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Reverse Logistics and Firm Performance in Tunisia: An Empirical Study

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***Abstract*— This document investigates the impact of reverse logistics on firms' environmental, economic, and social performance in Tunisia, employing a quantitative approach. The findings reveal that effective reverse logistics strategies significantly enhance environmental performance, operating cost efficiency, and customer-related outcomes. The research highlights that reverse logistics not only serves as a strategic advantage in emerging markets but also emphasizes the importance of shifting towards circular business models. Ultimately, it positions reverse logistics as vital for achieving green logistics objectives and ensuring long-term competitiveness.**

***Keywords*—Green Logistics, Reverse Logistics, Firm Performance, Emerging Economy, Tunisia.**

I. INTRODUCTION

Businesses are progressively becoming more conscious of their environmental impact in an ever-changing environment. They are managing their supply chains in a very different way as a result [1]. The volume of waste resulting from product returns in supply chains has significantly increased as a result of the growth in international trade and transactions; these returns not only contribute to increased pollution but also impose significant financial and environmental costs on businesses. Thus, in light of these challenges, reverse logistics represents both a strategic response and a major challenge for organizations seeking to balance economic efficiency with social and environmental responsibility [2]. To put it another way, manufacturers may maximize their resources and improve their reputation while safeguarding the environment and the community at large through one of the most inventive practices, reverse logistics. In order to guarantee the effective use of resources, reduce waste, and satisfy customers' social expectations regarding environmental issues, managers have adopted a variety of environmental management strategies over time [3]. Numerous studies examine how this product life cycle practice affects business performance and show how it affects businesses' competitive advantage, environmental performance, and social responsibility. These studies include businesses that use waste management strategies (recovery, reuse, recycling, etc.) to cut expenses, make money, and lessen their environmental impact [4].

With this in mind, and in general, several countries have taken the initiative and implemented measures to mitigate the impacts of these changes and are capitalizing on this opportunity to improve their efficiency. Among others, Tunisia also places great importance on environmental protection and promotes the reuse, recycling, and recovery of waste. Furthermore, the literature on reverse logistics in Tunisia is limited; it focuses primarily on identifying barriers to its adoption rather than its actual benefits [5]. Although reverse logistics has been extensively studied in developed economies, the subject has obviously been less explored in developing countries, particularly in the case of Tunisia. However, this context has specific characteristics that require a tailored assessment: an economic structure dominated by small and medium-sized enterprises (SMEs), a logistics sector that is still unevenly developed, and a regulatory framework that is still taking shape. It is precisely this link in the causal chain which is associated with the concrete impacts of reverse logistics practices on industrial performance in Tunisia that this study aims to examine.

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Therefore, the goal of our research is to address the following problem: What is the impact of reverse logistics management practices on the environmental, economic, and social performance of firms operating within an emerging market context like Tunisia?

Thus, the primary goal of this research is to examine how reverse logistics methods impact the organizational performance of Tunisian businesses. The study's precise objectives are to: evaluate how reverse logistics contributes to customer satisfaction, economic viability, and sustainability.

In order to answer this research question, our article is organized as follows: a review of the literature on reverse logistics is presented in the first section; research hypotheses and the conceptual model of our study are developed in the second section; the study context and data collection methodology are discussed in the third section; and a discussion of the results is presented in the fourth and final section.

II. LITERATURE REVIEW

A. *Reverse Logistics*

Reverse logistics encompasses the tasks of collecting, recovering, or disposing of end-of-life products, with the aim of creating value, minimizing costs, and protecting the environment, thereby limiting pollution and reducing the impact of waste [6]. Many authors and researchers have defined reverse logistics; we will focus primarily on the more recent definitions. The table below summarizes several definitions of reverse logistics. (Table I).

TABLE I
Definitions Of Inverse Logistics

Definitions of inverse logistics	The author
Inverse logistics deals with waste management and recycling procedures, which are crucial to lowering the amount of waste shipped for disposal and protecting natural resources.	[6]
The inverse logistics focuses on reusing, reassessing, recycling, or eliminating products, materials, or materials to promote durability by increasing the flow of materials, reducing resource requirements, and minimizing waste.	[7]
It is the flow of products from consumer to producer, completing the cycle of traditional distribution. It declines mostly in three ways: operations related to pre-vented services, product returns, and recycling activities, where the goal is to value recovered materials in order to add value.	[8]

The goal of inverse logistics is to recover value or ensure responsible elimination by planning and controlling the flow of goods, information, and capital from the point of consumption to the site of origin.

B. *Development of Hypotheses and Conceptual Model*

Reverse Logistics and Economic Performance: Economic benefits are a major factor driving the adoption of reverse logistics. Reverse logistics enables companies to recover value from materials and resell them as recyclables, thereby reducing their dependence on resources and lowering their costs. In other words, it helps reduce waste-related costs, thereby generating even greater economic benefits. [9], [10]. From a natural resource perspective, reverse logistics can improve corporate profitability through the resale or reuse of returned products [11]. In particular, companies capture flows of used goods through various methods, such as reselling reconditioned products, reusing parts, and reselling them to waste management companies. This waste recovery promotes a return on investment through the recovery of waste in reverse logistics [12]. In this regard, the first hypothesis is as follows:

Hypothesis 1 (H1): Reverse logistics has a positive impact on the economic performance of Tunisian industries.

Reverse Logistics and Environmental Performance: Environmental performance is assessed using several indicators, such as the reduction of air emissions, wastewater, and solid waste; the reduction in the use of

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natural resources; the reduction or elimination of waste; and the use of hazardous and harmful substances [13]. Numerous studies demonstrate that reverse logistics also creates environmental value [12]. In this regard, the environmental argument emerges as a marketing tool that allows organizations to capitalize on their ecological initiatives, thereby helping to restore their legitimacy [12]. Consequently, hypothesis (H2) is formulated as follows:

Hypothesis 2 (H2): Reverse logistics has a positive impact on the environmental performance of Tunisian industries.

Reverse Logistics and Social Performance: The social aspect is addressed through the principles of corporate social responsibility (CSR), whose primary objective is to ensure working conditions that are safe, fair, and consistent with human rights at every stage of the manufacturing process [14]. From this perspective, reverse logistics drives customer satisfaction; it can be used as a means of building customer loyalty and improves social welfare ([10]- [15]). A third hypothesis (H3) is formulated:

Hypothesis 3 (H3): Reverse logistics has a positive impact on the social performance of Tunisian industries.

Research Model: A research model was developed to analyze the relationship between reverse logistics and organizational performance, encompassing economic, environmental, and social dimensions. In this model, reverse logistics is considered an independent variable, while the three dimensions of organizational performance are dependent variables. This model suggests that reverse logistics has a positive impact on these dimensions within Tunisian companies. (Fig.1)

H1: Reverse logistics has a positive impact on the economic performance of Tunisian companies.

H2: Reverse logistics has a positive impact on the environmental performance of Tunisian companies.

H3: Reverse logistics has a positive impact on the social performance of Tunisian companies.

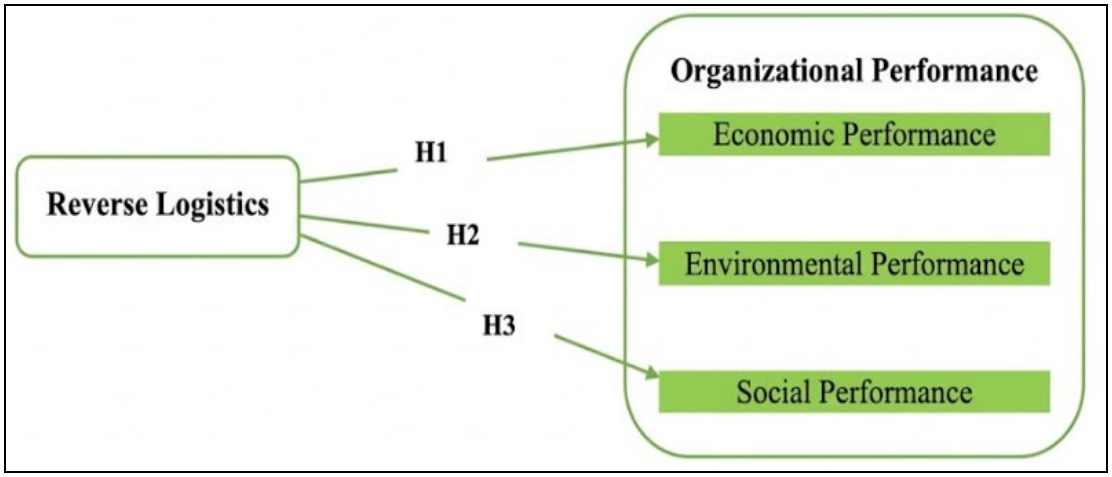


Fig.1.Research Model

III. RESEARCH METHODOLOGY

A. Research Context

The study focuses on the Tunisian industry, situated within a diverse economy characterized by significant service-oriented activities, which account for about 62% of GDP, primarily from consumer services. Primary activities like fishing and agriculture contribute about 9.5% of GDP, while manufacturing, especially in electronics, mechanics, and chemicals, makes up over 23.5%. This economic landscape reflects Tunisia's transition towards a diversified model, making it a relevant context for research.

B. Data Collection and Sample

Given the descriptive nature of the research method, the survey method is the most appropriate for this study. This is essentially a quantitative study. In this study, a deductive approach will be used to explain the

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relationship between reverse logistics and corporate performance across three dimensions (economic, environmental, and social), which will be of considerable benefit to the respondents. In particular, the independent variable is « reverse logistics » and the dependent variable is « organizational performance ». Of the 320 online questionnaires distributed, only 78 responses were received, representing a response rate of 24.37%. This result serves as the basis for an exploratory study conducted between September and December 2025 among 78 Tunisian companies from various regions.

C. Data analysis method

Data was collected using Google Forms and organized in Microsoft Excel, with automatic descriptive statistics for summarization. Principal Component Analysis (PCA) and regression analysis were conducted to analyze response distribution, and statistical analysis was performed using IBM SPSS Statistics.

D. Sample Characteristics

The firms involved were chosen from a variety of industrial sectors in terms of the sample. The purpose of this diversification was to guarantee sufficient representativeness and pertinent variation in the sample. The following table (Table II) lists the respondents' and participating firms' specific characteristics:

TABLE II
Characteristics Of The Sample

Subcategory	Frequency	Percentage (%)
Size of firm		
Micro firm (Less than 10 employees)	6	7.7%
Small firm (10-49 employees)	31	39.7%
Medium firm (50-249 employees)	21	2.9%
Large firm (250 employees or more	20	25.6%
Industry Sector		
Agri-food industry	45	57.7%
Manufacturing	18	23.7%
Textile industry	6	7.7%
Chemical manufacturing	5	6.4%
Metals and machinery	3	3.8%

The data presented in the table outline the sectors of firms responding to the questionnaire, highlighting a diverse sample. Firm size breakdown shows that 7.7% have fewer than 10 employees, 39.7% employ 10-49, 26.9% range from 50-249, and 25.6% have over 250 employees. The sectoral analysis indicates a strong representation of the Agri-food industry (57.7%), followed by manufacturing (23.7%), with lower participation from textile (7.7%), chemical product manufacturing (6.4%), and machinery and materials (3.8%).

IV. RESULTS AND DISCUSSION

This section presents the results of the survey. Analysis of these results has enabled researchers to better understand the implementation of reverse logistics, particularly its impact on the performance of Tunisian companies

E. Verification of the conditions for factoring

From this table, we were able to draw the following conclusions:

TABLE III
KMO And Internal Consistency Reliability Results

Variable	No of Items	KMO	Sig	Cronbach's Alpha
Independent variable				
Reverse Logistics (RL)	5	0.806	0.000	0.820

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Dependent Variable				
Environmental performance	6	0.844	0.000	0.910
Economic performance	7	0.790	0.000	0.866
Social performance	5	0.748	0.000	0.902

The results demonstrate high validity and reliability for both the independent and dependent variables. With regard to the independent variable (consisting of five items). Overall, all KMO values exceed the 0.5 threshold, and Cronbach's Alpha values surpass 0.7, confirming that the measurement scales are both valid and reliable. This provides a robust methodological foundation for subsequent analyses of the relationship between green logistics practices and sustainability performance.

F. Tests of Hypotheses

The following table shows the findings of the multiple regression study carried out in Tunisia in order to evaluate the relationship between reverse logistics and organizational performance across three dimensions (environmental, economic, and social).

TABLE IV
Summary Of Multiple Regression Analysis Of Reverse Logistics In Tunisia

Assumptions	Dimension	(β)	Sig.	R2 Adjusted	Durbin-Watson	Results
H1	Environmental	0.273	< 0.001	0.074	1.642	Validated
H2 H2b (1)→ Factor 1 H2b (2)→ Factor 2	Economic	0.072 0.374	< 0.001 <0.001	0.005 0.140	1.857 1.954	Validated
H3	Social	0.172	0.000	0.030	2.061	Validated

The regression analysis confirms that all tested hypotheses (H1a–H3c) are statistically significant (Sig = 0.000), thereby validating the positive associations between green logistics practices and the three dimensions of performance in Tunisian firms. The regression coefficients (β) range from 0.175 to 0.541, indicating that while the strength of influence varies, the direction of impact is consistently positive. Adjusted R^2 values, ranging from 0.031 to 0.293, reflect modest explanatory power, while Durbin-Watson statistics (1.18–2.06) confirm the absence of problematic autocorrelation.

The findings demonstrate that green procurement, production, and distribution practices positively and significantly influence environmental, economic, and social performance in Tunisian enterprises.

Regression research indicates that green production, distribution, and procurement practices have an important and positive effect on Tunisian enterprises' social, economic, and environmental performance. The triple bottom line approach is supported by these findings, which demonstrate how sustainability-focused logistics practices can improve social legitimacy, economic efficiency, and ecological results all at the same time.

The findings support the findings of [16], [17], which state that green procurement and production improve environmental and economic performance. They concur with [18], who found a significant link between green supply chain practices and environmental sustainability in developing countries. This conclusion is further supported by [19], who emphasize the beneficial effects of eco-centric activities on social and environmental consequences. The results, however, are in contrast to those of [20], [21], who found little impact on financial success in Pakistan and China. Positive economic effects: Tunisian data shows positive economic effects, suggesting that sustainability could provide a competitive advantage. By Tunisian data, indicating that sustainability might be a competitive advantage. This distinction highlights the significance of contextual elements since Tunisia's frameworks might foster an atmosphere that is conducive to green practices.

V. CONCLUSIONS

The study demonstrates that reverse logistics improves the environmental, economic, and social performance of Tunisian companies, affirming its importance in the triple bottom line framework. It offers practical and theoretical implications, enabling professionals to benchmark challenges in reverse logistics. Recommendations for industrial companies include encouraging customer returns for recycling, refurbishing

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returned products to minimize waste, and forming partnerships with recycling centers for proper disposal of non-recyclable items.

Despite these contributions, this study has several limitations, such as the sample size and the country's specific circumstances. Future study could expand on this analysis using sector-specific studies, cross-national comparisons, and longitudinal approaches to completely understand the dynamic consequences of sustainable practices.

In conclusion, the Tunisian case demonstrates that reverse logistics is a strategic pathway to long-term competitiveness and organizational resilience, rather than merely an environmental requirement.

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