

# **Headphone Sales and Public Transport Commuters**

**Correlation Analysis: Swiss Cantons 2024**

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## **1 Research Question**

**Do cantons with higher public transport commuter rates purchase more headphones?**

**Hypothesis:** Commuters use headphones during their daily travel on public transport. We expect cantons with higher percentages of public transport commuters to show higher headphone sales per capita.

**Background:** In Switzerland, public transport usage varies significantly between cantons. Urban cantons like Zürich and Basel have high percentages of commuters using trains, trams, and buses (>40%), while rural cantons rely more on private vehicles (<20%). Headphones have become essential for commuters who listen to music, podcasts, or take calls during their daily travel. This analysis investigates whether this behavioral pattern is reflected in online retail data.

## 2 Data Collection and Preparation

This dataset combines three key variables:

- **Public Transport Commuters:** Percentage of commuters using public transport (2020-2022)
- **Headphone Sales:** Product category “kopfhoerer-48” from Digitec online retail
- **Population:** Resident population by canton (2024)

We calculate headphone sales per 10,000 residents to enable fair comparison between cantons of different sizes.

### Data Summary:

Number of cantons: 26

Total headphone sales: 6025

PT commuter range: 10 % - 43.2 %

## 3 Statistical Analysis

### 4 Statistical Analysis

#### 4.1 Correlation Test

We use **Pearson correlation** to measure the linear relationship between public transport commuter percentage and headphone sales per capita.

Correlation coefficient ( $r$ ): 0.493

P-value: 0.0104

95% Confidence Interval: [ 0.131 , 0.739 ]

STATISTICALLY SIGNIFICANT ( $p < 0.05$ )

#### 4.2 Linear Regression

We fit a **linear regression model** to quantify the relationship:

$R^2$  (explained variance): 0.243

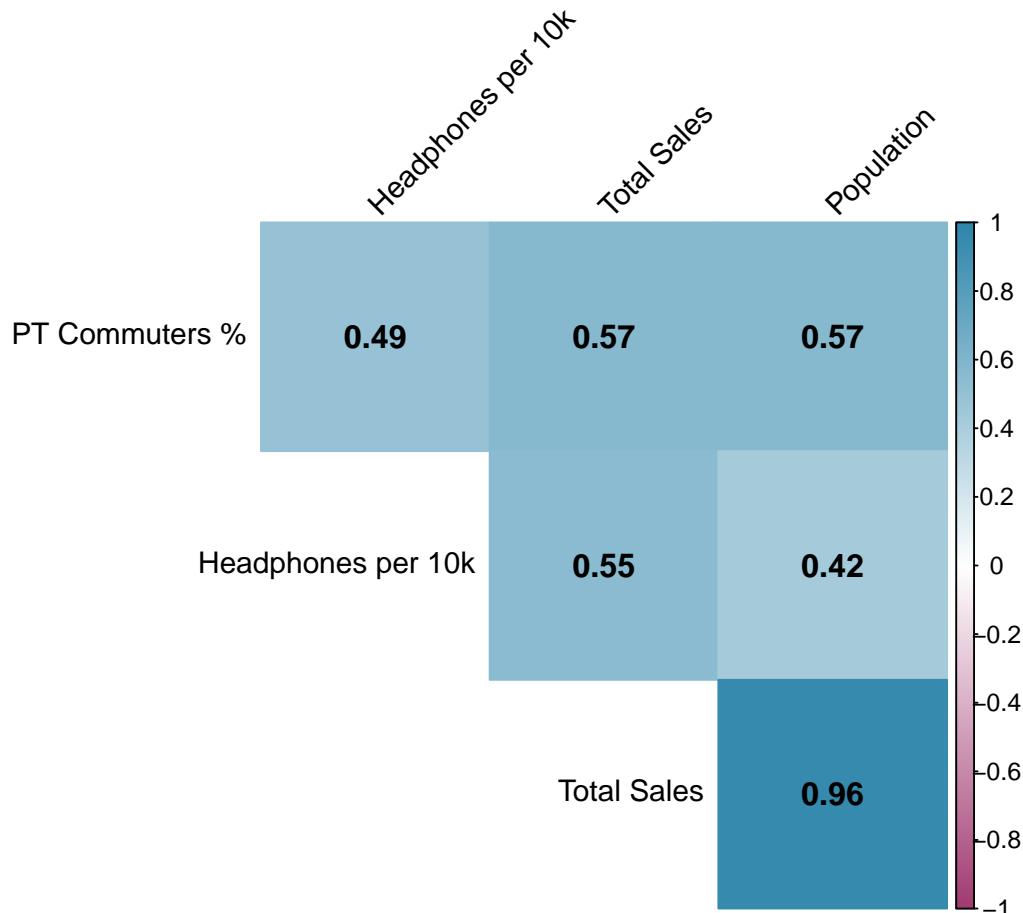
Adjusted  $R^2$ : 0.212

Slope (): 0.1126

Intercept: 3.1739

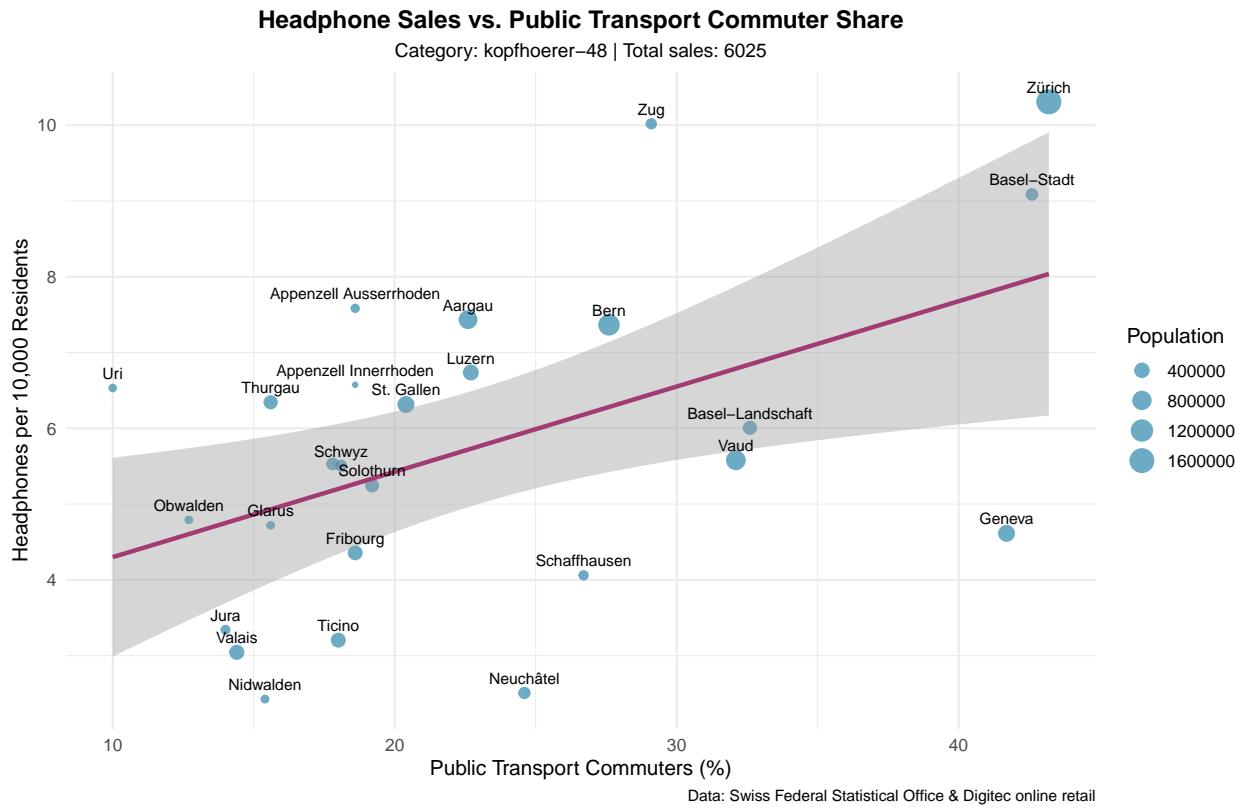
The  $R^2$  value indicates how much of the variance in headphone sales can be explained by public transport commuter rates.

### 4.3 Correlation Matrix



The correlation matrix visualizes relationships between all variables. Values range from -1 (perfect negative correlation) to +1 (perfect positive correlation).

## 5 Visualization



The scatter plot shows each canton as a point (size = population). The regression line indicates the overall trend, with the shaded area representing the 95% confidence interval.

## 6 Top Cantons by Headphones per 10k

### 6.1 Top 5 Cantons (Highest per capita sales)

Canton	PT Commuters (%)	Total Sales	Per 10k Residents
Zürich	43.2	1670	10.31
Zug	29.1	134	10.02
Basel-Stadt	42.6	183	9.09
Appenzell Ausserrhoden	18.6	43	7.58
Aargau	22.6	547	7.43

### 6.2 Bottom 5 Cantons (Lowest per capita sales)

Canton	PT Commuters (%)	Total Sales	Per 10k Residents
Nidwalden	15.4	11	2.43
Neuchâtel	24.6	45	2.51
Valais	14.4	113	3.04
Ticino	18.0	115	3.20
Jura	14.0	25	3.34

These tables rank cantons by **normalized headphone sales per capita**. This controls for population size and reveals which cantons have the highest and lowest per-capita headphone demand.

## 7 Conclusion

The analysis reveals a **statistically significant** correlation between public transport commuter rates and headphone sales per capita ( $r = 0.49, p = 0.01$ ).

The positive correlation coefficient ( $r = 0.49$ ) indicates that cantons with higher percentages of public transport commuters tend to purchase more headphones per capita, supporting our hypothesis that commuting behavior influences headphone demand. The linear regression model explains 24.3% of the variance in headphone sales.

### Dataset Summary:

- Product Category: kopfhoerer-48 (headphones)
- Total Sales: 6025 units
- Number of Cantons: 26
- Data Period: 2020-2024
- Data Sources: Swiss Federal Statistical Office, Digitec online retail platform