence of a significant relationship.

This conclusion can be justified by the argument that ED tackles the reduction of resource consumption (energy, water, material,..etc) and waste reduction; thus, its impact of cost saving and reduction is rapidly reflected in both short-term financial performance as well as the long-term one. However, for IEM, GP and CC, the impact of these practices does not often reflect in the short-term, but they have a long-term orientation (Bowen, Cousins, Lamming, & Farukt, 2001).

Moving forward to the second model, China Model exhibits a behavior of not rejecting the hypothesis *H4b* for the significance of relationship between the independent variable of ED and ROE, thus, a conclusion that there is a significant positive relationship between ED and ROE in the context of Industrial sector firms in China is reached. This conclusion is similar to the one reached by the US Model and it is in-line with the previously mentioned findings in the literature review.

Moreover, hypothesis *H1b* is not rejected for the significance of relationship between the independent variable of IEM and ROE, thus, China's context reveals a new conclusion of the existence of a negative relationship between IEM and ROE. This conclusion regarding the significance and direction of the relationship is in line with the findings of Miroshnychenko et al. (2017). However, it contradicts the findings of (Sarkis & Cordeiro, 2001) ; (Ameer & Othman, 2012) who pointed to a positive direction of the relationship. This can be justified by the argument of Miroshnychenko et al. (2017) that firms are still in early stages of applying Green Supply Chain Management practices and that the practices of IEM as obtaining an ISO 14001 certificate, having environmental management teams and green policies and targets are costly to businesses and have a negative effect on company's profit margin.

Furthermore, it is concluded from China Model that hypotheses *H2b* and *H3b* for the impact of the independent variables of GP and CC on ROE were rejected. This implies that there is no significant relationship between each of these two Green Supply Chain Management practices and ROE. This conclusion contradicts the findings of previous researchers (Horbach, Rammer, & Rennings, 2012); (Miroshnychenko, Barontini, & Testa, 2017); (Petljak, Zulauf, Štulec, Seuring, & Wagner, 2018); (Sheth & Sharma, 1997); (Zhu, Q.; Sarkis, J.; Lai, K. H., 2008).

Lastly, comparing the findings of the two models, both models agreed on the existence of a significant positive relationship between ED and ROE for industrial sector firms in both US and China. This implies that the contexts of both nations are quite similar in the application

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and implications of ED practice of Green Supply Chain Management. On the contrary, contradictory findings regarding the impact of IEM on ROE were achieved since the US model exhibited a significant negative relationship while China model concluded an insignificant relationship between both variables. This can be justified by the differences and variation in the economic climate of both contexts and how it is sensitive and responsive to changes in operational activities including the Green Supply Chain Management practices.

5. Conclusion

The main aim of this study is to test the impact of Green Supply Chain Management practices on firms' financial performance. The four included Green Supply Chain Management practices are IEM, GP, ED and CC as the independent variables and they are employed to test their impact on the financial performance indictor of ROE. The main research motivation has been the current global urge of encouraging and persuading firms, in both developed and developing countries and specially in highly polluting industries, that shifting from traditional Supply Chain Management practices to Green Supply Chain Management practices does not necessarily mean sacrificing profitability. This has been in accordance with the current global direction of achieving the 17 SDGs by the UN.

Therefore, the study has based its focus on the context of the sustainability implications of the Trade-War between a developed country "US" and a developing country "China" by tackling the industrial sector firms to study the hypothesized relationships from 2018 to 2020. Accordingly, after analyzing the two models, it is concluded that ED has a significant positive relationship with ROE in both contexts, while IEM has a significant negative impact on ROE in the context of the United States only, unlike China which points to an insignificant relationship. Furthermore, both models agree on the insignificance of the impact of GP and CC on ROE. These findings were justified by relying on predecessor researchers' findings in literature.

Consequently, this research effort tackles both research and managerial implications. Regarding research implications, the literature gap of studying the impact of Green Supply Chain Management practices on the ROE of industrial sector firms in the United States and China was addressed and filled. Therefore, a foundation for future research in sustainability field has been built.

In the light of the findings, it is concluded that Green Supply Chain Management practices generally correlate with firms' financial performance as measured by ROE. However, this correlation has not been strong enough in some practices to induce a significant relationship, specifically in the short-term. Moreover, the significant impact of IEM practice on ROE displays a negative direction of the relationship in China. Thus, it is recommended that firms in China specifically, and globally in-general, should maximize their efforts to find cost-efficient ways of incorporating IEM systems to their value-chains instead of costly ones. In this way, firms can make good use of the significance of the impact of IEM practice on financial performance by shifting the direction of the relationship to reflect positive outcomes in terms of refining their policies of resource and emissions reduction, energy and water

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efficiency, sustainable packaging and ISO 14000 acquisition. This in turn will boost firms' reputation and gradually increase their market share, and consequently, financial returns (Bonini & Görner, 2011).

In addition, it is of high importance that firms accept sustainability as a strategic priority prior to implementing Green Supply Chain Management practices. Once sustainability has been elevated to be a strategic priority, firms can begin to implement sustainability practices with some confidence that these practices will not only yield improvements in environmental and operational performance, but also improved organizational and economic performance on the long-term (Green Jr, Zelbst, Meacham, & Bhadauria, 2012).

Future researchers can use the classification of items that have been pulled out and related to their corresponding Green Supply Chain Management practices from the ESG reports to build on them in further research about Green Supply Chain Management practices. This will facilitate future research to have a readily established classification rather than starting from scratch.

Moreover, referring to study limitation of disclosures availability, it is suggested that further research can include a broader time range given that data is available, maybe in different databases, countries or industries. In addition, future studies may compare the financial and operational performance of firms before and after applying the Green Supply Chain Management practices over extended periods since investment in green initiatives usually pay off on the long-term. Moreover, future studies can consider moderation and/or mediation testing for factors that influence the relationship as firm's size and sustainable growth, technological and green innovation, pressures of environmental and economic regulations, suppliers and customers, to achieve a substantial relationship between the independent and dependent variables (Wong, Lai, Shang, Lu, & Leung, 2012). Future studies may also look at the financial performance indicators of firms, including liquidity, financial leverage, efficiency, and market value, to have a better understanding of how Green Supply Chain Management practices affect firm's overall financial performance.

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