Single-Person Household Product Analysis

E-Readers, Coffee Machines & Microwaves in Swiss Cantons

1 Executive Summary

This analysis investigates the correlation between the proportion of single-person households and sales of three product categories in Swiss cantons: - **E-Readers** (481 sales) - **Coffee Machines** (170 sales) - **Microwaves** (145 sales)

Research question: Which of these products shows the strongest correlation with single-person household rates?

Hypothesis: Products typically used by individuals living alone will show higher per-capita sales in cantons with more single-person households.

2 1. Data & Method

We analyze sales data from Digitec Galaxus for three product categories and compare them with single-person household rates across Swiss cantons.

Product categories: 1. **E-Readers** (ereader-1138): Digital reading devices - potentially popular with solo readers 2. **Coffee Machines** (kaffeevollautomat-125): Single-serve capability - convenient for one person 3. **Microwaves** (mikrowelle-130): Quick individual meals - typical for solo living

Data sources: - Product sales by canton (Digitec Galaxus) - Single-person household rates and population by canton (BFS 2024)

Method: Pearson correlation between single-person household percentage and sales per 5,000 residents for each product category.

3 2. Data Preparation

```
# Load packages
library(tidyverse)
library(readr)
library(ggplot2)
library(knitr)
library(corrplot)

options(scipen = 999)
theme_set(theme_minimal())
```

```
# Load household data
household_data <- read_delim("Einpersonenhaushalt.csv",
                             delim = ";",
                             locale = locale(encoding = "UTF-8"))

# Rename columns for easier handling
colnames(household_data) <- c("Canton_ID", "Canton", "Single_Household_Pct", "Population")

# Load sales data
sales_data <- read_csv("DigitecLive_Cleaned.csv",
                       locale = locale(encoding = "UTF-8"))

kable(household_data,
      digits = 1,
      format.args = list(big.mark = "'"),
      caption = "Single-Person Household Rates by Canton")
```

Table 1: Single-Person Household Rates by Canton

Canton_ID	Canton	Single_Household_Pct	Population
1	Zürich	37.2	1'620'020
10	Freiburg	33.8	346'674
11	Solothurn	36.3	289'792
12	Basel-Stadt	47.8	201'384
13	Basel-Landschaft	35.2	301'323
14	Schaffhausen	38.7	88'667
15	Appenzell Ausserrhoden	35.8	56'705
16	Appenzell Innerrhoden	32.1	16'733

Canton_ID	Canton	Single_Household_Pct	Population
17	St. Gallen	36.2	540’036
18	Graubünden	39.9	206’138
19	Aargau	33.4	735’808
2	Bern	38.5	1’071’216
20	Thurgau	34.5	299’509
21	Tessin	42.1	358’903
22	Waadt	38.4	855’106
23	Wallis	38.6	371’288
24	Neuenburg	42.2	179’518
25	Genf	38.0	531’102
26	Jura	39.0	74’840
3	Luzern	35.1	437’944
4	Uri	34.1	38’275
5	Schwyz	33.6	168’931
6	Obwalden	34.0	39’662
7	Nidwalden	34.3	45’345
8	Glarus	37.1	42’371
9	Zug	32.4	133’739

```
# Filter for three product categories
ereader_sales <- sales_data %>%
  filter(`infos.Category` == "ereader-1138")

coffee_sales <- sales_data %>%
  filter(`infos.Category` == "kaffeevollautomat-125")

microwave_sales <- sales_data %>%
  filter(`infos.Category` == "mikrowelle-130")

# Display sample counts
cat("E-Readers:", nrow(ereader_sales), "sales\n")
```

```
E-Readers: 481 sales
```

```
cat("Coffee Machines:", nrow(coffee_sales), "sales\n")
```

```
Coffee Machines: 170 sales
```

```r
cat("Microwaves:", nrow(microwave_sales), "sales\n")
```

```
Microwaves: 145 sales
```

```r
cat("\nUnique cantons in data:", length(unique(sales_data$canton)), "\n")
```

```
Unique cantons in data: 26
```

4 3. Results

```r
# Prepare canton mapping
canton_mapping <- c(
  "ZH" = "Zürich", "BE" = "Bern", "LU" = "Luzern", "UR" = "Uri",
  "SZ" = "Schwyz", "OW" = "Obwalden", "NW" = "Nidwalden", "GL" = "Glarus",
  "ZG" = "Zug", "FR" = "Freiburg", "SO" = "Solothurn", "BS" = "Basel-Stadt",
  "BL" = "Basel-Landschaft", "SH" = "Schaffhausen", "AR" = "Appenzell Ausserrhoden",
  "AI" = "Appenzell Innerrhoden", "SG" = "St. Gallen", "GR" = "Graubünden",
  "AG" = "Aargau", "TG" = "Thurgau", "TI" = "Tessin", "VD" = "Waadt",
  "VS" = "Wallis", "NE" = "Neuenburg", "GE" = "Genf", "JU" = "Jura"
)

# Function to aggregate sales by canton
aggregate_by_canton <- function(sales_df, product_name) {
  sales_df %>%
    group_by(canton) %>%
    summarise(Total_Sales = n(), .groups = 'drop') %>%
    mutate(Canton_Full = canton_mapping[canton]) %>%
    select(Canton_Full, Total_Sales) %>%
    rename(!!product_name := Total_Sales)
}

# Aggregate each product category
ereader_agg <- aggregate_by_canton(ereader_sales, "EReader_Sales")
coffee_agg <- aggregate_by_canton(coffee_sales, "Coffee_Sales")
microwave_agg <- aggregate_by_canton(microwave_sales, "Microwave_Sales")

# Merge all products with household data
```

```r
analysis_data <- household_data %>%
  left_join(ereader_agg, by = c("Canton" = "Canton_Full")) %>%
  left_join(coffee_agg, by = c("Canton" = "Canton_Full")) %>%
  left_join(microwave_agg, by = c("Canton" = "Canton_Full")) %>%
  mutate(
    EReader_Sales = replace_na(EReader_Sales, 0),
    Coffee_Sales = replace_na(Coffee_Sales, 0),
    Microwave_Sales = replace_na(Microwave_Sales, 0),
    EReader_per_5k = (EReader_Sales / Population) * 5000,
    Coffee_per_5k = (Coffee_Sales / Population) * 5000,
    Microwave_per_5k = (Microwave_Sales / Population) * 5000
  )

kable(analysis_data %>%
        select(Canton, Single_Household_Pct, EReader_per_5k, Coffee_per_5k, Microwave_per_5k
        arrange(desc(Single_Household_Pct)),
      digits = 2,
      col.names = c("Canton", "Single HH %", "E-Reader", "Coffee", "Microwave"),
      caption = "Product Sales per 5,000 Residents by Canton")
```

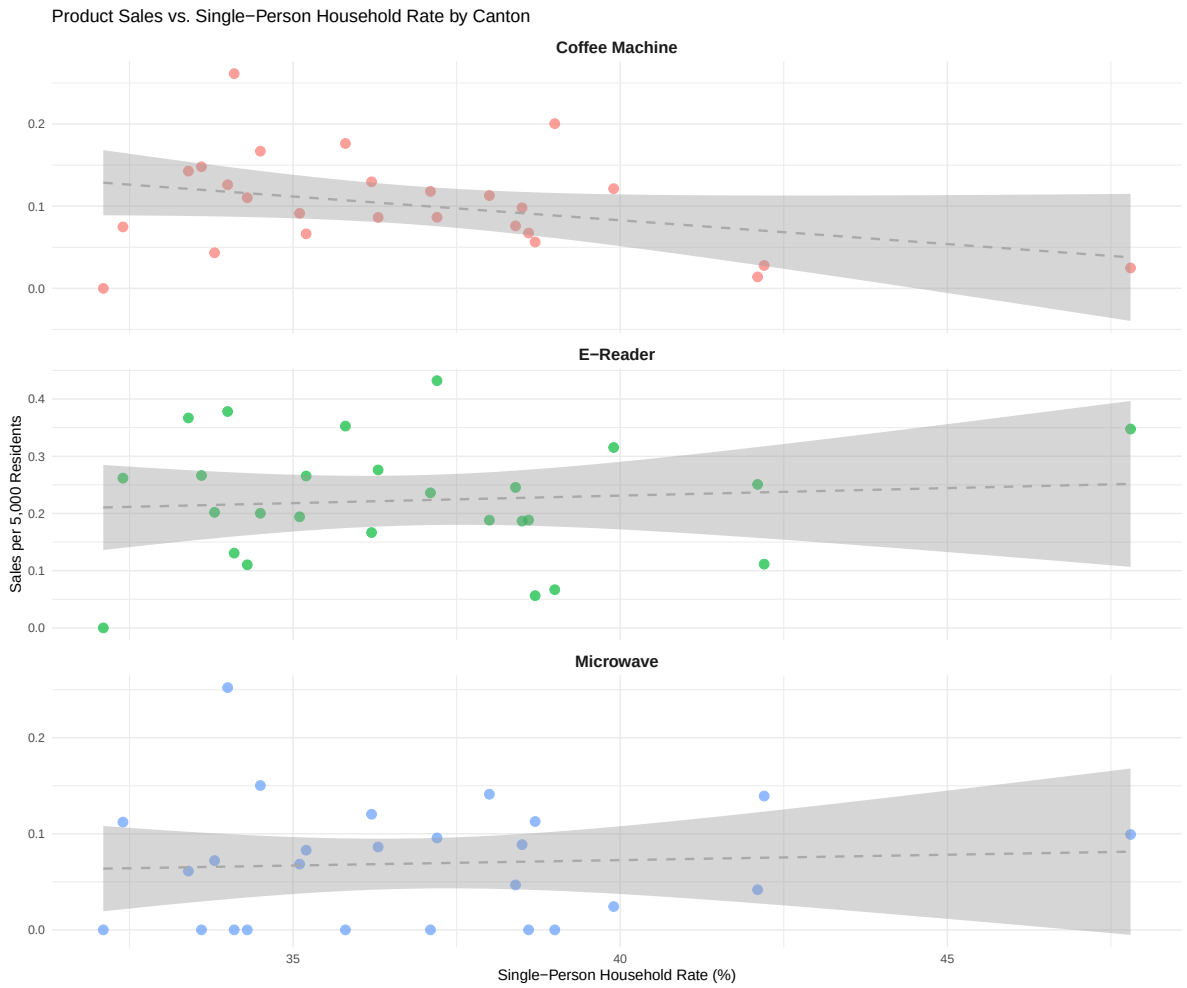
Table 2: Product Sales per 5,000 Residents by Canton

Canton	Single HH %	E-Reader	Coffee	Microwave
Basel-Stadt	47.8	0.35	0.02	0.10
Neuenburg	42.2	0.11	0.03	0.14
Tessin	42.1	0.25	0.01	0.04
Graubünden	39.9	0.32	0.12	0.02
Jura	39.0	0.07	0.20	0.00
Schaffhausen	38.7	0.06	0.06	0.11
Wallis	38.6	0.19	0.07	0.00
Bern	38.5	0.19	0.10	0.09
Waadt	38.4	0.25	0.08	0.05
Genf	38.0	0.19	0.11	0.14
Zürich	37.2	0.43	0.09	0.10
Glarus	37.1	0.24	0.12	0.00
Solothurn	36.3	0.28	0.09	0.09
St. Gallen	36.2	0.17	0.13	0.12
Appenzell Ausserrhoden	35.8	0.35	0.18	0.00
Basel-Landschaft	35.2	0.27	0.07	0.08
Luzern	35.1	0.19	0.09	0.07
Thurgau	34.5	0.20	0.17	0.15

Canton	Single HH %	E-Reader	Coffee	Microwave
Nidwalden	34.3	0.11	0.11	0.00
Uri	34.1	0.13	0.26	0.00
Obwalden	34.0	0.38	0.13	0.25
Freiburg	33.8	0.20	0.04	0.07
Schwyz	33.6	0.27	0.15	0.00
Aargau	33.4	0.37	0.14	0.06
Zug	32.4	0.26	0.07	0.11
Appenzell Innerrhoden	32.1	0.00	0.00	0.00

```
# Prepare data for plotting
plot_data <- analysis_data %>%
  select(Canton, Single_Household_Pct, EReader_per_5k, Coffee_per_5k, Microwave_per_5k) %>%
  pivot_longer(
    cols = c(EReader_per_5k, Coffee_per_5k, Microwave_per_5k),
    names_to = "Product",
    values_to = "Sales_per_5k"
  ) %>%
  mutate(Product = case_when(
    Product == "EReader_per_5k" ~ "E-Reader",
    Product == "Coffee_per_5k" ~ "Coffee Machine",
    Product == "Microwave_per_5k" ~ "Microwave"
  ))

# Visualization with facets
ggplot(plot_data, aes(x = Single_Household_Pct, y = Sales_per_5k)) +
  geom_point(aes(color = Product), size = 3, alpha = 0.7) +
  geom_smooth(method = "lm", se = TRUE, color = "darkgray", linetype = "dashed", linewidth =
  facet_wrap(~Product, scales = "free_y", ncol = 1) +
  labs(
    title = "Product Sales vs. Single-Person Household Rate by Canton",
    x = "Single-Person Household Rate (%)",
    y = "Sales per 5,000 Residents"
  ) +
  theme_minimal() +
  theme(
    legend.position = "none",
    strip.text = element_text(size = 12, face = "bold")
  )
```




```
# Correlation analysis for all three products
cor_ereader <- cor.test(analysis_data$Single_Household_Pct, analysis_data$EReader_per_5k)
cor_coffee <- cor.test(analysis_data$Single_Household_Pct, analysis_data$Coffee_per_5k)
cor_microwave <- cor.test(analysis_data$Single_Household_Pct, analysis_data$Microwave_per_5k)

# Create summary table
correlation_summary <- data.frame(
  Product = c("E-Reader", "Coffee Machine", "Microwave"),
  Correlation = c(cor_ereader$estimate, cor_coffee$estimate, cor_microwave$estimate),
  P_Value = c(cor_ereader$p.value, cor_coffee$p.value, cor_microwave$p.value),
  Significant = c(
    ifelse(cor_ereader$p.value < 0.05, "Yes", "No"),
    ifelse(cor_coffee$p.value < 0.05, "Yes", "No"),
    ifelse(cor_microwave$p.value < 0.05, "Yes", "No")
```

```
  )
)

kable(correlation_summary,
      digits = 4,
      col.names = c("Product", "Correlation (r)", "p-value", "Significant (p<0.05)"),
      caption = "Correlation Results: Single-Person Households vs. Product Sales")
```

Table 3: Correlation Results: Single-Person Households vs. Product Sales

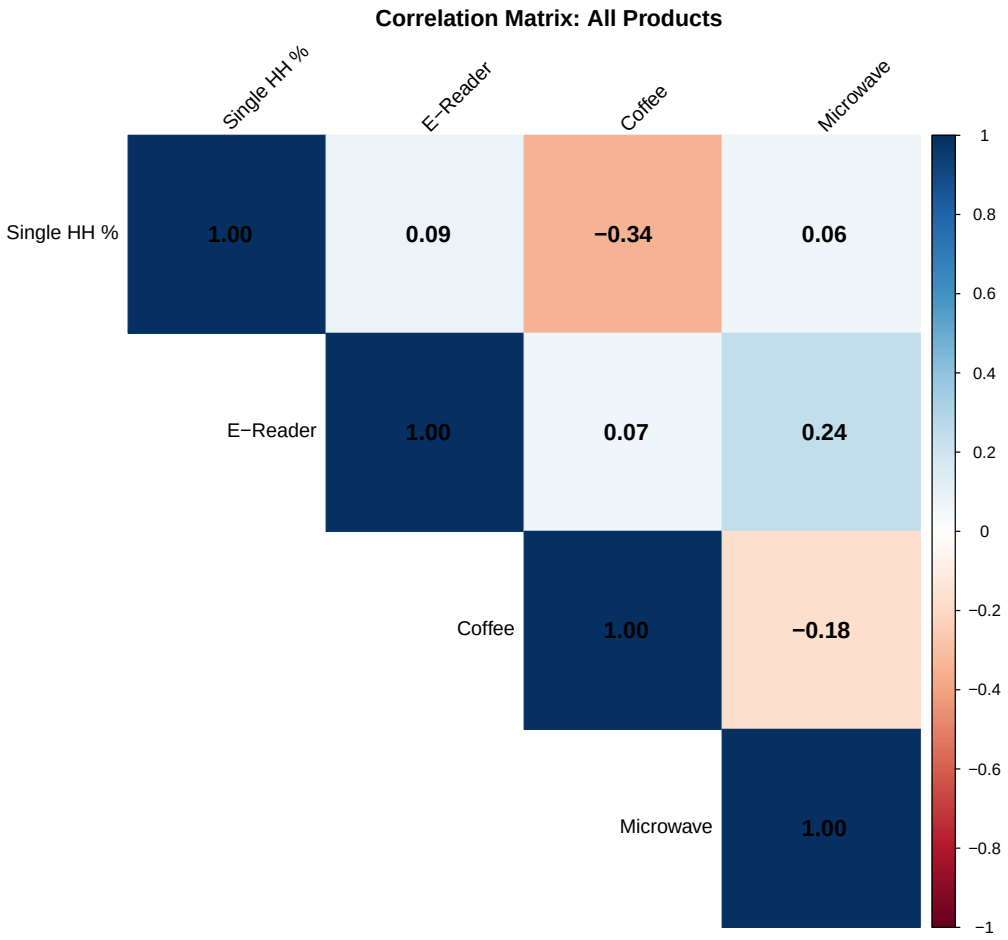
Product	Correlation (r)	p-value	Significant (p<0.05)
E-Reader	0.0872	0.6720	No
Coffee Machine	-0.3405	0.0888	No
Microwave	0.0626	0.7611	No

```
# Correlation matrix for all variables
cor_data <- analysis_data %>%
  select(Single_Household_Pct, EReader_per_5k, Coffee_per_5k, Microwave_per_5k)

colnames(cor_data) <- c("Single HH %", "E-Reader", "Coffee", "Microwave")

cor_matrix <- cor(cor_data, use = "complete.obs")

corrplot(cor_matrix,
         method = "color",
         type = "upper",
         addCoef.col = "black",
         tl.col = "black",
         tl.srt = 45,
         number.cex = 1.2,
         title = "Correlation Matrix: All Products",
         mar = c(0, 0, 2, 0))
```




```
# Canton ranking by single-household rate
ranking <- analysis_data %>%
  select(Canton, Single_Household_Pct, EReader_per_5k, Coffee_per_5k, Microwave_per_5k) %>%
  arrange(desc(Single_Household_Pct))

kable(ranking,
      digits = 2,
      col.names = c("Canton", "Single HH %", "E-Reader", "Coffee", "Microwave"),
      caption = "Canton Ranking by Single-Household Rate with Product Sales per 5k")
```

Table 4: Canton Ranking by Single-Household Rate with Product Sales per 5k

Canton	Single HH %	E-Reader	Coffee	Microwave
Basel-Stadt	47.8	0.35	0.02	0.10

Canton	Single HH %	E-Reader	Coffee	Microwave
Neuenburg	42.2	0.11	0.03	0.14
Tessin	42.1	0.25	0.01	0.04
Graubünden	39.9	0.32	0.12	0.02
Jura	39.0	0.07	0.20	0.00
Schaffhausen	38.7	0.06	0.06	0.11
Wallis	38.6	0.19	0.07	0.00
Bern	38.5	0.19	0.10	0.09
Waadt	38.4	0.25	0.08	0.05
Genf	38.0	0.19	0.11	0.14
Zürich	37.2	0.43	0.09	0.10
Glarus	37.1	0.24	0.12	0.00
Solothurn	36.3	0.28	0.09	0.09
St. Gallen	36.2	0.17	0.13	0.12
Appenzell Ausserrhoden	35.8	0.35	0.18	0.00
Basel-Landschaft	35.2	0.27	0.07	0.08
Luzern	35.1	0.19	0.09	0.07
Thurgau	34.5	0.20	0.17	0.15
Nidwalden	34.3	0.11	0.11	0.00
Uri	34.1	0.13	0.26	0.00
Obwalden	34.0	0.38	0.13	0.25
Freiburg	33.8	0.20	0.04	0.07
Schwyz	33.6	0.27	0.15	0.00
Aargau	33.4	0.37	0.14	0.06
Zug	32.4	0.26	0.07	0.11
Appenzell Innerrhoden	32.1	0.00	0.00	0.00

5 4. Conclusion

Research Question: Which product shows the strongest correlation with single-person household rates?

Results: - **E-Reader**: r = 0.087, p = 0.672 - NOT SIGNIFICANT - **Coffee Machine**: r = -0.34, p = 0.0888 - NOT SIGNIFICANT - **Microwave**: r = 0.063, p = 0.7611 - NOT SIGNIFICANT

Key Findings: - Canton with highest single-household rate: Basel-Stadt (47.8%) - Strongest correlation product: Coffee Machine

Interpretation: No significant correlations found. The Coffee Machine shows the strongest (negative) relationship with single-person households.

Possible explanations: 1. **Urban lifestyle**: Higher single-household rates in cities correlate with different consumer behaviors 2. **Demographics**: Age and income of people living alone influence product preferences 3. **Living space**: Smaller apartments may drive demand for compact appliances 4. **Independence**: Solo living requires individual-sized appliances and personal devices

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Data: Digitec Galaxus (E-Readers, Coffee Machines, Microwaves), BFS (Single-Person Households 2024)