

MASTERS IN
MANAGEMENT AND INDUSTRIAL STRATEGY

MASTER'S FINAL WORK
DISSERTATION

**THE SOCIO-ECONOMIC EFFECTS OF LOGISTICS
INFRASTRUCTURE IMPLEMENTATION IN REGIONAL
DEVELOPMENT**

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Abstract

This dissertation provides new insights on the socio-economic effects that logistics infrastructure implementation can have in shaping regional socio-economic dynamics, regional competitiveness and development.

In order to analyse it, this study based itself on the Growth Pole Theory developed by François Perroux in 1950's, which defends that economic growth begins in specific "growth poles" and then spreads throughout the broader economy, representing these poles concentrations of industries that drive economic expansion, which then influence surrounding sectors through various mechanisms.

Within those mechanisms, the Multiplier Effect stands out, as according with it the expanding impact of a primary industry has an effect on other sectors, creating this connection a ripple effect that strengthens the regional economy. Based on this theory, this study aimed to analyse the socio-economic effects of logistics infrastructure investment on its surrounding areas.

To this end, the Portuguese Average Multiplier Effect of Logistics Infrastructures Investment on GVA was assessed, alongside the socio-economic transformations observed in Azambuja municipality between 1981 and 2022, relying for that both on quantitative (such as socio-economic indicators, socio-demographic data, and employment rates) and qualitative data (case studies) from institutional sources.

The results found demonstrated that Azambuja has the characteristics of a growth pole as it has attracted investment, fostered innovation, and strengthened the tertiary sector in surrounding areas. Furthermore, it has also proven, that the integration of logistics infrastructure into the regional supply chain acts as a strategic lever for economic competitiveness, territorial cohesion, and long-term sustainable growth of a given region.

Lastly, this research also demonstrated that the strategic development of logistics infrastructure, such as the one seen in Azambuja, can create long lasting socio-economic benefits on the broader economy, acting as a key driver of competitiveness, cohesion, and resilience in a changing socio-economic landscape.

Keywords: Growth Pole, Logistics Infrastructure Investment, Multiplier Effect, Regional Development and Socio-Economic Effects

Resumo

Esta dissertação disponibiliza novos pontos de vista sobre os efeitos socioeconómicos que a implementação de infraestruturas logísticas pode ter na dinâmica socioeconómica, competitividade e desenvolvimento de uma dada região. De modo a analisá-los, este estudo baseou-se na Teoria dos Polos de Crescimento, desenvolvida por François Perroux em 1950, que defende que o crescimento económico começa em Polos de Crescimento específicos e, em seguida, espalha-se por toda a economia, representando estes polos, concentrações de indústrias que promovem a expansão económica e que por sua vez influenciam setores adjacentes através de vários mecanismos.

Dentro destes mecanismos, destaca-se o Efeito Multiplicador, segundo o qual o crescente impacto de uma dada indústria afeta outros setores circundantes, criando através desta conexão, um efeito em cadeia que fortalece a economia regional. Deste modo, com base nesta teoria, este estudo teve como objetivo analisar os efeitos socioeconómicos do investimento em infraestruturas logísticas no desenvolvimento regional.

Para este efeito, efetuou-se o cálculo do Efeito Multiplicador Médio Português do Investimento em Infraestruturas Logísticas no VAB, assim como, analisou-se simultaneamente as transformações socioeconómicas observadas no município da Azambuja entre 1981 e 2022, recorrendo para isso a dados quantitativos (como indicadores socioeconómicos, dados sociodemográficos e taxas de emprego) e qualitativos (estudos de caso) de fontes institucionais fidedignas.

Os resultados obtidos evidenciam que a Azambuja apresenta o comportamento típico de um “Polo de Crescimento” Logístico, o qual é capaz de atrair investimento, promover a inovação e de fortalecer o setor terciário regional. Adicionalmente, a integração de infraestruturas logísticas na cadeia de abastecimento regional manifestou-se enquanto alavanca estratégica para a competitividade, coesão territorial e crescimento sustentável a longo prazo. Por fim, esta dissertação provou também que o desenvolvimento de infraestruturas logísticas pode gerar benefícios socioeconómicos duradouros, impulsionando a competitividade, coesão e resiliência de uma dada região.

Palavras-Chave: Desenvolvimento Regional, Efeito Multiplicador, Efeitos Socioeconómicos, Investimento em Infraestrutura Logística e Polos de Crescimento

List of Abbreviations

APLOG – Associação Portuguesa de Logística (Portuguese Association of Logistics)

CAPEX – Capital Expenditure

DGARTES – General Directorate for the Arts (Direção Geral das Artes)

EUROSTAT – The Statistical Office of the European Communities

GEE – Strategy and Studies Office (Gabinete de Estratégia e Estudos)

GEP – Strategy and Planning Office (Gabinete de Estratégia e Planeamento)

GVA – Gross Value Added

INE – Statistics of Portugal (Instituto Nacional de Estatística)

LMA – Lisbon Metropolitan Area

MOPTC – Ministry of Public Works, Transportation and Communications (Ministério das Obras Públicas, Transportes e Comunicações)

NUTS – Common Nomenclature of Territorial Units for Statistics

PLLN – North Lisbon Logistic's Park (Parque Logístico Lisboa Norte)

ROI – Return on Investment

VAB – Valor Acrescentado Bruto (GVA)

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1. Introduction

Playing a pivotal role in regional development, logistics enables the efficient movement of goods, services and information, being thus the base of any society and economy. Moreover, logistic infrastructure implementation also allows the connection of peripheral areas providing them access to main markets and goods, and at the same time promoting income diversification, job creation, business growth, workforce qualifications upgrade, unemployment reduction as well as attracting new investments. Therefore, this dissertation aims to further explore the socio-economic effects that logistics infrastructure implementation has in regional development.

As noted, logistics infrastructures are critical to society; as they allow the efficient movement of goods, services, and information, being thus a basic structure for modern economies and enabling communities to access basic resources and opportunities (Karayun *et al.*, 2012). Furthermore, they also play a key role in advancing regional socio-economic development, a relationship that is gaining recognition across academic and policy-making spheres, as studies indicate that effective logistics infrastructure can foster regional connectivity, lower costs of living (by lowering imports and exports costs), enhance market accessibility, support economic diversification through the growth of the demand for support services, while contributing to an overall uplift in socio-economic conditions (Karayun *et al.*, 2012; Vieira *et al.*, 2022) (Figure 7, Appendix).

Effective logistics infrastructure connects regions both domestically and globally, facilitating the movement of goods and services. Besides, it also promotes socio-economic development, attracts investments, and creates job opportunities, elevating the living standards in regions with restricted connectivity (Karayun *et al.*, 2012; Norman, 2013; Vieira *et al.*, 2022).

To study these benefits, this dissertation focused itself on the Growth Pole Theory developed by François Perroux in 1950's, exploring its Multiplier Effect mechanism in order to understand how logistics infrastructure implementation can affect its surroundings in a multiplying way (Darwent, 1969). Consequently, in order to do it, Azambuja's municipality socio-economic indicators from 1981 to 2023 were studied, and

the Portuguese Average Logistics Infrastructure Investment Multiplier Effect on GVA was calculated (Table 11).

Although the mentioned benefits, the establishment and expansion of logistics activities can also present significant challenges for local communities, as developments in logistics infrastructure may disrupt established social systems, affect land use, disturb local ecosystems, and change natural landscape, damage roads and houses due to the passage of heavy vehicles. In addition, it might also increase the possibility of accidents and traffic disturbances due to an increase in heavy traffic, decrease levels of security (as logistics centres can become targets for criminal acts such as cargo theft, smuggling, or illegal dumping), decrease property values in the surrounding area, and potentially lower quality of life due to increased visual effects, noise, and air pollution; thus, affecting therefore a number of social determinants (Norman, 2013) (Figure 5, Appendix).

Therefore, this dissertation aims to illustrate the multifaceted role of logistics infrastructure implementation and its integration with regional development from a systematic perspective, while also addressing its social and economic effects. Additionally, it also seeks to access its multiplier effect in surrounding areas, as well as to discover the GVA output to the Portuguese economy for every euro invested in logistic infrastructures. These insights are intended to support decision-makers and companies in conducting their activities with a stronger focus on socio-economic responsibility. Given that the objective of this study is to examine the effects of logistics infrastructure on regional socio-economic indicators and regional welfare, a critical research question arises to further this dissertation and guide policies that encourage sustainable and equitable logistics development:

"How can the implementation of a logistic infrastructure act as a Growth Pole and how does it socio-economically affect its surroundings in a multiplying way?"

2. Literature Review

This section aims to give a thorough review of the research topic on the relationship between the investment in logistics infrastructure and the socioeconomic effects on its surrounding areas. Besides, it also aims to provide background information and help the reader understand the analysis carried out during the study.

First, prior research is reviewed providing an overview of the different categories of logistics infrastructure and the factors that influence their selection, highlighting how crucial logistical infrastructure is to both regional and international trade. Afterwards, it examines the socioeconomic effects of logistics infrastructure implementation, with a focus on how logistic infrastructures act as economic drivers that foster surrounding industries and regional development, analysis which is framed within the context of the “Growth Pole Theory”.

Lastly, to help readers comprehend the analyses and findings reported in the study, this section combines relevant literature and provides essential background aiming to offer a thorough understanding of the dynamic relationship between logistics infrastructure and socio-economic effects that follows.

2.1. Logistic Infrastructure Categories and Choice Factors

By acting as the backbone of supply chains, logistics infrastructure enables the effective movement of goods, raw materials and resources between distribution centres, marketplaces and production facilities, while guaranteeing reliable, timely and cost-effective deliveries. According with the study “The Geography of Transport Systems”, conducted by Rodrigue *et al.* (2006) logistics infrastructure are divided into five main components: supply chain support infrastructure, freight hubs and terminals, storage and distribution facilities, and transportation infrastructure; which by working together create a network that improves the efficiency and dependability of global trade (Rodrigue *et al.*, 2006).

By using one or more of the main means of transportation (such as air, sea, train and road), logistics are able to get to any location, playing warehouses and distribution centres a relevant role in effective distribution and storage operations. Moreover, ports and terminals provide smooth transitions between transportation modes (accelerating the

movement of commodities), while multimodal or intermodal transport solutions, along with associated information systems, facilitate flexibility, efficiency, and performance enhancement of logistics operations (Rodrigue *et al.*, 2006).

Furthermore, the selection of the appropriate mode of transportation plays also a crucial role for supply chain efficiency and cost management, as different key factors influencing this decision (include cargo characteristics, time sensitivity, distance, transportation costs, infrastructure availability, regulations, risk, and sustainability) must be considered (Rodrigue *et al.*, 2006).

In order to meet particular logistical needs, a well-balanced approach takes these factors into account, as by strategically integrating them firms and nations can boost their logistics capabilities, increase their trade competitiveness, and promote sustainable economic growth (Rodrigue *et al.*, 2006).

2.2. Logistics Infrastructure Implementation & Regional Development

As stated, logistics infrastructure implementation refers to the structured process of conceiving, building, and finally implementing physical and organizational structures that will be needed for effective transportation, storing, and handling of goods, services, and information. Furthermore, it also encompasses transportation networks, warehousing facilities and processes that enhance supply chain efficiency and connectivity, including in this way all physical and systemic assets essential to this activity (Sheffi, 2012).

Logistics infrastructure implementation plays a relevant role in regional development as it enhances both regional efficiency, productivity and regional business competitiveness, as well as enhances the flow of goods and services and market accessibility. Besides, it also reduces transport costs and fosters economic diversification and integration of regions, creating a symbiotic relationship that attracts both national and international investments and fosters inter-regional trade, collaboration and development (Karayun *et al.*, 2012) (Figure 6, Appendix).

The implementation of logistics infrastructures in a given location (e.g. logistic parks), can lead to the development of logistics hubs, significantly enhancing regional resilience, especially during economic shocks and disruptions in global trade. It's concentration of networks of distribution, services, and transportation, allow regions to

quickly adjust to shifts in supply or demand, preserving their economic stability in uncertain times and fostering synergies with nearby communities, that promote economic recovery and regional resilience during times of crisis (Karayun *et al.*, 2012; Yingxiu *et al.*, 2017).

2.3. Transition to a Logistics Based Economy

From the 1970's to the early 1990's, logistic providers began repurposing existing historical industrial zones into logistics areas, as the demand for new manufacturing sites declined, creating in a first instance the first logistic areas nearby metropolitan areas. Since then, new warehouses have been set up in increasingly remote suburbs away from inner urban areas to outer-suburban areas, a phenomenon also known as “logistics sprawl” (Raimbault & Bahoken, 2014; Sakai *et al.*, 2020).

This transition marks a significant shift in the socio-economic and political characteristics of logistics territories, as the new outer-suburban logistics zones are established in municipalities with smaller populations compared to those in the previous period. Furthermore, these areas, by lacking any industrial history, tend to become highly specialized, with their development often being limited to logistics activities (Raimbault & Bahoken, 2014; Sakai *et al.*, 2020).

In contrast to the working-class profile of the initial logistics hubs, the population in the new logistics areas tends to have an intermediate socio-economic profile, with an over-representation of intermediate professions such as technicians, civil servants, and lower supervisory roles, and incomes that are close to the regional average. In fact, this transition becomes even more expressive if we consider that the logistics industry is one of the few sectors experiencing blue-collar jobs growth, concerning both warehousing and deliveries, being 80% of its workers' blue-collars (Bonacich. Edna & Alimahomed-Wilson, 2008; Sakai *et al.*, 2020).

Furthermore, with the decline of manufacturing areas and associated jobs, logistics blue-collar workers have become the dominant group within the blue-collar workforce in large urban regions, often outnumbering those in manufacturing. As a result, logistics zones have emerged as key blue-collar workplaces in contemporary post-industrial metropolises (Bonacich. Edna & Alimahomed-Wilson, 2008; Sakai *et al.*, 2020).

2.4. Logistics Hubs and Their Role in Shaping Regional Economic Landscape

Logistics influence in shaping a given country's economy, can be understood through the "Growth Pole Theory", formulated by the economist François Perroux in the 1950's and according to which, economic growth begins in specific "growth poles" and then spreads throughout the broader economy. By representing a concentration of a given industry, these poles, drive economic expansion and end up influencing surrounding sectors through various mechanisms (Dai & Yang, 2013) (Figure 8, Appendix).

Logistic hubs can function as a growth poles, as by accumulating logistics functions and industrial operations end up not only producing economies of scale but also influencing other regional industries through mechanisms like the Dominance, Multiplier and Polarization-Diffusion Effects (Dai & Yang, 2013; Montwiłł *et al.*, 2021).

2.4.1. Dominance Effect

The first, the "Dominance Effect" arises when larger economic units or growth poles exert influence over smaller, related industries (the "Dominance" occurs when the flow of goods and services from industry J (dominant) to industry I (dependent) is a greater proportion of J's output than is the flow from I to J of I's output) (Dai & Yang, 2013).

By combining industrial and logistical operations, logistics hubs act as growth hubs that enhance the expansion of associated sectors such as warehousing, distribution, processing, and information management. As a result, the Dominance Effect takes place as these sectors benefit from the park's expansion, which then boosts local economic activity (Dai & Yang, 2013).

2.4.2. Multiplier Effect

The second, the Multiplier Effect refers to the expanding impact of a primary industry on other sectors. This theory is based on the idea that dynamic economic activity impacts local and regional economies and multiplier effects are the basic mechanism whereby a growth pole affects its surroundings (Dai & Yang, 2013; Montwiłł *et al.*, 2021).

By having close linkages to industries such as manufacturing, transportation, warehousing, and information technology, logistic hubs, support the growth of an interconnected network of industries. Thus, the implementation of logistics infrastructure in a given location ends up stimulating job creation, production levels growth and

generating higher economic returns, creating a ripple effect that strengthens a region's economy (Dai & Yang, 2013; Montwiłł *et al.*, 2021).

2.4.2.1. Multiplier Effects of Logistics Investment on Regional Development

The measurement of the multiplier effect of Logistics Infrastructure Investment on regional development can be done by assessing the number of jobs created, the business revenue generated, or the GVA growth due to their implementation, with the former being the more frequently used measure due to its reliability (Domanski & Gwosdz, 2010).

Basic multiplier-effect calculations, based on economic base theory, compare total economic activity or employment in a given city or region with its economic base. Afterwards, through regression models, these multipliers can be estimated, using either multi-city or single-city data over a longer period. Additionally, in order to increase accuracy of the results produced, some studies evaluate multiplier effects in terms of value added, such as gross domestic or regional product, personal income, employment and demographic levels (Domanski & Gwosdz, 2010; Montwiłł *et al.*, 2021).

The multiplier effect, through supply-side and income-type mechanisms, shows how initial economic activities, like establishing a logistics centre, lead to greater economic impact. As manufacturing investments intensify, more labour and resources are required, creating this a cycle of spending and increasing demand through the supply-side effect. On the other hand, the income-type effect increases consumption as workers spend more of their wages (due to higher purchasing power), as well as demand and prompts businesses to hire or produce more (Domanski & Gwosdz, 2010; Montwiłł *et al.*, 2021) (Figure 1).

As a result, this raises income and consumption, which perpetuates the cycle and demonstrates how spending money produces additional economic benefits that magnify the initial effect. Within its outcomes, higher construction activity, increased tax revenue, the development of social and technical infrastructure, and the creation of new manufacturing and service industries can be highlighted for their contribution towards economic growth, improved public services, and a more diversified economy (Domanski & Gwosdz, 2010; Montwiłł *et al.*, 2021).

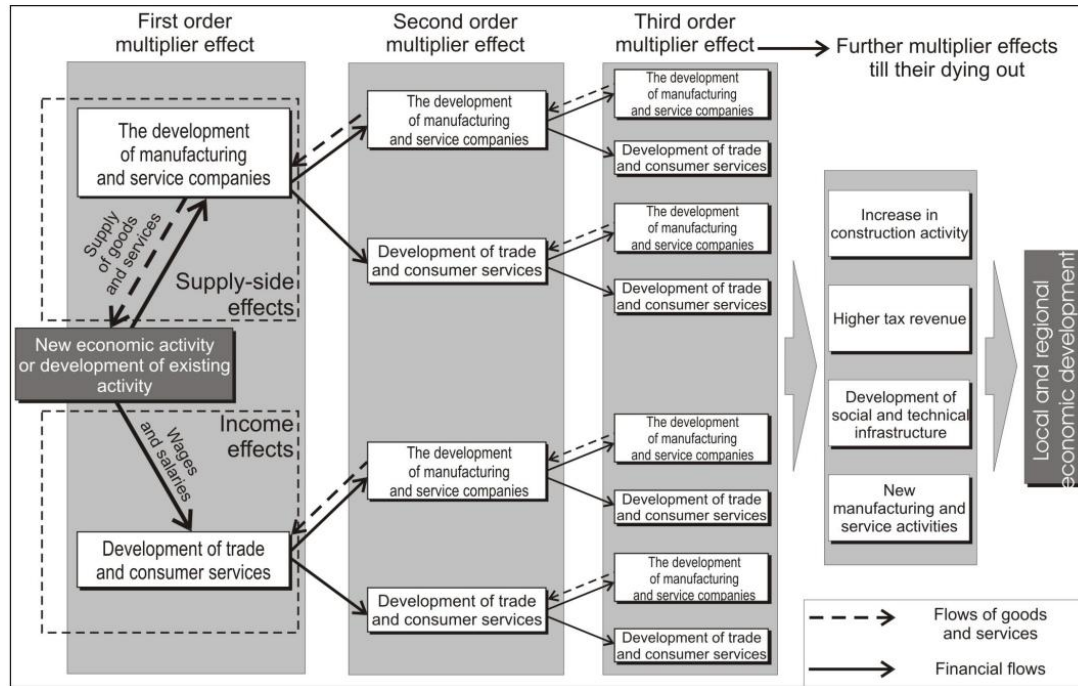


Figure 1: Mechanism of Supply-Side and Income-Type Multiplier Effects. **Source:** (Domanski & Gwosdz, 2010)

In order to help policymakers understand the broader economic impacts of a given project's execution in terms of long-term growth, wealth development, and job creation, it becomes crucial to assess its multiplier effect when granting tax incentives to firms. The reason behind it is due to the fact that this evaluation helps to ensure that tax incentives result in substantial and sustainable benefits for the local economy, avoiding the misuse of public funds on projects that may not deliver the expected outcomes, prioritizing investments with the greatest overall benefit and ROI, and ensuring efficient use of resources (Gavrila-Paven & Bele, 2017; Montwiłł *et al.*, 2021).

2.4.3. Polarization-Diffusion Effect

Finally, regarding the Polarization-Diffusion Effect, it occurs in two stages. Known as the “Polarization Process”, the first happens when an investment due to its competitive advantages, attracts resources such as capital, labour and technology. These phenomena end up leading to a high concentration of a given economic activity in a certain area, generating this way geographical and economic polarizations. Its rapid growth creates a cluster effect by attracting other industries that end up generating economies of scale, process which can be used for logistic investments effects analysis (Dai & Yang, 2013).

The second, “Diffusion Process”, focus on the outward spread of the benefits generated by the growth pole to surrounding areas, diffusion which leads to the establishment of regional logistics systems, generating a broader economic impact and increasing income in the surrounding areas (Dai & Yang, 2013).

The influence of Logistics Infrastructure, as a growth pole, mainly depends on its quality and logistics systems, as strong internal and external connectivity enables the attraction of labour, technology, and investment, ultimately driving regional economic development (Dai & Yang, 2013).

2.5. The Socio-Economic Effects of Logistics Infrastructure Implementation

The integration of the logistics system with socio-economic development has brought about major recognition of the importance of these infrastructures in providing for economic growth, while considering social wellbeing, and equal and fair regional development, besides creating jobs and enhancing living conditions. Research studies, such as the one conducted by the United Kingdom Department for International Development in 2015 - “Social Dimensions of Transport”, have found that while logistics infrastructure implementation is able to enhance employment opportunities to local communities in disadvantaged locations, it also presents several adverse effects associated with their execution. Therefore, this study stresses the fact that logistics infrastructure projects can lead to environmental issues such as air and noise pollution, as well as to social disruptions in nearby communities, negatively impacting their quality of life (Norman, 2013) (Figure 5, Appendix).

Other studies, such as the one conducted by Bis Henderson (2014), further the economic side of logistics infrastructure implementation, stating that logistics parks are able to create 1389 direct jobs for every 93000 square meters of warehousing (Henderson, 2014), as well as several additional other ones, due to their seasonal and flexible work patterns, indirect and induced effects:

- Indirect effects come from supply chain links: the establishment of a new logistic site requires a wide range of inputs, including the manufacturing, servicing, and repair of machinery and motor vehicles, as well as catering, cleaning, and security services (Economics Frontier, 2022) (Figure 13, Appendix).

- Induced effects arise from the increased purchasing power of individuals employed at the logistics site (Economics Frontier, 2022).

In addition, the study states that it also improves public infrastructure, provides career opportunities and stimulates several off-site service sectors, including vehicle maintenance, catering and cleaning, while also increasing demand for local hospitality businesses, requiring, according to the report, 23 hotel beds for every 93000 square meters of warehousing that are implemented (Henderson, 2014) (Figure 12, Appendix).

Moreover between 2008 and 2019, research studies carried out in the UK, have shown that logistics employment levels have increased in regions that had previously experienced weak economic performance prior to the 2008/2010 recession. Since then, dense logistics areas, despite being outside city centres, having low population levels and a lower-skilled workforce, have outpaced other regions in terms of GDP per capita and employment growth. As a result, regions with higher logistics density experienced an extra 1.3 percentage points of GDP per capita growth from 2012 to 2019, compared to areas in the UK with lower logistics density and similar starting conditions (Economics Frontier, 2022).

These outcomes reinforce the Multiplier Effect discussed earlier in the context of the Growth Pole Theory, as logistics infrastructure serve as an economic driver, generating positive spillover effects across multiple industries and sectors. Among the main benefits of their implementation, supporting economic activities, streamlining trade, and improving market accessibility can be highlighted. While their development promotes hinterland GDP growth, increases annual revenues for local companies, promotes job creation and other positive societal impacts, it's development also presents several challenges that stakeholders' coordination and regulatory control may not always be able to address (Domanski & Gwosdz, 2010; Montwiłł *et al.*, 2021).

Thus, although the positive economic contribution of logistic infrastructure referred above, they can also lead to negative social and environmental outcomes (such as increased traffic congestion, the erosion of existing road infrastructures, rising socio-economic inequalities due to the displacement of affordable housing, higher carbon

emissions and natural resources consumption) that must be taken into account upon their development (Henderson, 2014).

The establishment of integrated logistics centres outside of cities could be one way of reducing these infrastructure's negative effects, as by concentrating several logistics facilities and companies in the same location and streamlining goods from different suppliers, can not only reduce the number of vehicles entering urban areas but improve safety and reduce traffic and pollution levels as well. Therefore, successful logistics centre's location planning can help reduce truck travel kilometres, transport costs, carbon emissions, and congestion, as well as guide the distribution of freight traffic flows and enhance the quality of life of nearby communities, promoting long-term sustainability, and ensuring overall societal benefits (Karayun *et al.*, 2012; Sheffi, 2012; Wang *et al.*, 2023).

Thus, as a key element of economic and social progress, logistics infrastructure implementation requires strategic planning to minimize the environmental impact of transport activities and alignment with broader sustainability goals.

3. Research Methodology

3.1. Methodology Orientations

This chapter aims to present the methodology followed throughout this study, as well as to further explain its investigation process and data collection methods used, enabling readers to evaluate the quality of the research topic. Besides, this chapter is divided into two parts, the development and design of the research approach and the data collection methods employed (Creswell, 2008).

The aim of this study is to access and understand the socio-economic effects that logistics infrastructure implementation has in regional development, adopting for that both a deductive and mixed methods (quantitative and qualitative research) approach.

According to Saunders *et al.* (2023) a "deductive reasoning begins with a general theory or hypothesis and narrows down to specific instances to test its validity", following a logical progression from a broad principle to specific conclusions and being commonly used in scientific studies where hypotheses are formulated based on existing theories and then tested empirically.

Furthermore, according to Creswell (2008) a "mixed methods research is an approach to inquiry that combines both qualitative and quantitative forms of research, involving as well philosophical assumptions", providing a research study with the necessary analysis of numerical and non-numerical data necessary to understand a research problem in a more comprehensive way.

3.2. Research Approach and Design

As stated above, the Deductive Research Approach followed aimed to analyse the relationship between logistic infrastructure implementation and its socioeconomic effects, following for that the mentioned theoretical frameworks, such as the Growth Pole Theory and the Multiplier Effect. This way, it aimed to test and validate those theories in real life contexts (Dai & Yang, 2013; Domanski & Gwosdz, 2010; Montwiłł *et al.*, 2021).

Moreover, to ensure a multidimensional understanding of the research problem, the mixed-methods approach referred above was employed, allowing to capture both statistical trends and contextual insights, as well as to conduct a comprehensive analysis that integrated both quantitative (socio-economic indicators and socio-demographic data) and qualitative data (case studies), taking this way into account the complex nature of logistics infrastructure attributes.

3.3. Sample and Data Collection

According to Malhotra & Dash (2019) a sample is representative of a target population and a list or set of directions for identifying the target population, being those, a group of people that share common attributes relevant for this research. Nevertheless, it is important to stress that it is not representative of a global target population, being consequently not possible to generalize its results.

In order to conduct this analysis, this study followed a structured approach to sample selection and collect data. Therefore, the research done was specifically focused in Azambuja, a key logistics hub located on the outskirts of the Lisbon district. The reason behind this choice lies in its strategic importance in the national supply chain, its high concentration of logistics operations, and its role as a gateway for freight distribution across Portugal and beyond (Mateus *et al.*, 2011).

To ensure the accuracy and reliability of the analysis, official data sources such as Bank of Portugal, Eurostat, Pordata and INE were used to collect historical and up-to-date information on economic and socio-demographic indicators (such as total number of businesses operating, wages evolution, workforce qualifications, unemployment and demographic growth, economic activity and business development) allowing for an in-depth examination of Azambuja evolution over time.

Furthermore, in order to quantify the direct, indirect, and induced effects generated by logistic infrastructure investments in Azambuja region, the following formulas based on the multiplier effect of the Growth Pole Theory were applied:

$$(1) \text{ Multiplier Effect} = Y \text{ in Year } X / I \text{ in Year } X-2$$

Where, “Y” represents the total economic output or total impact of the logistics infrastructure, measured through the evolution of the GVA of the Portuguese Transports and Warehousing sector (including this direct, indirect, and induced effects) and the “I” represents the initial investment made in logistics infrastructure with a two-year lag period (Ganti, 2025; Irtysheva *et al.*, 2021).

Moreover, this research also measured the variation and percentual variation of Azambuja regional indicators in terms of disposable income, employment levels, demographic levels and business activity levels throughout the time between 1981 and 2022, using the respective variation formulas below:

$$(2) \text{ Variation} = (\text{Final Value} - \text{Initial Value})$$

&

$$(3) \text{ Percentual Variation} = ((\text{Final Value} - \text{Initial Value}) / \text{Initial Value}) * 100$$

4. Analysis and Discussion of Results

4.1. Azambuja: From Agrarian Roots to a Logistics Hub

Over the last decades, the municipality of Azambuja once characterized by its rural economy and poor infrastructure services, has passed through significant socio-economic changes, being nowadays one the most relevant strategic industrial and logistical centres of Portugal (Mateus *et al.*, 2011).

Within this transformation, several reasons lie behind, such as its proximity with Lisbon city, having therefore an ideal geographic location that enables to serve Portugal's main commercial, demographic and economic hub easily (Mateus *et al.*, 2011; Silva *et al.*, 2024).

Located at the intersection of the LMA and the rural areas of Lezíria do Tejo and Oeste, Azambuja integrates an important logistical crossroad within the Azambuja, Benavente and Vila Franca de Xira area that is responsible for 60% of Portugal's logistics activity. By being supported by strong infrastructural networks such as the A10 and A13 highways and effective rail services, its location offers quick access to national and international transit corridors, facilitating the rapid movement of both labour and goods. This accessibility enhances Azambuja's attractiveness as a base for industrial and distribution activities, as well as increases operational efficiency for logistics firms that operate through this location (Logistica, 2007; O Mirante, 2024) (Figure 11, Appendix).



Figure 2: Aerial View of the Municipality of Azambuja. **Source:** (Junta de Freguesia de Azambuja, 2024)

Throughout the years, more than 214.2 hectares have been allocated for industrial and logistics development in Azambuja, elevating its logistical prominence and making it one of the largest zones of its kind in Portugal. Furthermore, nowadays this area hosts major logistics operators such as Auchan, Sonae, Jerónimo Martins and Luís Simões, being the majority of its land either already occupied or under active development, further embedding Azambuja within critical supply chains and integrating it within regional and national logistics strategies (Mateus *et al.*, 2011; O Mirante, 2024; Silva *et al.*, 2024).

Azambuja's socio-economic shift through wards a logistics ecosystem has led to a strong multiplier effect, as the expansion of this sector contributed to the growth of a variety of interrelated industries, such as transportation, warehousing, construction, retail, and manufacturing. Therefore, this effect not only stimulated job creation within the core logistics sector but also across a wide range of ancillary services, including equipment maintenance, packaging, information technology systems, and hospitality. Attracting, both upstream suppliers and downstream clients, amplifying the region's overall economic output and reinforcing its competitive advantage (Irtysheva *et al.*, 2021; Raimbekov *et al.*, 2016; Rodrigue, 2012).

Consequently, the multiplier effect of logistics infrastructure investment in Azambuja brings about several direct socio-economic benefits to this municipality, as well as promotes its territorial cohesion, innovation and employment levels growth, making it a model for logistics-driven regional development (Raimbekov *et al.*, 2016).

4.2. Azambuja's Socio-Economic Shift

4.2.1. Evolving Employment Landscape

Over the last years the municipality of Azambuja has undergone a significant change in the composition of its employed population, which was marked by a substantial rise in the employment within the tertiary sector. According with the data extracted from INE, the share of employment within this sector rose from 72.6% in 2013 to 83.4% in 2021, marking a decisive shift towards a service-oriented economy (GEE - INE & Eurostat, 2024) (Figure 2).

Furthermore, this transformation can also be seen, through the analysis of the sectorial specialization index of Azambuja, which according with INE, this municipality exhibited in 2016 a high degree of specialization in the Transports and Warehousing (4.04),

Agriculture, Forestry and Fisheries (1.30) and Business Services (1.15) sectors (Rosa *et al.*, 2020) (Figure 3).

Moreover, it's important to stress that according to this index, values above 1 indicate that a given sector holds greater relative importance locally than it does nationally, whereas values below 1 signal underrepresentation (Rosa *et al.*, 2020).

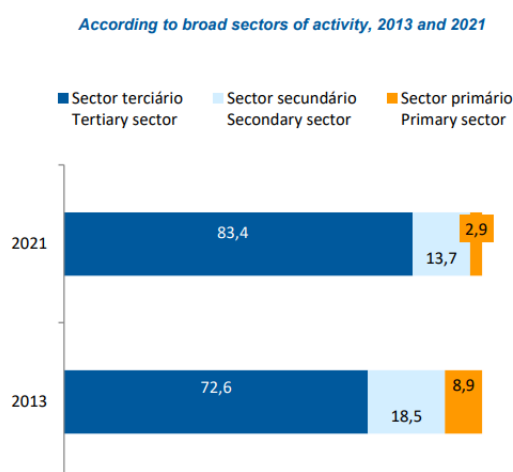


Figure 3: Employees by Sector of Activity (2013-2021). **Source:** (GEE - INE & Eurostat, 2024)

Localização / Atividade	Agricultura, silvicultura e pescas	Ind. Extrativa	Ind. Transformadora	Construção	Energia, Água e Saneamento	Transportes e Armazenagem	Comércio	Serviços empresariais	Hotelaria e Restauração	Educação	Saúde e Apoio Social	Outras Atividades (inclui Cultura)
AML	0,27	0,14	0,42	0,76	0,94	1,27	0,95	1,59	1,12	1,18	1,24	1,20
Vila Franca de Xira	0,19	-	0,82	0,66	0,71	3,46	0,93	1,22	0,55	0,77	1,33	0,66
Alcochete	1,21	0,00	0,58	0,91	1,39	0,75	1,77	0,78	0,77	1,41	0,74	0,97
Almada	0,18	0,07	0,27	0,84	1,30	0,94	1,20	1,20	1,32	2,12	1,57	1,61
Amadora	0,09	-	0,43	0,80	0,18	0,45	1,31	1,56	1,09	0,89	1,01	0,86
Barreiro	0,13	-	0,70	0,86	0,64	0,84	1,25	1,02	1,12	1,68	1,35	1,25
Cascais	0,16	-	0,26	0,80	1,78	0,71	1,09	1,25	1,62	1,81	1,45	0,89
Lisboa	0,19	0,10	0,14	0,41	0,69	1,43	0,71	2,09	1,37	1,10	1,18	1,11
Loures	0,19	-	0,65	0,90	2,62	2,16	1,19	1,02	0,82	0,78	1,49	0,70
Mafra	0,73	0,14	0,66	0,93	0,92	2,62	1,05	1,10	0,87	1,08	0,79	1,03
Moita	0,50	0,00	0,95	1,40	0,31	0,65	1,13	0,77	0,92	1,49	1,67	1,49
Montijo	2,78	-	0,62	0,72	0,66	0,85	1,17	0,92	0,90	1,06	1,07	0,65
Odivelas	0,17	0,00	0,48	1,39	0,19	0,82	1,15	1,31	0,83	1,49	1,40	1,33
Oeiras	0,10	-	0,27	1,04	0,85	0,73	1,01	1,90	0,68	0,91	1,46	0,49
Palmela	0,82	0,00	1,94	1,01	0,96	0,93	0,74	0,77	0,52	1,13	0,86	0,75
Seixal	0,14	0,25	0,69	1,20	0,95	0,75	1,18	1,02	0,91	1,90	1,38	1,68
Sesimbra	1,56	3,66	0,32	1,39	0,19	0,72	1,12	0,88	1,47	1,03	1,49	1,53
Setúbal	0,49	0,21	0,73	0,84	1,38	1,07	1,00	1,23	1,08	1,20	1,39	1,08
Sintra	0,19	0,44	0,79	1,18	1,16	0,81	1,15	1,16	0,94	1,16	0,95	1,34
Oeste	1,90	1,77	1,07	0,97	1,01	1,15	1,22	0,63	0,87	0,96	0,76	0,87
Lezíria do Tejo	2,50	2,62	1,03	0,76	1,54	1,36	1,13	0,64	0,71	0,83	0,89	0,96
Azambuja	1,30	0,00	0,83	0,46	0,80	4,04	0,99	1,15	0,38	0,39	0,61	0,63

Figure 4: Degree of Employment Specialization by Activity Sector in 2016. **Source:** (Rosa *et al.*, 2020)

Through the analysis of the figures above, it becomes clear that Azambuja's economic structure is heavily oriented towards logistics, agriculture and business services activities, while sectors such as extractive industries, tourism and education remain relatively underrepresented. Even though the shift towards the tertiary sector mimics wider national trends, it is undoubtedly more pronounced in Azambuja, reflecting its strategic emergence as a logistics and industrial hub within the Lisbon District (Rosa *et al.*, 2020).

As the economic benefits start emerging from a given initial investment, this transition can also be analysed in the light of the multiplier effect generated by strategic investments in logistics infrastructure that lead to broader gains across various sectors of a given economy.

Besides Azambuja's dynamic shift was strongly influenced by the significant road and rail infrastructures, industrial areas and logistic platforms (such as the Azambuja Green Logistics Park) investments that happen since the 1980's. Taken together, these investments have made this municipality as an attractive location for major logistics operations (such as distribution centres and supply chain hubs), as well as leveraged it due to its proximity to Lisbon and strategic location along the Sacavém–Entroncamento corridor.

Within its effects, this investment brought about several direct effects in terms of employment creation in areas such as warehousing, transportation, inventory management, and logistics coordination. Moreover, areas like the operation and maintenance of logistics facilities and support services (ranging from security and IT to administrative and managerial roles) also grew in demand, explaining once again the rise in the tertiary sector levels of employment observed in the chart graft above (GEE - INE & Eurostat, 2024; Raimbault, 2019; Rodrigue, 2012) (Figure 2 and Figure 13, Appendix).

Besides the effects mentioned above, these investments also led to equally important other ones, as local suppliers, service providers, and contractors benefited from increased business opportunities, further reinforcing employment across the municipality. Beyond that, other induced effects emerged as well, as increased household income from these logistics-related jobs boosted consumption of local goods and services, stimulating sectors like retail, real estate, food services, and entertainment, contributing again to tertiary sector growth (Rodrigue, 2012).

4.2.2. Workforce Qualifications and Wage Level Transformation in Azambuja

Expressive transformations, such as the ones analysed above, have transformed Azambuja over the past decades. Within those, workforce qualifications level upgrade can also be highlighted, as it can be directly associated to the multiplier effect generated by the long-term investment in logistics infrastructure that has impacted multiple dimensions of Azambuja's development (Raimbault, 2019).

According to Pordata between 1981 and 2021, Azambuja's assisted to a decline in its illiteracy rates that decreased from 23.8% in 1981 to just 3.5% in 2021, exceeding over the same period the national average decline (that reduced from 18.3% in 1981 to just 3% in continental Portugal), marking a 20.3 percentage point reduction in the municipality over this period. This improvement not only reflects national education policies that were put in action but also a localized link to the growing demand for a qualified labour force. Consequently, with the growth of the logistics sector in this region, the need for skilled operational, administrative, and managerial roles also grew, incentivizing both public and private initiatives toward upskilling and adult education, thereby fostering a more literate and prepared population (Instituto da Segurança Social, 2018; Mateus *et al.*, 2011; A. Pordata, 2024) (Table 1).

Geographic Areas/Years	1981	1991	2001	2011	2021	Total Reduction (2021 vs 1981)
Continental Portugal (NUTS I)	18.3%	10.9%	8.9%	5.2%	3%	-15.30%
Azambuja (Municipality)	23.8%	14.0%	12.7%	6.5%	3.5%	-20.30%

Table 1: Evolution in Illiteracy rates in Azambuja vs Continental Portugal. **Source:** “Municípios: Taxa de Analfabetismo segundo os Censos Total e por Sexo - Excel File” (A Pordata, 2024)

Regarding Azambuja's illiteracy rates decrease, it also aligns with the employment structure shift analysed above, when between 2013 and 2021 this municipality experienced a rise in its tertiary sector employment (Figure 2). As stated, although this trend reflects national tendencies, it can also be imputed to Azambuja's logistics activity growth as its strategic location within the Sacavém–Entroncamento logistics

corridor and its proximity to Lisbon have led to a rise in the development of key logistic projects over the last years that have attracted multinational corporations and large distribution centres (Mateus *et al.*, 2011).

The effects of logistic infrastructure investment multiplier can also be observed both direct and indirectly. About the first, logistics sector generates jobs in warehousing, transport, and supply chain management, while in the latest, local service providers, suppliers, and subcontractors benefit from increased business opportunities that surge from these investments. Besides those, induced effects can also be seen through household income rise (due to logistics-related employment), consumption of local goods and services increase and through the boost in other sector such as retail, food services, real estate and entertainment that reinforce tertiary sector growth (Raimbault, 2019).

Year	Tertiary Sector (Azambuja)	All Employees (Azambuja)	National Average (Portugal)	% Difference Between All Employees Wages in Azambuja and National Average
2017	1083.50 €	1000.30 €	938 €	6.64%
2018	985 €	1019.00 €	953 €	6.93%
2019	1002.30 €	1040.90 €	976 €	6.65%
2020	1032.40 €	1087.90 €	1,009 €	7.82%
2021	1086.70 €	1128.50 €	1,039 €	8.61%
2022	1123.80 €	1178,45 €	1,070 €	10.14%

Table 2: Evolution of Average Monthly Wages in the Tertiary Sector and All Employees in Azambuja Compared to the National Average (2017–2022). **Source:** (GEE - INE & Eurostat, 2024)

Through the analysis of figure 2 and table 1 it's possible to conclude that between 2017 and 2022, Azambuja registered a consistent growth in its employment figures, particularly in the tertiary sector. Furthermore, through the analysis of table 2, whose data was extracted from INE, in 2017, the average monthly wage for the tertiary sector in Azambuja was 1083.50€, significantly surpassing the national average of 938€ by 6.64%. By 2022, this difference had increased to 10.14%, with Azambuja's tertiary sector wages

reaching 1123.80€ compared to the national average of 1070€ (GEE - INE & Eurostat, 2024).

At the same time, overall employees' wages in Azambuja also outpaced the national trend, increasing the percentual difference between all employee wages in Azambuja and the national average from 6.64% in 2017 to 10.14% in 2022, reflecting the growing impact of logistics and its associated industries on the local economy. Taken together, the decline in illiteracy rates, the employment shift toward the tertiary sector and the rising income levels, can be interpreted as manifestations of a broader logistics-induced development cycle, where infrastructure investment hasn't only modernized the economy but also catalysed deep changes (Economics Frontier, 2022; GEE - INE & Eurostat, 2024).

4.2.3. Unemployment Level Throughout Time

The investment that has been occurring in logistics platforms, industrial zones, and road and rail infrastructure since the 1980's across Azambuja has transformed this municipality in a key logistics and industrial hub within the Lisbon District, as well as has brought significant socio-economic transformations to it worth studying (Mateus *et al.*, 2011).

Within those, the unemployment levels in Azambuja shouldn't be overlooked, as from 1981 to 2021, this municipality assisted to consistent decrease in its levels, as well as registered rates below the national average for Continental Portugal (NUTS I) over five decades. By analysing table 3, whose data was extracted from Pordata and respectively Censos, it is possible to compare the unemployment rates in both Azambuja and Continental Portugal (NUTS I) over this period, along with the percentual difference between the two regions, shedding light on the potential impact of logistics investment on unemployment levels in Azambuja (Gouardères, 2025; D. Pordata, 2024).

Through the analysis of table 3 bellow, it's possible to state that in 1981 Azambuja's unemployment rate was lower than the national average (6.6% vs 6.9%), with a percentual difference between them of -4.35%, indicating the existence of a better local job market in this municipality. Ten years later, in 1991, its unemployment rate rose to 8.1% while the national average rate decreased to 6.1%, leading to a percentual difference among them of 32.79% that indicates that a specific local economic factor may have affected this

municipality in that year. Afterwards in 2001, Azambuja's unemployment level decreased to 6.0%, while average national rate remained at 6.9%, a percentual difference of -13.04% that suggests a recovery of Azambuja's job market when compared with its historical performance and the national outlook. In 2011, both Azambuja and Continental Portugal saw an increased in unemployment levels most likely due to the aftermath of the 2008 financial crisis, with Azambuja's rate reaching 11.6% and the national rate rising to 13.2%. Despite the overall rise, the municipality's rate remained lower than the national average, with a percentage difference of -12.12%, indicating again a more stable outlook of logistic areas during economic uncertainty times (D. Pordata, 2024) (Table 3).

Lastly 10 years later, in 2021, Azambuja's unemployment rate was 7.4%, while the national average was 8.1%, resulting in a percentage difference of -8.64% between both and indicating once again a more favourable local job market for Azambuja (D. Pordata, 2024) (Table 3).

Region / Years	1981	1991	2001	2011	2021
Continental Portugal (NUTS I)	6.90%	6.10%	6.90%	13.20%	8.10%
Azambuja (Municipality)	6.60%	8.10%	6.00%	11.60%	7.40%
% Difference (Azambuja vs NUTS I)	-4.35%	32.79%	-13.04%	-12.12%	-8.64%

Table 3: Unemployment Rates in Azambuja vs Continental Portugal (1981–2021). **Source:**

“Municípios: Taxa de Desemprego por Grupo Etário - Excel file” (D. Pordata, 2024)

Over the years Azambuja consistently reported lower unemployment rates when compared to Continental Portugal, except in 1991, when it spiked above the national average. The trends suggest that the successive logistics investments that Azambuja received overtime have had a positive, stabilizing effect in its labour market. As, according with Multiplier Effect Theory, the logistic infrastructure development overtime not only creates direct employment but also fosters the growth of ancillary industries, effect which played a critical role in maintaining lower unemployment rates in Azambuja when compared to the national average, particularly during periods of economic uncertainty (D. Pordata, 2024) (Table 3).

4.2.4. Azambuja's Demographic Growth and Business Boom

The municipality of Azambuja presents an interesting case study of how logistics infrastructure investment can drive economic growth, even in a context of demographic stagnation.

Through the analysis of table 4, whose data was extracted from INE & Eurostat, it is possible to state that Azambuja has maintained a relatively stable population over the past decades, growing only modestly from 19768 in 1981 to 21421 people in 2021, with a peak of 21814 in 2011. The relative stability in its resident population levels indicates that this municipality has a high retention capacity which is most likely supported by quality infrastructure, easy access to essential services and employment opportunities as seen above, contrasting therefore with national rural trends of depopulation (GEE - INE & Eurostat, 2024).

Years	Resident Population of Azambuja According to Census (n° of People)
1981	19768
1991	19568
2001	20837
2011	21814
2021	21421

Table 4: Evolution of the Resident Population of Azambuja According to Census. **Source:** (GEE - INE & Eurostat, 2024)

Through the analysis of table 5, whose data was extracted from INE & Eurostat, it's possible to conclude that Azambuja has experienced a solid expansion in the number of active companies established in its territory, assisting between 2012 and 2022 to a rise of 26% in its numbers in just one decade (from 1614 to 2039, respectively). Due to its limited population growth, Azambuja has relied on labour inflows from surrounding regions to support this expansion, as it enabled this municipality to compensate for the lack of endogenous population and to meet the increasing demands of its growing enterprise base (GEE - INE & Eurostat, 2024).

According to the 2001 Census, Azambuja had 9229 employed residents, yet generated 10397 jobs, a surplus of 1168 jobs, representing a job-to-worker ratio of 113%, meaning that the municipality was not only self-sufficient in employment terms, but also provided jobs to neighbouring municipalities (Mateus *et al.*, 2011) (Table 6).

Year	Number of Companies in Azambuja
2012	1614
2013	1651
2014	1693
2015	1744
2016	1782
2017	1819
2018	1867
2019	1897
2020	1828
2021	1883
2022	2039

Table 5: Evolution of Number of Companies Established in Azambuja According to Census.**Source:** (GEE - INE & Eurostat, 2024)

Indicator	Definition	Value
(1) Resident employed population	Individuals living in Azambuja who are employed	9229
(2) Entries	Workers commuting into Azambuja from other municipalities	4319
(3) Exits	Azambuja residents working outside the municipality	3151
(4) Net employment balance (2–3)	Difference between entries and exits	1168
(5) Total jobs in Azambuja (1+4)	Total employment offered in the municipality	10397
(6) Extra-regional mobility rate $[3/1] * 100$	Share of residents commuting outward	34%
(7) Gross attraction rate $[2/5] * 100$	Share of local jobs filled by non-residents	42%
(8) Attractiveness index $[5/1] * 100$	Ratio of jobs to the local labour force	113%
(9) Job localization rate $[(1-3)/1] * 100$	Residents working within the municipality	66%

Table 6: Mobility Indicators of Azambuja According to INE & 2011 Censos. **Source:** (Mateus *et al.*, 2011)

This fact also aligns with Azambuja business structures, as it's marked by firms usually larger than the national average, which according to INE had on average in 2011 11.6 employees that contrasted with the 7.8 national average (Mateus *et al.*, 2011) (Table 6).

The data analysis mentioned above aligns with the conceptual framework of the multiplier effect explored by the Growth Pole Theory, as they prove that the logistics sector in Azambuja has acted as a core economic driver, attracting large-scale firms, generating employment, and fostering upstream and downstream linkages in a sequel of induced effects. Therefore, the labour inflows mentioned above can be seen as an induced effect of logistic infrastructures investment as external populations are integrated into the local economy to meet rising labour demand. Moreover, the growth in the number of businesses despite population stagnation also reinforces this effect, as increased income levels and employment in logistics lead to new business formation in secondary sectors. Together, these dynamics show how Azambuja has developed itself into a functional growth pole, generating spillover benefits beyond its administrative boundaries and contributing to broader regional socio-economic dynamics (Domanski & Gwosdz, 2010; Irtysheva *et al.*, 2021; Raimbault, 2019; Zhao & Ding, 2024).

4.2.5. Azambuja's Economic Activity Evolution

Through the analysis of table 7 below, whose data was extracted from INE and Pordata, a significant shift in trade profile happened in Azambuja between 2017 and 2023, change largely influenced by its growing role as a logistics and industrial hub within the Lisbon District (GEE - INE & Eurostat, 2024).

Year	Exports (€ '000)	Imports (€ '000)	Trade Balance (€ '000)
2017	134124.50	730188.80	-596064.30
2018	133876.00	537362.40	-403486.40
2019	141180.30	538120.30	-396940.00
2020	135008.30	556445.50	-421437.20
2021	184250.80	592885.00	-408634.20
2022	189515.00	881633.00	-692118.00
2023	177489.00	1130250.60	-952761.60

Table 7: Exports, Imports and Trade Balance Evolution in Azambuja According to Census Between 2017 and 2023. **Source:** (GEE - INE & Eurostat, 2024)

This transition marked the beginning of Azambuja's functional repositioning, where logistics infrastructure and its associated economic activity began to attract wider structural changes not only in terms of employment, education levels and business dynamics but also in trade (GEE - INE & Eurostat, 2024).

Year	Export Growth Rate (%)	Import Growth Rate (%)
2017	—	—
2018	- 0.2	- 26.4
2019	5.5	0.1
2020	- 4.4	3.4
2021	36.5	6.5
2022	2.9	48.7
2023	- 6.3	28.2

Table 8: Exports and Imports Growth Rate in Azambuja According to Census Between 2017 and 2023. **Source:** (GEE - INE & Eurostat, 2024)

According with table 7, between 2017 and 2023, the values of goods entering Azambuja increased from approximately 730 million € in 2017 to 1.13 billion € in 2023, reflecting a 55% increase over the six-year period (INE, 2024). Furthermore, through the analysis of table 8, it's also possible to verify that relevant annual growths occurred in 2021 (6.5%), 2022 (48.7%), and 2023 (28.2%). This growth can be directly linked the operationalization and expansion phases of relevant logistic projects in this area (like the Azambuja Green Logistics Parks which added 115000 square meters of warehousing capacity to this municipality and entered in operation in 2022) (GEE - INE & Eurostat, 2024; O Mirante, 2024).

Meanwhile during this period of time, the municipality of Azambuja also assisted to a growth of its exports although less accentuated, which only increased from 134 million € in 2017 to 189.5 million € in 2022 and decreased back to 177.5 million € in 2023, signalling despite the short variance, a gradual strengthening of its production and distribution base (GEE - INE & Eurostat, 2024).

The comparative difference between import and export volumes in Azambuja's indicates that this municipality acts as a logistics intermediary that receives, processes, and redistributes goods (both nationally and, to a lesser extent, internationally), rather than a traditional production-based exporter. Furthermore, the results achieved, are a

direct indicator of intensified inbound logistics activity in Azambuja, whose strategic location, has made it attractive to import reliant sectors, such as logistics operators, retail distributors, and manufacturing firms. As a result, Azambuja's logistics platforms act as central warehousing and regional distribution hubs that are responsible for the nationwide distribution of goods, directly contributing to the significant increase in import volumes recorded in the region over recent years (Hayaloğlu, 2015; Henderson, 2014; Vieira *et al.*, 2022).

The trade dynamics mentioned, reflects and reinforces the employment and entrepreneurial growth trends in the municipality stated above, which between 2012 and 2022, saw a 26.3% rise in the number of active companies in its territory despite its stable demographic levels (from 1614 to 2039, respectively) (Tables 6, 7 and 8). Through the analysis of tables 5 and 8, it's also possible to see that positive employment balances and favourable job-to-worker ratio were registered since the early 2000's, trend which further complement this evolution (Tables 5 and 8). Furthermore, data from the 2001 Census already pointed to this dynamic, recording 9229 employed residents compared to 10397 local jobs, resulting in a job-to-worker ratio of 113%, indicating that Azambuja attracted more workers than it generated locally (GEE - INE & Eurostat, 2024; Mateus *et al.*, 2011).

The results achieved align with the Multiplier Effect studied by the Growth Pole Theory, as primary investments in logistics stimulated job creation not only in warehousing and transport but also in secondary and tertiary sectors. As a result, a broader and more resilient economic base supported by labour inflows and sustained business dynamism, is formed even in the absence of demographic pressure, producing positive spillover effects that reinforce the theoretical foundations of growth poles as engines of cumulative and territorial development that have a multiplying effect in socio-economic dynamics of nearby surroundings (Irtysheva *et al.*, 2021; Rodrigue *et al.*, 2006).

4.3. Portuguese Logistics Investment Multiplier Effect on GVA

4.3.1. Multiplier Effect Assessment

According to Valfondo Director's Ben Alongo and Julián Labarra, a company dedicated to logistic assets management, 60% of Portugal's logistics activity is concentrated between Vila Franca de Xira, Azambuja, and Benavente. Nevertheless, due to the unavailability of specific logistics data for these regions, it was necessary to

consider the national logistics outlook to assess the effect of logistics investments on Portugal's Gross Value Added (GVA) (O Mirante, 2024).

Consequently, to assess the multiplier effect of the logistics investments on GVA in Portugal, it was first necessary to calculate the Gross Value Added (GVA) generated by its Transportation and Warehousing industry (Table 9). This was done by multiplying the total GVA of the Portuguese economy (Table 11, Appendix), provided by the Bank of Portugal, by the percentage share attributable to the Transportation and Warehousing sector for each respective year between 2010 and 2022 provided by Pordata (Banco de Portugal, 2019; V. Pordata, 2019) (Table 12, Appendix).

(4) GVA by the Transportation and Warehousing Industry in Portugal (M€)
= Portuguese Gross Value Added (M€) × Share of Transportation and
Warehousing Industry in GVA (%)

Year	Gross Value Added by the Transportation and Warehousing Industry in Portugal (M€)	GVA Growth Rate (%)
2010	7427.52	-
2011	7246.36	-2.44
2012	6923.13	-4.46
2013	7192.87	3.90
2014	7103.53	-1.24
2015	7647.95	7.67
2016	7763.76	1.51
2017	8453.57	8.89
2018	8857.87	4.78
2019	9459.17	6.79
2020	7004.17	-25.96
2021	7681.82	9.68
2022	9707.28	26.41

Table 9: Gross Value Added by the Transportation and Warehousing Industry in Portugal (M€ and % variance) between 2010 and 2022. **Source:** (Banco de Portugal, 2019; V. Pordata, 2019)

In order to do it and be able to progress with the analysis, it was extracted from Pordata data relative to the Portuguese annual capex in logistics from 2010 and 2022 (Table 13, Appendix). Besides, to achieve more accurate results and correctly capture the

relationship between logistics' investment and its economic output, it was essential to consider the time-lagged effects associated with infrastructure development, as the full productivity gains and multiplier effects of logistics investments typically manifest only one up to three years after the initial capital outlay (Irtysheva *et al.*, 2021).

Year	Annual Investment in Transports and Warehousing (M€)	Investment in Transports and Warehousing Growth Rate (%)
2010	1341.10	-
2011	2243.30	67.24
2012	1446.90	-35.52
2013	1430.70	-1.12
2014	1343.10	-6.13
2015	1868.00	39.11
2016	1633.90	-12.51
2017	1997.80	22.27
2018	1931.00	-3.34
2019	2184.50	13.13
2020	2113.20	-3.27
2021	2416.80	14.39
2022	3240.40	34.06

Table 10: Annual Investment in Transports and Warehousing in Portugal (M€) between 2010 and 2022. **Source:** (I. Pordata, 2019)

Therefore, unlike static correlation methods, where the multiplier effect of logistics investment on GVA would be calculated by dividing the GVA in year X by the corresponding capex investment in that same year, a dynamic and two-year lag-adjusted approach was adopted in order to address the issue of investment-to-output time lag, take into account temporal dynamics and reflect the full economic effect of this investments overtime (Ganti, 2025; Irtysheva *et al.*, 2021).

(5) Multiplier Effect of Logistics Investment on GVA

$$= \text{GVA in year X} / \text{Logistics Investment in year X}$$



(6) Lagged Multiplier Effect of Logistics Investment on GVA

$$= \text{GVA in year X} / \text{Logistics Investment in year X-2}$$

Year	Multiplier Effect of Logistics Investment in GVA with a Lag Period of 2 Years
2010	-
2011	-
2012	5.16
2013	3.21
2014	4.91
2015	5.35
2016	5.78
2017	4.53
2018	5.42
2019	4.73
2020	3.63
2021	3.52
2022	4.59
Trimmed Average	4.65

Table 11: Multiplier Effect of Logistics Investment in GVA with a Lag Period of 2 Years 2012 – 2022. **Source:** (Banco de Portugal, 2019; I. Pordata, 2019; V. Pordata, 2019)

Moreover, in order to reduce as much as possible, the effect of economic variations (like the COVID-19 pandemic), outliers and extreme values, the highest and lowest values assessed (Table 10 - 5.78 and 3.21, respectively) were removed when calculating the trimmed average of the Portuguese Logistics Investment Multiplier on GVA during the study period.

4.3.2. Multiplier Effect Analysis

The data presented above provides relevant knowledge about the long-term economic contribution of the logistics sector in Portugal, as well as expresses over a one-decade period, the relationship between logistics investment and its multiplier effect on Gross Value Added in Portugal's transportation and warehousing sector. Besides, through the analysis of table 9, it's possible to see that during this period the total investment in transports and warehousing grew 141% (from 1.34 billion € in 2010 to 3.24 billion € in 2022), rise which contrasts with a smaller increase of 30.7% of GVA (from 7.42 billion € in 2010 to 9.7 billion € in 2022) (Banco de Portugal, 2019; I. Pordata, 2019; V. Pordata, 2019) (Tables 9 and 10).

Furthermore, the Multiplier Effect calculated between 2012 and 2022 ranged from 3.21 to 5.78 gradually decreasing over time, with the highest multipliers occurring in the

early part of the decade, especially between 2013 and 2016 (values of 5.16 in 2012, 4.91 in 2014, and 5.35 in 2015) (Table 11).

These results while correlated also indicate strong initial returns from early-stage infrastructure development, when investments were directed toward addressing critical gaps in national logistics capacity. Notably, years like 2015, 2016, and 2018 saw multipliers above 5.3, evidencing periods of high operational efficiency and strategic capital deployment, factors that can be associated with the recovery of the Portuguese Economy after the 2008-2013 financial crisis, as well as with the completion of relevant logistics projects that boosted capacity, enhanced efficiency and improved service levels, effectively converting capital expenditure into strong value-added outcomes (Economics Frontier, 2022; Mateus *et al.*, 2011).

From 2016 forward, the multiplier effect began to stabilize at slightly lower levels, moving from 5.72 in 2016 to eventually declining to 3.52 in 2021 before rebounding modestly to 4.59 in 2022, pointing out to subsequent rounds of lower investment yield gains. Within the main reasons behind this fact, diminishing marginal returns (as the sector matures), capital intensive transition (as the sector may be moving towards capital heavy projects such as large-scale warehouses, whose effects take longer to reflect in GVA) or the time lag between investment and value creation (recent increases in investment may not yet fully reflect in GVA due to time lags between infrastructure development and economic output) can be highlighted as potential reasons for this results (Irtysheva *et al.*, 2021).

Moreover, the trimmed average multiplier, was found to be 4.65, meaning that, on average, 1 million € invested in logistics infrastructure generated approximately 4.65 million € in GVA in the transportation and warehousing sector after a two-year lag, which is the same as saying that each 1€ of investment generated, on average, 4.65€ in GVA output (Table 11).

Despite, the shrink registered throughout the years (as the annual investment in transports and warehousing grew faster than the GVA generated by it, as seen in Table 9 and 10), such figures mathematically confirm the economic effect that logistics infrastructure investment has in its surroundings and in delivering substantial returns to the broader economy and society. Moreover, it also aligns with the Growth Pole Theory

by showing that early-stage investments produce strong cumulative and induced socio-economic effects, while later-stage investments require more innovation and integration with other economic sectors to maintain multiplier strength (Irtysheva *et al.*, 2021) (Figure 10, Appendix).

4.4. Discussion of Results

As previously seen, the development or expansion of logistic infrastructures act as a catalyst for regional socio-economic development by attracting linked companies, creating jobs, and boosting local purchasing power, triggering a chain reaction that improves labour pools, increases demand for services, enables population growth, and rise tax revenues (Domanski & Gwosdz, 2010; Economics Frontier, 2022; Henderson, 2014; Irtysheva *et al.*, 2021; Karayun *et al.*, 2012).

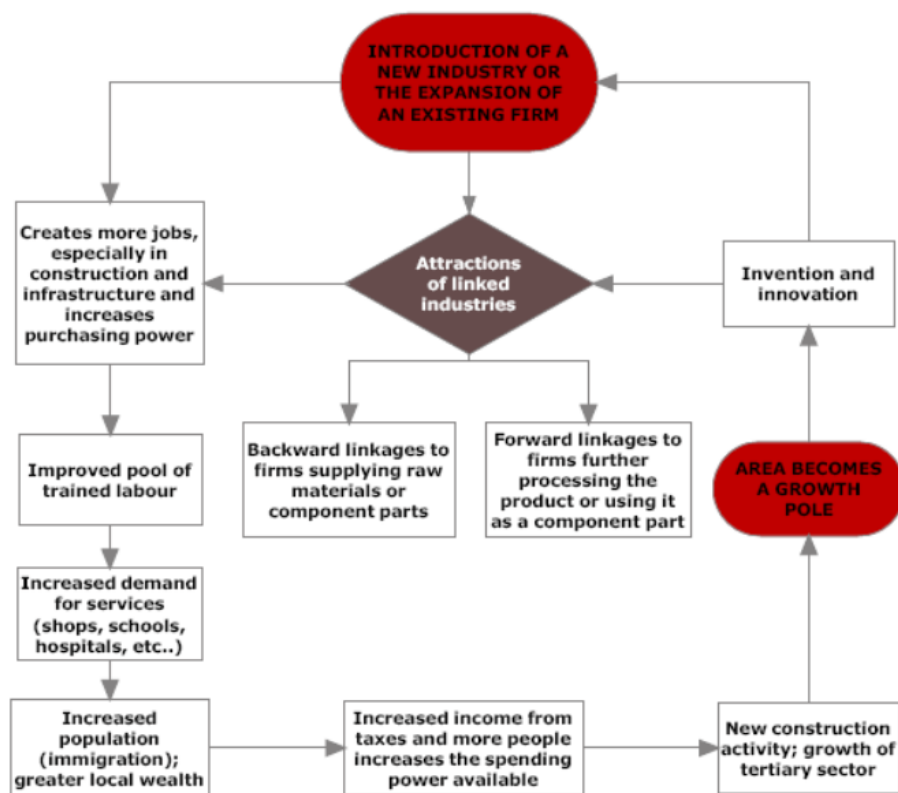


Figure 5: Multiplier Effect or Cumulative Causation Behind Growth Poles. **Source:** (Barcelona Field Studies Centre, 2014)

This phenomenon aligns with what has happened in Azambuja, which, over the past decade, has served as an example of how sustained investment in logistics infrastructure and the expansion of logistics activity in a given area, can drive regional development,

increase the number of operation firms, increase income levels, improve workforce qualifications, lower unemployment rates, and attract labour force while retaining resident population (APLOG, 2020; GEE - INE & Eurostat, 2024; Instituto da Segurança Social, 2018; Mateus *et al.*, 2011; Rosa *et al.*, 2020).

These factors, taken together, reflect a broader intensification of economic activity and a notable strengthening of the local business environment, as well as end up confirming that logistics infrastructure can act as growth poles that not only create economies of scale, accumulate logistics functions and industrial operations but also influence other regional industries through mechanisms such as the Multiplier Effect explored above (Darwent, 1969; Domanski & Gwosdz, 2010; Sharma, 2024).

Consequently, the Growth Pole Theory formulated by economist François Perroux in the 1950's can be used to illustrate this case study that confirms that growth begins in specific "growth poles" and then influences other economic sectors. Furthermore, it demonstrates that the integration of such linkages into a region's supply chain fosters innovation, reinforces the tertiary sector in surrounding communities, and serves as a strategic lever for economic competitiveness, territorial cohesion, and sustainable growth, generating significant direct, indirect, and induced effects, as illustrated in the figure 4 above (APLOG, 2020; Barcelona Field Studies Centre, 2014; Domanski & Gwosdz, 2010; Hayaloğlu, 2015; Irtysheva *et al.*, 2021; Raimbekov *et al.*, 2016).

Therefore, this evolution ultimately transforms an area into a growth pole and drives its long-term socio-economic development, actively answering to the research question placed above.

5. Conclusion

As this MFW reaches its conclusion, it becomes clear that logistics infrastructures investments have several socio-economic effects on regional development, worth studying. Through a theoretical-practical approach, this dissertation confirmed that logistics platforms can serve as powerful drivers of regional transformation, as the one seen in the Azambuja case, which examined the role that such infrastructure plays in shaping socio-economic dynamics (A. Frick & Rodríguez-Pose, 2025).

Within its main findings it was found that the introduction and expansion of logistics infrastructure in Azambuja has stimulated economic activity by drawing in associated businesses, creating jobs, and raising consumer demand. In turn, these adjustments, improved labour market conditions, workforce qualification levels, and overall socioeconomic dynamics, having a wider ripple effect throughout the local economy.

The results obtained are consistent with the Growth Pole Theory of François Perroux, which holds that economic development starts in dynamic centres and then diffuses outward in a multiplying way. In this instance, characteristics of a growth pole, have been found in Azambuja as it not only attracted investment but also strengthened the tertiary sector in surrounding areas. Furthermore, it has also suggested, that the integration of logistics infrastructure into a region's supply chain acts as a strategic lever for economic competitiveness, intra-regional territorial cohesion, and long-term sustainable growth (Domanski & Gwosdz, 2010; Irtysheva *et al.*, 2021; Mateus *et al.*, 2011).

Despite these findings, this dissertation also found certain limitations, particularly regarding the reliance of the multiplier effect as a measurement tool, as the unavailability of GVA and capex investment (in the warehousing and transportation sector) at regional level poses some limitations to the conclusions made. Therefore, due to the fact of the multiplier calculated provided only approximate indications of socio-economic trends, it would be necessary a data-driven contextual interpretation based on Azambuja's specific socio-economic structure to generate more solid and trustworthy results. Additionally, due to the unavailability of disaggregated regional data, it was also necessary to assume that the Multiplier Effect of Logistics Investment on GVA was consistent across all Portuguese regions, being only feasible to compute this effect using national-level data due to the lack of disaggregated regional data.

Furthermore, as previously stated, the effects of investments, particularly in the transportation and warehousing sectors aren't immediate. The reason behind this fact is associated with the existence of a significant time lag between the initial investment and the realization of its full economic impact, which may extend from one up to three years. This delay is frequently influenced by the structural characteristics of a region's economy (such as the physical condition of its logistics systems, the predominance of certain industries, the level of foreign trade activity, and its proximity to national or international hubs) making it difficult to precisely determine the timing of the investment's effects.

Another key limitation faced was related with the interconnectedness of the multiplier effect, which doesn't operate in isolation but rather in well-functioning regional ecosystem. Thus, its success requires coordinated spatial planning and active involvement from both local governance and the private sector to fully unlock the positive externalities of logistics investments (A. Frick & Rodríguez-Pose, 2025).

Regardless of these constraints, this study has significant practical and theoretical implications. From a theoretical perspective, it broadens the existing knowledge base on why logistics infrastructure is of primary importance to socio-economic development not only as facilitator of trade, but also as an organizing factor that reconfigures socio-economic relations. Practically, it highlights the importance of aligning investment strategies with regional characteristics, as well as reinforces the fact that public and private stakeholders should prioritize not just the volume but the quality, efficiency, and territorial articulation of logistics infrastructure projects (Figure 12, Appendix).

Looking forward, further research could investigate how these dynamics work out in different regional contexts, incorporating longitudinal data to better capture delayed multiplier effects. Additional studies might also explore the environmental dimensions of logistics investments and assess the role of governance and institutional capacity in enhancing regional outcomes.

In conclusion, this research demonstrates that the strategic development of logistics infrastructure, such as the one seen in Azambuja, can generate long lasting socio-economic benefits when effectively integrated within its implementation regions. Therefore, logistics infrastructure will remain a key axis for advancing competitiveness, cohesion, and resilience in the evolving socio-economic landscape.

6. References

- A. Frick, S., & Rodríguez-Pose, A. (2025). Lessons-Learnt from Growth Pole Strategies in the Developing World. *Progress in Planning*, 195(100958).
<https://www.sciencedirect.com/science/article/abs/pii/S0305900625000169>
- APLOG. (2020). *A Inovação em Portugal - Inovação, Tendências e Desafios do Futuro*.
https://aplog.pt/wp-content/uploads/2022/06/APLOG_Estudo_versao_completa_digital_baixa-resolucao_v1.pdf
- Artes, D. G. (2016). *Região de Lisboa e Vale do Tejo NUT III (Área Geográfica Afeta à Direção-Geral das Artes)*. DGARTES.
<https://www.dgartes.gov.pt/sites/default/files/mapa.pdf>
- Banco de Portugal. (2019, January 1). *VAB a Preços de Base-Anual-Preços Correntes-M€*. Banco de Portugal Eurosistemas.
<https://bpstat.bportugal.pt/serie/12518200>
- Barcelona Field Studies Centre. (2014). *Multiplier Effect or Cumulative Causation*.
Barcelona Field Studies Centre.
<https://geographyfieldwork.com/MultiplierEffect.htm>
- Bonacich, Edna, & Alimahomed-Wilson, J. (2008). *Getting the Goods: Ports, Labor, and the Logistics Revolution* (E. Bonacich & J. Alimahomed-Wilson, Eds.). Cornell University Press.
https://www.researchgate.net/publication/360657895_Getting_the_Goods_Ports_Labor_and_the_Logistics_Revolution
- Browne, M., Allen, J., Patier, D., Nemoto, T., & Allen, J. (2012). Reducing Social and Environmental Impacts of Urban Freight Transport: A Review of Some Major Cities. *Procedia - Social and Behavioral Sciences*, 39, 1–858.
<https://www.sciencedirect.com/science/article/pii/S1877042812005551>
- Caid, N. (2015). *Decoupling the Environmental Impacts of Transport from Economic*. OECD Publishing.
<file:///C:/Users/Tester/Downloads/DecouplingEconomyandtransportNadiaCadNov2006Pub.pdf>

- Creswell, J. W. (2008). *Research Design - Qualitative, Quantitative, and Mixed Methods Approaches*.
https://www.ucg.ac.me/skladiste/blog_609332/objava_105202/fajlovi/Creswell.pdf
- Dai, Q., & Yang, J. (2013). Input-output Analysis on the Contribution of Logistics Park Construction to Regional Economic Development. In J. Yang & Q. Dai (Eds.), *Procedia - Social and Behavioral Sciences* (Vol. 96, pp. 599–608). ELSEVIER.
https://www.sciencedirect.com/science/article/pii/S1877042813021964?ref=pdf_download&fr=RR-2&rr=93c47b57af44ab0d~
- Darwent, D. F. (1969). *Growth Poles and Growth Centers in Regional Planning—A Review*. https://www.tgc.ac.in/pdf/study-material/geography/GEOACORE08T_darwent1969.pdf
- Domanski, B., & Gwosdz, K. (2010). *Multiplier Effect in Local and Regional Development*. <https://shorturl.at/MFkj9>
- Economics Frontier. (2022). *The Impact of Logistics Sites in the UK*. <https://logistics.org.uk/CMSPages/GetFile.aspx?guid=d3e3d23c-2dca-4b0a-8406-0d126c71eb4d&lang=en-GB>
- Ganti, A. (2025, April 14). *What Is the Multiplier Effect? Formula and Example*. Investopedia. <https://www.investopedia.com/terms/m/multipliereffect.asp>
- Gavrila-Paven, I., & Bele, I. (2017). Developing a Growth Pole: Theory and Reality. *Management, Organizations and Society*.
https://www.researchgate.net/publication/312209513_Developing_a_growth_pole_theory_and_reality
- GEE - INE & Eurostat. (2024). *Indicadores Concelho da Azambuja*. <https://www.gee.gov.pt/pt/lista-publicacoes/estatisticas-regionais/distritos-concelhos/lisboa/azambuja/3191-azambuja/file>
- Gouardères, F. (2025, April). *Nomenclatura Comum das Unidades Territoriais Estatísticas (NUTS)*. Parlamento Europeu.
<https://www.europarl.europa.eu/factsheets/pt/sheet/99/nomenclatura-comum-das-unidades-territoriais-estatisticas-nuts->

- Hayaloğlu, P. (2015). The Impact of Developments in the Logistics Sector on Economic Growth: The Case of OECD Countries. *International Journal of Economics and Financial Issues*, 5, 523–530. https://www.researchgate.net/publication/282936706_The_Impact_of_Developments_in_the_Logistics_Sector_on_Economic_Growth_The_Case_of_OECD_Countries
- Henderson, B. (2014). *The Economic and Social impact of Logistics Parks*. [file:///C:/Users/Tester/Downloads/M15.022g%20Appendix5%20Barwood%20and%20Tatton%20\(6\).pdf](file:///C:/Users/Tester/Downloads/M15.022g%20Appendix5%20Barwood%20and%20Tatton%20(6).pdf)
- Horizon Industrial Parks. (2024, August 20). *Unpacking the Economic Impact of Industrial and Logistics Parks*. Horizon Industrial Parks. <https://www.linkedin.com/pulse/unpacking-economic-impact-industrial-logistics-d816f/>
- Instituto da Segurança Social. (2018). *Diagnóstico Social do Concelho da Azambuja*. https://www.cm-azambuja.pt/images/pdfs/Acao_Social/2023/Diagnostico-Social-Azambuja-2018.pdf
- Irtysheva, I., Nosar, A., Boiko, Y., Stehnei, M., Kramarenko, I., & Zavhorodnij, K. (2021). The Multiplier Effect of Investment and Innovation Support for the Development of Transport and Logistics Systems: Foreign Experience and Practice for Ukraine. *Journal of Hygienic Engineering and Design*. <https://keypublishing.org/jhed/wp-content/uploads/2023/02/05.-Full-paper-Inna-Irtysheva.pdf>
- Junta de Freguesia de Azambuja. (2024, June 12). *Foto Galeria da Azambuja*. Junta de Freguesia Da Azambuja. <https://jfazambuja.pt/galeria-azambuja/>
- Karayun, I., Aydin, H., & Gulmez, M. (2012). *The Role of Logistics in Regional Development*. https://www.researchgate.net/publication/324601976_The_Role_of_Logistics_in_Regional_Development
- Lakshmanan, T. R. (2011). The Broader Economic Consequences of Transport Infrastructure Investments. *Journal of Transport Geography*, 19(1), 1–12.

- <https://www.sciencedirect.com/science/article/abs/pii/S0966692310000037?via%3Dihub>
- Logistica, A. (2007). *Plataforma Logística de Lisboa Norte - Estudo de Impacte Ambiental*.
https://siaia.apambiente.pt/AIADOC/AIA1818/rnt_1818201656152828.pdf
- Malhotra, N. K., & Dash, S. (2019). *Marketing Research An Applied Orientation* (Seventh). Pearson.
https://api.pageplace.de/preview/DT0400.9781292265919_A37749261/preview-9781292265919_A37749261.pdf
- Mateus, A., Madruga, P., Rosa, V., Veludo, R., Silva, A. C., Caetano, A., Marques, A., Lopes, F., & Mateus, S. (2011). *Azambuja 2025 – Uma Estratégia Com Un Rio De Oportunidades*.
https://www.cm-azambuja.pt/files/Diversos/PlanoEstrategico_Azambuja_agosto2011.pdf
- Montwiłł, A., Pietrzak, O., & Pietrzak, K. (2021). The Role of Integrated Logistics Centers (ILCs) in Modelling the Flows of Goods in Urban Areas Based on the Example of Italy. *Sustainable Cities and Society*, 69(102851).
<https://www.sciencedirect.com/science/article/abs/pii/S2210670721001414>
- Norman, N. (2013). *Social Dimensions of Transport – A Resource for Social Impact Appraisals*.
https://assets.publishing.service.gov.uk/media/5a7b9c3be5274a7202e18484/Social_Dimensions_of_Transport_for_externals.pdf
- O Mirante. (2024, October 21). *Eixo Vila Franca de Xira/Azambuja é Estratégico para a Logística Nacional mas Faltam Terrenos para Continuar a Crescer*. O Mirante. <https://omirante.pt/economia/2024-10-21-eixo-vila-franca-de-xira-azambuja-e-estrategico-para-a-logistica-nacional-mas-faltam-terrenos-para-continuar-a-crescer-3e2ed6a8>
- Pordata, A. (2024). *Municípios - Taxa de Analfabetismo segundo os Censos Total e Por Sexo*. Pordata. https://www.pordata.pt/sites/default/files/2024-06/Municipios_Taxa_de_analfabetismo_segundo_os_Censos_total_e_por_sexo.xlsx

- Pordata, D. (2024). *Municípios - Taxa de Desemprego: Total e Por Grupo Etário (%)*. Pordata - Fundação Francisco Manuel Dos Santos. https://www.pordata.pt/sites/default/files/2024-09/Municipios_Taxa-de-desemprego-por-grupo-etario.xlsx
- Pordata, I. (2019, January 1). *Investimento por Ramo de Atividade*. Pordata. <https://www.pordata.pt/pt/estatisticas/economia/setores-de-atividade/investimento-por-ramo-de-atividade>
- Pordata, V. (2019, January 1). *Valor Acrescentado Bruto (VAB) por Ramo de Atividade (%)*. Pordata. <https://www.pordata.pt/pt/estatisticas/economia/setores-de-atividade/valor-acrescentado-bruto-vab-por-ramo-de-atividade-0>
- Raimbault, N. (2019). *Multiplication of Logistics Parks and Invisibilisation of Blue-Collar Workplaces in Post-Industrial Metropolises*. <https://hal.science/hal-02157182/document>
- Raimbault, N., & Bahoken, F. (2014). Quelles Places pour les Activités Logistiques dans la Métropole Parisienne? *Territoire En Mouvement*, 53–74. https://www.researchgate.net/publication/272432028_Quelles_places_pour_les_activites_logistiques_dans_la_metropole_parisienne
- Raimbekov, Z., Baimbetova, A., Rakhmetulina, Z., & Syzdykbayeva, B. (2016). Evaluating the Impact of Logistics Infrastructure on the Functioning and Development of Regional Economy. *Productive Forces Development and Regional Economy*. https://www.researchgate.net/publication/309093273_Evaluating_the_impact_of_logistics_infrastructure_on_the_functioning_and_development_of_regional_economy
- Rodrigue, J.-P. (2012). *The Benefits of Logistics Investments: Opportunities for Latin America and the Caribbean*. file:///C:/Users/Tester/Downloads/The-Benefits-of-Logistics-Investments-Opportunities-for-Latin-America-and-the-Caribbean.pdf

- Rodrigue, J.-P., Claude, C., & Slack, B. (2006). *The Geography of Transport Systems* (Third). Routledge.
https://geonas.at.ua/_ld/0/34_The_Geography_o.pdf
- Rosa, V., Proença, A., Silva, A. C. S., Vaz, M. P., Azevedo, M., Marques, T. O., & Virtuoso, T. (2020). *Vila Franca de Xira - Construção de uma Visão de Futuro*.
https://www.cm-vfxira.pt/cm-vfxira/uploads/writer_file/document/23280/pde_fase_i.pdf
- Sakai, T., Beziat, A., & Heitz, A. (2020). Location Factors for Logistics Facilities: Location Choice Modeling Considering Activity Categories. *Journal of Transport Geography*, 85(102710).
<https://www.sciencedirect.com/science/article/abs/pii/S0966692319304582>
- Saunders, M., Lewis, P., & Thornhill, A. (2023). *Research Methods for Business Students* (9th ed.). Pearson.
https://www.researchgate.net/publication/240218229_Research_Methods_for_Business_Students
- Sharma, S. N. (2024, August 15). *Exploring the Urban Growth Pole Theory*. Track2Training. <https://track2training.com/2024/08/15/exploring-the-urban-growth-pole-theory/>
- Sheffi, Y. (2012). Logistics Clusters: Delivering Value and Driving Growth. In *Massachusetts Institute of Technology*. Massachusetts Institute of Technology Press.
https://www.researchgate.net/publication/274310009_Logistics_Clusters_Delivering_value_and_Driving_Growth_MIT_Press_2012
- Silva, P., Figueiras, P., Fideles, N., & Gomes, A. (2024). *Portugal Logistics Market*.
<https://pdf.euro.savills.co.uk/portugal/report-il-2024.pdf>
- Vieira, T., Silva, Â., Garcia, J. E., & Alves, W. (2022). *Boosting Regional Socioeconomic Development through Logistics Activities: A Conceptual Model*.
https://www.researchgate.net/publication/366702995_Boosting_Regional_Socioeconomic_Development_through_Logistics_Activities_A_Conceptual_Model

- Wang, Y., Li, Y., & Lu, C. (2023). Evaluating the Effects of Logistics Center Location: An Analytical Framework for Sustainable Urban Logistics. *Sustainable Urban Freight Transport, City Logistics and Transportation*. <https://www.mdpi.com/2071-1050/15/4/3091>
- Yingxiu, Q., Sun, Y., & Lang, M. (2017). *Evaluating the Performance of the Logistics Parks: A State-of-the-Art Review*. https://www.researchgate.net/publication/315107218_Evaluating_the_Performance_of_the_Logistics_Parks_A_State-of-the-Art_Review
- Zhao, B., & Ding, Y. (2024). Multiplier Effects of Transport Sectors in China's National Economy: An Input-Output Approach. *Research in Transportation Business & Management*, 53. <https://www.sciencedirect.com/science/article/abs/pii/S2210539524000117>

7. Appendix

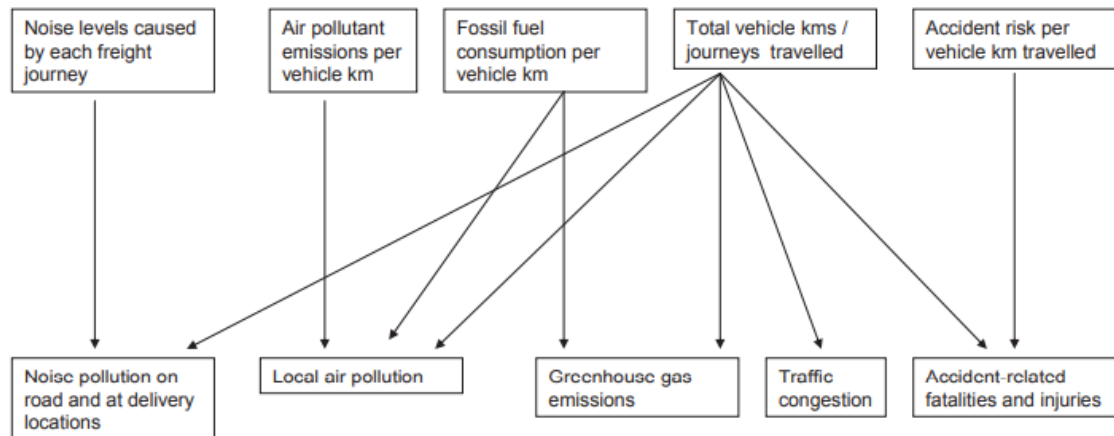


Figure 6: Negative Impacts of Urban Freight Transport Operations. **Source:** (Browne *et al.*, 2012)

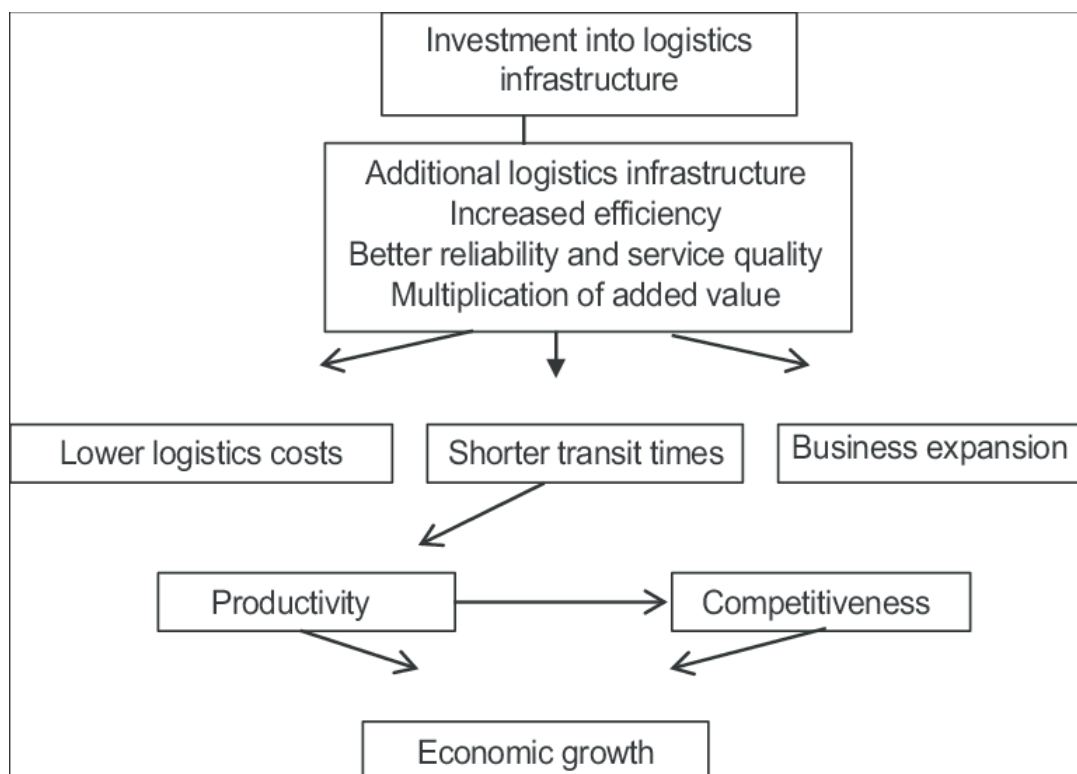


Figure 7: The Impact of Logistics on Economic Growth. **Source:** (Hayaloğlu, 2015)

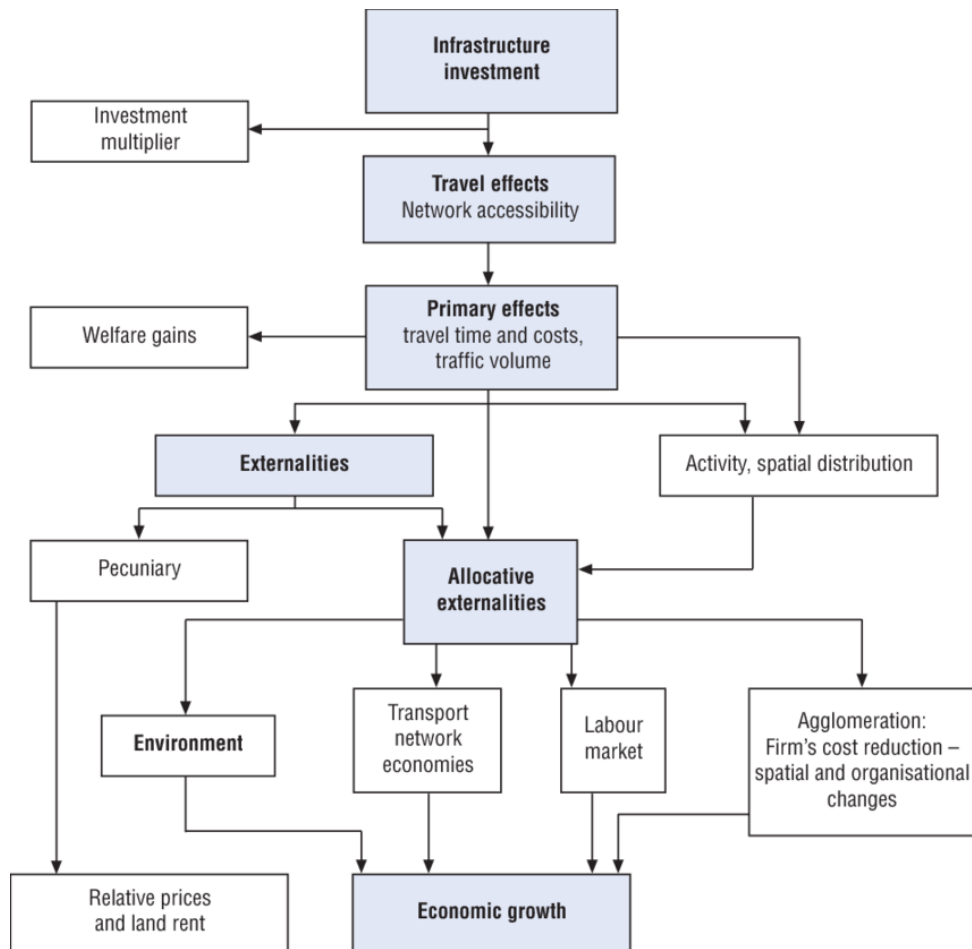


Figure 8: Links between transport infrastructure investment and economic growth. **Source:** (Caid, 2015)

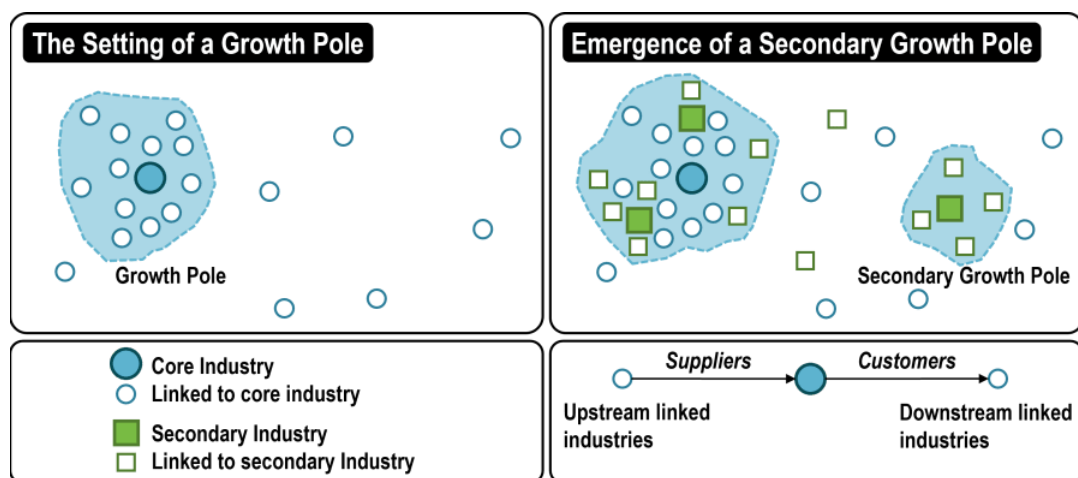


Figure 9: Growth Pole Theory in Action. **Source:** (Rodrigue *et al.*, 2006)

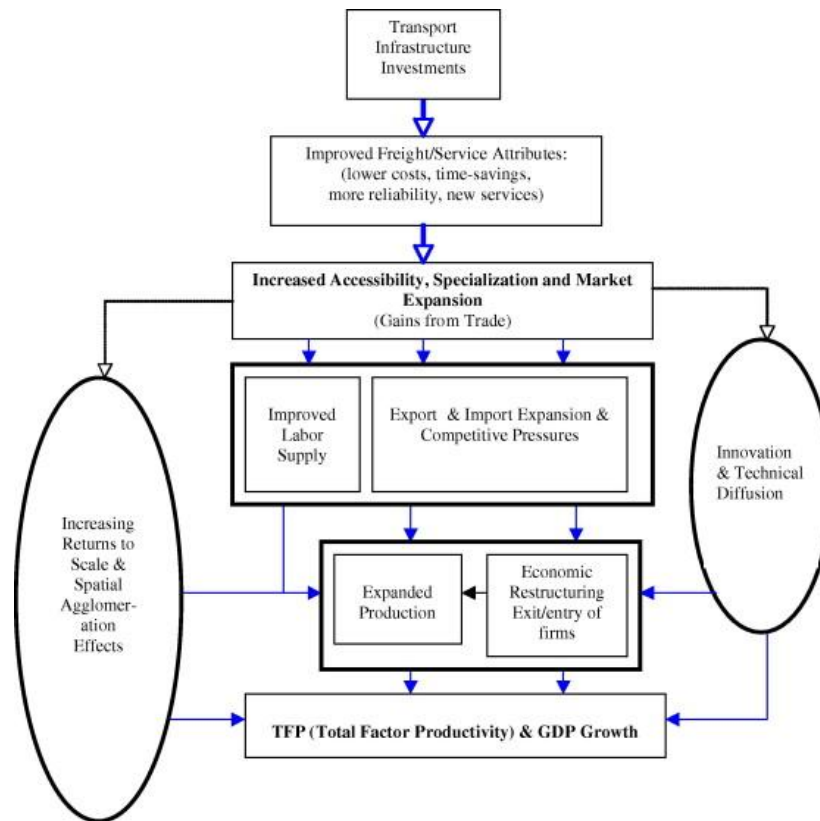


Figure 10: The broader economic consequences of transport infrastructure investments.

Source: (Lakshmanan, 2011)

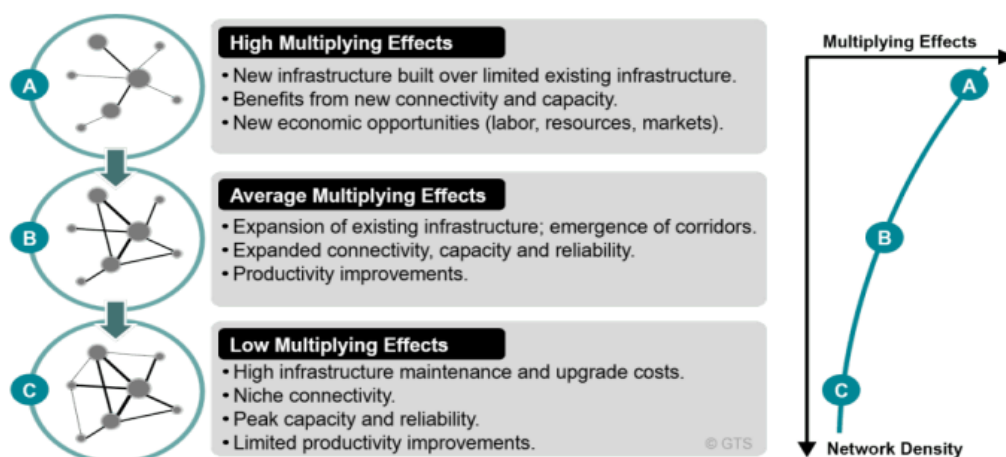


Figure 11: Interdependence of the multiplier effect of investments in the transport and logistics systems with a given region's network density. Source: (Irtysheva *et al.*, 2021)



Figure 12: Região de Lisboa e Vale do Tejo NUT. **Source:** (Artes, 2016)

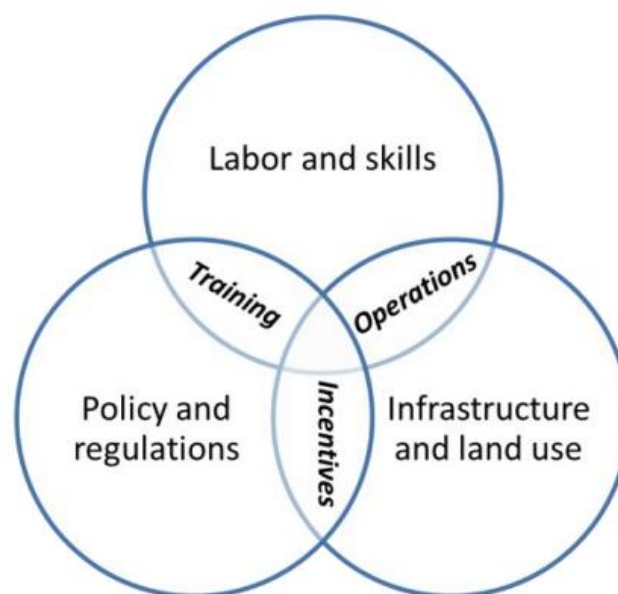


Figure 13: Key Public Intervention Areas in Logistics Projects. **Source:** (Rodrigue, 2012)

Container and chassis maintenance	Container preparation and inspection before usage. Container cleaning and repair. Chassis inspection and repair. Important for the container and chassis location industry.
Equipment maintenance	Maintenance of vehicles and intermodal equipment.
Fabrication	Light manufacturing activities often undertaken at the distribution center. Include labeling, assembly, testing, and quality control. Can also include the bagging of bulk cargo. Provides added value.
Cold chain	Activities maintaining the thermal integrity of cargo. Includes temperature-controlled warehousing but also preparation, transformation, and inspection.
Recycling	"Green logistics" activities (reverse distribution). Returns of defective or discarded merchandises. Recycling of components, such as boxes, used in freight distribution.
Corporate Services	
Office space	Space and services for managers involved in logistics activities.
Customs clearance	Services supporting compliance with customs -clearance procedures for imports and exports.
Security	Site integrity (e.g. access). Important if there is a free-trade zone or custom activities.
Site maintenance	General activities related to cleaning and garbage collection as well as technical maintenance such as utilities.
Parcel services	Support the high transactional level of logistical activities.
Certification and quality control	Certifying and benchmarking agencies to insure that users meet recognized criteria.
Cargo inspection	Expert assessment in cargo losses and damages. Specialized laboratories.
Logistics equipment location	Sale and location of logistical equipment, such as racks, fork lifts, conveyors, etc. Maintenance of this equipment.
Container and chassis location	Availability of maritime and domestic containers for export and import activities. Availability of chassis.
Export facilitation	Activities promoting exports such as certification, financing, and marketing.
Work supplies	Uniforms, work equipment (e.g. gloves), wraps, labels, boxes, security equipment (fire extinguishers), etc.
Temporary workers agencies	Supplying temporary workers to cope with fluctuations in demand.
Office supplies	Sale and rental of office equipment and supplies.
IT equipment	Sale and rental of computers, telecommunication equipment, and software. IT network setting and management.
Human resources	Personnel management from recruiting to payroll. Labor training and certification.
Accounting	Management of transactions and finances.
Insurance and financial services	Variety of insurance products for people and merchandises. Activities facilitating commercial transactions at the national and international levels (e.g. letters of credit).
Legal services	Expertise for contract redaction and commercial dispute resolution.
Hospitality	Availability of hotel and meeting facilities to support the transactional intensity of logistics zones. Extended-stay facilities. Overnight facilities for truckers.
Restoration	Availability of restaurants for workers and truckers. Lounges for short-term relaxation and informal meetings.
Personal services	Array of services for workers (e.g. convenience store, hair salon, sports club, daycare, clinic, postal services, etc.)

Figure 14: Types of services associated with logistics activities. **Source:** (Rodrigue, 2012)

Year	Portuguese Gross Value Added (M€)
2010	158032.30
2011	154177.97
2012	147300.54
2013	149851.50
2014	151138.89
2015	156080.70
2016	161745.00
2017	169071.40
2018	177157.30
2019	185473.90
2020	175104.30
2021	187361.50
2022	211027.90

Table 12: Portuguese Gross Value Added between 2010 and 2022. **Source:** (Banco de Portugal, 2019)

Year	Gross Value Added by the Transportation and Warehousing Industry in Portugal (%)
2010	4.70
2011	4.70
2012	4.70
2013	4.80
2014	4.70
2015	4.90
2016	4.80
2017	5.00
2018	5.00
2019	5.10
2020	4.00
2021	4.10
2022	4.60

Table 13: Percentage of the Total Gross Value Added that the Transportation and Warehousing Industry is responsible for. **Source:** (V. Pordata, 2019)

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1. I affirm that no generative AI tools (e.g., ChatGPT, GPT-4, or other similar language models) were used to write any part of this dissertation. All text, analysis, and conclusions are my original work, except where explicit citations are provided.

OR

2. I disclose that AI tools were employed during the development of this dissertation as follows:
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