RELATIONSHIP ORIENTED SUPPLY CHAIN: INTERNATIONAL EVIDENCE

By

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THESIS ACCEPTANCE CERTIFICATE

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Table of Contents

Table of Figures

Table of Tables

Abstract

Measuring Supply chain performance is vitally essential for gauging the efficiency of modern supply chains. There are many methods of measuring supply chain performance that rely mainly on financial indicators, which are used for benchmarking to draw comparisons among organizations. The performance of a supply chain is significantly influenced by various factors, with a primary emphasis on the firm's financial performance indicators. Additionally, literature suggests that management styles vary between eastern and western companies, potentially impacting supply chain performance, although empirical evidence supporting this notion is lacking.

This research aims to address the inquiry of whether distinct management styles across companies affect supply chain performance. The investigation involves analyzing the financial indicators of sample firms and their investments in suppliers, establishing a correlation between management approach and supply chain efficiency.

The research is conducted on the automotive industries of 6 major eastern and western countries and regression analysis is performed on the collected dataset of automobile manufacturers from Capital IQ. The results show that integration of supplier in sample firm and investment of sample firm in the supplier have no statistically significant effect on the performance of sample firm.

Introduction

Every logistics firm has to manage its supply chains effectively since they are a crucial business component. However, managing them requires proper measurement of supply chain performance so that apt measures can be taken when needed to improve the company's overall supply chain. A supply chain can be defined as "***a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer***"(Mentzer et al., 2001).

Supply chain management (SCM) is essential for minimizing costs and increasing the company's revenue. SCM can be defined as "***the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, to improve the long-term performance of the individual companies and the supply chain as a whole***"(Mentzer et al., 2001). The supply chains can only be well managed if they are monitored and evaluated using proper measures.

Hence, techniques for measuring supply chain performance are employed to assess its effectiveness and develop appropriate strategies for enhancing both the supply chain and the company's revenue. Management may find assessing supply networks' performance difficult because of their complexity and industry-specificity. Various literature sources have proposed several theoretical frameworks incorporating qualitative and quantitative elements to measure supply chain performance.

Supply chain performance measurement requires continuous improvement for smooth operations of supply chains and needs to incorporate organizational performance rather than only focusing solely on financial measures (Elrod et al., 2013). In a study by Beamon, (1998), the metrics for evaluating supply chain performance were categorized into qualitative and quantitative. Then, these were divided into three different categories: flexibility measurements (F), output measures (O), and resource measures (R). The methods often employed may categorized into two categories: (i) supply chain

performance measurement systems that are financial and (ii) supply chain performance measurement systems that are non-financial. Both of them have been thoroughly examined in the body of current literature.

The common approach often includes using financial indicators within the supply chain as they directly link a company's financial success with its supply chain efficiency. Nevertheless, multiple research studies recommend integrating organizational performance indicators and financial metrics to understand the supply chain's performance comprehensively (Kaplan & Norton, 2005).

This research aims to find the relationship between a supplier firm's performance and integration in its supply chain. The research is conducted on the automotive industries of 6 major countries, and quantitative analysis is performed on the collected dataset of automobile manufacturers from CapitalIQ. The study covers the two different management styles of the industry i.e., Keiretsu and Non-Keiretsu. Japanese companies mainly follow Keiretsu, and most have vertically integrated supply chains.

Toyota Motor Corporation has 400 suppliers listed on CapitalIQ, and Toyota is invested in 15 of its suppliers, whereas 1 of the suppliers is invested in Toyota as well. On the other hand, Ford Motor Company has 209 suppliers, and Ford has invested in only 4 of its suppliers. This example reflects the different management approaches of Eastern and Western car manufacturers.

This research endeavor encompasses the evaluation of supply chain performance using financial indicators. The research involves direct financial metrics and ***proxy measures*** that establish a connection between financial performance, supply chain efficiency, and organizational performance. As a result, a wide-ranging literature survey was conducted to compile existing research on supply chain performance measurement, with a precise emphasis on the detailed examination of monetary indicators in the subsequent section of the review.

Furthermore, this research also discusses the different integration strategies companies adopt for their growth. Specifically, the Keiretsu model is discussed in detail, keeping its relationship with supply chain performance in context. There are two main types of

integration strategies, i.e., horizontal and vertical. Both of these strategies have their benefits and drawbacks; hence, companies adopt either one according to their requirements. On the other hand, the Keiretsu model is the structure of major companies in Japan. The two types of Keiretsu model are shown in Figure 1 below.

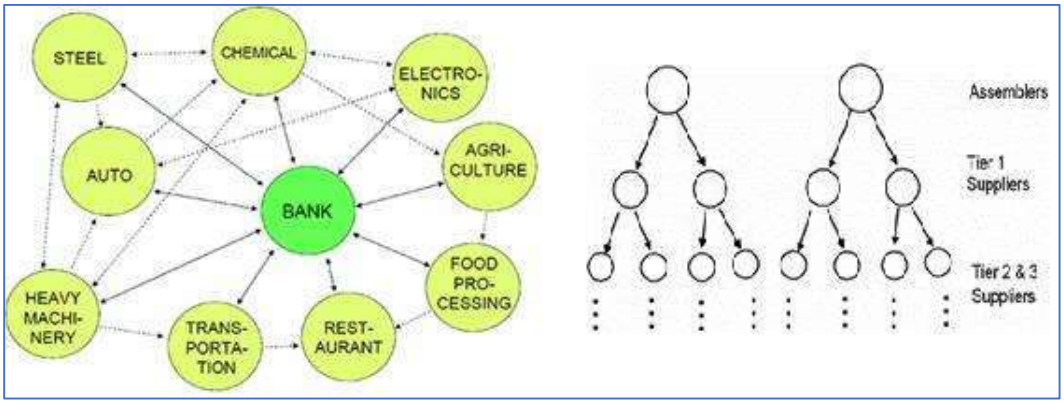

Figure 1-Horizontal vs Vertical Keiretsu (Klim, 2021)

Vertical integration is a widely misunderstood commercial strategy. For a significant duration, it has served as a crucial driving force fostering the progress of both enhanced productivity and managerial effectiveness within the business sphere of the United States of America (Eichner, 1978). In the past, vertically integrated firms have been important development drivers and have increased shareholder value (Lubatkin, 1982). Nonetheless, historical outcomes indicating that "dominant verticals" Rumelt, (1974) and “vertical mergers” Baker et al., (1981) were the least effective diversification strategies may have unduly discouraged both managers and academic researchers from considering the utility of this approach.

In its initial stages, the Ford Motor Company took control of every aspect of production, spanning from iron ore processing to finish-and-trim facilities, except tires and glass. Ford's comprehensive approach and well-organized logistical system led to reduced procurement expenses, the standardization of components, and streamlined end-to-end production. Consequently, many consumers gained access to affordable and reliable vehicles in 1910 (Eichner, 1978). Such vertical integration is typical in burgeoning industries, particularly when companies are compelled to rely solely on their own infrastructure and resources.

By 1983, vertical integration had lost some of its appeal, largely due to a lack of understanding among managers regarding its role within their company's organizational structure. Many firms lacked the necessary structures to leverage the synergies that vertically integrated links could offer fully, or they applied them inappropriately (Williamson, 1975). While many companies opt to develop their crucial resources and services internally rather than through acquisition, their struggles in effectively managing integration taint their perception of this strategy. Moreover, the approach to vertical integration must evolve, as an excessive level of integration can lead to substantial competitive disadvantages, as evidenced by the experiences of the car and steel sectors in the United States in 1983.

The ***Keiretsu*** model succeeded the ***Zaibatsu*** system, evolving from family-owned businesses and transforming them into larger corporations. The bank oversees the cross-shareholding firms alliance in a horizontal (financial) keiretsu. However, in a vertical (industrial) keiretsu, there is a partnership between the supplier, manufacturers, and distributors that work in cooperation to increase the overall efficiency and minimize the costs.

Just as the zaibatsu conglomerates played a central role in Japan's swift economic growth before the war, the keiretsu networks emerged as a pivotal aspect of the country's economic resurgence after the war. Throughout the postwar era of rapid economic development, the presence of keiretsu had a constructive impact on Japan's economy. However, as Japan faced economic stagnation in the 1990s, the advantages of belonging to a keiretsu became less evident, leading to a trend of mergers and a push for transformation.

The key objectives of business keiretsu systems revolve around heightened efficiency and reduced production expenses. Among these networks, the automotive sector is notably prominent. Conversely, financial keiretsu display a complex and diverse structure reminiscent of the pre-war zaibatsu, primarily focusing on monetary facilities. Horizontal keiretsu networks possess even more complex structures and pursuits, typically prioritizing the overall financial stability of the group.

Vertical keiretsu aims to reduce expenses, whereas horizontal keiretsu seeks to minimize risk (Brouthers et al., 2014). ***Cross-shareholding*** binds keiretsu organizations together (Berglöf & Perotti, 1994; Gerlach, 1992; Kōsai & Goble, 1989). Long-term connections between reliable partners are symbolized by cross-shareholding (Gerlach, 1992). It's one of the main traits that set them apart from zaibatsu. Cross-shareholding gave rise to a distinctive corporate governance structure, wherein managers within financial keiretsu entities oversee one another (Berglöf & Perotti, 1994). Furthermore, cross-shareholding is an additional safeguard against hostile takeover attempts (Kanno, 2019).

Problem Statement

Companies in different parts of the world follow two different management styles, i.e., Keiretsu and Non-Keiretsu. However, no comprehensive quantitative research has been conducted on the financial performance of these companies due to their differences in management styles. This research aims to compare integrated and relationship-oriented supply chains of automobile companies from 6 countries, i.e. (Japan, South Korea, France, Germany, UK, and USA). The cross-national data is analyzed to deduce inferences about the financial performance of the sample companies due to their integration into supply chains. Moreover, this study aims to explore the correlation between the performance of a supplier firm and its level of integration within the supply chain.

The research aims to answer the below-mentioned problem statement:

1. ***Does the supplier invested in the sample firm affect the performance of the sample firm?***

Aims and Objectives

The overarching objective of this research is to evaluate the performance of supply chains by utilizing publicly available data from listed companies. This will be achieved by calculating financial indicators and finding the relationship between suppliers and sample firms. Therefore, the objectives can be divided as follows:

- To collect data related to Ownership, Portfolio, and Suppliers of automobile manufacturers from 6 countries, i.e., France, Germany, Japan, Korea, United Kingdom, and United States using Capital IQ database.
- To find the list of crossholdings and the relationship with their suppliers.
- To calculate the financial ratios of the companies.
- To perform a regression analysis to find the connection between company performance and supply chain integration.
    - To check if the supplier invested in the sample firm affects the performance of the sample firm.

Literature Review

The optimization of supply chains has been the focus of researchers for quite some time, and extensive work has been done on measuring and optimizing supply chain performance. After conducting a detailed literature survey, this section has been divided into six main sections according to the scope of work: (i) Automobile Supply Chain (ii) Supply Chain Integration (iii)Keiretsu Model (iv) supply chain performance methods (v) supply chain financial performance indicators (vi) proxy measures.

Automobile Supply Chain

The automobile sector supply chains have been primarily focused on the performance and relationship of supply chains. This section discusses the literature on automobile supply chains and their performance measurement techniques.

The research by Grodzicki & Skrzypek, (2020) delves into cost-competitiveness's pivotal role in reshaping European automotive value chains. They employ the World Input-Output Tables (WIOT) database to scrutinize the automotive sectors of the largest European exporters in 2014 (Germany, Spain, UK, France, and Italy). The study underscores the empirical significance of vertically integrated unit labor costs (VULC). It emphasizes the necessity of highly detailed data for a comprehensive analysis of automotive production in the "***global value chain (GVC)"*** framework.

The paper also highlights the emergence of functional specialization within these value chains, with cost-effective locations typically handling labor-intensive and standardized production stages. At the same time, headquarters countries focus on design, research and development, and marketing. This functional division of labor can impact industrial upgrading and potentially reinforce initial imbalances in the value chains.

Another research conducted by Doran et al., (2007) demonstrates that implementing modular supply chains in the automobile industry necessitates distinct competencies beyond traditional procurement methods, involving risk sharing, enhanced supply chain management capabilities, and disposing of non-core functions. Through a case-based

assessment of key suppliers in the French automobile sector, it was found that adopting a modular approach requires both operational adjustments and strategic planning.

The proximity to the original equipment manufacturer (OEM) mandates a focus on pivotal activities for modular supply, with less critical, low-value-adding tasks delegated to upstream suppliers. One supplier within the modular supply chain has begun identifying key value-adding functions and contemplating integrating outsourced activities, like parts painting, into their core operations to bolster in-house value contribution. However, the supplier maintains a mindful approach towards preserving flexibility.

Toyota's supply chain management system, also called the ***"Toyota Production System (TPS)",*** is renowned for its effectiveness in enhancing productivity and flexibility in the automotive industry. Toyota's affiliated companies, including Toyota Central RD Labs, Kanto Auto Works, and Toyota Auto Body, conduct fundamental research and manufacture various automotive components. The Wall Street Journal has emphasized Toyota's competitive edge in the industry, underscoring its interest in companies involved in auto bodies, parts, and related products. This efficiency is exemplified by Toyota's impressive capability to complete an order for a new automobile for a customer in five days, a stark contrast to competitors who typically require at least 30 days for vehicle assembly. (Fane et al., 2003)

In another research work conducted by Ahmadjian & Lincoln, (2001a) discusses that the Japanese automotive industry is experiencing a notable transition towards increased reliance on market-based transactions and standardization of parts across suppliers and assemblers. This shift is propelled by the proliferation of parts varieties and cost reduction objectives. Notably, automakers like Nissan are now turning to keiretsu suppliers of other manufacturers, diverging from their traditional supplier networks. This alteration in purchasing relationships is motivated by performance and financial considerations, alongside the pursuit of economies of scale.

Despite the celebrated concept of co-specialization between assemblers and suppliers in automobile manufacturing, there is a current trend towards greater parts standardization in the Japanese auto industry. This development prompts inquiries into the motivations

behind this shift, particularly given that Japan is the birthplace of such practices. Japanese car manufacturers' readiness to procure from suppliers affiliated with their competitors can be ascribed to governance considerations. These include a reduction in asset specificity over time and the imperative for a suitable alignment between transaction type and governance framework. Additionally, the escalating portion of electronics in automotive production expenses is impelling the industry to pursue customization and specialized collaboration beyond Japan's border.

A research work by Ó hUallacháin & Wasserman, (1999) discusses the Brazilian automobile sector. The paper reflects that in Brazil continues to have scale economies, vertical integration, and a car parts industry, despite recent shifts toward flexible production systems. Due to the adoption of flexible production methods and the subcontracting of component manufacturing by vehicle assemblers due to the economic reforms, supply chains faced difficulties since first-tier subsystem assemblers were dependent on tiny, inefficient parts manufacturers. Major tier one suppliers, including British Tyre and Rubber Corporation, Dana Corporation, and Bradesco Bank purchased existing components manufacturers to address this issue and built new facilities to service the newly structured car assembly factories in Brazil and Argentina.

This demonstrates the ongoing significance of vertical integration and scale efficiencies in the Brazilian automotive supply chains, which are typified by large-batch part manufacturing, subsystem assembly by big global tier-one suppliers, and ownership concentration. While the growth of the car industry has slowed in places like North America, Europe, and Japan, a noticeable expansion has been seen in developing nations like Brazil and Argentina.

Another paper, authored by Novak & Stern, (2009), investigates the connection between automotive industry choices on vertical integration. It looks into how different aspects affect the decision to integrate in various vehicle systems vertically. The study uses system-specific measurements like sunk assets and production capacity as influential parameters to explain the amount of vertical integration. According to the empirical paradigm, the system-specific vertical integration drivers are independent of and unrelated to the

distinctive returns from vertical integration. In order to validate their identification technique, the study provides evidence of heterogeneity among systems, notably within model-generations. The possibility for endogeneity is also discussed, and the authors emphasize the significance of exogeneity in the system-specific drivers when employing the instrumental variables method.

Another paper by Sakuramoto et al., (2019) compares supply chain structures in traditional automakers versus those in South Korea and China, underscoring the inefficiencies present in the conventional automotive supply chain. Traditional automakers often employ a horizontal supply chain structure, relying on a limited number of Tier 1 suppliers and lacking robust connections with Tier 2 suppliers. This leads to higher transaction costs and challenges in supply chain management. Conversely, emerging automakers adopt vertical upstream supply chains, improving profitability.

The study advocates that traditional automakers should reevaluate their upstream supply chain model and consider implementing vertical integration to enhance their competitiveness. The research methodology involves qualitative techniques, including semi-structured interviews with executives, individual meetings, and secondary data analysis. The paper also highlights the significance of strategic decision-making and transaction cost analysis in comprehending supply chain configurations. It delves into the choice between vertical integration and outsourcing, taking into account factors like transaction frequency, asset specificity, and uncertainties.

Another similar research work related to the automotive industry as part of Thesis by Nduncij & Iiy, (2008) focused on analyzing the employment of vertical integration strategies within Kenya's motor vehicle industry and identifying the associated difficulties. The research employs measures of central tendency and content analysis to elucidate industry trends and challenges connected to vertical integration strategies. It emphasizes that personal interviews yielded the most comprehensive and high-quality information, while a combination of closed and open questions in the questionnaire provided specific data. The analysis of gathered data incorporates percentages, mean scores, and averages to encapsulate the trends in vertical integration. Ultimately, the paper concludes by offering

valuable insights into the industry's vertical integration strategies, effectively addressing the study's objectives.

Moreover, a research paper by Delic et al., (2019) discusses Additive Manufacturing (AM), which stands as a transformative technology with substantial potential to reshape supply chain practices and principles. However, despite its promise, there remains a scarcity of empirical research investigating the tangible effects of AM on supply chain integration, supply chain performance, and overall firm performance.

A theoretical model has been constructed to address this gap based on an extensive literature review. Subsequently, a quantitative analysis has been conducted utilizing data gathered from 124 automotive manufacturers within the European Union. The study's primary focus is examining the interrelationships between supply chain integration, supply chain performance, and firm performance within the context of AM adoption.

The study's findings highlight several key points. Firstly, they indicate a positive influence of AM adoption on enhancing supply chain performance, which subsequently translates into improvements in overall firm performance. Furthermore, the research uncovers an additional positive indirect effect of supply chain integration on augmenting both supply chain and firm performance. This enhancement is facilitated through the adoption of AM, signifying the technology's role as an enabler for the positive impacts of supply chain integration.

Notably, the study underscores that while AM can significantly contribute to optimizing supply chains, its effectiveness is not solely contingent upon the technology itself. Traditional supply chain management activities also play a pivotal role in maximizing the benefits derived from AM adoption.

Another research work by Delic et al., (2019) explores the factors influencing inter-organizational eco-innovation within supplier networks in the automotive industry, aiming to bridge a critical research gap in comprehending the mechanisms driving such developments.

To investigate this, the study utilizes co-patenting data between automakers and their suppliers as a metric. The focus is on examining how supplier eco-innovation capabilities impact the occurrence of inter-organizational eco-innovation co-patents. The findings reveal a positive relationship between supplier capabilities in electric and hybrid technologies and the generation of eco-innovation co-patents.

Interestingly, the study uncovers an exception in the case of supplier fuel cell capabilities within the Toyota supplier association. The absence of a significant association suggests Toyota's strategic inclination towards internal development of fuel cell innovations with limited supplier involvement.

Furthermore, the research delves into the influence of alliance partner diversity on the process of developing inter-organizational eco-innovations. Surprisingly, the findings indicate a negative moderating effect of alliance partner diversity on the relationships between supplier electric capabilities, supplier hybrid capabilities, and eco-innovation co-patenting. This suggests that firms might face challenges in effectively managing a diverse network of alliance partners while striving to develop inter-organizational eco-innovations.

Another study by Pacana & Czerwińska, (2020) focuses on improving the production process of aluminum pistons for passenger cars by addressing the issue of a significant number of non-compliant products. The analysis of nonconformities was performed through penetration testing, and various tools such as histograms, brainstorming sessions, and Pareto-Lorenz diagrams were used to identify the causes of the problem.

The presented solution demonstrates the practical effectiveness of a sequence of selected instruments in solving production problems. This sequence of methods can be applied in other qualitative analyses in different companies.

The quality of components in the automotive industry is crucial for the overall quality and safety of the finished product. The selection of materials, including metal alloys, should consider technical design assumptions and economic factors.

Supply Chain Integration

The connection between supply chain performance and integration stands as a fundamental aspect of this study. This section delves into an analysis of research concerning diverse approaches to supply chain integration and their impact on the overall efficacy of the supply chain.

Guan & Rehme, (2012) discusses the dynamics and outcomes of vertical integration within supply chains, explicitly emphasizing downstream integration in a manufacturer-distributor-reseller chain. Through an exploratory case study of a Swedish timber manufacturer's integration of a distribution center in the UK, the research uncovers that the principal impetus behind this integration originated from the requirements of prominent retail chains. It also highlights the manufacturer's strategic emphasis on enhancing its position within the supply chain. The factory became a crucial supplier for well-known resellers of timber products as a consequence of this vertical integration, enabling the business to provide full solutions and position itself as a strategic partner to its customers.

In another paper by Rai et al., (2006) which discusses the influence of Information Technology (IT) on performance of firm within the realm of ***"Supply Chain Management (SCM)"*** is discussed. The authors introduce the concept of higher-order capabilities and a hierarchical framework to elucidate how IT shapes advanced process capabilities, ultimately leading to enhanced performance outcomes for firms. The research contends that firms that establish integrated IT infrastructures for SCM, leveraging them to cultivate a higher-order supply chain integration capability, stand to attain substantial and enduring performance improvements.

The enhanced capacity of integration of processes in the supply chain, which entails the separation of information flows from physical flows and the sharing of information with SCM partners, is made possible by this integrated IT architecture. This IT-enabled capability for supply chain integration results in notable and long-lasting improvements in business

performance, notably in terms of operational effectiveness and revenue growth. In order to encourage process capabilities for the smooth integration of resource flows between a business and its SCM partners, the paper emphasizes the crucial need of developing and exploiting an integrated IT infrastructure.

Another detailed review paper by Martinelli & Tunisini, (2019) discusses the integration of customers within supply chains, with a specific focus on customer-driven and customer-centric approaches. The authors identify, analyze, synthesize, and discuss findings from existing literature on this subject through an organized literature analysis. The paper introduces a conceptual framework and research propositions that compare and combine the two configurations of supply chain management.

This rigorous literature analysis contributes to a more holistic understanding of customer integration within supply chains. It pinpoints the distinguishing features of customer-driven and customer-centric supply chains and offers managerial insights for achieving effective customer integration. The article advocates for further exploration of factors that underpin these methodologies, the internal workings of customer-centric supply chains in terms of organizational dynamics, and the effects of digitization on the operations within the supply chain.

Another book chapter by Vickery & Dröge, (2010) discusses that Supply chain management (SCM) necessitates a comprehensive and strategic oversight of the entire supply chain as a unified entity to achieve desired outcomes efficiently. The key component of SCM is integration, which includes both internal integration within sections and external supplier's integration, clients, and other network partners. Optimizing system operations and creating seamless connections are the major concerns in integration research.

Teams and information technology (IT) serve as crucial mechanisms for attaining integration, aiding in the amalgamation of knowledge and enabling collaborative decision-making. The current body of research indicates a correlation between supply chain integration and organizational success. Nevertheless, there is a notable scarcity of studies examining the interconnections and impacts of integration mechanisms, especially within complex environments characterized by factors such as environmental turbulence. This

scarcity of research presents a novel avenue for further exploration in the field of supply chain management.

In a separate study conducted by Li & Chen, (2020), an investigation was conducted into the vertical integration strategies employed by manufacturers within a three-tier supply chain involving two suppliers, one manufacturer, and two retailers. The effectiveness of quality-differentiated products plays a pivotal role in deciding whether to pursue forward or backward integration. The manufacturer's choice of integration strategy is significantly influenced by the existing structure of the supply chain, particularly when considering product quality. Forward integration holds a promise of benefiting both the manufacturer and the non-integrated retailer, whereas backward integration negatively impacts the non-integrated supplier.

The consequences of the producer's integration strategy on product quality, retail pricing, and demand are also covered in detail in the study. Manufacturers use forward or backward vertical integration as a channel strategy to increase profitability. Backward integration assures a constant supply of resources and power over raw material quality, whereas forward integration offers control over retail prices and response to demand fluctuations.

Another paper by Ursino, (2015) introduces a novel theory of vertical integration, emphasizing its aim to enhance a company's bargaining power among suppliers in the production process. It argues that firms most inclined to integrate are those making highly specialized investments in production. The theory provides insight into several observable events, including how financial development affects the vertical structures of organizations, how outsourcing has replaced Foreign Direct Investment (FDI) in international commerce, and how technology obsolescence affects organizational strategy.

The model is examined in both a benchmark and an extended version, with the latter applied to interpret real-world scenarios in conjunction with existing literature. The study endogenizes enterprises' investment choices and considers the presence of several vertically integrated assemblers in the supply chain. The model operates on the assumption of incomplete contracts and acknowledges that firms vary in their capacity to claim revenue, with each type of firm able to stake a share of the revenue it generates. Additionally, the

level of specificity and complexity in the final product being manufactured are key characteristics that distinguish different industries.

Another paper by Andreou et al., (2016) explains how vertical integration affects inventory turnover and business effectiveness. It creates a causal model to analyze how multiple inventory kinds (raw materials, work-in-progress, and finished commodities) interact with one another and how this affects various elements of business performance. The results suggest that vertical integration has a beneficial influence on raw material and completed good turnover rates but has no discernible impact on work-in-progress inventory turnover.

Furthermore, an increased turnover rate of finished goods leads to reduced expenses in supporting processes and a greater return on investment. Additionally, vertical integration significantly influences the return on sales. This study contributes to the existing pool of knowledge regarding the correlation between vertical integration and inventory turnover performance, thus furthering theoretical comprehension in this area. The research employs structural equation modeling to explore causal connections, incorporating path analysis to estimate the empirical model. Various fit statistics, including the chi-squared statistic, root mean squared error of approximation, and comparative fit index, are utilized to evaluate the model's adequacy.

Another paper by Ursino, (2015) introduces a novel theory of vertical integration, emphasizing its aim to enhance a company's bargaining power in the production process among suppliers. This comes at the cost of reduced flexibility in supplier selection for specific final products. Companies that make substantial and highly specialized investments in their production processes possess the greatest motivation or drive to pursue integration. While technological progress may eventually lessen the need for vertical integration, such firms are likely to persist due to ongoing scientific advancements and basic research that create new, intricate, and non-standard products. Furthermore, industries with more intricate production processes tend to be more inclined towards vertical integration.

A similar research work by Jadhav et al., (2019) discusses Supply chain orientation (SCO) that holds the potential to contribute to the sustainability performance of supply chains significantly. However, the existing literature does not definitively determine whether SCO

directly influences supply chain sustainability performance. Additionally, there is a gap in understanding the distinct impacts of various categories of SCO on supply chain sustainability performance.

In an effort to address these gaps, a Structural Equation Modeling (SEM) analysis was conducted using data collected from supply chain managers. The study aimed to discern the effects of different SCO categories on supply chain sustainability performance.

The study highlights that when different parts of the supply chain work well together and communicate effectively, it directly improves both the environmental and social sustainability of the supply chain. On the other hand, when the focus is on coordinating activities within the company's own supply chain, it mainly impacts the environmental sustainability aspect. The extent of this impact is influenced by how much the organization embraces sustainable practices internally. These insights provide valuable implications for enhancing sustainability performance within supply chain management.

This research underscores the notion that different SCO constructs follow distinct pathways in their relationship with supply chain sustainability performance. Specifically, supply chain collaboration and communication directly impact environmental and social sustainability, whereas internal supply chain coordination primarily influences environmental sustainability, mediated through internal sustainability practices within the organization.

It's important to note that the globalization of supply chains has transformed the landscape of social sustainability concerns within supply chains. These issues encompass a range of factors, such as child labor, forced labor, inadequate health and safety standards, discrimination, and compliance with government regulations.

A study by Habib et al., (2021) highlights the pivotal role of strategic orientation—encompassing green entrepreneurial, market, and knowledge management orientations—in influencing the adoption of organizational environmental activities. Moreover, these orientations are shown to contribute significantly to superior firm performance.

Specifically, the research demonstrates a strong correlation between green entrepreneurial orientation and GSCM practices, viewed through the lens of dynamic capability.

Additionally, it reveals an association between market orientation and GSCM practices, emphasizing the perspective of resource advantages theory.

Another study conducted by Mishra et al., (2022) explores the roles that environmental collaboration and environmental orientation play in accomplishing sustainable production and consumption goals in a supply chain. With a particular focus on a supply chain in the automotive industry, the research methodically examines the relationship between environmental collaboration practices and sustainable consumption and production objectives by utilizing the situation–actor–process (SAP) and learning–action–performance (LAP) models.

The study uses the SAP-LAP model to try to understand the complex relationships and dynamics between the current situation, the parties engaged, and the processes that affect environmental cooperation for promoting sustainable production and consumption in an Indian automaker. An overview of the environmental collaboration practices aimed at sustainable production and consumption throughout the Indian automotive supply chain is provided by the SAP study. After that, LAP clarifies the learning objectives and suggests doable actions to improve environmental cooperation performance, ultimately advancing the objective of sustainable production and consumption.

The results highlight how crucial it is for businesses to work with their internal departments, suppliers, and customers to improve supply chain performance. Furthermore, the research formulates hypotheses emphasizing the connection among environmental consciousness, environmental cooperation, and sustainable behaviors in both production and consumption. The study's ultimate goal is to provide guidance to practitioners and policymakers by showing how important environmental cooperation is to reaching sustainable production and consumption goals.

Another research work by Al-Doori, (2019) argues that against the backdrop of fast technological development, global growth, and the growing impact of regional dynamics, supply chains (SC) have become increasingly important in a variety of businesses. These days, competition affects whole industries rather than individual firms, and any disruption might influence individual organizations and industry. Pakistan's industrial sector,

particularly the automobile industry, which stands out as a fast-rising industry, sustains a significant section of the population despite the country's primary reliance on agriculture. However, changes in regional dynamics and economic influences—particularly from China and India—present serious problems for this industry.

There are just thirteen significant automobile groups in Pakistan, and promoting cooperation amongst these organizations has the potential to address several difficulties unique to the industry. Collaboration throughout the supply chain has traditionally affected performance in a variety of sectors and places. Therefore, the main goal of this research is to explore and reveal the possible benefits of supply chain cooperation for improving operational performance in the automobile industry.

Ownership and Earnings Management:

Previous literature on ownership and earnings management is conducted in several research papers, which are included in this section. The study conducted by Gopalan & Jayaraman, (2012) explores the relationship between private control benefits and the practice of earnings management within firms controlled by insiders across 22 different countries. The research indicates that insider-controlled firms are more inclined to involve themselves in increased earnings management than non-insider-controlled firms, especially in countries with less robust investor protection measures. This inclination is amplified within insider-controlled firms that exhibit a significant disparity between cash flow and control rights, indicating the exploitation of private benefits.

The study emphasizes that the extent of divergence between cash-flow rights and control rights in insider-controlled firms correlates with heightened earnings management, especially noticeable in countries with less robust investor protection regulations. Yet, growth opportunities appear to mitigate this relationship, diminishing the link between insider control and earnings management, even in nations with weaker investor protection measures. Furthermore, in countries with stronger investor safeguards, limited evidence

supports the notion that insider-controlled firms are connected with decreased earnings management practices.

In a separate study by Mian et al., (2023), the focus is on the relationship between the investment duration of foreign institutional investors and the practice of earnings management in firms across 29 countries. This research investigates whether long-term foreign institutional investors can limit company managers' self-serving use of earnings management. The findings reveal that long-term foreign institutional investors' substantial equity ownership correlates with reduced earnings management levels, irrespective of the robustness of institutional oversight in their home countries.

This effect is more pronounced in companies operating within weaker information environments, indicating that long-term foreign institutional investors can help alleviate the information disparity linked to international equity investments. The study also emphasizes the diversity in the supervisory role foreign institutional investors play concerning their impact on the quality of financial reporting.

The paper centers on evaluating earnings management by utilizing accruals and suggests that forthcoming research could delve into the correlation between the investment duration of foreign institutional investors and tangible earnings management via operational choices. It hypothesizes that short-term foreign institutional investors are likely to restrict the utilization of discretionary accruals in environments where information constraints are less stringent. The study posits that the supervisory influence of short-term foreign institutional investors in curbing earnings manipulation is more prominent in companies characterized by lower information asymmetry.

Another study conducted by Kim et al., (2019) examines the impact of foreign institutional investors on the selection of auditors by firms in an international context. This research delves into how foreign institutional ownership influences the decision of non-US firms to engage the Big four auditors. The study proposes that firms with greater foreign institutional ownership exhibit a higher propensity to enlist Big 4 auditors. This inclination indicates a desire for top-tier audits by foreign institutional investors to reduce information asymmetry and promote external oversight.

Additionally, the paper investigates cross-sectional and cross-country disparities in the connection between foreign institutional investors and the selection of auditors. It discovers that this correlation is more robust when foreign institutional investors originate from nations with more robust governance structures and when recipient firms operate in countries with elevated information asymmetries. These results underscore the impact of international institutional investment in shaping firms' decisions regarding auditors and enhancing the information landscape of firms across diverse nations.

Another study by R. Chen et al., (2017) utilizing a substantial multinational dataset, examines the correlation between ownership structures and investment efficiency within newly privatized firms (R. Chen et al., 2017). Privatization, which involves the transfer of state-owned enterprises (SOEs) to private entities within the economy, offers a distinctive context for analyzing the influence of ownership types on investment efficiency.

The transition of SOEs to private hands is linked to agency dynamics and information dissemination challenges, thereby amplifying the significance of the examinations conducted within this study. This research primarily concentrates on two distinct owner categories: governments and foreign institutions. It contends that these ownership entities contribute varying levels of information asymmetry and agency issues, consequently impacting investment behaviors differently.

The study posits that retaining residual government ownership in NPFs can distort a firm's investment strategies and diminish the sensitivity of investments to stock prices. This distortion is attributed to the information asymmetry and agency problems prevalent in such ownership structures. Government ownership often diverges from the principles of maximizing shareholder wealth and efficient resource allocation. Instead, it tends to align more with the interests of politicians, leading to relatively weaker oversight of managerial actions.

Similarly, Baik et al., (2013) research investigates whether foreign institutional investors encounter liabilities of foreignness (LOF) within the US stock market. It reveals that foreign institutional investors display a stronger preference for stocks with lower information

asymmetry compared to domestic institutional investors. This inclination is particularly evident among investors from countries characterized by high LOF.

A noteworthy finding is the negative association observed between changes in foreign institutional ownership and future returns. Interestingly, this relationship is absent in the case of domestic institutional ownership. Moreover, the study highlights that the negative correlation between alterations in foreign institutional ownership and future returns becomes more pronounced when these investors grapple with greater LOF in the US stock market. Factors such as higher institutional distance, information asymmetry, unfamiliarity, and cultural differences exacerbate this negative relationship.

The study's conclusion underscores the substantial costs of LOF faced by foreign institutional investors in the US stock market, leading to their diminished ability to predict returns accurately. This suggests that these investors encounter challenges in effectively navigating and forecasting returns due to the barriers posed by LOF.

Additionally, the LOF theory has been expanded to encompass foreign capital markets. The argument posits that LOF might manifest differently between product and capital markets owing to the information sensitivity inherent in capital markets and the reliance on third-party endorsements for information production.

It's important to note that limited research exists on the LOF experienced by foreign institutional investors in host-country stock markets. One notable exception is a study focusing on the information advantage of foreign money managers in the Korean market.

Moreover, as discussed by Loncan, (2020) discusses that increased openness to cross-border finance has facilitated the integration of financial markets in developing countries into the global financial system. Foreign institutional investors' pursuit of diversification opportunities in emerging economies has primarily driven this integration.

The involvement of foreign institutional investors in owning stakes in corporations has sparked debates regarding its impact on corporate behavior. On one side, there's an argument suggesting that foreign investors push firms towards adopting short-term strategies. Conversely, another perspective posits that their involvement yields various

advantageous effects. These benefits encompass improved capital allocation, enhancements in corporate governance practices, reductions in the cost of equity capital, and the augmentation of transparency in corporate policies.

Despite these discussions, the influence of foreign institutional ownership on corporate financing choices, particularly concerning the policy of cash holdings, remains largely unexplored. This study seeks to delve into and understand the effects of foreign institutional ownership on corporate decisions pertaining to financing. Specifically, the study aims to investigate these effects by considering two theoretical channels: the potential mitigation of agency problems and the alleviation of external finance constraints. These channels are anticipated to show how foreign institutional ownership might impact how corporations manage their cash holdings as part of their financing decisions.

Another study by Han et al., (2022) examines how foreign investors affect China's profits management methods by using manually gathered foreign ownership data from 2003 to 2018. The study shows a constant, inverse relationship between foreign ownership and earnings control. In addition to promoting corporate transparency and offering monitoring advantages inside invested enterprises, foreign investors exhibit strong market discipline.

The study emphasizes how foreign investors affect State-Owned Enterprises (SOEs) and non-SOEs differently. Compared to non-SOE firms, foreign investors are less effective at restricting profits management within SOEs. The study also highlights how important it is for investors to have a positive investment climate in their home countries and to be involved in governance. Investors from nations with low disclosure quality, large information asymmetry, or little monitoring intensity—especially those from non-IFRS or civil law countries—help spread stronger governance standards and reduce manipulation of earnings in the companies in which they have invested.

The study also finds that the disciplinary effect of foreign ownership on profits management is lessened by more cultural or institutional distance. The results highlight the critical role that foreign investors play in reducing managerial opportunism in emerging markets by improving governance practices and transparency. However, they also highlight

the disparate effects of these investments depending on the type of firms they invest in and the characteristics of the foreign investors' home countries.

Another study by Kang & Stu&, (1997) examines Japanese investors' ownership of shares in Japanese companies between 1975 and 1991. The results of this study contradict the predictions of current predictive models, which state that foreign investors should primarily own national market portfolios or portfolios that emphasize equities with high predicted returns.

According to the study's findings, overseas investors typically own a disproportionate number of shares in particular types of Japanese companies. This comprises companies in the manufacturing sector, larger companies, and companies with good accounting performance combined with traits like lower unsystematic risk and leverage. Furthermore, the study identifies other characteristics impacting foreign ownership after adjusting for size. These consist of companies that issue American Depository Receipts (ADRs), have a greater share turnover rate, and are smaller businesses that export more.

The study's results defy current assumptions by showing that non-Japanese investors in Japan's market have preferences for businesses other than national market portfolios or equities predicted to yield high returns. As an alternative, they frequently support investments in the manufacturing sector, bigger businesses with solid financial records, low-risk profiles, and specific traits like increased turnover, export intensity, and ADR availability.

Keiretsu Model

A keiretsu is "*an intricate network of businesses interconnected through cross-shareholdings and informal business relationships, centered around a single commercial bank known as the main bank*". The emergence of keiretsu occurred during a period in Japan when holding companies were prohibited, necessitating unconventional approaches. While the keiretsu system exerted significant influence over the economy, autonomous (non-keiretsu) Japanese businesses established their distinct authority structures (Tomeczek, 2022).

The keiretsu system primarily revolves around key entities such as major banks, sogo shosha (horizontal keiretsu), and kyoryoku-kai (vertical keiretsu). In the early stages of keiretsu networks, commercial banks played a central role by providing financial resources, leadership, and strategic direction. These networks predominantly emphasized business associations, employment stability, and long-term objectives. Keiretsu can be categorized as following:

- Financial (horizontal) keiretsu is the network's central bank connecting several companies in different sectors.
- Industrial (vertical) keiretsu – several companies in the same sector jointly working to form an effective supply chain.

Horizontal Keiretsu Model

There are two organizational structures involved in the horizontal keiretsu. It includes an authority structure that employs incentive mechanisms to coordinate economic transactions among various member companies. Furthermore, horizontal keiretsu serve as social systems wherein economic transactions are intricately interwoven within the social network of member enterprises (Granovetter, 1995; Smelser et al., 2005). By virtue of its distinctive governance system and the social interactions among member businesses, belonging to a keiretsu influences the performance of member companies, impacting both risk and return by modifying the character and structure of their economic transactions.

The horizontal keiretsu structure, particularly in the context of banks, provides what is referred to as an "insurance mechanism" (Nakatani, 1984). In cases where a member business faces a financial crisis, the primary bank within a horizontal keiretsu typically assumes the responsibility of extending loans or making investments in the distressed company. On occasion, representatives from the main bank may even be dispatched to serve on the troubled firm's corporate board (Sheard, 1989). This practice serves as a stabilizing force within the keiretsu network.

Horizontal keiretsu participation may help member companies make more money in various ways. Horizontal keiretsu businesses, for example, have a better reputation and recognition than independent keiretsu enterprises. Members of the group gain advantages from the collective reputation, which enables them to attract top-tier talent more effortlessly, establish a robust market presence and recognition, and negotiate more favorable terms with various entities including financial institutions, governmental bodies, professional organizations, in addition to market middlemen like vendors and buyers. This collective strength enhances their competitive edge in the market (Isobe et al., 2006).

Second, individuals in horizontal keiretsu have solid social relationships, which impact economic choices by providing special opportunities and enabling access to those opportunities (Burt Ronald, 1992). Strongly connected businesses create social capital among their associate companies by trading and combining complementary and unspoken information to produce original intelligent capital that benefits the company.

Vertical Keiretsu Model

In vertical keiretsu partnerships, a single final-product assembler assumes a central role, with numerous component suppliers operating under its authority. This structure is prevalent in industries such as Japan's automotive sector, including Keiretsu of Toyota and Nissan, and electronics sectors, including Hitachi and Panasonic.

Previous studies have shown that long-term vertical integration between manufacturers and suppliers of components offers significant competitive benefits to all stakeholders. This approach has been especially advantageous for Japanese automakers, enabling them to

manufacture more efficient, higher-quality automobiles (Dyer & Hatch, 2006; Dyer & Nobeoka, 2000; Kotabe et al., 2003).

In the automotive industry, vertical keiretsu is defined by “suppliers' willingness to make specialized investments, their long-term relationships with manufacturers, and the ties they have both financially and interpersonally” (Morita & Nakahara, 2004). Suppliers work closely with specialized customers (like auto assemblers) in this arrangement to create high-quality, reasonably priced final products (Kosaka et al., 2020). In addition to cultivating these connections, suppliers share a manufacturer’s culture with them (Chen et al., 2017).

Some of the key advantages of vertical keiretsu are listed below that are the main reason for its wide adoption across the automobile industry in Japan:

- The interactions in vertical keiretsu are recurring, close, and long-term, facilitating, and collaboration (Ahmadjian & Lincoln, 2001b; Asanuma, 1989; Liker et al., 1996).
- The supplier relationship type is of “voice type” due to which coordination between each company is improved (Helper, 1991).
- The risk and information are shared by both the suppliers and the automakers (Lamming, 2000).
- Within their keiretsu structure, part suppliers and assemblers develop a mutual trust that promotes on-time delivery and enhances product quality (Dyer & Chu, 2000; Kotabe et al., 2003).

Supply Chain Performance Methods

In the literature, several supply chain performance methodologies have been put forth based on application in the area main objective of research. While some research emphasizes the supply chain's financial components, others also make connections between the organizational impact and other supply chain factors like flexibility and resilience.

Recent research is mainly focused on non-financial methods that include other measures for better supply chain performance measurement. As discussed by Arzu Akyuz & Erman Erkan, (2010; Cuthbertson & Piotrowicz, (2011); Lauras et al., (2011); Ramaa et al., (2009),

these methods are divided according to the different criteria of measurement. Some of the most commonly non-financial methods are discussed in detail as follows:

Supply Chain Balanced Scorecard (SCBS):

"The Balanced Scorecard (BSC)", introduced by Kaplan & Norton, (2005), emerged as a pivotal toll for performance management. With time, this tool has emerged as one of the most widely adopted performance assessment methods, extensively utilized in both academic research and industry applications. This instrument provides managers with a comprehensive overview of operational and financial metrics in a concise manner. The authors introduced four core perspectives—finance, customers, internal business processes, and innovation and learning—designed for managerial monitoring. By incorporating these four perspectives, managers can adeptly convert strategies into tangible metrics, thereby assessing the holistic influence of a strategy on the organization. *"The Balanced Scorecard (BSC)"* is recognized for giving management with a inclusive view of a company's performance (Abu-Suleiman & Priest, 2006). Nevertheless, the literature highlights two significant flaws. Firstly, it is criticized for being a top-down strategy lacking participatory elements and may overlook existing relationships between various process metrics. Additionally, research by Lohman et al., (2004) characterizes BSC as a static technique that does not facilitate the development, communication, and implementation of strategy in a corporate setting. Secondly, while BSC is widely adopted and effective in industry, it primarily serves as a conceptual framework. As a result, it lacks a structured approach for practical application, which somewhat diminishes its potential benefits. A pictorial representation of BSC is shown in Figure 2 below.

Figure 2-Balanced Scorecard (CFI Team, n.d.)

Supply Chain Operations Reference Model (SCOR):

The *"Supply Chain Operations Reference (SCOR)"* Model, introduced by the Supply Chain Council (SCC) in 1996 as detailed in Mccormack, (2004), serves as an industry-standard framework amalgamating benchmarking, business process reengineering, and best practices. This model delineates a supply chain into five primary interconnected processes: *"Plan, Source, Make, Deliver, and Return".* Five viewpoints are used to assess these processes' performance:

1. Cost
2. Responsiveness
3. Asset
4. Flexibility
5. Reliability

The model is labeled as comprehensive due to its coverage of the entire supply chain, spanning from suppliers to customers, and its integration with operational strategy, material flow, work processes, and information exchange. Conforming to best practices

takes a clear infrastructure, completely devoted management officials, and continuous re-engineering of business processes. Later several versions of SCOR are discussed in the literature and the most recent one is the SCOR 4.0 model developed Ayyildiz & Taskin Gumus, (2021a) as shown in Figure 3 below.

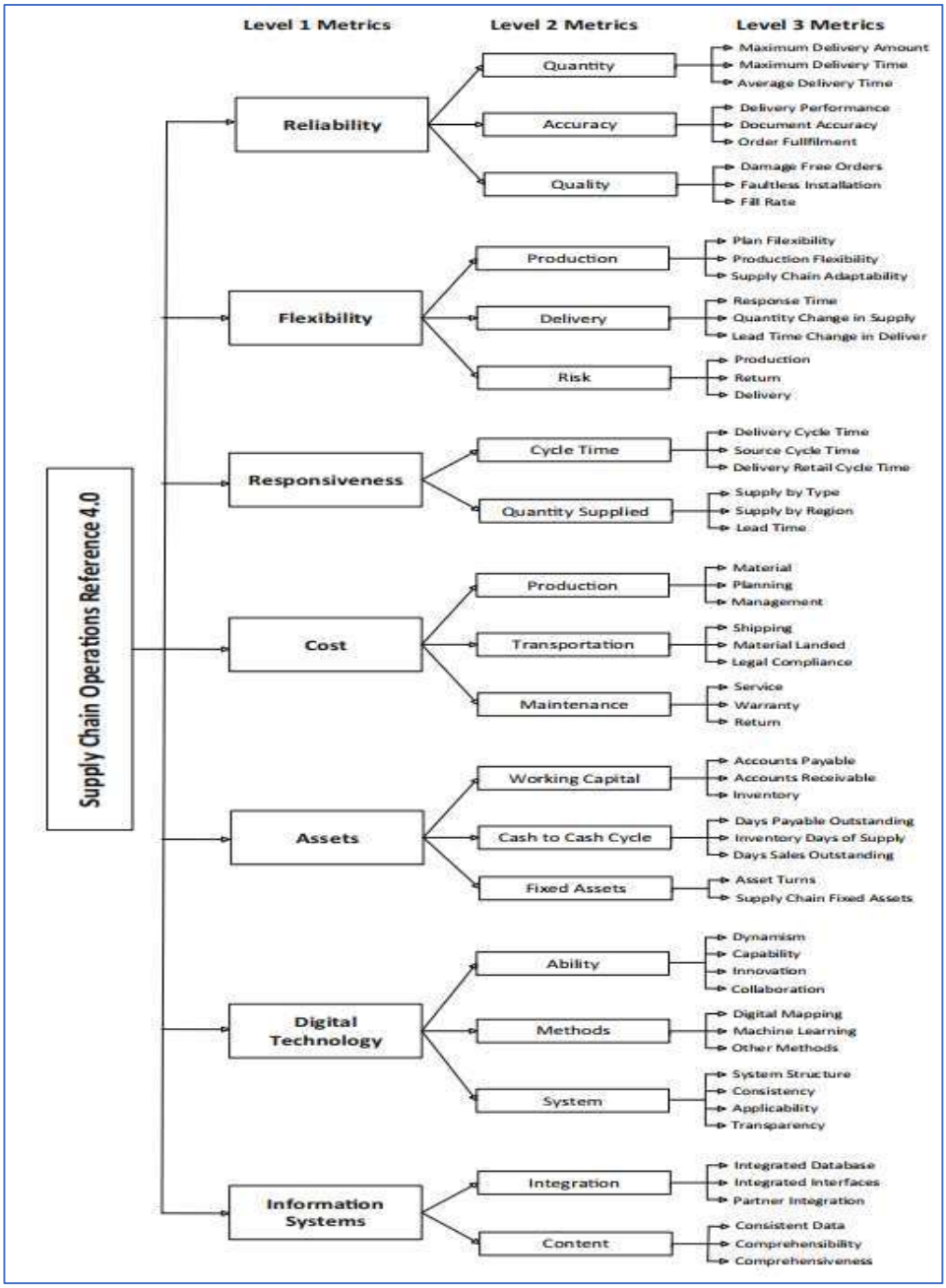

Figure 3-SCOR 4.0 (Ayyildiz & Taskin Gumus, 2021b)

Dimension-based Measurement Systems (DBMS):

Every supply chain can be determined in magnitudes, according to the perception of DBMS. In 1999, Ramaa et al., (2009) identified three fundamental sorts of metrics crucial for the assessment systems of supply chain performance: *"resources (R), output (O), and flexibility (F)"*. According to the author, each of these classes holds a crucial role in assessing the complete efficiency of a supply chain, with performance in one area having a notable influence on the others. Resource performance metrics encompass manufacturing costs, inventory expenses, and return on investment (ROI). The output indicators encompass metrics like deliveries on-time, total sales, and fill rate, whereas elasticity measurements include factors like volume fluctuations and the successful launch of new products.

According to Hausman, (2003), a proficient supply chain must excel in 3 necessary scopes: *"service, assets, and speed"*. Customer service involves the capacity to foresee, capture, and meet customer needs. Assets encompass all valuable holdings, including inventories and cash, while speed pertains to time-related metrics indicating responsiveness and execution efficiency. It's worth noting that Database Management Systems (DBMS) are typically straightforward, adaptable, and quick to execute, and it doesn't necessarily mirror the internal processes' performance and supply chain operations, as they primarily emphasize high-level metrics.

There are several other less commonly used methods as well such as "Interface-based Measurement Systems ***(IBMS)"*** by (Lambert et al., 1998), "Perspective-based Measurement Systems ***(PBMS)"*** by (Otto & Kotzab, 2003), and "Hierarchical-based Measurement Systems ***(HBMS)"*** by (Gunasekaran et al., 2004), etc.

Supply Chain Financial Performance Indicators

Financial indicators assess various fixed and operational expenses associated with a supply chain. Their calculation aims to enhance revenue while simultaneously minimizing supply chain costs. Below, we delve into some of the pivotal financial indicators:

Gross profit margin (GP):

The gross profit margin is a key profitability ratio used to gauge a company's performance.

$$\text{GP}= \frac{Revenue - COGS}{Revenue} * 100$$

Current ratio (CR):

The current ratio is a liquidity metric that assesses a company's ability to settle its short-term liabilities within a year.

$$\text{CR} = \frac{Current\ Asset}{Current\ Liability}$$

Return-on-Assets (ROA):

Return on assets (ROA) is a profitability metric calculated by dividing net profit by the average assets of the organization. It provides insight into how effectively the firm utilizes its existing resources and assets to generate revenue. In essence, ROA indicates the efficiency of asset utilization in generating profits.

$$\text{ROA} = \frac{Net\ Profit}{Average\ Total\ Asset}$$

Return-on-Sales (ROS):

The return on sales (ROS) ratio stands as a pivotal metric for assessing a company's operational effectiveness. It offers a glimpse into the amount of profit generated for every dollar of sales. A rising ROS signifies enhanced efficiency, whereas a declining ROS could indicate potential financial difficulties ahead.

$$\text{ROS} = \frac{Operating\ Profit/EBIT}{Net\ Sales}$$

Days-Sales-Outstanding (DSO):

"Days' Sales Outstanding (DSO)" is a metric that quantifies time (in days) it takes for a company to collect back the payments. It is typically monitored on a monthly, quarterly, or annual basis. DSO is a significant indicator of a company's receivables management and ability to convert sales into cash efficiently.

$$\text{DSO} = \frac{Account\ receivables}{Revene} * 365$$

Asset Turnover:

The asset turnover ratio assesses the connection between a company's total assets and its sales or revenues. This metric gauges how effectively a corporation utilizes its assets to generate income. It reflects a company's capacity to generate revenue from its assets. A higher asset turnover ratio signifies greater efficiency in asset utilization. Conversely, a low asset turnover ratio indicates that a company may not effectively leverage its assets to generate revenue.

$$\text{Asset Turnover} = \frac{Net\ sales}{Total\ Assets}$$

Inventory Turnover:

Inventory turnover is a fiscal indicator that illustrates how frequently a company's inventory is sold and restocked within a given period. To calculate the number of days it takes to sell the existing inventory, one can multiply the inventory turnover formula by the number of days in the period. The calculation of inventory turnover can aid companies in taking more informed decisions regarding pricing, production, marketing, and inventory procurement. This metric provides valuable insights into inventory management efficiency and helps optimize operational strategies.

$$\text{Inventory Turnover} = \frac{COGS}{Average\ Inventory}$$

Cash to Cash Cycle (C2C):

The Cash-to-Cash Cycle often termed the Cash Conversion Cycle (CCC), is a metric that measures the timeframe, typically in days, required for a company to convert its investments in inventory and other assets into cash from sales. Also recognized as the Net Operating Cycle or Cash Cycle, CCC aims to assess the duration that each net input dollar remains engaged in the production and sales process before being converted into actual received cash. This measure shows how well a business manages its working capital and capacity to turn resources into cash flows.

$$C2C = DIO + DSO - DPO$$

Where, DIO=Days of inventory outstanding

DSO=Days sales outstanding

DPO=Days payables outstanding

Proxy Measures

Direct financial indicators cannot gauge supply chain performance directly from a company's financial reports. Therefore, proxy measures are suggested for evaluating supply chain performance through financial statements. One such proxy measure, previously proposed in the study by Johnson & Templar, (2011a), involves calculating the cash generation ratio and asset efficiency, as illustrated in Figure 3.

Cash Generation Ratio:

The cash generation ratio is computed by dividing the net cash inflow by the sales value over a specified time period. This involves deducting non-cash charges (such as amortization and depreciation) and other changes from the operating profit to determine the net cash inflow, which includes factors like accounts receivable, inventories, and accounts payable. Some of these values can be extracted from a company's publicly available financial statements. The cash generation ratio is a crucial proxy measure for assessing supply chain performance through financial reports.

Asset Efficiency:

The asset efficiency of a company is assessed by dividing sales by the sum of total assets and liabilities. While the income statement provides information on revenues, the balance sheet furnishes details on total assets and liabilities in a company's public financial records. Total assets encompass both physical and non-physical assets. It also includes current assets like inventory, accounts receivable, and cash. To arrive at the overall asset value, current liabilities, which consist of obligations like accounts payable and other short-term commitments, are subtracted from the calculation of assets.

Figure 4 illustrates the interrelations between various tactical options and the calculated requirements that underlie the proxy measure. Each choice made has repercussions on liquidity, profitability, and productivity. The figure delineates a range of supply chain scenarios and the potential advantages and drawbacks that should be carefully weighed before taking action. It is a valuable tool for assessing the multifaceted influence of different supply chain strategies on the company's overall performance.

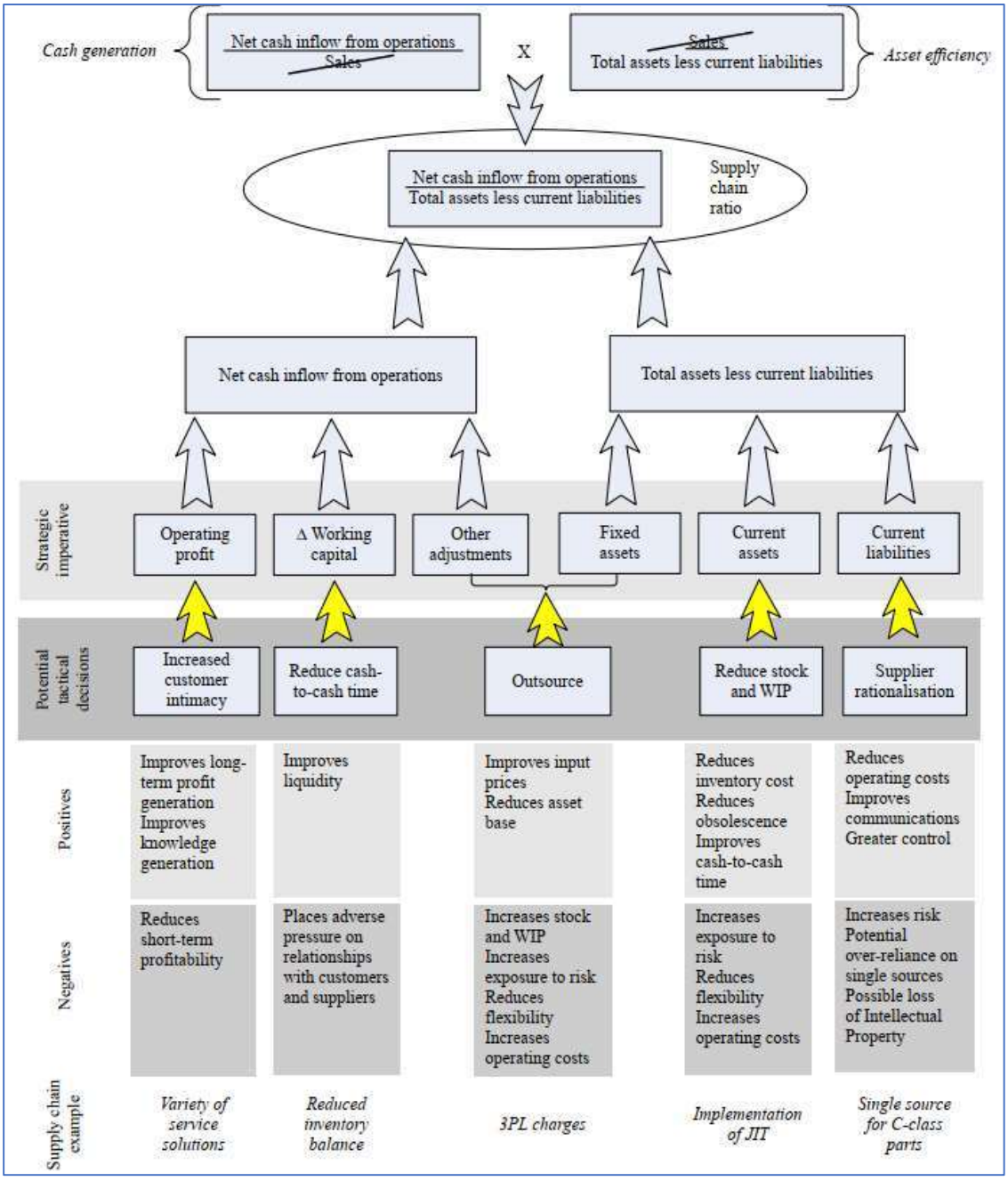

Figure 4-Supply Chain Proxy (Johnson & Templar, 2011b)

Data and Methodology

The methodology of this research work is shown in Figure 5 below. The diagram indicates that initially, the data is extracted from the Capital IQ database. Afterward, data is combined to form a master dataset for analysis. The next step is to find the crossholdings done on the master dataset collected. Subsequently, financial ratios are calculated from the Capital IQ database, and then after combining financial and holdings data, regression analysis is performed to find the results.

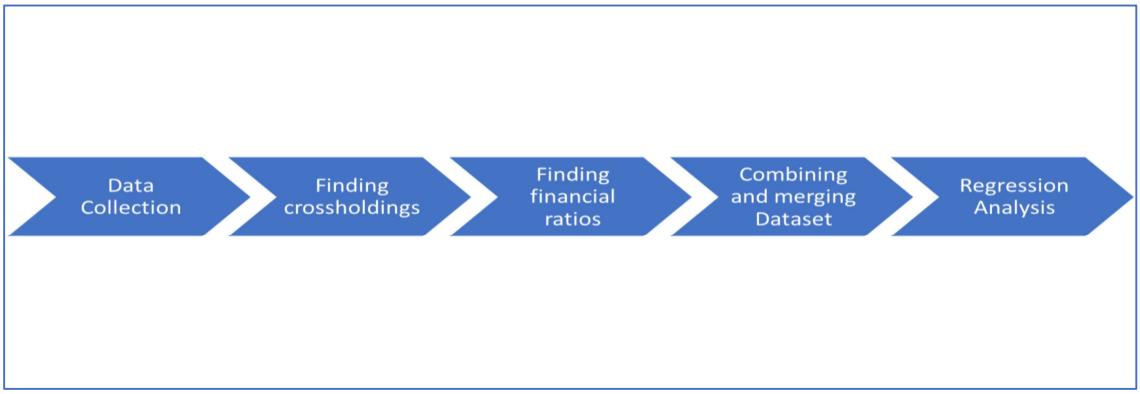

Figure 5-Methodology

Sample:

The sample includes data from automobile companies from 6 major countries, i.e., France, Germany, Japan, Korea, United Kingdom, and United States. All the financial values of the companies have been extracted from COMPUSTAT Global. However, the information on business ownership and institutional investors' portfolios was taken from the Capital IQ database from 2004 to 2022. All the financial values are in USD. The sample does not include firms whose ownership and financial data are unavailable online. The final sample of the research work is 5850 firm-years from 6 countries. The number of companies varies as per the available data in the respective years. Finally, all the variables are winsorized at the 1% and 99% levels to account for the influence of outliers.

Data Collection:

The first step of this research work is the data collection of 3 categories (i) Ownership, (ii) Portfolio, and (iii) Suppliers for the automobile industry of 6 major countries i.e., France, Germany, Japan, Korea, United Kingdom, and United States from Capital IQ database over period of 2004-2022. The sample data consists of 344 companies listed in the automobile sector with these four secondary sectors, i.e., Automobile Manufacturers, Automotive Parts and Equipment, Motorcycle Manufacturers, and Tires and Rubber. The breakdown of these companies in terms of their country's distribution is shown in the Table 1 below:

Table 1-Companies Distribution Country wise

Country	**Companies**
France	10
Germany	21
Japan	129
South Korea	113
United Kingdom	14
United States	57
Grand Total	**344**

Data Combination:

The second step of the research involves extensive data analysis and preparation steps. Initially, all three data sets, i.e., Ownership, Portfolio, and Suppliers, were combined. After combining these datasets, a master dataset was formed to find the crossholdings. In this step, two lists of common companies are calculated: (i) suppliers invested in sample firm, and (ii) sample firm invested in suppliers. A dummy variable is included in the dataset to find the common companies, using the CIQ Unique Identifier Code given to each company by Capital IQ.

Afterward, the two datasets of ownership and portfolio are combined with the third financial dataset to form the final dataset for regression analysis. All the variables and financial ratios used in the dataset are explained below for reference. Finally, all the variables are winsorized at the 1% and 99% levels to account for the influence of outliers.

The descriptive analysis of the dataset is given Tables 2-4. The final dataset of the research work is 5850 firm-years from 6 countries. The number of companies varies as per the available data in the respective years. The breakdown of companies' years and country is shown in Table 2 below:

Table 2-Sample Distribution year and Country wise

Year	France	Germany	Japan	South Korea	United Kingdom	United States	Grand Total
2004	8	14	120	50	5	55	252
2005	8	16	122	78	6	56	286
2006	8	17	121	85	6	56	293
2007	8	17	121	89	6	59	300
2008	8	18	121	92	6	57	302
2009	8	17	121	91	4	54	295
2010	8	18	120	92	6	52	296
2011	8	19	121	102	7	52	309
2012	8	20	121	102	7	47	305
2013	9	19	123	95	6	46	298
2014	9	19	124	101	7	45	305
2015	9	18	126	105	8	43	309
2016	10	19	129	107	9	42	316
2017	9	19	128	109	9	40	314
2018	9	20	129	111	9	44	322
2019	9	21	128	112	10	50	330
2020	10	21	129	113	14	57	344
2021	9	21	130	115	13	52	340
2022	8	19	128	115	13	51	334
Grand Total	**163**	**352**	**2362**	**1864**	**151**	**958**	**5850**

Variables

The research design used for this research work uses several variables that are used for the regression analysis, which are explained in this section:

Institutional Ownership (% of Common Stock/Shares Outstanding (CSO))

Institutional ownership is measured using "S&P Capital IQ's Public Ownership database" data. Comprehensive quarterly holdings at the company level are provided by this database, which includes institutional shareholders, public and private businesses, corporate executives, and strategic investors. Since March 2004, the data has been available for use. For every institutional portfolio, comprehensive quarterly data on all publicly owned constituents is accessible via the Public Holding database.

The first dataset consists of the yearly values of % of CSO of companies from 2004-2022. This value represents the % a company is invested in the sample firm (supplier invested in the sample firm). The values were calculated from the Capital IQ database, and the list only included the companies with public ownership history available on the database.

Market Value (USD in mm)

The whole worth of a corporation as determined by the stock market is represented by its market value. This calculation helps in determining the company's overall value as perceived by the market and provides insights into its market capitalization. Market capitalization is a key metric used by investors, analysts, and financial professionals to assess the size, performance, and relative value of a company within the market.

The market value reflects how investors perceive the company's current and prospects. A higher market value typically indicates that investors have confidence in the company's ability to make revenues and grow. Comparing market values among similar companies within the same industry helps in understanding the relative size and standing of a firm. It provides insights into how the market perceives the company's competitive position and potential.

The second dataset consists of the yearly values of Market Value (MV) of companies from 2004-2022. This value represents the market value of the sample firm invested in a company (sample firm invested in the supplier). The values were calculated from the Capital IQ database and the list only included the companies with public holdings history available on the database.

Financial Measures:

The financial measures used for analyzing the performance of the sample firm in this research work are “return on assets (roa)” and “market to book value (mtob)”.

Return on Assets (ROA):

“*Return on Assets (ROA)”* stands as a financial measure gauging a corporation's profitability concerning its entire asset base. ROA serves as a pivotal gauge, revealing the competence with which a company leverages its resources to produce earnings. A heightened ROA signals the company's adeptness at converting its asset investments into profits. This metric holds significance for investors, analysts, and management as it aids in evaluating a company's operational effectiveness and profitability concerning the scale of its asset holdings.

Market to Book Value (MTOB)*:*

The “*Market-to-Book Value (M/B ratio)*” is a financial indicator employed to assess how a company's market value (ascertained from its stock price) corresponds to its book value (the asset value listed on its balance sheet).

A large M/B ratio infers that the market values the company higher than its book value, indicating market confidence in its growth prospects, profitability, and future earnings potential. Conversely, a low M/B ratio might suggest that the market has less confidence in the company's growth prospects or expects lower future returns.

Control Variables:

To examine the role of supplier investment and market value on company performance and company valuation, we use the following firm-level characteristics as control variables in all regressions: firm size (SIZE), cash-to-assets (CASH), property, plant & equipment-to-assets (PPE), total leverage (LVRGE), total dividends (DIV), capital expenditures-to-assets (CAPEX) , R&D-to-assets (RD).

These control variables are calculated using the below mentioned formulas:

SIZE: Natural log of total assets

CASH: Cash and short-term investments divided by total assets)

PPE: Net property, plant, & equipment divided by total assets.

LVRGE: Total liabilities divided by total assets.

DIV: Total dividends paid divided by total assets

CAPEX: Capital expenditures divided by total assets

RD: Research & development expenditures divided by total assets

All the variables statistical summary is given in the Table 3 below:

Table 3- Descriptive Summary

Variable	N	Mean	S.D.	Min	Max
Dependent Variable					
Return on Assets (ROA)	5,850	-0.02984	0.347065	-2.93068	0.149133
Market to Book Value Ratio (MTOB)	5,850	1.851047	5.480301	0.25213	48.98606
Explanatory Variables					
Supplier invested in Sample (OWN)	5,850	0.006477	0.046498	0	0.540802

Market Value of Company invested in Supplier (MV)	5,850	451.3922	4243.011	0	119348.5
Natural log of Market Value of Company invested in Supplier (LN_MV)	5,850	0.490396	1.827209	0	11.68981
Control & Independent Variables					
Natural log of total assets (SIZE)	5,850	6.027598	2.681118	-9.90349	13.31808
Cash and short-term investments divided by total assets (CASH)	5,850	0.146238	0.142934	0.000487	0.833745
Net property, plant, & equipment divided by total assets (PPE)	5,850	0.336763	0.155862	0	0.706522
Total liabilities divided by total assets (LVRGE)	5,850	0.671343	0.909387	0.06463	8.260029
Total dividends paid divided by total assets (DIV)	5,850	0.005996	0.007548	0	0.045981
Capital expenditures divided by total assets (CAPEX)	5,850	0.06123	0.046197	0	0.243105
Research & development expenditures divided by total assets (RD)	5,850	0.017845	0.05217	0	0.392549

Research Design:

The research design is formulated using the baseline study conducted by (Mian et al., 2023) which is very similar to the proposed research work. To investigate the impact of suppliers' ownership in sample firm and market value on return on assets, following panel regression model is used:

$$\text{ROA} = \propto + Own + \ln_{mve} + Controls + FirmFE + YearFE + \varepsilon$$

Moreover, to investigate the impact of supplier's ownership in sample firm and market value on market to book value, following panel regression model is used:

$$\text{MTOB} = \propto + Own + \ln_{mve} + Controls + FirmFE + YearFE + \varepsilon$$

In both of these regression models the main dependent variable OWN is the value of common stock outstanding of supplier invested in the sample firm and ln_mve is the market value of sample firm invested in the supplier. $\propto$ is the constant term, $\boldsymbol{\varepsilon}$ is the error term. Controls are the control variables i.e. firm size (SIZE), cash-to-assets (CASH), property, plant & equipment-to-assets (PPE), total leverage (LVRGE), total dividends (DIV), capital expenditures-to-assets (CAPEX), R&D-to-assets (RD). Additionally, the regression model uses high-dimensional fixed effects by using year denoted by (YearFE) × firm fixed effects denoted by (FirmFE).

Ordinary least squares (OLS) are used to estimate all panel regression specifications, with standard errors clustered at the firm level.

Critical Analysis:

Table 4 shows the summary of observations and the average values of main variables shown below:

Table 4- Descriptive Summary Country wise

Country	No. of Obs	% of sample	Average Return on Assets	Average Market to Book value	Average Supplier invested in sample	Average $ MV of sample invested in supplier
France	163	2.786%	-0.00701	1.830	0%	195.9837934
Germany	352	6.017%	0.0235	1.192	0%	4679.351
Japan	2362	40.376%	0.0324	0.898	0.87%	248.4972419
South Korea	1864	31.863%	0.0223	0.913	0.93%	161.6534802
United Kingdom	151	2.581%	-0.049	1.842	0%	71.090
United States	958	16.376%	-0.305	6.274	0%	65.303

The total size of the sample is 5850 out of which around 40% data is of Japan and 30% of Korea, followed by 16% data of US and the France, Germany and UK data is significantly low in the sample dataset. The average ROA and MTOB are calculated from the winsorizsed values of the sample dataset whereas Average % of CSO and Average (MV) are calculated from the original values of the dataset.

As clearly seen from Table 4 that only Japan and South Korea data includes the data of %of CSO because only suppliers in these countries are invested in the sample firms. However, in the case of MV, all the countries have data because all the companies in these six countries are invested in their suppliers.

Results & Discussion

This section discusses the findings of the research work conducted. The results indicate that the main explanatory variables company stock outstanding (OWN) and market value (MV) are not statistically significant to the main dependent variables return on assets (ROA) and market to book value (MTOB) both.

Table 5 shows the results of 3 models of high dimensional regression analysis for return on assets (ROA) with these variables. The results show that leverage (LVRGE) and R&D (rd) are very statistically significant to return on assets (ROA) and dividends (div) is also statistically significant to return on assets (ROA), but the main explanatory variables company stock outstanding (OWN) and market value (MV) are not statistically significant to return on assets (ROA). The table represents the coefficient values and standard errors in brackets mentioned against each variable.

The model 1 includes company stock outstanding (OWN) as main explanatory variable and other control variables, model 2 includes market value (MV) as main explanatory variable and other control variables whereas the model 3 includes both company stock outstanding (OWN) and market value (MV) as main explanatory variables along with other control variables. The results of all the three models are consistent and support the same analysis that there is no statistically significant relationship between supplier invested in sample firm and sample firm invested in supplier with the performance of the sample firm.

Table 5- Regression Analysis-ROA

VARIABLES	(Model-1) Return on Assets	(Model-2) Return on Assets	(Model-3) Return on Assets
OWN	-0.029		-0.027
	(0.035)		(0.034)
MV		-0.001	-0.001
		(0.002)	(0.002)

SIZE	0.017	0.017	0.017
	(0.014)	(0.014)	(0.014)
CASH	-0.102	-0.102	-0.102
	(0.117)	(0.117)	(0.117)
PPE	-0.125	-0.125	-0.125
	(0.088)	(0.088)	(0.088)
LVRGE	-0.101***	-0.101***	-0.101***
	(0.023)	(0.023)	(0.023)
DIV	1.153**	1.157**	1.159**
	(0.485)	(0.485)	(0.485)
CAPEX	0.082	0.082	0.082
	(0.172)	(0.172)	(0.172)
RD	-1.628***	-1.628***	-1.628***
	(0.439)	(0.439)	(0.439)
Constant	0.009	0.009	0.009
	(0.092)	(0.092)	(0.092)
Observations	5,846	5,846	5,846
R-squared	0.750	0.750	0.750
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

*** indicates p < 0.01 (very statistically significant)

** indicates p < 0.05 (statistically significant)

* indicates p < 0.1 (marginally significant)

The total number of observations for the regression is 5,846 because 4 values are dropped as singleton observations and the standard error adjusted for 408 clusters in company. The r-squared value of 0.7498 shows that the independent variables explain almost 75% of the main dependent variable. All the models include Firm and Year fixed effect.

Table 6 shows the results of 3 models of high dimensional regression analysis for MTOB with these variables. The results show that leverage (LVRGE) and cash-to-assets (CASH) are

very statistically significant to market to book value (MTOB) and R&D (RD) is also statistically significant to market to book value (MTOB), but the main explanatory variables company stock outstanding (OWN) and market value (MV) are not statistically significant to market to book value (MTOB). The table represents the coefficient values and standard errors in brackets mentioned against each variable.

The model 1 includes company stock outstanding (OWN) as main explanatory variable and other control variables, model 2 includes market value (LN_MV) as main explanatory variable and other control variables whereas the model 3 includes both company stock outstanding (OWN) and market value (MV) as main explanatory variables along with other control variables. The results of all the three models are consistent and support the same analysis that there is no statistically significant relationship between supplier invested in sample firm and sample firm invested in supplier with the performance of the sample firm.

Table 6-Regression Analysis-MTOB

VARIABLES	(Model-1) Market to book Value	(Model-2) Market to book Value	(Model-3) Market to book Value
OWN	-0.303		-0.361
	(0.460)		(0.466)
MV		0.025	0.026
		(0.034)	(0.034)
SIZE	-0.400	-0.401	-0.401
	(0.299)	(0.299)	(0.299)
CASH	4.348***	4.346***	4.348***
	(1.573)	(1.572)	(1.573)
PPE	1.806	1.813	1.813
	(1.646)	(1.648)	(1.648)
LVRGE	2.934***	2.934***	2.933***

	(0.518)	(0.518)	(0.518)
DIV	8.877	8.682	8.715
	(8.007)	(8.050)	(8.055)
CAEPX	-0.994	-0.996	-0.994
	(1.970)	(1.970)	(1.970)
RD	15.591***	15.581***	15.583***
	(6.668)	(6.668)	(6.668)
Constant	0.777	0.768	0.770
	(1.995)	(1.993)	(1.993)
Observations	5,846	5,846	5,846
R-squared	0.736	0.736	0.736
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

*** indicates p < 0.01 (very statistically significant)

** indicates p < 0.05 (statistically significant)

* indicates p < 0.1 (marginally significant)

The total number of observations for the regression is 5,846 because 4 values are dropped as singleton observations and the standard error adjusted for 408 clusters in company. The r-squared value of 0.736 shows that the independent variables explain almost 73% of the main dependent variable. All the models include Firm and Year fixed effect.

Conclusion

The study embarked upon an intricate exploration into the relationship between supply chain performance and the integration of supplier firms within the automotive industries across major Eastern and Western countries. The goal was to ascertain whether the integration of suppliers within a firm's supply chain has a significant impact on the firm's overall performance. This investigation utilized a robust regression analysis technique on a dataset sourced from Capital IQ, focusing on various parameters such as return on assets (ROA) and market-to-book value ratio (MTBV) as the dependent variables, while % of Common Shares Outstanding (OWN) and natural log of Market value (LN_MV) served as the main explanatory variables.

The findings derived from the high-dimensional regression models provided notable insights into the relationship between the integration of suppliers and the performance metrics of the sample firm. However, the outcomes of the regression analysis unveiled that the main explanatory variables, OWN and LN_MV, did not demonstrate statistically significant correlations with the primary dependent variables, ROA and MTBV. In essence, these results indicate that the percentage of investment by a supplier in the sample firm (% of CSO) and the sample firm's investment in its suppliers (Market value) did not exhibit substantial influence on the performance metrics of the sample firm.

Consequently, this study suggests that the conventional metrics often employed to measure supply chain performance, particularly concerning the integration of suppliers, may not inherently reflect or predict the overall performance outcomes of a firm within the automotive industry. Despite the considerable attention directed towards understanding the dynamics between supply chain integration and firm performance, the empirical findings from this research highlight the absence of a statistically significant relationship between these variables within the scope of this study.

The implications of these findings suggest that while supply chain integration remains a pivotal aspect of modern supply chain management practices, solely focusing on the integration of suppliers may not be adequate to gauge or influence the overall performance metrics of firms within the automotive sector across diverse global markets. Future research endeavors could delve deeper into nuanced factors or variables that might more accurately delineate the intricate interplay between supply chain integration and firm performance, thereby contributing to a more comprehensive understanding of relationship-oriented supply chains and their impact on organizational success within various industries.

References

Abu-Suleiman, A., & Priest, J. W. (2006). A framework for quantitative enterprise strategy management using strategy maps. *2006 IIE Annual Conference and Exhibition*.

Ahmadjian, C. L., & Lincoln, J. R. (2001a). Keiretsu, Governance, and Learning: Case Studies in Change from the Japanese Automotive Industry. *Organization Science*, *12*(6), 683–701. https://doi.org/10.1287/orsc.12.6.683.10086

Ahmadjian, C. L., & Lincoln, J. R. (2001b). Keiretsu, governance, and learning: Case studies in change from the Japanese automotive industry. *Organization Science*, *12*(6), 683–701.

Al-Doori, J. A. (2019). The impact of supply chain collaboration on performance in automotive industry: Empirical evidence. *Journal of Industrial Engineering and Management*, *12*(2), 241–253. https://doi.org/10.3926/jiem.2835

Andreou, P. C., Louca, C., & Panayides, P. M. (2016). The impact of vertical integration on inventory turnover and operating performance. *International Journal of Logistics Research and Applications*, *19*(3), 218–238. https://doi.org/10.1080/13675567.2015.1070815

Arzu Akyuz, G., & Erman Erkan, T. (2010). Supply chain performance measurement: A literature review. *International Journal of Production Research*, *48*(17), 5137–5155. https://doi.org/10.1080/00207540903089536

Asanuma, B. (1989). Manufacturer-supplier relationships in Japan and the concept of relation-specific skill. *Journal of the Japanese and International Economies*, *3*(1), 1–30.

Ayyildiz, E., & Taskin Gumus, A. (2021a). Interval-valued Pythagorean fuzzy AHP method-based supply chain performance evaluation by a new extension of SCOR model: SCOR 4.0. *Complex & Intelligent Systems*, *7*(1), 559–576. https://doi.org/10.1007/s40747-020-00221-9

Ayyildiz, E., & Taskin Gumus, A. (2021b). Interval-valued Pythagorean fuzzy AHP method-based supply chain performance evaluation by a new extension of SCOR model: SCOR

4.0. *Complex & Intelligent Systems*, *7*(1), 559–576. https://doi.org/10.1007/s40747-020-00221-9

Baker, H. K., Miller, T. O., & Ramsperger, B. J. (1981). AN INSIDE LOOK AT CORPORATE-MERGERS AND ACQUISITIONS. *MSU Business Topics*, *29*(1), 49–57.

Beamon, B. M. (1998). Supply chain design and analysis: Models and methods. *International Journal of Production Economics*, *55*, 281–294. https://doi.org/10.1109/LEOS.2006.278761

Berglöf, E., & Perotti, E. (1994). The governance structure of the Japanese financial keiretsu. *Journal of Financial Economics*, *36*(2), 259–284.

Brouthers, L. E., Gao, Y., & Napshin, S. (2014). Keiretsu centrality—profits and profit stability: A power dependence perspective. *Journal of Business Research*, *67*(12), 2603–2610.

Burt Ronald, S. (1992). Structural holes: the social structure of competition. *Boston, MA*.

CFI Team. (n.d.). *Balanced Scorecard*.

Chen, Y.-S., Su, H.-C., & Ro, Y. K. (2017). The co-evolution of supplier relationship quality and product quality in the US auto industry: A cultural perspective. *International Journal of Production Economics*, *184*, 245–255.

Cuthbertson, R., & Piotrowicz, W. (2011). Performance measurement systems in supply chains: A framework for contextual analysis. *International Journal of Productivity and Performance Management*, *60*(6), 583–602. https://doi.org/10.1108/17410401111150760

Delic, M., Eyers, D. R., & Mikulic, J. (2019). Additive manufacturing: empirical evidence for supply chain integration and performance from the automotive industry. *Supply Chain Management*, *24*(5), 604–621. https://doi.org/10.1108/SCM-12-2017-0406

Doran, D., Hill, A., Hwang, K. S., & Jacob, G. (2007). Supply chain modularisation: Cases from the French automobile industry. *International Journal of Production Economics*, *106*(1), 2–11. https://doi.org/10.1016/j.ijpe.2006.04.006

Dyer, J. H., & Chu, W. (2000). The determinants of trust in supplier-automaker relationships in the US, Japan and Korea. *Journal of International Business Studies*, *31*(2), 259–285.

Dyer, J. H., & Hatch, N. W. (2006). Relation-specific capabilities and barriers to knowledge transfers: creating advantage through network relationships. *Southern Medical Journal*, *27*, 701–719.

Dyer, J. H., & Nobeoka, K. (2000). Creating and managing a high-performance knowledge-sharing network: the Toyota case. *Strategic Management Journal*, *21*, 345–367.

Eichner, A. S. (1978). The Visible Hand. The Managerial Revolution in American Business. By Alfred D. ChandlerJr., Cambridge, Mass., Harvard University Press, 1977. Pp. xvi+ 608. $18.50. *Business History Review*, *52*(1), 98–101.

Elrod, C., Murray, S., & Bande, S. (2013). A review of performance metrics for supply chain management. *EMJ - Engineering Management Journal*, *25*(3), 39–50. https://doi.org/10.1080/10429247.2013.11431981

Fane, G. R., Vaghefi, M. R., Van Deusen, C., & Woods, L. A. (2003). Competitive advantage the Toyota way. *Business Strategy Review*, *14*(4), 51–60. https://doi.org/10.1111/j..2003.00286.x

Gerlach, M. L. (1992). The Japanese corporate network: A blockmodel analysis. *Administrative Science Quarterly*, 105–139.

Gopalan, R., & Jayaraman, S. (2012). Private control benefits and earnings management: Evidence from insider controlled firms. *Journal of Accounting Research*, *50*(1), 117–157. https://doi.org/10.1111/j.1475-679X.2011.00431.x

Granovetter, M. (1995). Coase revisited: Business groups in the modern economy. *Industrial and Corporate Change*, *4*(1), 93–130.

Grodzicki, M. J., & Skrzypek, J. (2020). Cost-competitiveness and structural change in value chains – vertically-integrated analysis of the European automotive sector. *Structural Change and Economic Dynamics*, *55*, 276–287. https://doi.org/10.1016/j.strueco.2020.08.009

Guan, W., & Rehme, J. (2012). Vertical integration in supply chains: Driving forces and consequences for a manufacturer's downstream integration. *Supply Chain Management*, *17*(2), 187–201. https://doi.org/10.1108/13598541211212915

Gunasekaran, A., Patel, C., & McGaughey, R. E. (2004). A framework for supply chain performance measurement. *International Journal of Production Economics*, *87*(3), 333–347. https://doi.org/10.1016/j.ijpe.2003.08.003

Habib, M. A., Bao, Y., Nabi, N., Dulal, M., Asha, A. A., & Islam, M. (2021). Impact of strategic orientations on the implementation of green supply chain management practices and sustainable firm performance. *Sustainability (Switzerland)*, *13*(1), 1–21. https://doi.org/10.3390/su13010340

Han, M., Ding, A., & Zhang, H. (2022). Foreign ownership and earnings management. *International Review of Economics & Finance*, *80*, 114–133. https://doi.org/https://doi.org/10.1016/j.iref.2022.02.074

Hausman, Warren. H. (2003). Supply Chain Performance Metrics. In *International Series in Operations Research & Management Science*.

Helper, S. (1991). How much has really changed between US automakers and their suppliers? *MIT Sloan Management Review*, *32*(4), 15.

Isobe, T., Makino, S., & Goerzen, A. (2006). Japanese horizontal keiretsu and the performance implications of membership. *Asia Pacific Journal of Management*, *23*(4), 453–466. https://doi.org/10.1007/s10490-006-9015-2

Jadhav, A., Orr, S., & Malik, M. (2019). The role of supply chain orientation in achieving supply chain sustainability. *International Journal of Production Economics*, *217*, 112–125. https://doi.org/10.1016/j.ijpe.2018.07.031

Johnson, M., & Templar, S. (2011a). The relationships between supply chain and firm performance: The development and testing of a unified proxy. *International Journal of Physical Distribution & Logistics Management*, *41*(2), 88–103. https://doi.org/10.1108/09600031111118512

Johnson, M., & Templar, S. (2011b). The relationships between supply chain and firm performance: The development and testing of a unified proxy. *International Journal of Physical Distribution & Logistics Management*, *41*(2), 88–103. https://doi.org/10.1108/09600031111118512

Kang, J.-K., & Stu&, R. M. (1997). Why is there a home bias? An analysis of foreign portfolio equity ownership in Japan. *Journal of Financial Economics*, *46*, 28.

Kanno, M. (2019). Network structures and credit risk in cross-shareholdings among listed Japanese companies. *Japan and the World Economy*, *49*, 17–31.

Kaplan, R. S., & Norton, D. P. (2005). The balanced scorecard: Measures That drive performance. *Harvard Business Review*, *83*(7–8).

Kim, J. B., Pevzner, M., & Xin, X. (2019). Foreign institutional ownership and auditor choice: Evidence from worldwide institutional ownership. *Journal of International Business Studies*, *50*(1), 83–110. https://doi.org/10.1057/s41267-018-0160-x

Klim, S. (2021, May 24). *A Historical Perspective on the Japanese Keiretsu*.

Kōsai, Y., & Goble, A. (1989). The postwar Japanese economy, 1945–1973. In P. Duus (Ed.), *The Cambridge History of Japan* (Vol. 6, pp. 494–538). Cambridge University Press. https://doi.org/10.1017/CHOL9780521223577.011

Kosaka, G., Nakagawa, K., Manabe, S., & Kobayashi, M. (2020). The vertical keiretsu advantage in the era of Westernization in the Japanese automobile industry: investigation from transaction cost economics and a resource-based view. *Asian Business and Management*, *19*(1), 36–61. https://doi.org/10.1057/s41291-019-00074-2

Kotabe, M., Martin, X., & Domoto, H. (2003). Gaining from vertical partnerships: knowledge transfer, relationship duration, and supplier performance improvement in the US and Japanese automotive industries. *Strategic Management Journal*, *24*(4), 293–316.

Lambert, D. M., Cooper, M. C., & Pagh, J. D. (1998). Supply Chain Management: Implementation Issues and Research Opportunities. *The International Journal of Logistics Management*, *9*(2), 1–20.

Lamming, R. (2000). Japanese supply chain relationships in recession. *Long Range Planning*, *33*(6), 757–778.

Lauras, M., Lamothe, J., & Pingaud, H. (2011). A business process oriented method to design supply chain performance measurement systems. *International Journal of Business Performance Management*, *12*(4), 354–376. https://doi.org/10.1504/IJBPM.2011.042013

Li, W., & Chen, J. (2020). Manufacturer's vertical integration strategies in a three-tier supply chain. *Transportation Research Part E: Logistics and Transportation Review*, *135*(February), 101884. https://doi.org/10.1016/j.tre.2020.101884

Liker, J. K., Kamath, R. R., Wasti, S. N., & Nagamachi, M. (1996). Supplier involvement in automotive component design: are there really large US Japan differences? *Research Policy*, *25*(1), 59–89.

Lohman, C., Fortuin, L., & Wouters, M. (2004). Designing a performance measurement system: A case study. *European Journal of Operational Research*, *156*(2), 267–286. https://doi.org/10.1016/S0377-2217(02)00918-9

Loncan, T. (2020). Foreign institutional ownership and corporate cash holdings: Evidence from emerging economies. *International Review of Financial Analysis*, *71*. https://doi.org/10.1016/j.irfa.2018.12.003

Lubatkin, M. H. (1982). *A market model analysis of diversification strategies and administrative experience on the performance of merging firms*. The University of Tennessee.

Martinelli, E. M., & Tunisini, A. (2019). Customer integration into supply chains: literature review and research propositions. *Journal of Business and Industrial Marketing*, *34*(1), 24–38. https://doi.org/10.1108/JBIM-07-2017-0162/FULL/PDF

Mccormack, K. (2004). The development of a supply chain management process maturity model using the concepts of business process orientation. *Supply Chain Management: An International Journal*, *9*(4), 272–278. https://doi.org/10.1108/13598540410550019

Mentzer, J. T., Keebler, J. S., Nix, N. W., Smith, C. D., & Zacharia, Z. G. (2001). JOURNAL OF BUSINESS LOGISTICS, Vol.22, No. 2, 2001 1. *Journal of Business*, *22*(2), 1–25.

Mian, R. U., Irfan, S., & Mian, A. (2023). Foreign institutional investment horizon and earnings management: Evidence from around the world. *International Review of Financial Analysis*, *86*(January), 102509. https://doi.org/10.1016/j.irfa.2023.102509

Mishra, R., Singh, R. K., & Rana, N. P. (2022). Developing environmental collaboration among supply chain partners for sustainable consumption & production: Insights from an auto sector supply chain. *Journal of Cleaner Production*, *338*. https://doi.org/10.1016/j.jclepro.2022.130619

Morita, H., & Nakahara, H. (2004). Impacts of the information-technology revolution on Japanese manufacturer--supplier relationships. *Journal of the Japanese and International Economies*, *18*(3), 390–415.

Nakatani, I. (1984). The economic role of financial corporate grouping. *The Economic Analysis of the Japanese Firm*, *20*, 227–258.

Novak, S., & Stern, S. (2009). Complementarity among vertical integration decisions: evidence from automobile product development. *Management Science*, *55*(2), 311–332. https://doi.org/10.1287/mnsc.1080.0924

Ó hUallacháin, B., & Wasserman, D. (1999). Vertical integration in a lean supply chain: Brazilian automobile component parts. *Economic Geography*, *75*(1), 21–42. https://doi.org/10.1111/j.1944-8287.1999.tb00072.x

Otto, A., & Kotzab, H. (2003). Does supply chain management really pay? Six perspectives to measure the performance of managing a supply chain. *European Journal of Operational Research*, *144*(2), 306–320. https://doi.org/10.1016/S0377-2217(02)00396-X

Pacana, A., & Czerwińska, K. (2020). Improving the quality level in the automotive industry. *Production Engineering Archives*, *26*(4), 162–166. https://doi.org/10.30657/pea.2020.26.29

Rai, A., Patnayakuni, R., & Seth, N. (2006). Firm performance impacts of digitally enabled supply chain integration capabilities. *MIS Quarterly: Management Information Systems*, *30*(2), 225–246. https://doi.org/10.2307/25148729

Ramaa, A., Rangaswamy, T. M., & Subramanya, K. N. (2009). A review of literature on performance measurement of supply chain network. *2009 2nd International Conference on Emerging Trends in Engineering and Technology, ICETET 2009*, 802–807. https://doi.org/10.1109/ICETET.2009.18

Rumelt, R. P. (1974). *Strategy, structure, and economic performance*.

Sakuramoto, C., Di Serio, L. C., & Bittar, A. de V. (2019). Impact of supply chain on the competitiveness of the automotive industry. *RAUSP Management Journal*, *54*(2), 205–225. https://doi.org/10.1108/RAUSP-07-2018-0051

Sheard, P. (1989). The main bank system and corporate monitoring and control in Japan. *Journal of Economic Behavior \& Organization*, *11*(3), 399–422.

Smelser, N. J., Swedberg, R., & others. (2005). *The handbook of economic sociology* (Vol. 752). Princeton university press Princeton, NJ.

Tomeczek, A. F. (2022). The evolution of Japanese keiretsu networks: A review and text network analysis of their perceptions in economics. *Japan and the World Economy*, *62*(February), 101132. https://doi.org/10.1016/j.japwor.2022.101132

Ursino, G. (2015). Supply Chain Control: A Theory of Vertical Integration. *B.E. Journal of Economic Analysis and Policy*, *15*(4), 1831–1866. https://doi.org/10.1515/bejeap-2014-0099

Vickery, S. K., & Dröge, C. (2010). Integration in global supply chains. *Managing Global Supply Chain Relationships: Operations, Strategies and Practices*, 135–154. https://doi.org/10.4018/978-1-61692-862-9.CH006

Williamson, O. E. (1975). Markets and Hierarchies The Free Press New York. *WilliamsonMarkets and Hierarchies1975*.