CTIS 365 - Phase II Report

E-Commerce Adoption and the Digital Divide in the European Union (2010-2024): Trends, Demographic Differences, and the COVID-19 Effect

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Course: CTIS 365 - Applied Data Analysis

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1. Purpose of Phase II

The purpose of Phase II is to collect, clean, and prepare the dataset that will be used in the analysis of e-commerce adoption across EU countries. This phase also includes producing descriptive statistics and exploratory visualizations (frequency distributions and relationship plots), all created using R and RStudio.

2. Data Sources

All datasets were collected from **Eurostat – Digital Economy and Society Database**:

- Internet Purchases by Individuals (before 2020)
- Internet Purchases by Individuals (after 2020)
- Level of Internet Access (TIN00134)
- Real GDP per Capita (TIPSNA40)
- Broadband Coverage (ISOC_CBS)
- Individuals' Digital Skills Dataset

The datasets cover EU countries between 2013 and 2024.

3. Work Completed in Phase II

During this phase:

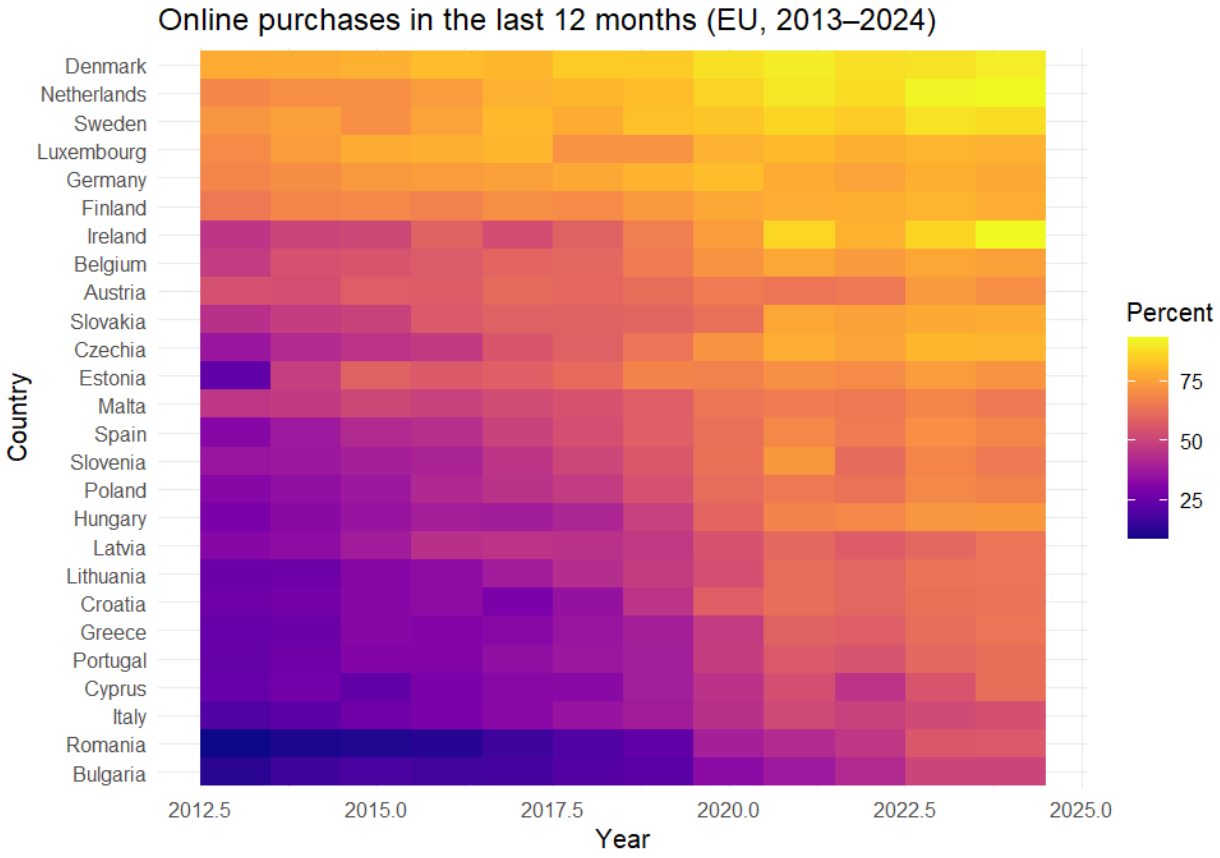
- All datasets were loaded and cleaned in RStudio.
- EU-only filtering, year alignment, merging, and variable preparation were completed.

- Descriptive statistics (mean, median, min, max, standard deviation, and summary tables) were generated.

3.1 Exploratory Data Analysis and Visualizations

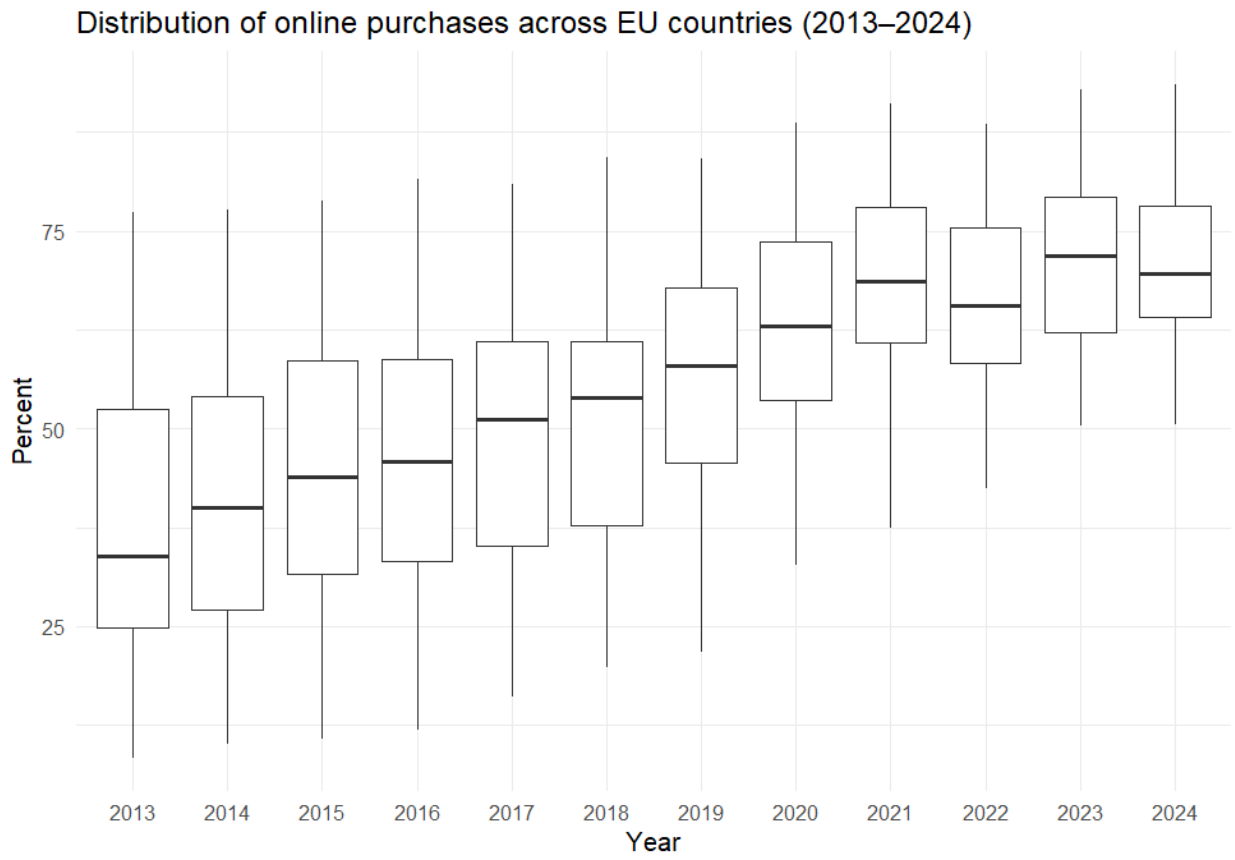
As part of Phase II, several exploratory visualizations were produced using *ggplot2* in R to examine trends, distributions, and relationships related to e-commerce adoption across EU countries.

Figure 1. Online purchases in the last 12 months across EU countries (2013–2024)



This heatmap illustrates the percentage of individuals who made online purchases in the last 12 months across EU countries between 2013 and 2024.
A perceptually uniform color scale (viridis) is used to clearly highlight cross-country differences and the overall increase in e-commerce adoption over time, particularly after 2020.

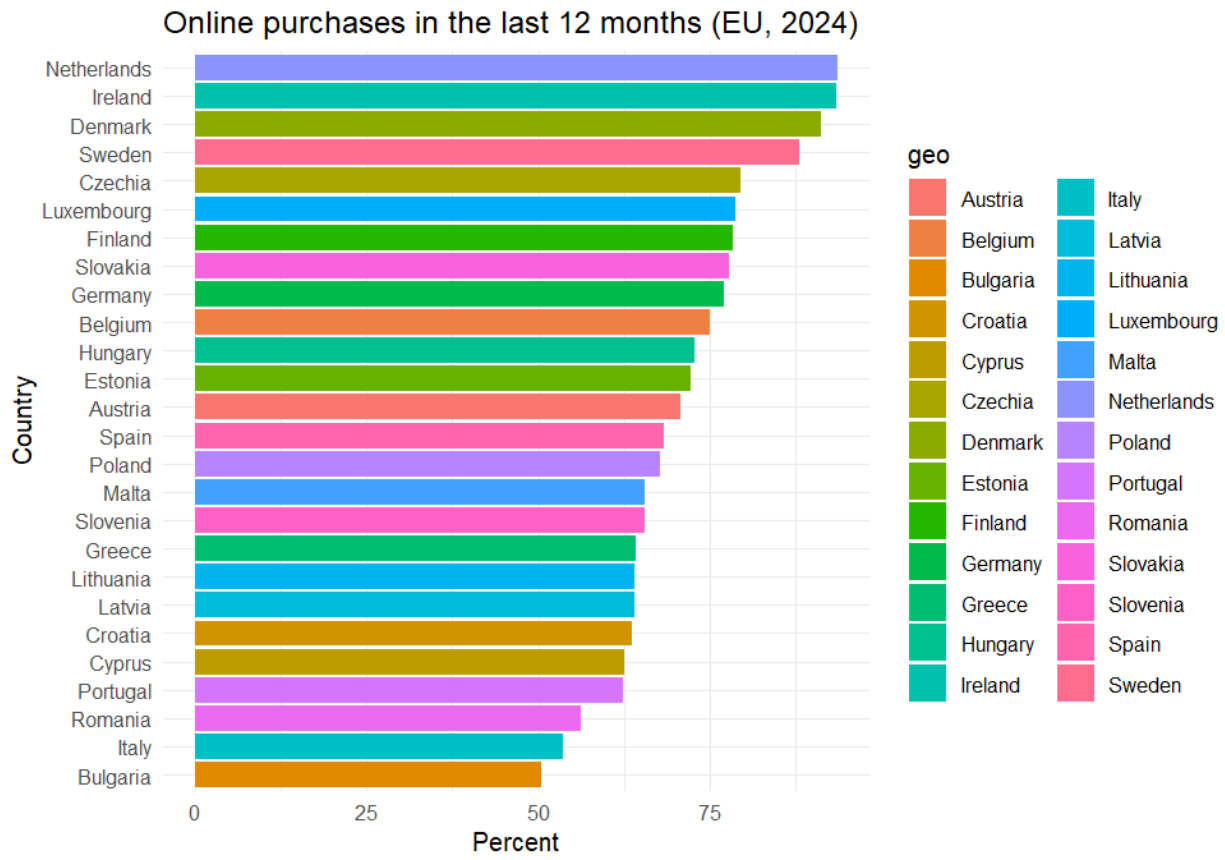
Figure 2. Distribution of online purchases across EU countries (2013–2024)



This boxplot shows the distribution of online shopping rates across EU countries for each year between 2013 and 2024.

The upward shift in the median and interquartile range over time indicates a steady increase in e-commerce adoption, with greater cross-country variation observed after 2020.

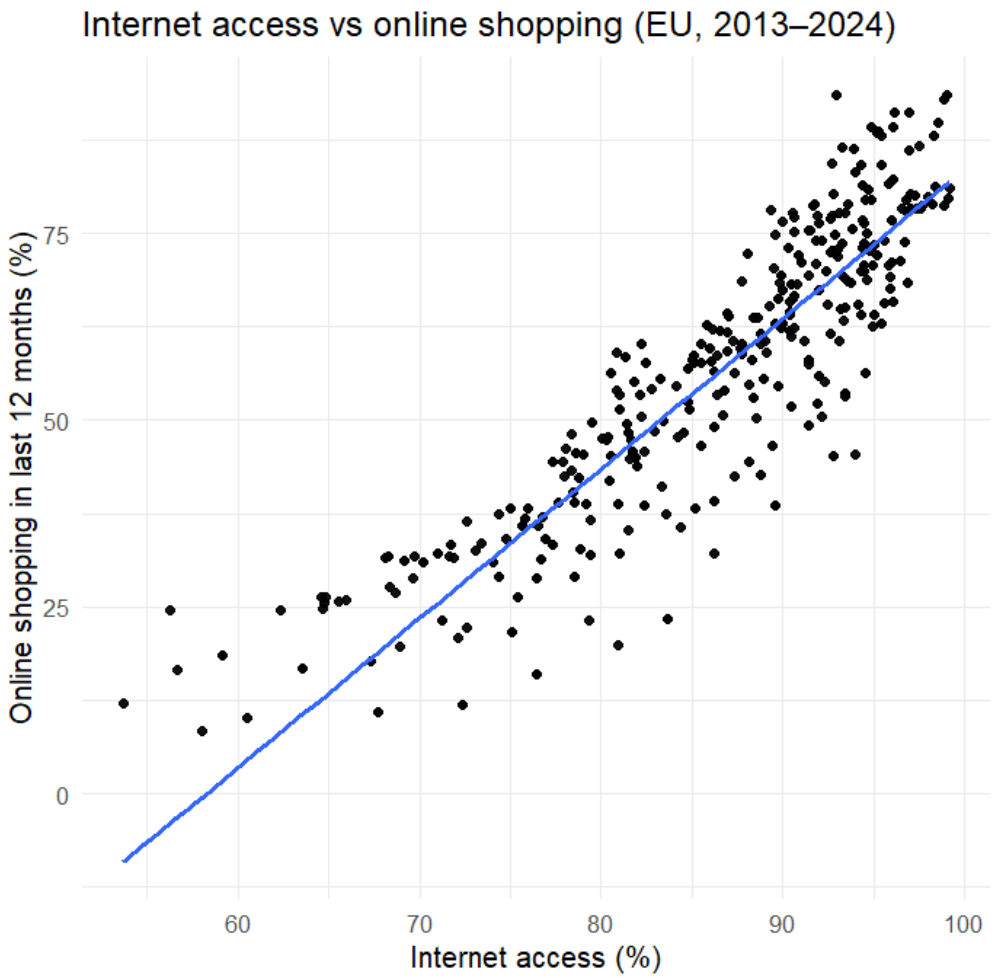
Figure 3. Online purchases in the last 12 months by country (EU, 2024)



This bar chart compares EU countries based on the percentage of individuals who made online purchases in the last 12 months in 2024.

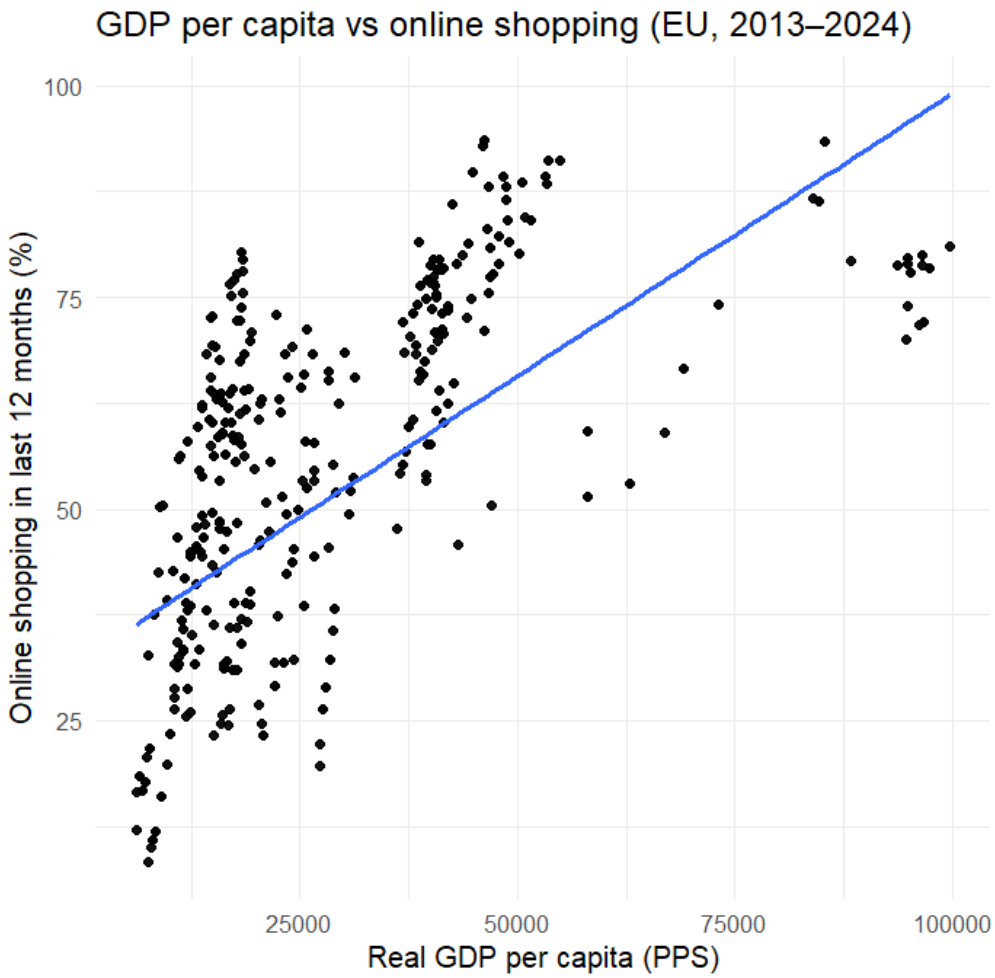
The ranking highlights substantial cross-country differences, with Northern and Western European countries showing higher adoption levels than Southern and Eastern European countries.

Figure 4. Internet access vs online shopping (EU, 2013–2024)



This scatter plot examines the relationship between internet access and online shopping adoption across EU countries from 2013 to 2024.
The positive linear trend indicates that higher internet access rates are strongly associated with higher levels of online shopping.

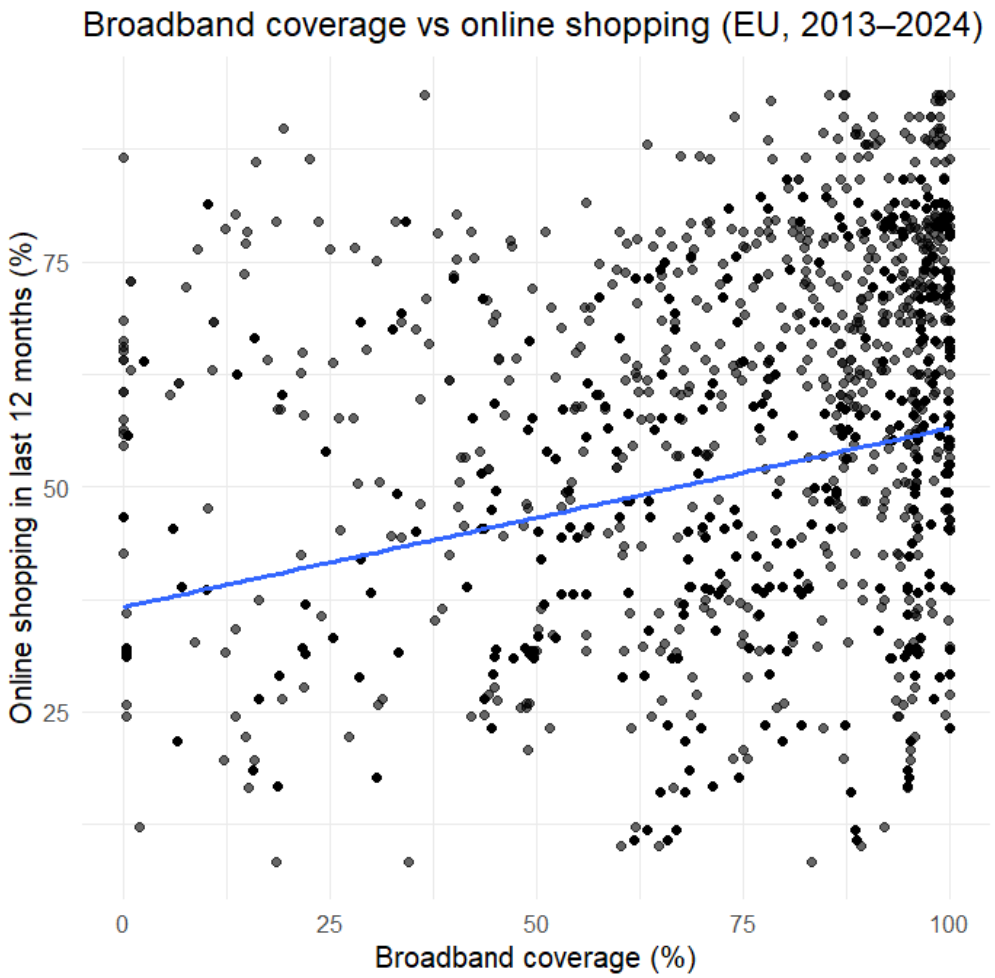
Figure 5. GDP per capita vs online shopping (EU, 2013–2024)



This scatter plot explores the relationship between real GDP per capita and online shopping adoption across EU countries from 2013 to 2024.

The upward linear trend suggests that higher income levels are associated with higher rates of online shopping, although noticeable dispersion indicates heterogeneity across countries.

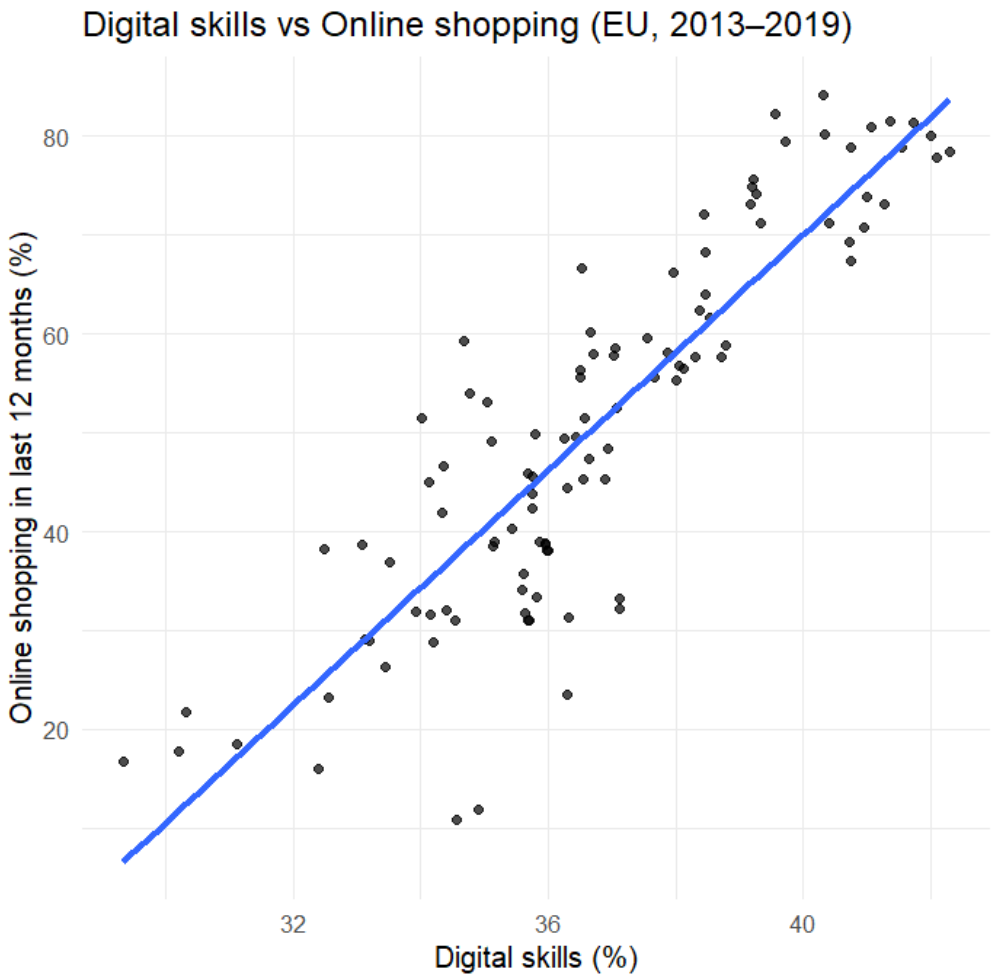
Figure 6. Broadband coverage vs online shopping (EU, 2013–2024)



This scatter plot analyzes the relationship between broadband coverage and online shopping adoption across EU countries from 2013 to 2024.

While a positive trend is observed, the wide dispersion of points suggests that broadband availability alone does not fully explain differences in online shopping behavior.

Figure 7. Digital skills vs online shopping (EU, 2013–2019)



This scatter plot examines the relationship between digital skills and online shopping adoption across EU countries between 2013 and 2019.

The strong positive linear trend suggests that higher levels of digital skills are closely associated with higher online shopping participation.

3.2 Descriptive Statistics

To complement the exploratory visualizations, descriptive statistics were computed for the main variables used in the analysis.

The table below summarizes key measures such as mean, standard deviation, median, minimum, and maximum values.

Variable	N	Mean	SD	Median	Min	Max	Skewness	Kurtosis
Online shopping (last 12 months, %)	1,026,898	51.28	18.63	51.43	8.32	93.54	-0.06	-0.88
Internet access (%)	1,026,895	83.88	8.43	83.61	53.71	99.18	-0.31	-0.33
GDP per capita (PPS)	1,026,898	28,392.49	19,606.12	20,810.00	6,130.00	99,760.00	1.66	3.08
Broadband coverage (%)	1,026,898	73.63	25.18	79.10	0.00	100.00	-1.06	0.46
Digital skills (%)	997,409	36.75	28.50	28.38	0.00	100.00	0.59	-0.88

The descriptive statistics reveal substantial variation across EU countries, particularly for GDP per capita and digital skills, highlighting structural differences relevant for further analysis.

4. Files Submitted

The ZIP folder includes:

a) Data Folder

- All raw CSV files downloaded from Eurostat
- The merged and cleaned dataset (merged_dataset.csv)

b) R Script

- Data cleaning and preparation
- Descriptive statistics
- Exploratory graphs
- Relationship analyses

c) This document

A short summary describing the purpose of Phase II and how the data were prepared.