



Delhi Business Review Vol. 25, No. 1 (January - June 2024)

DELHI BUSINESS REVIEW

An International Journal of SHTR

Journal Homepage: <https://www.delhibusinessreview.org/Index.htm>
<https://www.journalpressindia.com/delhi-business-review>



Unraveling the Nexus of Supply Chain Performance, Firm-Specific Attributes, and Macroeconomic Indicators: Insights for Proactive Business Strategies

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ARTICLE INFO

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Article history:

Received - 11 December 2023

Revised - 20 February 2024

27 February 2024

Accepted - 11 March 2024

Keywords:

Supply Chain Performance,
Supply Chain Management,
Firm-Specific Attributes, and
Macroeconomic Indicators.

ABSTRACT

Purpose: This study covers the complex dynamics of supply chain management and its repercussions on business operations, consumer outcomes, and economic growth. It aims to describe the interplay between firm-specific attributes, supply chain performance, and macroeconomic indicators to inform proactive business strategies.

Design/Methodology/Approach: Using quantitative methodologies, the research unfolds in two segments. The first segment assesses the impact of firm-specific attributes—namely supply chain cost, technology investments, and debt—on supply chain efficiency. The second segment explores the relationship between macroeconomic indicators and supply chain performance, focusing on inventory turnover and Gross Margin Return on Investment as performance measures.

Findings: The study revealed that supply chain costs and debt levels significantly influence supply chain efficiency, with a notable positive correlation between debt and performance in financially sophisticated firms.

Research Limitations: The research acknowledges limitations in its scope, particularly in the generalizability of findings across different industries and economic contexts.

Managerial Application: The insights offer valuable guidance for managerial decision-making, emphasizing the importance of optimizing cost efficiency, strategic debt management, and judicious technology investments. Understanding the influence of macroeconomic conditions enables businesses to adapt their supply chain strategies more flexibly to prevailing economic climates.

Originality/Value: This research bridges the gap between micro-level business practices and macro-level economic influences, providing a comprehensive perspective beneficial for both practitioners and policymakers. It contributes to the literature by quantitatively mapping the intricate relationships that define supply chain outcomes within the broader economic framework.

DOI: [10.51768/dbr.v25i1.251202401](https://doi.org/10.51768/dbr.v25i1.251202401)

Background/Objectives and Goals

Effectively managing supply chains is a cornerstone of successful business operations. [Khairi Kleab, \(2017\)](#) stated that optimizing the supply chain of a business not only improves customer satisfaction and loyalty but also reduces costs and increases profitability. In today's highly interconnected global economy, competition no longer solely involves companies as it also hinges on the competitiveness of supply chains. This competitiveness directly influences the long-term profitability and sustainability of businesses ([George & Pillai, 2019](#)).

Interconnected Supply Chains and Ripple Effects

Modern supply chains are intricately linked, allowing raw materials from one region to be processed elsewhere and sold globally. It is common to get raw materials from Africa processed in China and sold in the United States of America. This complexity means that disruptions in any part of the supply chain can set off a chain reaction, impacting the entire network. Therefore, a potential problem stemming from one of these countries or "links" in the supply chain can cause a domino effect on the entire system. These disruptions caused both supply problems for businesses and inflationary pressure on consumers. [Moosavi et al., \(2022\)](#) studied that food shortages occurred in Europe due to panic buying and border controls. In contrast, automobile part exports from China dropped by 80% due to reduced automobile demand from the United States and extreme measures imposed by world governments. These cases underscore the interconnected nature of supply chains and the potential for disruptions affecting businesses and consumers.

Implications for Business and Consumers and Contributions to Economic Growth

While the extreme disruptions experienced during the COVID-19 pandemic were unprecedented, they highlighted the vulnerability of supply chains to unexpected events. Even minor disruptions can lead to financial losses and inflationary pressures. The key takeaway is that businesses must adopt proactive supply chain strategies to mitigate

risks and ensure operational continuity. Companies can minimize disruptions' impact by implementing effective inventory management, diversifying sourcing, and establishing agile production and distribution channels. On a growth-oriented note, [Goel et al., \(2021\)](#) emphasize that robust supply chains with efficient logistics can contribute to overall economic growth. This creates additional profit opportunities for businesses. Achieving efficient supply logistics requires a combination of public policy and internal initiatives from multinational corporations. It's crucial for both firms and public institutions to manage supply chains effectively.

Challenges and Opportunities in Supply Chain Management

While companies often use metrics like inventory turnover and lead time accuracy to gauge supply chain efficiency, disruptions remain inevitable. One significant gap lies in the absence of a standardized methodology for measuring supply chain performance and identifying the critical factors that influence it ([Özkanlýsoy & Bulutlar, 2022](#)).

This challenge is intricate due to the inherently subjective nature of the topic. In addition to measuring efficiency, supply chain managers must anticipate how internal and external factors impact supply chain performance. This practice is complex and subjective due to variations in managerial styles and business models. Another gap pertains to the practical feasibility of economics-based forecasting. Given managers' substantial responsibilities, they might lack the bandwidth to consider these forecasts. In addition, managers often rely on pre-existing, usually accurate, assumptions derived from macroeconomic news. However, there's merit in expanding insights into these areas. This is, perhaps, an impossible task to do due to its subjective nature and economics-based forecasting, which from a practical standpoint, managers may already have too much on their plate to even consider. They also may already have prior, usually correct, assumptions on the trends of supply chains based on macroeconomic news. Still, there is value in providing more information regarding these topics.

In line with this, the objectives of this research are (1) to determine how to measure the performance of a company's supply chain by investigating the validity of the supply chain performance measure utilized in this research. This validation takes place within the study context, ensuring the chosen metrics' reliability and relevance. The initial issue revolves around devising effective methods for quantifying a company's supply chain performance. This entails selecting appropriate metrics that accurately gauge the efficiency and effectiveness of supply chain operations. Second (2), to identify the potential variables that influence the supply chain performance, and Lastly (3), to develop a suitable model to explore the intricate relationships between the identified variables. This quantitative investigation is essential to unraveling how various factors interact to shape supply chain outcomes.

This research holds substantial significance for managers tasked with supply chain decision-making. Managers gain valuable insights by delving into both firm-specific and macroeconomic variables and quantifying their effects and statistical significance. These insights enable the prioritization of actions based on publicly available information complemented by economic news updates. In today's volatile business landscape, being equipped with accurate and comprehensive information is a sound practice.

Literature Review

Understanding and evaluating supply chain performance is a multifaceted challenge. According to [Shepherd and Shepherd & Günter, \(2006\)](#), performance measures can be categorized into qualitative and quantitative metrics, with dimensions spanning cost, innovativeness, quality, flexibility, and time-based criteria. It's important to note that these measures are diverse and depend on the specific circumstances of each company or industry.

[Larry Lapide, \(2000\)](#) underscores the versatility of measuring supply chain performance. Different methodologies can be employed, leaving managers to select the most suitable system for their organization. Simplicity is often favored in these approaches. For instance, methods might

encompass functional-based monitoring, overseeing aspects like purchasing, logistics, and manufacturing; financial-based techniques involving tracking manufacturing costs and inventory; or performance metric-based strategies such as standardized measures like SCOR, Balanced Scorecard, or Economic Value Added.

The Crucial Role of Inventory in Supply Chain Performance

[Kwak, \(2019\)](#) and [Rao & K. Prahlada Rao, \(2009\)](#) shed light on the significance of inventory in supply chain performance. They argue that available inventory is the ultimate objective of all supply chain endeavors. This is primarily because inventory is intrinsically connected to consumer demand, directly impacting sales revenue. A higher turnover ratio signifies better company performance and hints at the efficiency of supply chain operations.

Exploring Approaches to Studying Factors Influencing Supply Chain Performance

When investigating factors that impact Supply Chain Performance, two distinct methods emerge: observational and survey/scorecard-based approaches, which can be broadly categorized as qualitative versus quantitative. The primary distinction lies in the source of data. While some overlap exists, qualitative studies often allow for customization, yielding more comprehensive insights than those derived solely from aggregate financial or economic data. However, there are drawbacks, including challenges in finding a statistically significant number of respondents and securing funding for participants, typically supply chain managers or SME business owners who may be reluctant to divulge proprietary practices. In contrast, employing financial or public data for quantitative studies offers ease and cost-effectiveness, particularly for studies involving publicly listed companies. However, this approach may lack the depth needed to uncover intricate supply chain challenges, potentially leading to a one-size-fits-all model that isn't practically adaptable.

On the other note, [Saleheen & Habib, \(2022\)](#) mentions several key gaps in the current methodologies for measuring supply chain

performance, including the absence of benchmarking, lack of association with the organization's mission and strategy, failure to address practical measurement issues, lack of systematic thinking, and lack of a method for prioritizing measures.

Qualitative studies from [Gellynck et al., \(2008\)](#), which employed a Likert Scale survey, provide insight into supply chain performance indicators in the traditional food sector of the European Union. [Govindan et al., \(2020\)](#) explore the impact of Industry 4.0 technology on supply chain performance using data from Danish companies. Their research highlights improvements in crucial areas such as warehousing, procurement, logistics, and manufacturing. On the other hand, [Kusrini et al., \(2014\)](#) developed their criteria affecting Supply Chain Performance, focusing on product simplicity, low cost, supplier responsiveness, and involvement of the supplier's management team. Through surveying 144 companies across various industries, they identify simplicity, clarity, and validity as the top factors influencing supply chain performance.

On the other hand, [Kwak, \(2019\)](#) employs regression analysis to explore the linkage between inventory turnover and capital intensity, finding positive effects from factors like property and equipment, while debt levels negatively impact supply chain performance. Similarly, [Rao & K. Prahlada Rao, \(2009\)](#) analyze trends in an Indian battery manufacturing company, highlighting how efficient internal operations, technology use, and clear supplier-customer information sharing enhance inventory turnover, contributing to improved supply chain performance.

The Philippines' Distinct Imperative and Consideration of Economic Indicators

The Philippines, operating as a net importing country, places significant emphasis on effective supply chain management. Disruptions can lead to business losses and exacerbate inflationary pressures on consumers, elevating the importance of local supply chain performance studies from both managerial and policy standpoints. For instance, [Talavera, \(2010\)](#) proposes that more integrated supply chains could enhance order-to-delivery

timelines in Philippine manufacturing. [Parilla & M Abadilla, \(2021\)](#) further substantiate the connection between firm profitability and robust supply chain management, technological systems, and inventory tasks.

Exploring Economic Indicators' Influence

An often-neglected dimension in firm-specific studies is the impact of economic indicators on supply chain performance. This area holds relevance for businesses and governments alike. [Bavarsad et al., \(2014\)](#) highlight the predictive nature of various macroeconomic factors in assessing supply chain risk. Notably, studies such as those by [Hakimah et al., \(2019\)](#) and [Shwekeh et al., \(2021\)](#) indicate that the Human Development Index (HDI) and Gross Domestic Product (GDP) positively impact supply chains, while adverse effects emerge from interest and inflation rates. These economic indicators significantly shape financial resources and opportunities, ultimately influencing efficiency enhancement initiatives.

A Glimpse into the "Green" Logistics Landscape

[Yu et al., \(2018\)](#) study delves into "green" supply chains, revealing that factors like Trade Openness, Foreign Direct Investment (FDI), and Renewable Energy Use positively influence profitability. In contrast, Carbon Emissions exert a negative impact. While these findings go beyond the scope of this research, the global trend towards incentivizing environmentally friendly supply chains makes these factors increasingly relevant down the line.

Methods

Research Design

The researchers have adopted a quantitative research design, which aligns with methodologies previously utilized by [Kwak, \(2019\)](#) and [Syahira, \(2017\)](#). This non-experimental approach focuses on the observation and analysis of pre-existing data rather than manipulating variables or establishing experimental conditions. The data underpinning this research were sourced from the annual financial statements from the year 2022. Consequently, the study takes on a cross-sectional design, which involves analyzing variables at a single point in time, as opposed

to a longitudinal approach that would track changes over multiple periods.

The study encompasses two distinct investigations: Study One (S1) involves regression analysis to examine the interplay between firm-specific factors and Supply Chain Performance (SCP) as the dependent variable (y) and various “firm-specific” factors as the independent variables (x) while Study Two (S2) employs hypothesis testing and correlation analysis to explore the relationship between SCP and macroeconomic indicators.

To begin, it’s important to establish a clear definition of SCP for the context of this research. As various techniques exist, the focus is on investigating the cost-efficiency aspect of SCP, particularly within the realm of inventory management. This emphasis stems from the understanding that inventory management directly influences revenue, making it a key element of SCP as it is the candidate-dependent variable(y). Dai et al., (2017) find that properly managed inventory mitigates the “bullwhip effect,” enhancing the stability and overall performance of the supply chain.

Whereas Baganha & Cohen, (1998), conclude that proper inventory policy creates a stable supply chain. To operationalize inventory management efficiency as a measure of overall supply chain performance, theresearchers follow Kwak, (2019) and Talavera, (2010) method of using inventory turnover as a candidate variable. The rationale for this is twofold, first, it’s because inventory turnover measures how fast a companyconverts its inventory to sales, directlyrelating to bottom line profit, and second, its ease of measurement for firms regardless of size.

Inventory Turnover (IT) is measured by dividing the Cost of Goods Sold (COGS), an income statement item, by average inventory value, which takes the sum of beginning inventory and ending inventory and dividing it by two. Where $IT = COGS/AveINV$

$$*AveINV=(InventoryBeg +Inventory end)/2$$

An alternative to measuring Supply Chain Performance based on inventory is using Gross Margin Return on Investment (GMROI).

Beamon, (1998) and Gunasekaran et al., (2004) nominated Return on Investment (ROI) as a measure of SCP, but the researcher deemed this as too broad of a metric given that investment can range from investments to improve operations-which is related to the study; and to investments in financial markets- which is not at related to this research. There is value in using a more specific, yet related measure such as GMROI for this purpose. These two measures- IT and GMROI are the main measures of Supply Chain performance in this paper.

The formula of GMROI is as follows:

$$GMROI = GrossMargin/AveINV$$

$$*AveINV=(InventoryBeg +Inventory end)/2$$

The next section will elaborate on the independent variables (x), and statistical treatments used.

Study One: Exploring Firm-Specific Factors

In Study One (S1), the focus centers on investigating the interaction between firm-specific factors and SCP. This means how three independent variables: Supply Chain Cost, Technology Investments, and Debt relate to SCP. The assumptions guiding this analysis are grounded in the inverse relationship of supply chain cost to SCP (negative sign), the positive impact of technology investments on SCP, and the negative influence of debt on SCP. The calculation of these variables involves aggregating cost components and considering various debt metrics. A sample of 30 companies from the Philippine Stock Exchange’s Industrial sector was randomly selected for this analysis.

This sector was chosen due to its alignment with the researcher’s industry and the perceived reliability of publicly listed companies’ disclosures and Financial Statements.

The mathematical expression for S1 is:

S1: Investigates how firm-specific factors interact with supply chain performance:

$$\ln SCP(Y) = a \pm b1 \ln SCC(x1) \pm$$

$$b2 \ln TechI(x2) \pm b3 \ln Debt(x3) + c$$

The independent variables used for S1 are Supply Chain Cost, Technology investments, and debt. The prior assumptions are (1) supply chain cost is inversely related to supply chain performance and with a negative sign, (2) technology is positively related to SCP, because it can speed up and improve efficiency of operations and finally, (3) debt is negatively related to SCP, since the more indebted the firm is, then the less effective a supply chain is, given that a lot of a firm's resources is allocated into debt servicing.

The calculation of the variables is as follows:

(1) Supply Chain Cost is measured by adding the company's Cost of Goods Sold and Operational costs (such as fuel/logistics costs). All of these are Income Statement items. The formula equates to **$SCC = COGS + Operating Expenses$**

(2) Debt is the outstanding debt of companies in the liability column of their balance sheet. There was some consideration of either using short-term debt or "accounts payable" vs long-term debt or liabilities arising from the purchase of "property-plant and equipment" (PPE) or bank loans in this study. Since SCP can be affected by a combination of factors related to the debt management of accounts receivables, PPE loans, and other long-term loans, just the aggregate debt figure was used.

(3) Calculating technology investment is not as straightforward. There is typically no Financial Report item that explicitly states the level of technology investment of a firm. So as a proxy for this variable, the researcher used items in the cashflow statement related to investments in equipment or technology. These items could be the purchase of software, machines, or other similar, discretionary items.

On a technical note, the researchers converted all variables to their natural logarithm (ln) form. The rationale for this is the preference for the results of (S1) to be directly interpreted as a percentage. This conversion also helps create a common percentage-based scaling for the mathematical model.

Study Two (S2) on the other hand, assumes a

different dimension by focusing on the validity of the relationship between SCP and macroeconomic indicators. Given the absence of firm-specific survey data, the research explores this relationship using available data through hypothesis testing and correlation analysis. Inventory Turnover and GMROI serve as SCP measures.

S2 hypotheses center on key macroeconomic indicators: Human Development Index (HDI), Gross Domestic Product (GDP), Inflation (INF), and Interest Rate (INT). The anticipated direction of correlation for each indicator is explained, with expectations of positive correlations for HDI and GDP, and negative correlations for INF and INT.

The researchers also implemented correlation testing. Economic Indicator data was taken from the World Bank and the United Nation's 50-year databases, which are publicly available.

The Human Development Index (HDI) serves as a comprehensive measure, encompassing factors like average lifespan, educational investment, and living standards within a country. The argument here is for a positive correlation, as higher HDI scores typically reflect better overall development, which in turn supports enhanced business growth. Gross Domestic Product (GDP), on the other hand, captures a nation's income derived from consumption, investments, government spending, and net exports. A rising GDP signals progress in a country's growth trajectory, indicative of expanding businesses. This is expected to be positively correlated, as robust economic activity often aligns with improved supply chain performance.

Inflation (INF) gauges the increase in the prices of goods within a country, measured on an annual basis. The anticipation here is for a negative impact on Supply Chain Performance (SCP). Elevated inflation rates lead to higher costs for inputs along the supply chain, potentially hindering its efficiency and overall performance. Interest Rate (INT) is the real interest rate prevailing in a country, and its influence is projected to be negative on SCP. Higher interest rates translate to increased debt servicing obligations for firms, diverting

resources away from Supply Chain Management initiatives. Consequently, SCP may be adversely affected due to the allocation of resources towards debt management rather than operational enhancement.

The hypotheses for (S2) are as follows:

H₀₁: Human Development Index Affects Supply Chain Performance

H₀₂: Gross Domestic Product Affects Supply Chain Performance

H₀₃: Inflation Affects Supply Chain Performance

H₀₄: Interest Rate Affects Supply Chain Performance

Methodology Limitations

The study acknowledges certain limitations that have been previously discussed in the paper. Quantitative data, unlike qualitative studies involving methods like Likert scales, does not yield specific, detailed insights into individual issues. While qualitative approaches offer better contextual understanding, factors such as time, budget constraints, and convenience played a crucial role in opting for quantitative methods. To bridge this gap, the researcher strategically selected independent variables that align with those highlighted in survey-based studies. This approach aims to ensure that the chosen variables capture the essence of the issues at hand despite the limitations of quantitative data.

Furthermore, the study is reliant on publicly available data, eliminating concerns related to copyright. However, a limitation emerges due to the exclusion of transparency as an independent variable, despite its significance in previous literature. The challenge lies in the difficulty of measuring transparency using public data. Nonetheless, the study acknowledges the importance of exploring transparency further through dedicated research efforts. This extends beyond the scope of supply chain literature and holds potential for enriching various avenues of research.

Data Treatment and Statistical Analysis

A suitable model for Study 2, particularly when dealing with economic indicators, could involve time-series analysis. This approach can provide

more robust correlation studies and forecasting capabilities. However, the application of time-series analysis is limited in this study due to the unavailability of comprehensive time-series data, particularly for Supply Chain Performance (SCP) measurements.

Additionally, it's important to highlight the specific statistical methodologies employed in this research. In Study 1, the researcher utilized the Ordinary Least Squares (OLS) technique. This method yields a correlation coefficient that reflects both the direction and magnitude of the relationship between firm-specific factors and SCP. For Study 1 (S1), the chosen framework ensures that the coefficients associated with the independent variables are interpreted as percentages. To be precise, a 1% increase in an independent variable X corresponds to an SCP increase by the percentage indicated by the coefficient. The researcher also intends to assess the statistical significance of the independent variables within this framework.

In Study 2, a different statistical approach was adopted. The researcher employed the T-Test (two-tailed) to ascertain the probability of an existing relationship between SCP and various macroeconomic indicators. This allows the researchers to either accept or reject the null hypothesis based on the obtained results. Furthermore, Pearson's correlation coefficient (R-coefficient) was utilized to explore the direction of correlation (positive or negative) between SCP and the macroeconomic indicators under investigation.

Several other significant statistics will be assessed in the research, including the statistical significance of variables determined by computed p-values at a significance level of 0.05, and the R-squared value, which serves as a measure of the goodness of fit for the Study 1 (S1) model. The software tools employed for conducting the statistical analyses are Gretl and Microsoft Excel.

Results

The results of Study 1 indicate that both supply chain cost and debt are statistically significant variables, demonstrated by their p-values being less than 0.05. Additionally, the model's R-squared value stands at 0.45, equivalent to 45%. This R-squared value signifies that the model exhibits an average level of correlation. The summarized results are presented in the table 1:

Table 1: Regression results of SCP(x) with various firm-specific factors of publicly listed companies (y)

Variable	Coefficient	P-value
Supply Chain Cost (lnSCC)	-0.519*** (0.121)	0.002
Debt (in debt)	0.291*** (0.096)	0.0056
Technology Investments (lnTechin)	0.042(0.028)	0.1536
Constant (a)	7.68*** (1.61)	0.000

The obtained results from Study 1 provide valuable insights into the relationship between various factors and supply chain performance. The findings underscore the significant role of supply chain cost and debt in influencing supply chain performance, as evident from their low p-values (less than 0.05) and the model’s ability to explain 45% of the observed data variation.

The observed negative coefficient for supply chain cost aligns with the initial expectation. This means that as the cost of a company’s supply chain increases, its efficiency decreases, affecting overall supply chain performance. Specifically, a percentage increase in supply chain cost can lead to a 0.51% decrease in supply chain performance. Given that many companies in the sample operate on a large scale, this impact can be substantial. Therefore, it underscores the importance of managers continually striving for cost efficiency in their supply chain operations.

The positive coefficient for debt reveals an interesting insight. Contrary to the initial assumption, a 1% increase in debt corresponds to a 0.29% increase in supply chain performance. This counterintuitive relationship could be attributed to the fact that the companies in the

sample, despite their indebtedness, are conglomerates with substantial financial resources and likely able to manage their debt without significantly affecting supply chain operations. Moreover, publicly listed companies in the study suggest financial sophistication and prudent debt management strategies. However, the exact mechanisms underlying this positive relationship warrant further investigation.

While statistically insignificant (with a p-value of 0.15), technology investment supports the initial hypothesis that investments in technology can enhance supply chain performance. Even though the exact technologies invested in are not specified in most financial statements and are typically aggregated as investments in equipment, there’s a suggestion that well-planned technology investments can contribute to overall firm efficiency. The finding indicates that a 1% increase in technology investment corresponds to a 0.04% increase in supply chain performance. Despite the limitations in capturing detailed technology figures, this finding reinforces that strategic technology implementation can positively impact supply chain operations.

The results for study two (S2) show the following test values:

Table 2: T-test results for SCP (dual measures) and Macroeconomic Indicators

N=30 Df=28	T-Test p-value. Limit < 0.05. ***statistically significant	
Testing Pairs	SCP-Inventory Turns (IT)	SCP- GMROI
SCP-GDP	0.0045***	0.0045***
SCP-INF	0.0146***	0.158
SCP-INT	0.0149***	0.164
SCP-HDI	0.0007***	0.035***

The T-Test results obtained from Study 2 (S2) reveal noteworthy patterns in the relationship between supply chain performance (SCP) and various macroeconomic indicators. When Inventory Turns (IT) is used as the measurement for SCP, the T-Test shows a significant relationship between SCP and all economic indicators. This signifies that changes in these economic indicators are associated with changes in supply chain performance, as measured by inventory turnover. However, when Gross Margin Return on Investment (GMROI) is considered as the measurement for SCP, the results are more selective. Only the Gross Domestic Product (GDP) and Human Development Index (HDI) show a significant relationship with SCP, while the relationships with Inflation (INF) and Interest Rate (INT) are not statistically significant. This indicates that GDP and HDI have a stronger influence on supply chain performance as measured by GMROI, while the impact of INF and INT is less pronounced.

The fact that the null hypothesis (H0) for GDP and HDI can be strongly rejected while partially rejecting the null hypothesis for INF and INT underscores the significance of macroeconomics in shaping decisions related to supply chain performance. The results provide empirical evidence that macroeconomic factors play a substantial role in influencing supply chain dynamics. In terms of directionality and correlation, Pearson’s R coefficient was used to explore these aspects. Specifically focusing on SCP measured by IT, these findings shed light on the degree and nature of the relationship between SCP and the economic indicators, offering insights into how changes in these indicators correlate with shifts in supply chain performance. This information contributes to a comprehensive understanding of the complex interplay between macroeconomic factors and supply chain efficiency.

Pearson’s R coefficient aligns with the researchers’ initial assumptions regarding the expected direction of correlation between SCP and economic indicators. However, the obtained figures are not statistically significant. This could be attributed to a few potential factors. One possibility is that the sample size used in the study might not be large enough to yield statistically significant results. Another reason could be the need for more sophisticated statistical treatments, such as time series analysis, to capture complex relationships that might exist over time. Unfortunately, these advanced methods are beyond the scope of the current research.

Nevertheless, the research successfully establishes the presence of a relationship between SCP and economic activity, even though the specific correlations are not statistically significant. This finding highlights the importance of considering macroeconomic factors in supply chain management decisions. In particular, the implications of economic conditions, such as interest rate policy volatility and inflation rate increases, are crucial for managers to formulate appropriate policies that align with the country’s economic trends.

These conclusions interconnect both studies conducted in this research. The implications of macroeconomic factors on supply chain performance tie into the insights garnered from the firm-specific analysis. The holistic understanding this research provides enables practitioners to make informed decisions that encompass both the micro-level factors within firms and the macro-level economic environment in which they operate.

Conclusion and Recommendation

In conclusion, the findings from study one (S1) underscore the importance of several critical factors for firms aiming to enhance their supply chain

Table 3: Pearson’s R between SCP (IT) and various Macroeconomic Indicatorss

N=30 Df=28	Pearson’s R	Critical Value (at p<0.05) = 0.361***significant
SCP-GDP	0.0359	Insignificant
SCP-INF	-0.080	Insignificant
SCP-INT	-0.071	Insignificant
SCP-HDI	0.0712	Insignificant

performance. Firstly, there is a compelling need for organizations to manage their supply chain costs effectively. This doesn't imply compromising quality but emphasizes the significance of optimizing costs to bolster efficiency. Secondly, prudent management of a firm's debt can be instrumental in maximizing cash leverage, providing resources for investments that can amplify operational efficiency. Lastly, strategic and well-planned technological investments and innovations are vital in supporting overall operations, particularly in terms of cost optimization.

These findings also align with the study of [Saleheen & Habib, \(2022\)](#) which revealed that strategic level Supply Relationship Management essentially requires an in-depth assessment of Financial Health (FH) including Economic Performance, Cost, and Budget Variance. Last but not least, equal importance lies on resilience (RE), evaluated through Global Risk, Enterprise Risk, Human Capital & Management Risk, and Supplier Selection & Appraisal processes. Last but not least, sustainability (SS) is an imperative enabler for care for the environment, engagement of the community, and practice of a green supply chain.

The managerial implications of this are significant for organizations aiming to achieve long-term success in supply chain management. By measuring and optimizing Financial Health, firms can ensure they are economically viable and competitive. Addressing Resilience allows companies to safeguard against various risks and adapt to changes effectively. Emphasizing Sustainability not only fulfills corporate social responsibility but also can lead to operational efficiencies and improved brand reputation. Companies that integrate these dimensions into their strategic planning are likely to experience enhanced supply chain relationships and performance.

In the broader context, the research also demonstrates that firm-specific factors, such as supply chain cost and debt, significantly impact supply chain performance. Similarly, macroeconomic factors, including GDP, HDI, inflation, and interest rates, affect supply chain performance statistically significantly. While these macroeconomic indicators may be beyond the direct control of managers, proactively understanding and addressing

their implications can enable firms to uphold the efficiency of their supply chains, ensuring a steady supply and ultimately contributing to improved profitability. In the simulation modeling study of [Lychkina et al., \(2017\)](#), they emphasized that there are various factors to consider in the context of supply chains at different levels such as price, quality, time, commercialization, and innovation and these factors are used to determine the cost-effectiveness of supply chains and the level of integration within the system. The detailed analysis of trade-offs in performance and efficiency at each level of the supply chain hierarchy has been carried out through simulation modeling. This forms a regional supply chain of such integration of these parameters that from this analysis, an all-round view is identified towards understanding the possible problems and scope for improvement.

Furthermore, there are potential extensions to this research. For instance, incorporating survey data in study one (S1) could provide deeper insights into the perceptions and practices of supply chain professionals, enriching the understanding of the relationships between variables. Additionally, including time series analysis and forecasting in study two (S2) could facilitate a more comprehensive evaluation of how macroeconomic indicators dynamically impact supply chain performance over time. These potential avenues for further exploration could yield valuable insights for both academics and practitioners in supply chain management.

Based on the conclusions drawn from the research, several recommendations can be offered to firms and supply chain managers to enhance their supply chain performance:

- 1. Develop a Strategic Cost Management:** The research underscores the significant negative impact of supply chain costs on overall supply chain performance. Therefore, firms are encouraged to prioritize cost optimization strategies while maintaining quality. This involves identifying areas where costs can be reduced without compromising efficiency or customer satisfaction. Regular reviews of cost structures, supplier negotiations, and process improvements are essential to ensure cost efficiency across the supply chain.

2. **Improve Debt Management and Resource Allocation:** Contrary to the initial assumption, the positive relationship between debt and supply chain performance suggests that well-managed debt can contribute positively to operational efficiency. Firms should focus on prudent debt management to avoid overleveraging while leveraging debt for strategic investments that enhance supply chain operations. Financial discipline, effective cash flow management, and efficient debt servicing mechanisms should be in place to ensure the optimal allocation of resources.
3. **Monitor Macroeconomic Trends:** The findings of Study 2 highlight the significance of macroeconomic indicators in shaping supply chain performance. Firms should closely monitor economic trends, especially GDP and Human Development Index (HDI), as these indicators have significant relationships with supply chain performance. This suggests that businesses should adapt their supply chain strategies in response to changes in economic conditions. During periods of economic volatility or inflation, strategic adjustments can mitigate potential disruptions and maximize efficiency.
4. **Adopt a Holistic Decision-Making:** The research demonstrates the interplay between firm-specific factors and macroeconomic influences on supply chain performance. Firms are encouraged to adopt a holistic approach to decision-making that takes into account both micro-level operational factors and broader economic trends. This approach enables managers to develop strategies that align with the dynamic landscape of supply chain management, enhancing adaptability and resilience.
5. **Future Research:** As part of future research endeavors, exploring additional variables and refining measurement techniques is recommended. Further investigation into technology investments, transparency, and other relevant factors can provide deeper insights. Expanding the sample size and employing more sophisticated statistical methods, such as time series analysis, can yield more robust and nuanced results.

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