

## Article

# Logistics Services Sector and Economic Recession in Greece: Challenges and Opportunities

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**Abstract:** The recent economic recession in Greece has had a detrimental impact on all national business activities, with the logistics industry being one of the most affected sectors primarily due to the significant decrease in market demand for goods and services. In this regard, the aim of this research is to identify key challenges and prospects for the Greek logistics services industry stemming from the recent economic crisis era through a critical literature taxonomy, a semantic analysis of the reviewed articles, and a questionnaire-based survey involving 140 executives from the third-party logistics sector. In principal, the recent economic crisis is reported to have significantly affected logistics service providers, thus further imposing structural reforms in the industry. The reduction in operating profits of transport companies is noticeable with the onset of the economic crisis, specifically in 2016. Nevertheless, logistics executives are optimistic regarding the near future, provided that educated and informed strategic management decisions are made and inventive business practices are embraced.

**Keywords:** economic recession; logistics services sector; Greece; third-party logistics (3PL); logistics functional areas; critical taxonomy; semantic analysis; text mining; word co-occurrences; questionnaire-based survey

## 1. Introduction

The 2001 recession is identified as one of the key external influential factors to have contributed to the evolution of the supply chain management concept and logistics operations [1]. More specifically, Christopher and Holweg [2] argue that this economic downturn has an on-going impact on the strategic decision-making process in logistics and supply chain management. To this effect, ‘structural flexibility’ is being imposed, as opposed to the relatively stable supply chain operational models having been established over the last 30 years.

Logistics and economic development are closely intertwined [3]. In general, research evidence demonstrates that economic growth drives demand for logistics services, thus leading to the development of the sector [4]. On the other hand, logistics efficiency can ensure firms’ competitiveness and promote financial performance, especially during periods of financial turmoil. Indicatively, Wal-Mart sustains its position as the top retailer in the world due to its ‘best-in-class’ distribution and logistics system that supports competitive differentiation [5].

Notwithstanding the importance of logistics for enhancing manufacturing and retail companies’ market responsiveness and competitiveness [6], existing studies are rather myopic in scope by generally: (i) discussing the impact of economic crisis on the logistics sector based on macroeconomic data to articulate generic inferences [7], and (ii) focusing only on the port logistics sector as

containerized trade flow statistics are easily accessible [8]. In particular, no study identifies key challenges and specific impacts of economic crisis per each functional area of logistics services [9], namely: (i) warehousing, (ii) transportation and distribution, (iii) procurement, and (iv) inventory management. Furthermore, to the best of our knowledge, there are no major studies capturing the actual views of logistics service providers about economic crisis-related challenges that impact their operations, especially for the case of Greece.

In this manuscript, our research objective is to identify main challenges, impact, and prospects for the Greek logistics services sector stemming from the recent economic crisis era that commenced in 2008, by attempting to answer the following research questions (RQs):

- RQ#1: What are the scientifically reported repercussions of economic crisis eras on each functional area of logistics services?
- RQ#2: What is the prioritization of the main challenges confronted by the Greek logistics service providers within the recent economic recession period?
- RQ#3: What is the business outlook about the prospects of the Greek logistics landscape?

The above RQs are critical to be addressed since Greece is a major freight transport logistics hub in South-eastern Europe [10]. More specifically, the answer to RQ#1 will identify key impacts of economic crisis periods on the functional areas of the logistics sector, both at national and business levels. Several logistics-wise mitigation strategies to respond to economic crisis effects are identified as well. The answer to RQ#2 will recognize the major challenges confronted by the Greek logistics sector during the recent economic crisis period. The attempt to answer RQ#3 will return important insights regarding the prospects of the Greek logistics managers about the future of the overall business landscape at both sectoral and individual companies' levels.

In this regard, we followed a two-phase methodological approach. In the first phase, we taxonomized the extant literature on logistics and economic crisis to answer RQ#1, while we conducted a semantic analysis of the reviewed studies based on text mining and co-occurrence investigation of related terms. In the second phase, we performed a questionnaire-based survey on executives in the Greek logistics sector for tackling RQ#2. Finally, the survey results address RQ#3 and generate future research potentials.

The remainder of the paper is structured as follows. Section 2 sets out the terminology along with the theoretical background, primary and secondary research approach that underpin this study. Section 3 explores the existing research on the interplay between economic crisis and logistics, with particular reference to the impact of financial recessions on the functional areas of logistics services. Thereafter, Section 4 presents the results of the questionnaire-based survey regarding the challenges confronted by the Greek logistics sector due to the recent economic crisis. Prospects of the national logistics landscape are also discussed. Finally, we wrap up with conclusions, limitations, and future research suggestions in Section 5.

## 2. Materials and Methods

The object of scrutiny in the present study is two-faceted, including: (i) taxonomy and generic semantic analysis of the extant literature, and (ii) primary, questionnaire-based, survey. The rationale of this process is to develop a coherent construct with regards to the complex subject under study [11]. The basic terminology, theoretical background, critical taxonomy and semantic analysis, and empirical research relevant to this study are specified in the sub-sections that follow.

### 2.1. Basic Terminology

According to the Council of Logistics Management [12], logistics is defined as: “... *the process of planning, implementing, and controlling the efficient, cost effective flow and storage of raw materials, in-process inventory, finished goods and related information from a point of origin to the point of consumption for the purpose of meeting customer requirements*”. Considering the relationship between logistics and

industrial production, efficiency and effectiveness in logistics operations are determinant elements of competitiveness [13], from a firm to sector and national levels. In particular, logistics operations are recognized as a set of integrated functional areas facilitating the efficient movement and handling of goods across supply networks [9], including: (i) warehousing, (ii) transportation and distribution, (iii) procurement, and (iv) inventory management.

Furthermore, economic crisis is often made apparent “... in terms of falling GDP [Gross Domestic Product], lack of capital liquidity and high inflation or deflation” [14]. The global financial crisis of 2008 which impacted Greece has resulted in a long-term severe national economic recession that further exerts pressure on the Greek industrial sectors [15]. Except for the economic-related ramifications, financial crisis and austerity measures have also impacted the structure and the form of trade union organizations with further social implications [16,17].

## 2.2. Theoretical Background

Economic crises are generally documented to negatively impact international trade and the related logistics operations [7], with the World Trade Organization [18] reporting that the economic recession of 2008 resulted in about 10% decline in global trade within a year. From an economics perspective, such effects are attributed to financial dismal developments at both macroeconomic (i.e. economy wide) and microeconomic (i.e. company or sector specific) levels. Investigating the social constituents that could impact logistics operations during economic recession periods extends the scope of this research.

Considering that macroeconomic factors are related to geopolitical events, economics-related studies suggest the exogenous effect of such factors on the logistics services' sector [19]. In principal, macroeconomic factors used to understand future trade flows, specifically in terms of maritime containers, include [20]: (i) growth in GDP, (ii) industrial output, and (iii) external trade. Negative outlook on these variables imposes limitations to freight flows and results in imbalanced trade structures. Furthermore, inflation and wide fluctuations in oil prices affect stock returns and the long-term financial performance of logistics service providers [21]. On the other hand, market liberalization fosters the development of new markets, propels the movement of goods, and subsequently increases the demand for logistics services [22].

At a microeconomic level, the ‘Transaction Cost Economics’ theory, which is extensively used to study the outsourcing of necessary services to third-party logistics (3PL) companies [23], supports the integration of production and logistics operations [24] at both intra- and inter-organizational levels. The theory further confirms the important role of supplier governance mechanisms in fostering 3PLs' growth via [25]: (i) ensuring the fulfillment of contractual agreements, and (ii) securing manufacturers against outsourcing opportunism. From a business logistics operations perspective, Goulielmos and Pardali [26] propose the ‘Economies of Recent Location’ theory for analyzing the equilibrium between demand and supply for the container ports in the Mediterranean and demonstrate that this underlining equilibrium and the ensuing viability of operations is affected by investments.

To sum up, as the national business environment is influenced by both macroeconomic and microeconomic level factors [27], the logistics sector could be argued to be affected accordingly. In this regard, we conduct a taxonomy and an analysis of word co-occurrence in the literature and then we use a primary, questionnaire-based survey, to explore the validity of the theoretical findings about the impact of economic crisis eras on national logistics sectors by focusing on the case study of Greece.

## 2.3. Critical Taxonomy and Semantic Analysis

The first methodological step in the present study is to review the relevant literature and recognize the key impacts of economic recession on logistics and operations thereof. To ensure scientific integrity, we reviewed studies retrieved from the Scopus<sup>®</sup> of Elsevier and Web of Science<sup>®</sup> of Thomson Reuters databases as the most representative sources of scientific publications in the fields of Natural Sciences and Engineering [28]. The Boolean query formulated for identifying scientific studies included the following keywords: (‘economic crisis’ OR ‘economic recession’) AND (‘logistics’ OR ‘transportation’

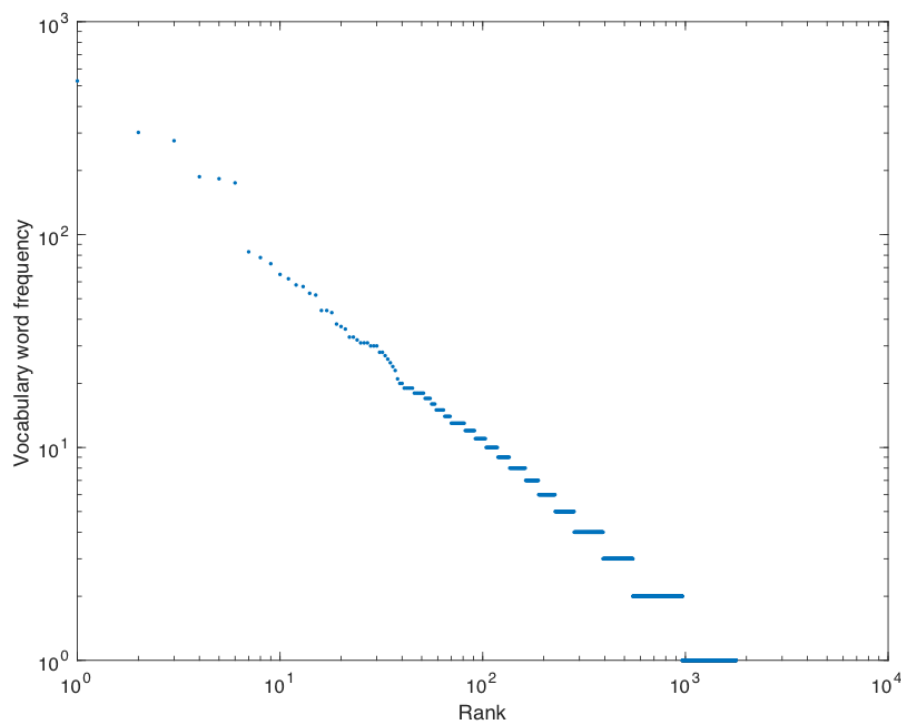
OR ‘warehousing’ OR ‘procurement’) AND (‘supply chain’). We utilized the ‘Article Title, Abstract, Keywords’ categories in Scopus<sup>®</sup>, as well as in Web of Science<sup>®</sup>, while the search timespan was set from ‘All years’ to ‘Present’. We reviewed studies from peer-reviewed journals that are written in English.

By 15 April 2018, a total of 19 articles concerning the impact of economic crisis on logistics was identified. The critical taxonomy of the selected literature, along with a mapping of the reviewed studies based on the logistics functional area of focus, is presented in Table 1. Key identified repercussions of the economic crisis on logistics operations are also summarized.

**Table 1.** Taxonomy of existing research.

Study	Functional Area	Methodology	Research Sample	Key Repercussions of Economic Crisis
[29]	• Procurement	Constructivist	12 Buying experts	• Promotes collaborative procurement practices
[30]	• Inventory Management	Simulation	Experimentation	• Promotes flexible inventory management practices
[31]	• Warehousing • Inventory Management	Statistical Analysis	1219 U.S. manufacturing firms	• Increases volatility
[32]	• Logistics	Statistical Analysis	40 Firms from the European automotive industry	• Supports reductions in working capital and cost of goods sold
[33]	• Warehousing	Survey	50 Logistics services providers and 52 retailers	• Motivates changes in manpower planning in warehouses
[34]	• Procurement	Empirical Procurement Framework	Intel Corporation	• Motivates new procurement frameworks that can drive cost reductions and revenues
[35]	• Logistics	Event Study	826 Mergers and Acquisitions (M&A) announcements from the global logistics industry between 1996 and 2015	• Fosters competition due to decline in international trade • Benefits 3PL companies engaged in M&A announcements
[36]	• Logistics	Bayesian Network	87 Experts through questionnaires	• Suggests the coordinated development of logistics with national economies through infrastructure investments, research and technological development, and growth of the logistics industry in terms of enhanced coordination and structural optimization
[37]	• Logistics	Primary Research - Interviews	15 Representatives from 10 firms	• Decreases flows • Fosters oligopoly in the logistics services market • Promotes strategic alliances and mergers • Promotes modal shifts towards less costly and more efficient modes of transport
[38]	• Warehousing • Transportation and Distribution	Descriptive Statistics (EU-28 data)	N/A	• Reveals that road freight transport flows (in t-km) are correlated to GDP
[8]	• Transportation and Distribution	Statistical Analysis	Major European ports	• Supports reductions in container throughput • Motivates structural changes in maritime logistics
[39]	• Transportation and Distribution	System Dynamics	N/A	• Fosters reductions in international trade and freight transport • Promotes structural changes in the sector of freight transport and logistics
[40]	• Warehousing • Logistics	Statistical Analysis	GTAP 6 multi-regional trade database	• Promotes reforms
[41]	• Transportation and Distribution	Grey Model Forecasting; Data Envelopment Analysis	19 Logistics companies from Europe, Japan, America and Korea	• Fosters investments on sustainable technologies
[42]	• Logistics	Survey	64 U.S. firms	• Limits the demand for 3PL services
[43]	• Logistics	Critical Discussion	N/A	• Promotes collaborations and alliances • Motivates new financing strategies
[44]	• Logistics	Survey	316 Respondents from: UK Chartered Institute of Logistics and Transport, UK logistics events, MSc and Executive MBA students	• Drives reductions in employment • Fosters reduction in product lines • Promotes leaner work-in-process inventories • Supports decreased stock levels • Promotes tightening of credit terms • Motivates use of electronic documentation to save on costs • Results in reduced company travels • Promotes changes in the use of 3PL • Promotes changes in warehousing • Promotes re-organization in distribution networks • Supports selection of local suppliers
[45]	• Logistics	Survey	N/A	• Motivates adaptive learning • Promotes innovation in logistics activities • Motivates inventory management changes • Fosters the analysis of alternative routing options
[46]	• Transportation and Distribution	Graph Theory	Sample of the movements of the world fleet of container ships that have docked at least once in a Chinese port in the years 2008 and 2010	• Affects containerized throughput • Affects ports' connectivity

We also perform a basic text mining analysis on the abstracts of the reviewed articles to explore any semantic relation between economic crisis and logistics. In this regard, we explore a fundamental property of languages, the Zipf's law [47]. The plot of the frequency of words (of the reviewed abstracts) versus their rank resembles a power law distribution (Figure 1). In the low rank extreme of the curve, five words are clearly separated from the rest, i.e. ‘the’, ‘of’, ‘and’, ‘to’, and ‘in’.



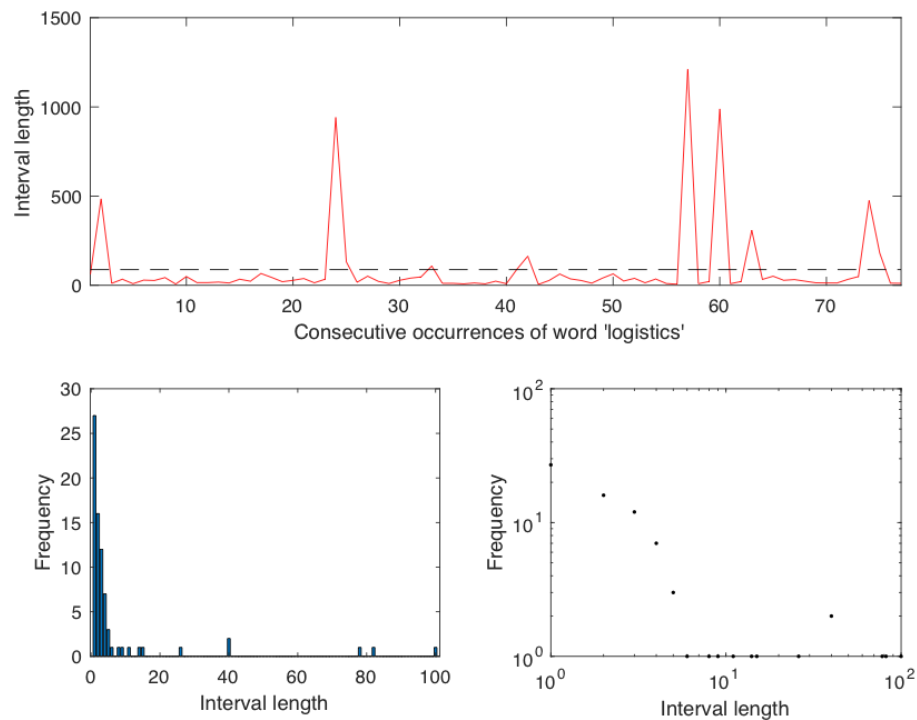
**Figure 1.** Plot of word frequencies versus rank for the reviewed studies (abstracts only).

The probability of occurrence of relevant terms, estimated by counting the number of times each of these words occurs in the developed dataset normalized by the total amount of words in the dataset, is inserted in Table 2. A ranking of the reviewed abstracts' vocabulary revealed that these tabulated words are the most frequently used (following articles and prepositions), thus indicating an intuition regarding their relation, from a textual content perspective. Notably, the terms 'warehousing' and 'procurement' do not appear in Table 2, thus denoting the myopic focus of the relevant literature on these functional areas of logistics.

**Table 2.** Research terms and likelihood probabilities of occurrence.

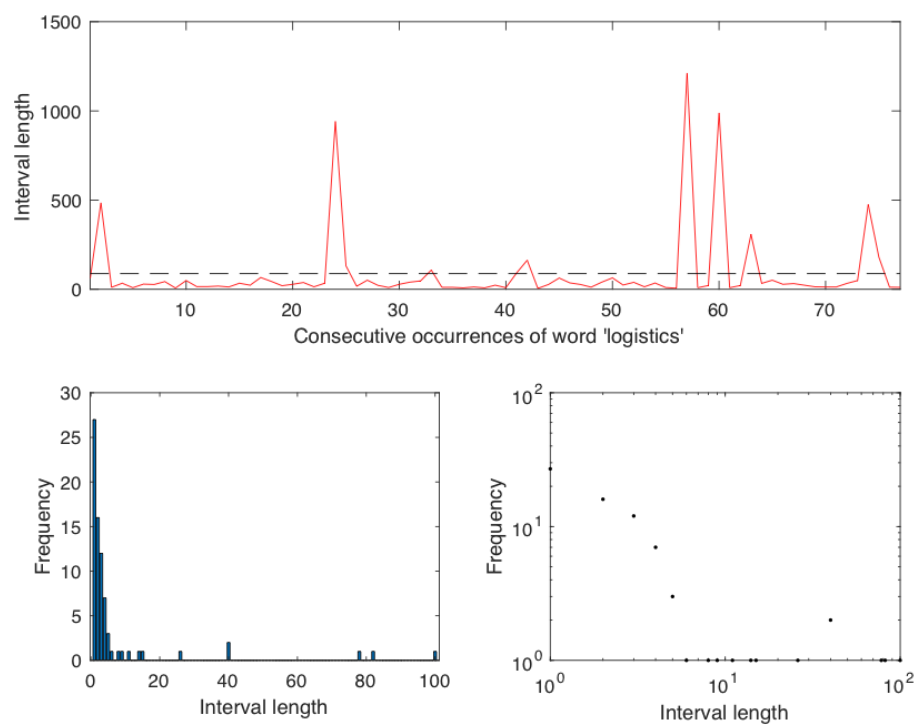
Term	Occurrence Probability
'economic'	0.0068
'crisis'	0.0039
'logistics'	0.0102
'transport'	0.0030
'distribution'	0.0012
'inventory'	0.0020
'supply'	0.0048
'development'	0.0042

Moreover, the distribution of intervals between consecutive occurrences of the word 'logistics' (which has the greatest probability of occurrence), along with the interval length and histogram, are demonstrated in Figure 2. In the upper panel, the average interval length is indicated via a segmented line and can be better perceived by the histogram of interval lengths shown in the bottom-left panel of the figure. The bottom-right panel of Figure 2 demonstrates the *burstiness* property, meaning that the word 'logistics' resembles bursts of occurrences.



**Figure 2.** Interval lengths between consecutive occurrences of the word ‘logistics’.

In Figure 3, we calculate the co-occurrence of the words ‘logistics’ and ‘economic’. This word co-occurrence analysis relates to the dependences between these terms. The short interval length for both terms indicates their prevalence and co-occurrence in the reviewed abstracts.



**Figure 3.** Interval lengths between consecutive occurrences of the terms ‘logistics’ and ‘economic’.



## 2.4. Empirical Research

A questionnaire-based survey was conducted during the first semester of 2017 involving 140 executives from the Greek 3PL services sector to make realistic conclusions and pragmatic inferences about the challenges of the economic crisis impacting the national logistics sector [48]. The first part of the questionnaire focuses on capturing descriptive characteristics about the Greek economic situation over the last two years. A prioritization/ranking of possible challenges for logistics operations during the recent economic recession is also a main research objective. The second part of the survey foresees to capture the surveyed executives' views on the prospects of the national logistics sector and respective firms in the immediate future (i.e. forthcoming 1–2 years).

In brief, 65% of the surveyed enterprises have been operating in the Greek logistics market for over 10 years; 60% are operating in the wider area of Attica, 25% in Thessaloniki, and the remaining 15% in other major Greek cities such as Larissa, Katerini, and Patra. Considering the services offered by the surveyed logistics service providers, these include: distribution (90%), storage and warehousing (86%), customs (58%), packaging (48%), insurance (46%), and labelling (42%).

## 3. Economic Crisis and Logistics: Effects and Response Mechanisms

Undeniably, the global economic crisis in 2008 distorted the trend in the development of the international logistics sector [49]. From the very beginning, the economic crisis motivated managers to appreciate cooperation, adaptive learning, and innovation in logistics activities as the appropriate response mechanisms to the pressures of rising cost of logistics and falling global market demand. Re-inventing inventory and analyzing alternative routing options, along with overturning the erstwhile emphasis on outsourcing, were foreseen as viable solutions [45].

A generic observation is that companies demonstrated a progressive adaptation to their logistics services to respond to the recent economic recession, specifically during the period 2008–2010, as observed by Bentley [44] through a survey of over 300 stakeholders. Downsizing the organization was the most common response strategy, followed by other strategic changes like using 3PL service providers, exploring alternative warehousing options, and sourcing from local suppliers.

Overall, during an economic crisis period, budgetary constraints and increased costs limit the demand for 3PL services [42]. The global economic crisis emerges several challenges for transport and logistics companies further imposing reforms that need to be undertaken by industry bodies and policy-makers to contribute to economic recovery and growth, as this is indicated for the Australian case [40]. In particular, Mazzarino [37] identifies financial crisis as a major macro-level driver that impacts global logistics operations, further concluding that economic downhill: (i) determines a decrease in logistics flows as transport dynamics are linked to national and regional economic performance, (ii) fosters oligopoly in the logistics services market by promoting strategic alliances and mergers, and (iii) promotes modal shifts towards less costly and more efficient transport options. Motivated by the dominant economic crisis related challenges, encountered by individual logistic service providers, Kiesel et al. [35] analyze 826 M&A transactions during the period 1996–2015 to investigate the resulting impact of such strategic consolidations on shareholder returns. The study findings reveal that the emergence of the financial crisis does have a positive impact on the performance of the combined company in the post-merger long-term integration period.

Despite the documented negative impact of the economic crisis on logistics, the extant literature recognizes structural changes in supply chain and logistics operations as an efficient response mechanism that should be adopted by senior corporate management. Indicatively, following the recent economic recession, Lan and Zhong [36] analyze the implications of the on-going global economy restructure for logistics at a Chinese metropolitan level. The authors support the coordinated development of economy and logistics for establishing sustainable logistics services, achieved through: (i) investments in infrastructure, (ii) research and technological development, and (iii) industry growth in terms of enhanced coordination and structural optimization.

Furthermore, Brandenburg [32] analyses the relationship among economic crisis, supply chain efficiency, and value creation in the European automotive industry during the period 2002–2010. From a financial point of view, the study findings reveal that the crisis indeed resulted in considerable value chain losses; however, automotive industry actors, especially car dealers, managed to improve their supply chain performance through structural changes like adjustments in their inventory levels. In this vein, Popa [43] foresees the need for collaborative management to support information flows and logistics operations within the Romanian business sector. The author suggests the rescheduling of invoice payments and the formation of alliances between buyers and suppliers as an approach to increase supply chain resilience in an economic recession era. In the sub-sections that follow, we briefly discuss the impact of economic crisis on each functional area of logistics through providing relevant literature evidence.

### *3.1. Warehousing*

Economic crisis raises barriers to business opportunities, thus hindering the establishment of 3PL service providers in strategic geographical locations. To this effect, the development of warehousing and distribution hubs that could drive decreased supply chain costs is impeded [40]. In addition, economic uncertainty and geopolitical factors appear to affect raw material prices [50]. In this sense, the purchases of bulk material are affected as well, thus subsequently impacting warehousing costs [31]. The evidence provided by Moschovou [38] demonstrate that warehousing and other support activities for the transport sector in Greece exhibited a considerable decline between 2009 and 2013, with observed annual drops in turnover by 32.2%, 10.8%, 7.9%, 4.8%, and 7.0%, respectively. To address these effects of an economic downturn, de Leeuw and Wiers [33] suggest the control of labor costs in warehousing. The authors surveyed retailers and logistics service providers in the Netherlands and recognize that flexible manpower planning and workload balancing are plausible strategies to improve warehouse performance in times of economic recession.

### *3.2. Transportation and Distribution*

Yu et al. [41] study the financial reports of 19 global logistics companies and find that during an economic crisis period firms in the sector do not invest on technical efficiency in freight transportation but rather focus on sustainable logistics. In terms of road freight transport, Rothengatter [39] develops a System Dynamics simulation model that links transport and economic modules for the European countries and concludes that restructuring of the transport sector is required, especially in terms of energy efficiency and environmental stewardship. Regarding the case of Greece, Moschovou [38] studies freight transport data and finds that, at a macro level, the economic crisis has pronounced effects on national and international road freight transport, both in terms of volumes (tonnes) and output (t-km). In particular, the decrease in the transported t-km in Greece during the period 2008–2014 was significantly higher to the respective drop in the national GDP.

With regard to maritime freight transport, the economic and financial crisis has affected both the global containerized throughput and the large ports' connectivity [46]. The economic downturn in Europe during the period 2008–2009 led to declining container throughput, further fueling concessions between the port industry and policy-makers in terms of substantial cargo shifts. These shifts were viewed as necessary to tackle congestion bottlenecks, port fees, containerized and non-containerized trade, and special clauses to assure that logistics operations are in the interest of the wider community [8].

### *3.3. Procurement*

Similar to the need for structural reforms to the abovementioned logistics functions, as a response to the negative impact of economic crises, Allal-Chérif and Maira [29] propose new forms of internal and external procurement practices in firms. Internally, the 'buyer of the future' should have a broad vision of a company, be digitally literate, and source all the components of a single project. Externally,



firms have to establish strategic partnerships and virtual communities with suppliers by means of pooling technical expertise, resources, risks, and profit to support investments and long-term mutual gains in terms of time, wealth, and quality. Indicatively, the Intel Corporation launched a pilot project in 2007 for increasing the agility of the company's capital equipment supply chain [34]. The program features a novel procurement framework to assess alternative ordering, shipping, and production equipment installation options, leading to significant cost savings. The pilot project contributed to the resulting revenues of at least \$2 billion during the recent period of global economic crisis [34].

### 3.4. Inventory Management

The economic crisis typically renders external financing increasingly difficult to secure, thus leading to unstable operating cycles. In particular, simulation modelling results provided by Bendavid et al. [30] show that constraints in working capital lead to large inventory shortfalls and distort operational decisions, hence necessitating the deployment of a flexible and forward-looking working capital requirements approach. At a more granular level, Bendig et al. [31] investigate a sample of U.S. manufacturing firms over the period 2005–2013 to examine operational risks and volatility in terms of three inventory components attributable to different supply chain echelons, namely: (i) raw materials, (ii) work-in-process, and (iii) finished goods. The study findings reveal a systematic increase of volatility in all three inventory components during the financial crisis era owing to the mismatch in the demand-supply nexus that further reflects upon investors' decisions on inventory positions.

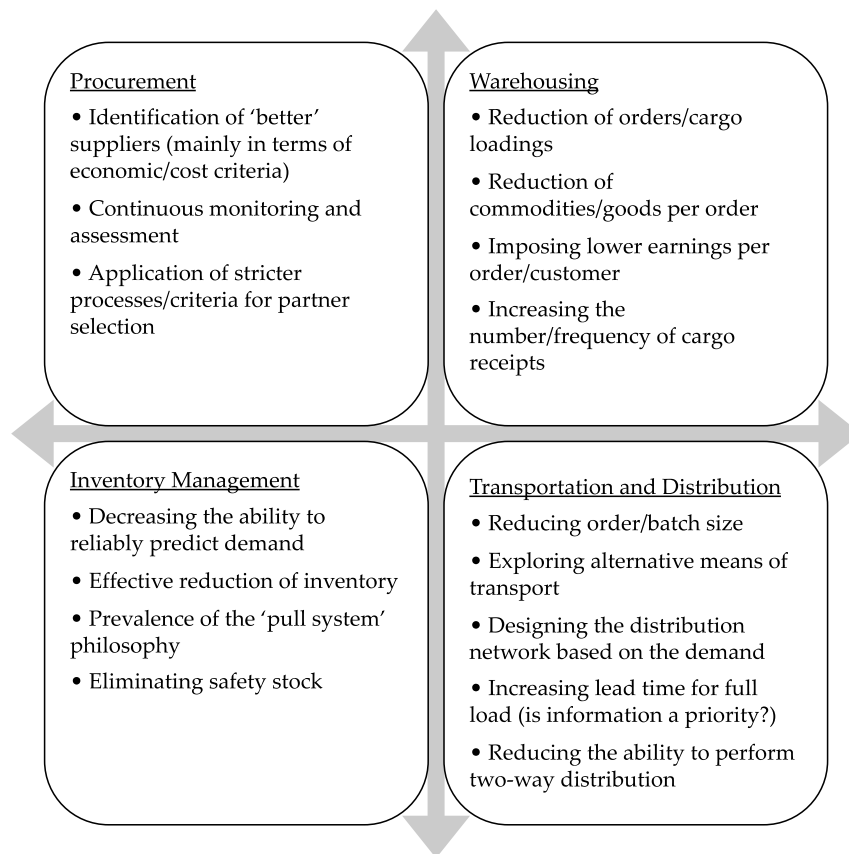
## 4. The Recession-Logistics Interplay in Greece

The ongoing economic crisis in Greece has a detrimental impact on almost all business and economic activities. Economic activities in the commerce and trade sectors were the first to be impacted due to the contemporary decrease in demand for both products and services. To this end, the Greek market for 3PL services encountered a series of effects like: drastic reductions in order placements, cancellations of freight transport-related contractual agreements, reductions in freight transport and storage volumes, and business mergers and acquisitions in the industry.

### 4.1. Challenges in the National Logistics Landscape

According to a sectoral study by the Directorate of Economic Studies of the ICAP Group, the overall Greek market for 3PL services had been increasing over the period 1998–2008, with an average annual growth rate of 19.7% [51]. However, during the period 2009–2016 the sector demonstrated a total decline of about 24%. Notably, in the landmark year 2016, the sector exhibited a marginal increase of about 0.6% compared to 2015, with the total value of the 3PL market following an upward trend in 2017 and marking a growth of around 1.8% with further positive prospects. The latter figures demonstrate the perception of senior business executives that logistics-related management decisions are determinant to respond to 'economic tsunami' phenomena. Nowadays, businesses regard logistics management as a tool that can drive reductions in operating costs and create competitive supply networks.

Our survey results reveal that for the period 2016–2017, about 29% of executives reported growth in earnings, 35% declared a stable-similar-financial performance to the previous year, while 36% reported a decrease in profits. The complex interrelation between economic crisis and logistics is illustrated by the following two examples: (i) while a decline of about 33% was recorded in the national transport sector during 2008–2016, a contemporary increase of about 16% in international transport and 18% in warehousing services (i.e. packaging, labelling, invoicing, order management) were observed, and (ii) despite that 3 out of 4 enterprises continue to internally plan their logistics operations and 3 out of 5 firms own their proprietary warehouses, 10–15% of business administrations declare their intention to outsource their logistics activities in the forthcoming 5 years [52]. Figure 4 summarizes the impact of economic crisis on the four identified functional areas of the Greek logistics sector.



**Figure 4.** Impact of economic crisis on the functional areas of the Greek logistics sector.

Table 3 presents the prioritization/ranking of 10 major challenges that govern the Greek logistics sector during the recent economic crisis era. Reduced pricing for logistics services, along with reduced production and distribution order volumes, constitute the dominant challenges in Greece.

**Table 3.** Major challenges in the Greek logistics sector during the recent economic crisis period.

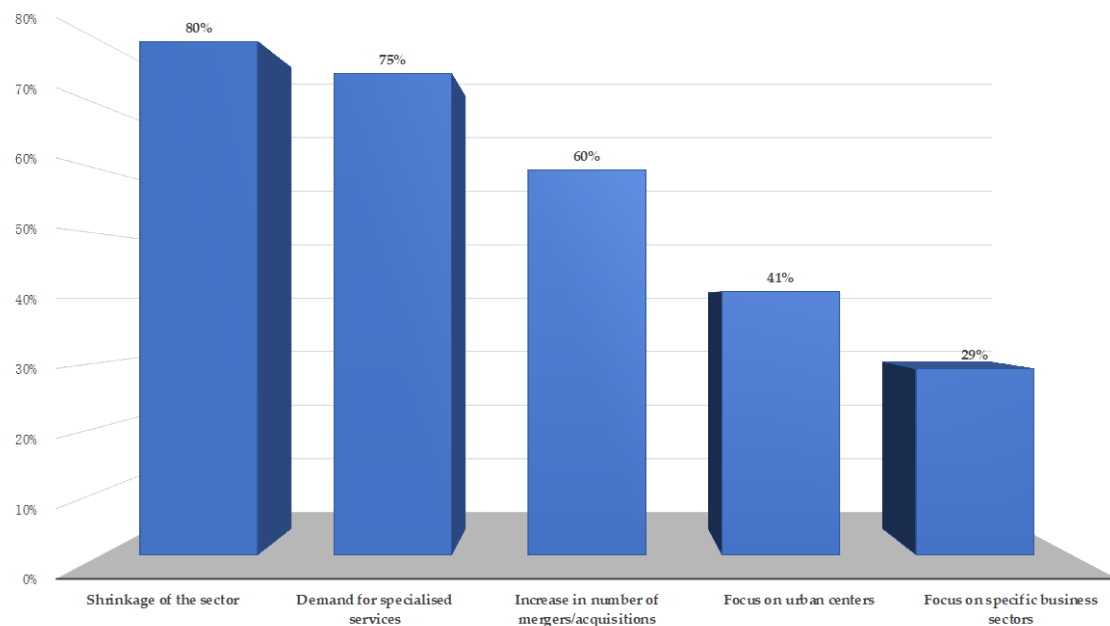
Challenge	Percentage	Prioritization/Ranking
• Reduced production orders from headquarters/upper management	52.17%	3
• Reduced market orders from customers	55.07%	2
• Reduced prices requested by major customers	62.31%	1
• Prevailed inertia in major markets	31.88%	6
• Stagnation in new customers or markets development	43.47%	5
• Reduced sales prices due to global oversupply	20.28%	8
• Growing market shares of competitors	14.49%	10
• Increased inflow of cheap imported goods	18.84%	9
• Growing market shares of competitors (cost of competition)	24.63%	7
• Increased delays in accounts receivable	47.82%	4
• Other	2.89%	11

#### 4.2. Prospects of the National Logistics Landscape

The economic crisis affects the views of logistics managers about the prospects of the national logistics landscape, both at sectoral and individual company levels. Notably, the study findings reveal

a paradox: the economic downturn has drastically affected the logistics sector while at the same time encouraged managers to embrace new business practices to address current challenges.

Figure 5 depicts the surveyed executives' views on the immediate prospects (i.e. forthcoming 1–2 years) of the 3PL sector in Greece. Logistics managers are not optimistic about the future, as the majority (around 80%) expect shrinkage of the overall sector; however, growth opportunities could arise as about 75% recognize the need for offering specialized services. Considering the limited financial liquidity and willingness to invest in the sector, as a result of the imposed financial austerity measures, around 60% of the managers anticipate mergers and acquisitions in the industry. Urbanization and the specific needs of other economic sectors are further believed to create market opportunities by 41% and 29%, respectively.



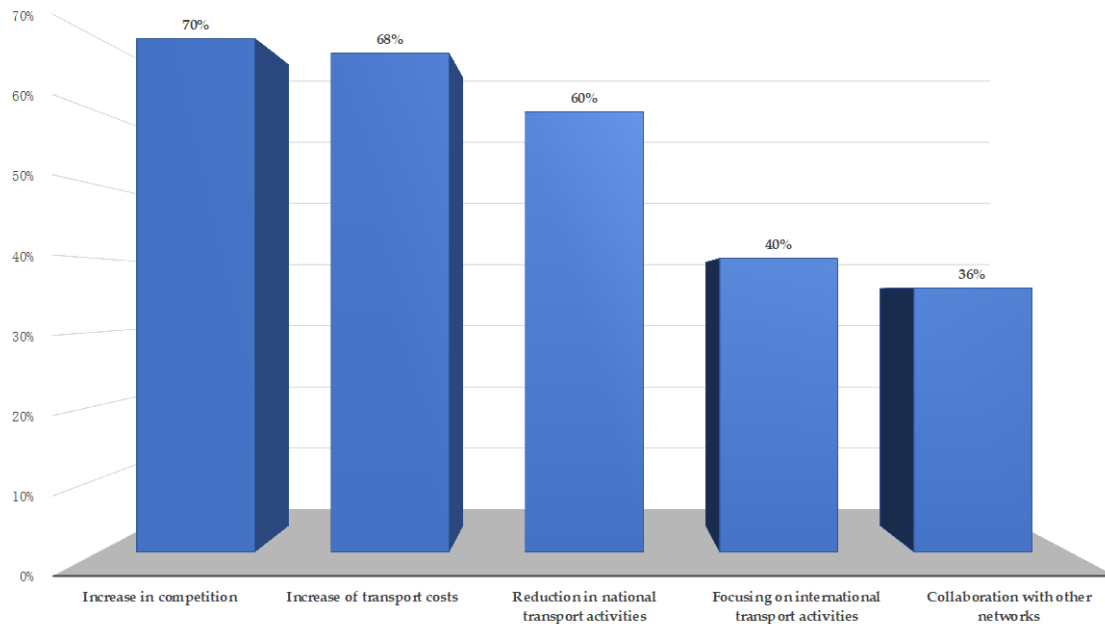
**Figure 5.** Expected outlook for the Greek third-party logistics (3PL) sector (immediate future, sector level).

Furthermore, Figure 6 demonstrates the surveyed 3PL executives' predictions for their companies for the next 1–2 years. The competition in the 3PL sector is foreseen to increase (70%), owing to the dynamic business conditions which, in combination with the expected increase in transportation costs (68%), leads to decreased profit margins and impacts the balance between cash flow inputs and outputs. In this sense, 3PL companies are actively seeking to reduce national transport activities (60%) and establish international logistics activities (40%) as a viable business option. International activities are expected to establish cooperation with reliable customers able to fulfill their financial obligations. Involvement with other networks is also expected (36%) to safeguard business operations and liquidity.

Our study results reveal that logistics performance is significantly linked to national economic performance. The main convergence points, as per the surveyed executives' views, are:

- Demand forecasting is a complex process—Demand prediction is difficult even for firms' loyal customers. The main underlining challenges refer to the collection of reliable demand information and the lack of proper communication with the customers.
- Continuous partner evaluation is essential—Continuous monitoring and assessment of partners is required to redefine collaborative relations. In this sense, short-term and flexible contractual agreements are regarded as beneficial, considering demand volatility as well.
- Inventory management and control needs revision—Meticulous inventory management and control should be redefined from the basis of full service to cost efficiency.

- Customer selection should be more rigorous—Logistics service providers should evaluate and select their customers. In simple terms, logistics managers should explore cooperation with trusted customers who are able to fulfil their business obligations, as the financial liquidity problem in the Greek logistics sector is growing.
- Warehouse operational efficiency should increase—The increased workload of staff in warehouse/distribution centers results in decreased productivity, particularly at peak times. In this regard, logistics managers should explore solutions to increase productivity while minimizing the operating costs in warehouse/distribution centers.



**Figure 6.** Expected outlook for the Greek 3PL individual companies (immediate future, company level).

## 5. Conclusions

In today's global trade environment, a paradoxical phenomenon is evident in the sector of logistics services [9]. On the one hand, logistics operations across end-to-end supply networks have become more complicated and vulnerable to both macroeconomic and microeconomic level factors. Nevertheless, economic crisis events encourage supply chain managers to explore inventive practices to overcome the associated challenges.

This research investigates the above paradox by attempting to systematically identify challenges and effects of economic recession on logistics services and outlines potential response strategies and opportunities, particularly for the case of Greece. To that end, this research set three research questions and applied different methodologies to address them. Especially, RQ#1 concerned the repercussions of economic crisis on the functional areas of logistics services and it was tackled through a critical taxonomy of the extant literature, along with a text mining and co-occurrence analysis of related terms. The findings indicate the close relationship between economic crisis and logistics; detailed repercussions of economic crisis on each functional area of the national logistics services sector are also identified. Furthermore, a questionnaire-based survey provided answers to RQ#2 and demonstrated that reduced prices requested by major customers, along with reduced market and production orders, severely impact the viability of logistics operations. The primary survey also assisted in answering RQ#3 through revealing the concerns of business stakeholders about the shrinkage of the national logistics sector due to the increasing competition and transportation costs.

In principal, the recent economic crisis had a significant negative impact on the sector of logistics services in Greece. However, there are companies that demonstrate growth through increased operating

profits due to appropriate strategic management decisions. More specifically, the study findings reveal that the dismal economic conditions have significantly affected logistics service providers, particularly the firms in the transportation and distribution sector. In this regard, a significant deficit in their operating profits that negatively impacts their core functions and practices is observed. The reduction in operating profits of transport companies is noticeable with the onset of the economic crisis, specifically in 2016.

Nevertheless, there seems to be optimism regarding the near future of the logistics landscape. Despite the challenges, it is well apprehended that there is the possibility of harnessing new business opportunities within the economic crisis era. Executives recognize the following main reasons for potential growth within the economic crisis era: improved sales' performance, increased sales due to exports, lower operating costs, increased sales due to the development of new and improved provided services. Regarding the main inhibiting factors, these include: higher interest rates, low growth in prices, increased fuel costs and cost of utilities (i.e. electricity, gas, etc.), and reduced sales. Zaman and Shamsuddin [53] extend this view by further highlighting the significance of the aforesaid relations, especially with regard to 'green' logistics.

This study also has some limitations that provide stimulating grounds for extending our research. Firstly, the provided analysis is based on a taxonomy of the extant literature, a text-mining and co-occurrence analysis of relevant terms, and the case study of Greece. Primary evidence for other countries that have been severely impacted by the recent economic recession in Europe, e.g. Italy, Portugal, Spain, would assist in verifying and extending our results. A further analysis including non-European countries could also enhance the resulting academic contribution by exploring the effect of social factors on the national logistics sectors' performance during economic crisis periods. Secondly, the prioritization of the challenges was not based on a design of experiments process that would allow us to unveil interconnections and the cumulative effect of the identified economic recession factors.

With respect to future scientific directions, we aim to develop a simulation tool for capturing the impact of multi-level challenges and alternative strategic management options on the performance of logistics at either a sector or national level. In particular, we intend to propose a System Dynamics modelling framework that could be employed by decision-makers and business stakeholders for investigating the impact of alternative strategic decisions on the financial sustainability and viability of the national logistics services sector. System Dynamics is a simulation methodological tool that combines feedback control characteristics that render it as the appropriate tool for decision-making at a strategic level [54]. Moreover, we are planning to perform an input-output analysis to investigate international trade flows and business transactions among the different economic sectors in Greece [55]; our aim is to explore the magnitude of the direct and indirect effects that dictate the prospects of the national logistics services sector.

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