ASSESSING THE IMPACT OF SUSTAINABLE LOGISTICS INNOVATION ON FIRM PERFORMANCE

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Abstract

In this article, the long-term effect of Sustainable Logistics Innovation (SLI) on multinational corporations' (MNCs) performance with respect to financial, operational, and environmental dimensions is investigated. With globalization and worldwide sustainability concerns, those businesses that need to adapt eco-friendly logistics solutions, but there is little empirical research in the long-term impact. This article uses longitudinal research methodology with the analysis of the secondary data of Corporate Sustainability Reports, financial statements, and industry benchmark to test the on-going trend. In a nutshell, firms are able to realize significant savings in cost despite the increase in cost associated with the adoption of sustainable logistics solutions, enjoy better brand reputation and increase in revenue with the majority of consumers now a lot more keen on purchasing sustainable products. With that said though, the high initial costs for investment are a main issue and technological adoption barriers are present too. At the same time, the study finds that SLI is much more than an environmental necessity; it is a business imperative for economic growth and business advantage over those competitors that have yet to comply with environmental regulations. The findings are useful for corporate decision makers as well policymakers in promoting sustainable logistics innovation.

Keywords: sustainable logistics innovation, supply chain management, environmental sustainability, logistics technology.

Introduction

Multinational corporations (MNCs), under the rising demands of sustainability, are looking for creative solutions for logistics that achieve high performance along with environmental responsibility. MNCs are global companies that have base operations in different countries. They usually emerge from their home counties and spread branches across the globe. They basically manage their production or services in more than one country. To analyze MNCs with respect to the integration of sustainable innovations on logistics operations, several indicators are considered. Some important indicators that help to coin this research are sustainability and Corporate social Responsibility CSR indicators, Foreign Direct Investment where sustainable logistics innovation is concerned and revenue growth indicator. Global trade and business operations depend on the logistics which is a critical component of the sector.

Nevertheless, environmental degradation by greenhouse gas emissions, energy consumption and misallocation of resources results from the degree of environmental degradation for traditional logistical processes. Sustainable Logistics Innovation (SLI) is, referring to the adoption of the eco-friendly technologies and process improvements or strategic innovations to minimize the environmental impact and sustaining the supply chain efficiency (Biegizadeh et al. 2022). Electric vehicles, the use of alternative fuels, antibody tracking, Smart Warehousing Solutions are a few examples.

Although sustainability in logistics efforts have grown in momentum, little research has been conducted on their long-term effect on firm performance.

The purpose of the study is to establish the conditions where investments in sustainable logistics result in measurable business benefits over time.

The research aim is to evaluate the extent to which sustainable logistics innovation plays a role in improving the performance of multinational corporations.

The following **objectives** have been set to achieve the aim:

1. To analyze the role of sustainable logistics innovation in improving firm performance.
2. To study relationship between SLI and performance indicators such as cost savings and revenue growth.
3. To access the factor that influence sustainable logistics practices to operational efficiency and supply chain resilience.
4. To evaluate how SLI can be utilized to assess the environmental benefits of SLI and align it with corporate sustainability goals.

Research object and methods

Research methods

In this study, the companies are multinational corporations that have in place sustainable logistical innovations between 2015 and 2024. The research design is based on a longitudinal study building on the secondary data from corporate sustainability reports, financial statements as well as industry databases. Comparative Analysis - reviewing the firms that incurred SLI over those who do not or barely use a SLI solution.

Research Results and Discussion

The role of sustainable logistics innovation in improving firm performance

Sustainable Logistics Innovation (SLI) has great impact on firm performance in terms of financial, operational and environmental performance of multi-national corporations (MNCs).

Financial Impact of Sustainable Logistics Innovation. Perhaps one of the most profitable financial advantages of SLI is the cut in operational costs. MNCs have incorporated energy efficient transportation, alternative fuels and optimized logistics routes in order to reduce costs by a significant amount. One example is Green Cargo, a Swedish state other than the Swedish foreign owned logistics company, with almost 400 freight trains daily and over 96% of tonne-kilometerage being done by traction. With Green Cargo's reliance on electric freight transport, the impact on the climate and operational costs that the shipping company has achieved has been minimal (Green Cargo, 2023).

In addition to this, introduction of AI driven route optimisation and predictive analytics has helped the armed logistics businesses to reduce fuel consumption and maintenance costs, resulting in an additional level of the total cost efficiency. Apart from cost saving, sustainable logistics strategies also help enhance revenue in line with the consumer demands for eco products.

The attraction to a larger customer base goes hand in hand with the fact that companies that focus on sustainable supply chains can often charge premium prices for their services. A prime example is the Zero Emission Maritime Buyers Alliance (Zemba) that feature players like major companies including Amazon and Patagonia. Shipping firms utilizing biomethane powered vessels, Zemba has paired up with so as to substantially reduce carbon emissions and attract environmentally conscious consumers (Hancock, 2024a).

These days, more and more investors are integrating the ESG factors into their investment strategies. Sustainability is the key for the companies to attract investors and thus the companies are more likely to attract investors and for them, the companies provide better shareholder value and financial stability. Moreover, financial stability is an essential factor to be considered when running an international business, this means that integrating the ESG factors into investment strategies opens up another possibility of maintaining sustainability which in turn has the likelihood of continuously attracting investors and improve shareholder value. To give an example, AP Moller Holding, including its global leader in sustainable investments is behind a €1.5 billion project in Belgium aimed at cutting out fossil fuel reliance in plastic production. This one aligns with at least one goal for sustainability, but it also provides a sense of confidence for investors in environmentally sound companies (Hancock, 2024b). This helps companies particularly those that prioritize ESG compliance to enjoy green financing options, experience lower borrowing costs, as well as enjoy higher long term profitability, all of which solidify the financial rewards of adopting SLI.

Swedish electric freight technology company Einride has come to forefront of sustainable transport after electrifying trucking fleets. The company is headed by CEO Robert Falck and has entered into strategic partnerships with leading brands such as Mars, Heineken, PepsiCo and Maersk. Einride has cut emission levels down to the minimum by using electric trucks and autonomous freight solutions, while also improving efficiency. With this transformation, Einride now leads in carbon neutral logistics and how sustainability investments lead to long term financial benefit (Walsh, 2024). Cost reductions, revenue growths and value to shareholders are the evident financial impact of Sustainable Logistics Innovation (SLI). Strategies that companies adopt to become more sustainable within the sphere of the logistics industry yield them a financial advantage that coincides with contemporary global sustainability targets.

With regulation continuously increasing plus a shift of end user expectation towards plusher, eco-friendly practices, SLI becoming part of corporate logistics strategy is no longer some optional condition for profitable future, but a necessity.

Operational Efficiency and Supply Chain Resilience

Multinational corporations involved in implementing Sustainable Logistics Innovations (SLI) have realized that it is a critical strategic imperative that should enhance operations efficiency and increase supply chain resilience. The implementation of modern technologies and green practices not only cuts down on the operations but also strengthens the supply chains against disturbance. However, the revolution of logistics operations has been made using technologies such as Artificial Intelligence (AI), Machine Learning (ML) and autonomous vehicles. Taking one such example, Volvo Autonomous Solutions and DHL supply chain are already running driverless truck operations between Dallas and Houston with trucks fitted with advanced sensor systems and Aurora Driver technology. The goal of this initiative is to boost the operational safety and efficiency with the plans of extending autonomous routes in Texas (Houston Chronicle, 2024).

Similarly, companies are asking for AI solutions to the problem supply chain fragility. With GPS trackers, Radio-Frequency Identification (RFID) tags, and Transport Management System (TMS) software pervasive, infielder’s projectiles are often not as effective as they could be, in providing a broad roll call of border crossing or movement methods.

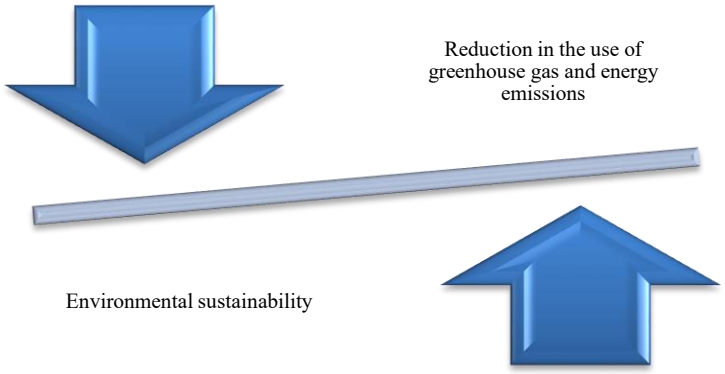
Although younger supply chain visibility providers with AI and ML use cases now provide better “control tower” views to companies that allow companies to prevent disruptions and better operate their operations. Until now, this elusive complete end to end visibility has been achieved, as more than half of companies have limited visibility beyond direct suppliers (Financial Times, 2024). Events related to the COVID 19 pandemic and other global events have brought some vulnerabilities of traditional supply chains into prominence. The most recent example of this is the East and Gulf Coast port strike, which highlighted how fragile fashion’s supply chains are and made the industry think about alternate ways to reduce cost and time, for instance, the sea-air freight. The strategies are intended to improve supply chain resilience by addressing risks of supply chain dependence on a single mode (Vogue Business, 2024).

Furthermore, LARG (Lean, Agile, Resilient, and Green) Supply Chain Management is the concept of combining lean, agile, resilient, and green in supply chain management. The lean supply chain management is to have close to zero inventory and work in process, agile is quick response to customers' queries and market changes with the moderation of cost and quality, resilience is to react promptly to the disruptions in the supply chain, and green relates to the supply chain

sustainability through emissions to the environment and product recycling. It is a side of the integration of interrelationships (conflicts and tradeables) between the lean, agile, resilient and green supply chain paradigms and will be essential for making these concepts compatible (Ghazvinian et al., 2024).

Environmental Impact of Sustainable Logistics Innovation

It has a huge positive effect on environmental sustainability when I adopt SLI. There have been many reductions in greenhouse gas and energy emissions for companies that implement sustainable supply chain practices. For example, there is integration of alternative fuels and energy efficient technologies in logistics operation to decreasing environmental footprint. Moreover, these environmental benefits also promote corporate image of MNCs as they strive to meet the stakeholder expectation for viable and effective business solutions that respond to global sustainability goals. The illustration below explains the simple relationship between the integration of sustainable logistics innovation and its environmental impact.



Source: compiled by author.

Fig. 1. Environmental Impact of Sustainable Logistics Innovation

Nevertheless, implementation of SLI is challenging for MNCs because of the benefits of it. However, there are a number of high initial investment costs, technological adoption barriers and regulatory uncertainties. According to Yuen, a requisite for the successful implementation is the understanding of the critical success factors and antecedents of sustainable management. Knowledge of these factors can be helpful to firms in developing sound strategies to overcome such barriers through effective integration of sustainable practices into their operations. In addition, the culture needs to support the development of an innovation, and sustainability. Such cultural shift has required leadership commitment, engagement throughout the organization to effectively implement and sustain SLI initiatives. Sustainable logistics is based on three core components-environmental, economic, and social sustainability (Witkowski 2009). Well, environmental sustainability, for one thing, seeks to curb environmental damage by discouraging behaviours that can lead to such damage, so that the environment can function properly and indefinitely (Witkowski 2009). In response to a continued focus on environmental sustainability, there has been a re-evaluation of logistics and supply chain practices across industries. Sustainable logistics is when you combine eco-friendly practices with the storage, distribution, and flow of goods.

Key environmental benefits arising out of implementing Sustainable Logistics Innovations (SLI) include lower greenhouse gas emissions, improved energy efficiency, reduced noise and air pollution, less environmental degradation, promotion of reverse logistics and recycling, as well as sustainable packaging and product design (Neto 2008). Simply put, sustainable logistics reduces the carbon footprint by investing in better means of transport, optimizing the delivery routes, and using fuel-efficient or electric vehicles Solution. “The strategy is compliant with international standards on environment and climate change.” Moreover, Renewables' potential for grid transformation enables multinational corporations (MNCs) to operate globally with the lowest possible carbon footprints, tagged to the industry's shift to a renewable-driven ecosystem, especially in the field of logistics, including transport and warehousing.

These corporations represent some of the largest logistics organizations, and inevitably, their operations are complex, highly energy-intensive, and result in both noise and air pollution on city streets when considering large, freight-sized vehicles. Such operations create noise and emit pollutants that are harmful, including nitrogen oxides. SLI is a direct response to these environmental issues. Moreover, one of SLI's most significant impacts, (Neto 2008) points out, is the prevention of environmental degradation, emphasizing that in traditional logistics systems, deforestation is widespread, as well as the over-exploitation and mismanagement of natural resources.

Sustainable logistics innovation practices adopted by MNC logistics operations promote efficient land usage, reduced waste, and less environmental disturbances. Efficient supply chain networks reduce the need for large volumes of warehousing and unnecessary transportation routes, relieving stress on ecosystems. Companies’ commitment to environmental sustainability also includes advocating for reverse logistics and recycling. Reverse logistics is defined as the planning, implementation, and control of the efficient, effective flow of raw materials, in-process inventory, finished goods, and related information from the point of consumption back to the point of origin, for the purpose of recapturing

value or proper disposal (Stock 1998). It allows for the return of products and materials through the supply chain to be repurposed, repaired, or recycled - decreasing landfill waste and the need to extract resources, guiding development towards a circular economy and more sustainable consumption patterns.

SLI pushes for sustainable packaging and product design, given that packaging is a huge part of the waste generated in logistics. Here, sustainable practices mean using recyclable, biodegradable and/or reusable packaging materials and reducing excessive packaging.

Conclusions

1. Sustainable Logistics Innovation (SLI) has great impact on firm performance in terms of financial, operational and environmental performance of multi-national corporations (MNCs). Investing in SLI allows firms to achieve cost efficiency while also reducing their carbon footprint, disproving that sustainability practices are costly.
2. Sustainable logistics strategies help with the improvement income flow which is in alignment with the consumer demands for eco products. Companies must pay attention to sustainable supply chains and focus on its implementation as this will help attract a vast customer base and also make their services stand out and can be labelled “Premium”.
3. Firms are advised to actively utilize sustainable logistics technology such as electric fleets, AI for logistics optimization and real time visibility. Doing so, they will have substantial operational as well as financial improvements.
4. Taken as a whole, this finding expressly clarifies that companies should think about SLI as an investment, not an expense.

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