

# Mid-Term Progress Report

Group 8



# Background Research

## **Global Supply Chain Disruptions:**

- Overview of how COVID-19 disrupted global supply chains.
- Specific impacts on different sectors, focusing on transportation and logistics.

## **Air and Sea Freight Challenges:**

- How air and sea freight were affected during the pandemic (e.g., flight cancellations, port congestion).
- Changes in the volume and value of goods transported through these modes during the pandemic.

## **Recovery Patterns:**

- General patterns of recovery post-pandemic, highlighting any key research that shows the divergence between air and sea freight recovery.
- Resilience strategies used by logistics companies to adapt to disruptions.

# Research Objective

## SMART Criteria

- **Specific:** Air and sea freight comparison
- **Measurable:** Freight volume and value changes, recovery rates due to COVID-19
- **Achievable:** Eurostat data, Python modeling
- **Relevant:** Supply chain resilience, global trade robustness
- **Time-bound:** Data span (2013-2023), European countries (Belgium, Germany, France, Netherlands, Italy)

# Research Questions

Explore how global air and ship freight volumes fluctuate and compare air vs. sea freight trends during the COVID-19 pandemic. Analyze how the pandemic impacted the volume and value of goods transported by air vs. sea, focusing on differences in recovery timelines and resilience.

## **Main Research Question:**

- *How did the COVID-19 pandemic affect global air and sea freight volumes and values, and what differences exist in the recovery patterns of these two transportation modes?*

## **Subquestion 1:**

- *What would global freight trends have looked like without the pandemic? (Counterfactual analysis)*

## **Subquestion 2:**

- *Which types of cargo (e.g., perishable, high-value, bulk commodities) experienced the most significant disruptions during the pandemic, and how did air and sea freight differ in their responses?*

# Data Pipeline

Subquestion 1: *What would global freight trends have looked like without the pandemic? (Counterfactual analysis)*

## 1. Data collection

- a. Public data base (EuroStat)
- b. Data set on freight transport 2013-2023
- c. Belgium, Germany, France, Italy and the Netherlands

## 2. Data loading

## 3. Data cleaning

- a. **Dropping null values**
- b. **Renaming columns**
- c. **Handeling inconsistent formats**

## 4. Data anlysis

- a. **Exploratory data analysis techniques (eg. displaying descriptive statistics and visualizing trends across countries)**
- b. **Time series modelling using ARIMA**
- c. **Time series analysis (e.g. difference between actual volume and forecasting volume)**

# Data Pipeline

## Subquestion 2:

### 1. Data collection

- a. **Source:** UN Comtrade Plus Database ([comtradeplus.un.org](https://comtradeplus.un.org))
- b. **Data Period:** 2019 - 2023 (Pre-pandemic, during-pandemic, post-pandemic)
- c. **Countries:** Germany (as the reporter) with the World (as the partner)
- d. **Commodity Codes:** Focus on specific product types, including:  
HS 07 (Vegetables), HS 08 (Fruits and Nuts), HS 85 (Electrical Machinery), HS 26 (Ores, slag, and ash) and HS 27 (Mineral fuels)
- e. **Transport Modes:** Air and Sea

### 2. Data loading

### 3. Data cleaning

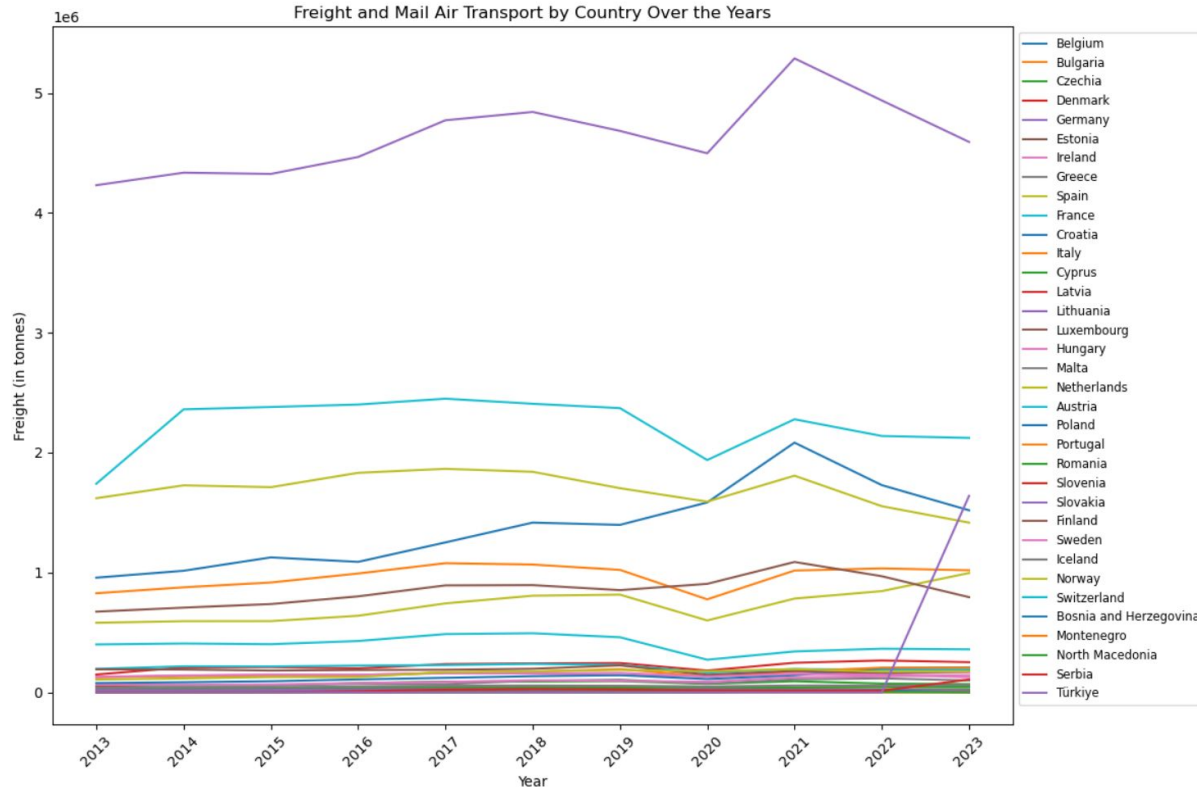
- a. **Dropping null values**
- b. **Renaming columns**
- c. **Handling inconsistent formats**

### 4. Data analysis

- a. **Aggregating Data:** Group the data by HS Code and Transport Mode to calculate the total trade value for each mode (air vs. sea).
- b. **Handling Missing Gross/Net Weight:** Since the weight fields might be missing, focus on the **Trade Value** as the main comparison metric.

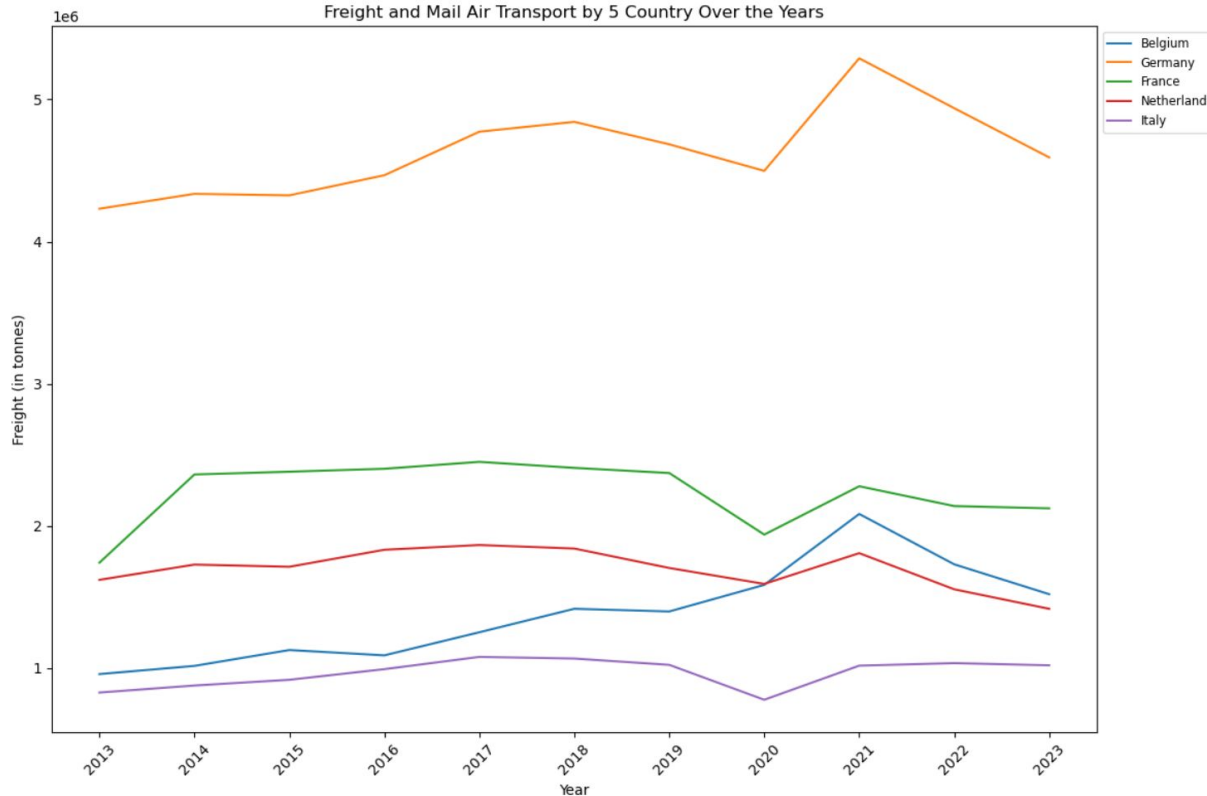
# Data Visualisation

## Freight and Mail Air Transport by Country Over the Years



# Data Visualisation

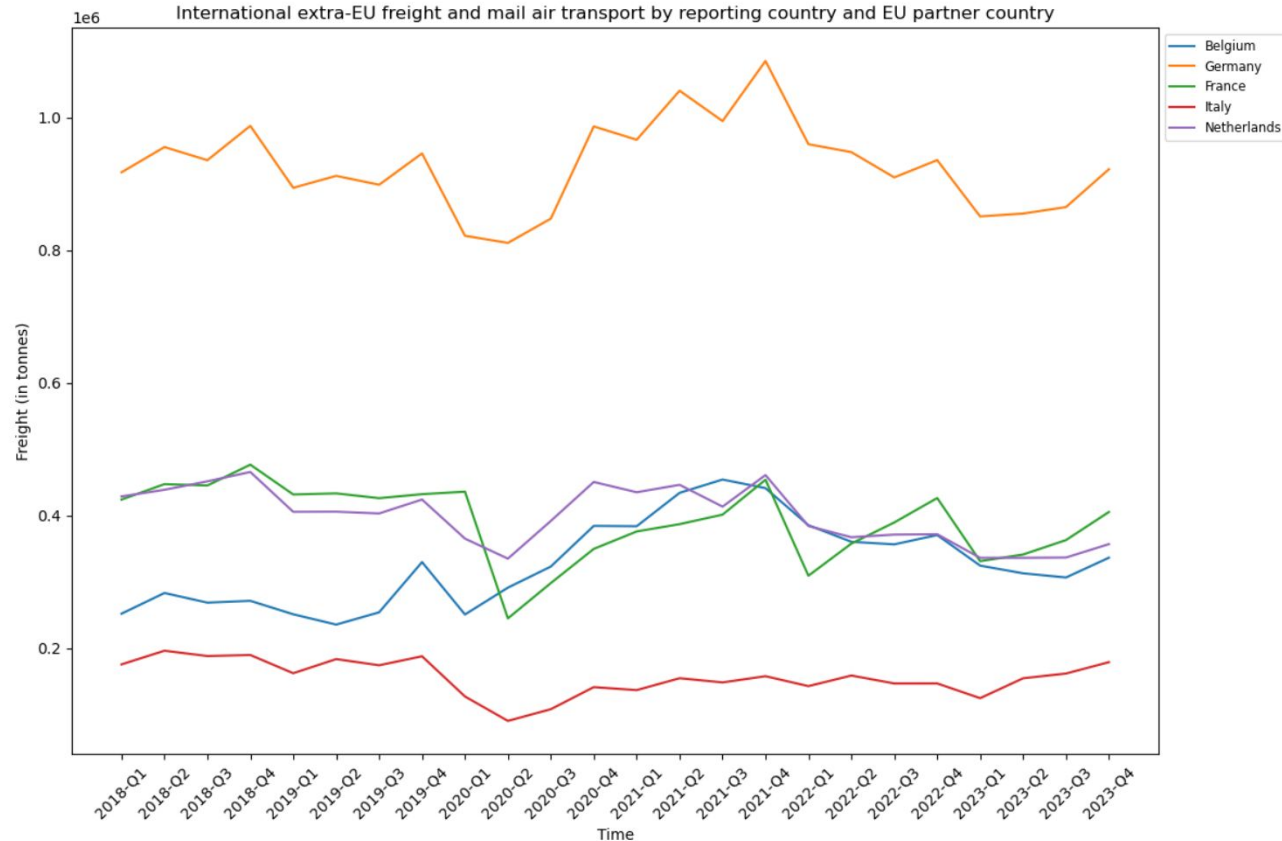
## Freight and Mail Air Transport by Country Over the Years (only for five countries)





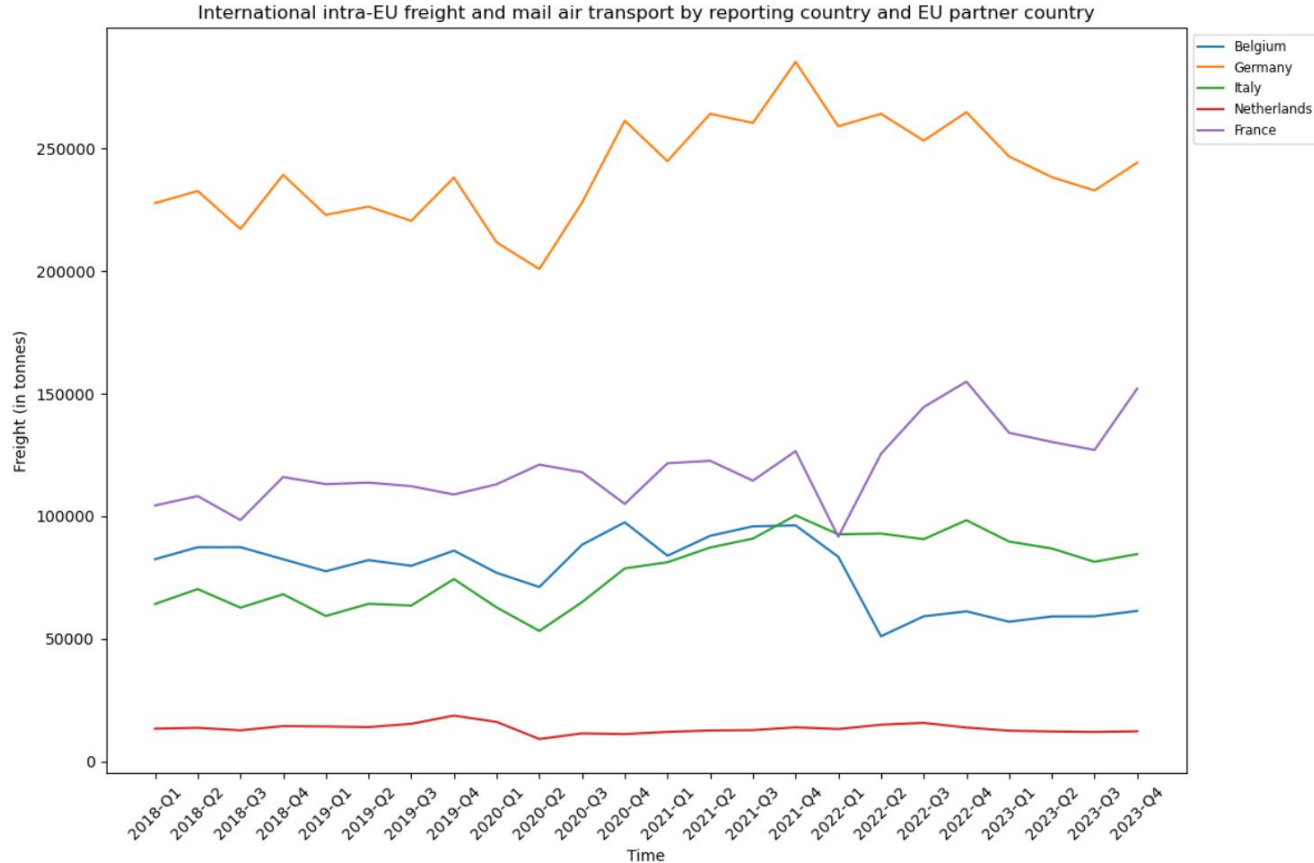
# Data Visualisation

## Trends in International Extra-EU Air Freight During the Pandemic



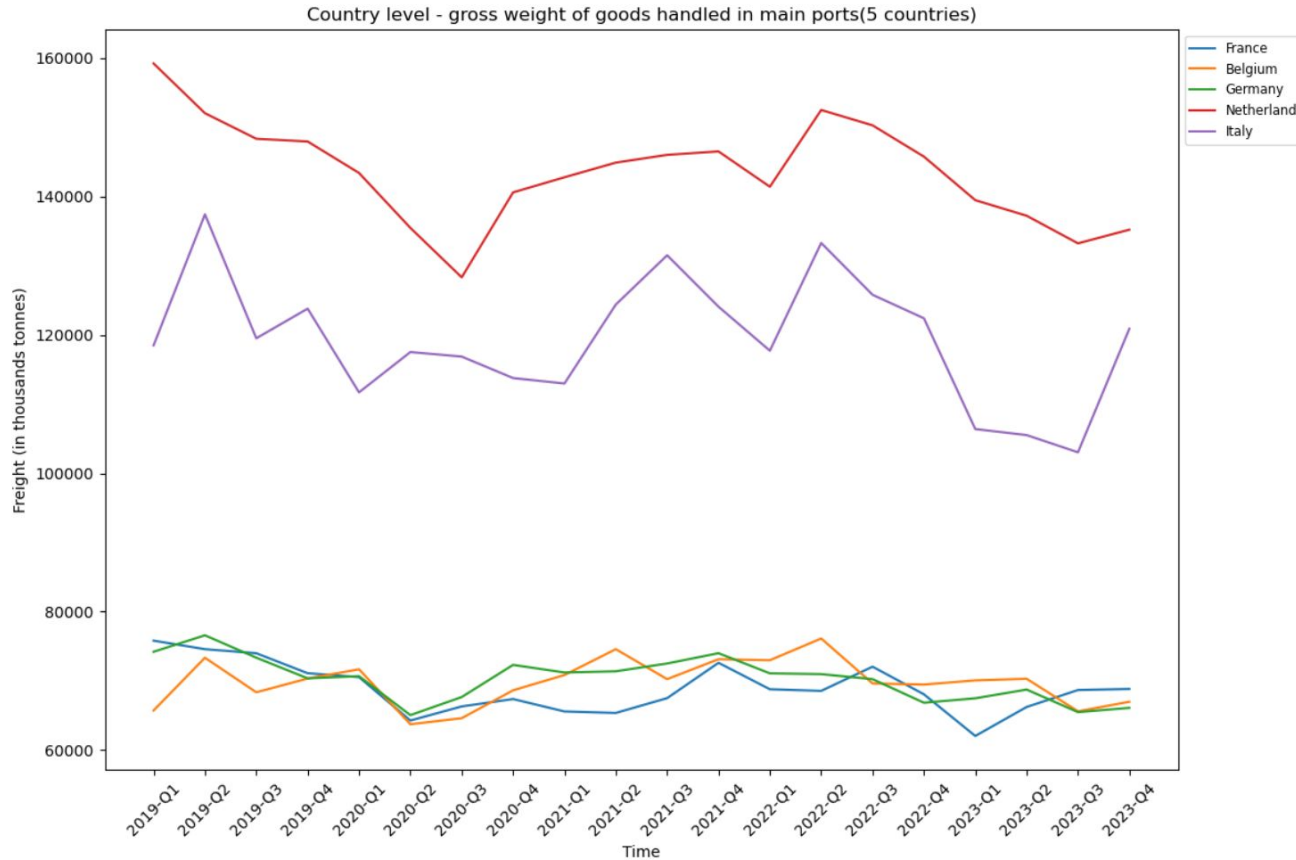
# Data Visualisation

## Trends in International intra-EU Air Freight During the Pandemic



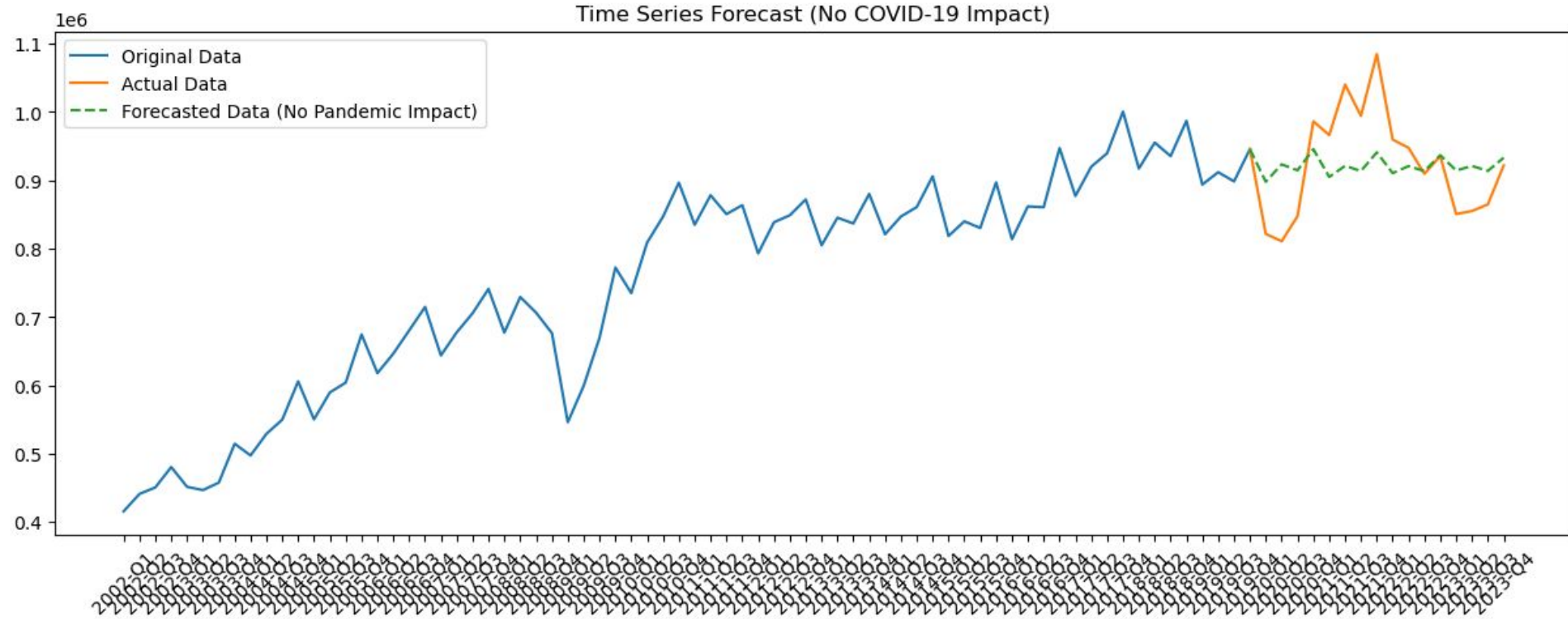
# Data Visualisation

Gross weight of goods handled in main ports by countries:



# Subquestion 1

Take Germany as example



# Subquestion 2

Showing 201 to 207 of 207 Results

Extended Columns



Period ↑↓	Trade Flow ↑↓	Reporter ↑↓	Partner ↑↓	2nd Partner ↑↓	Customs Desc ↑↓	Transport Mode ↑↓	Commodity Code ↑↓	Trade Value (US\$) ↑↓	Net Weight(kg) ↑↓	Gross Weight ↑↓	Qty Unit ↑↓	Qty ↑↓	Alternate Quantity unit ↑↓	Alternate Quantity ↑↓
2023	X	Germany	World	World	TOTAL CPC	Air	26	\$407,065	0	0	N/A		0 N/A	0
2023	M	Germany	World	World	TOTAL CPC	Sea	26	\$6,185,508,992	0	0	N/A		0 N/A	0
2023	X	Germany	World	World	TOTAL CPC	Sea	26	\$77,824,084	0	0	N/A		0 N/A	0
2023	M	Germany	World	World	TOTAL CPC	Air	27	\$8,937,516	0	0	N/A		0 N/A	0
2023	X	Germany	World	World	TOTAL CPC	Air	27	\$81,732,366	0	0	N/A		0 N/A	0
2023	M	Germany	World	World	TOTAL CPC	Sea	27	\$37,209,672,647	0	0	N/A		0 N/A	0
2023	X	Germany	World	World	TOTAL CPC	Sea	27	\$4,558,667,902	0	0	N/A		0 N/A	0