UniLaSalle Rouen

R Project

WHAT IMPACTS PROFITABILITY OF FARMS IN FRANCE?

FARM SIZE, SEX, TAXES & AGE

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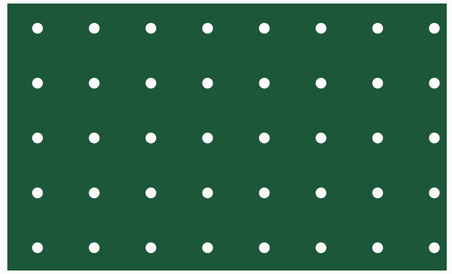
Overview



Introduction

- Leading EU country in agriculture
- 416,436 farms in 2020
- 39 billion euros in 2023
- Frances agricultural sector is in a critical situation
  - Agricultural crisis
  - Less people taking over farms
  - Decrease of incomes

(Chambres d'agriculture - France,2024)




MAIN QUESTION

How do sex and age demographics, along with farm size influence the profitability of farms in France?

Key questions :

SEX

1. How does gender affect the profitability of agricultural businesses?

AGE

2. How does the age of farm managers affect its profitability?

FARM SIZE

3.Does the size of the farm impact its profitability?

Data Source and Characteristics

SOURCE
RICA (Réseau d'Information Comptable Agricole)

NATURE
technical and economic operations of farms.

SCOPE
France

Age range of the farm manager

Gender of the farm manager

Revenues (in euros)

Total area (UAA and non-UAA) (portion)

Property Taxes

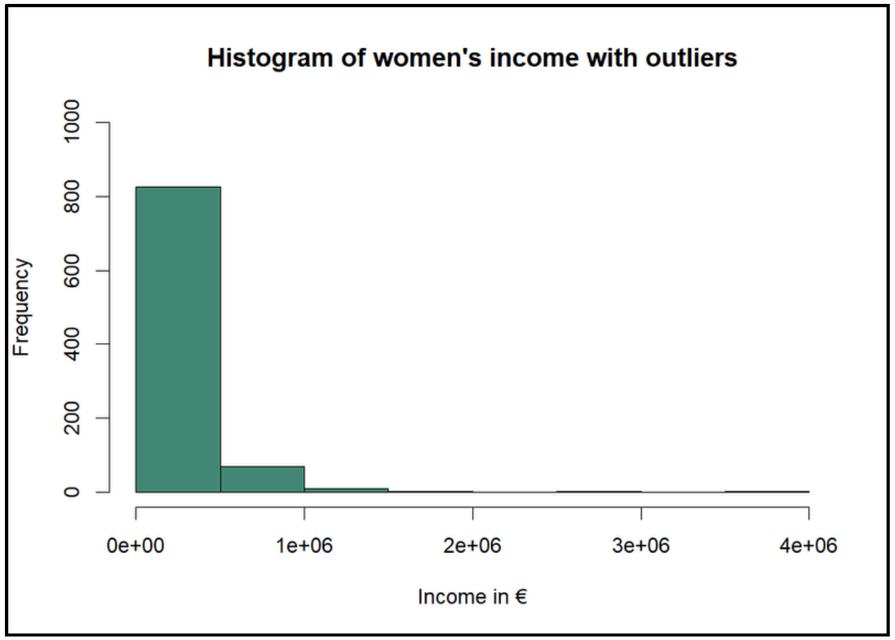
Cleaning - Revenues

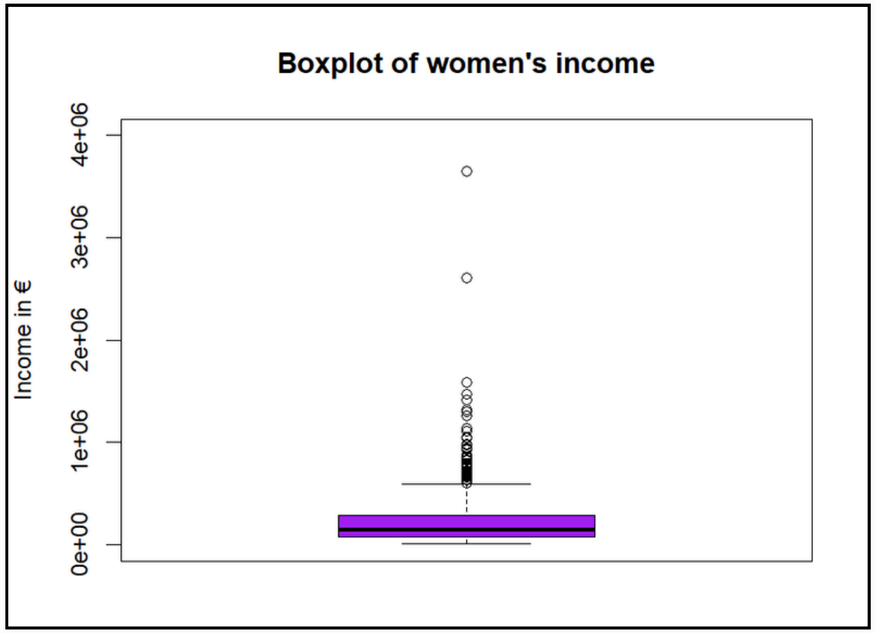
- Cleared irrelevant data from the dataset
- Attempted a **Shapiro-Wilk test** on **all farmers' Revenue**
  - R gave an error due to sample size (> 5000)
- Separated males from females due to the large male population
- Conducted **Shapiro-Wilk test** on **Female Farmers' Revenue**

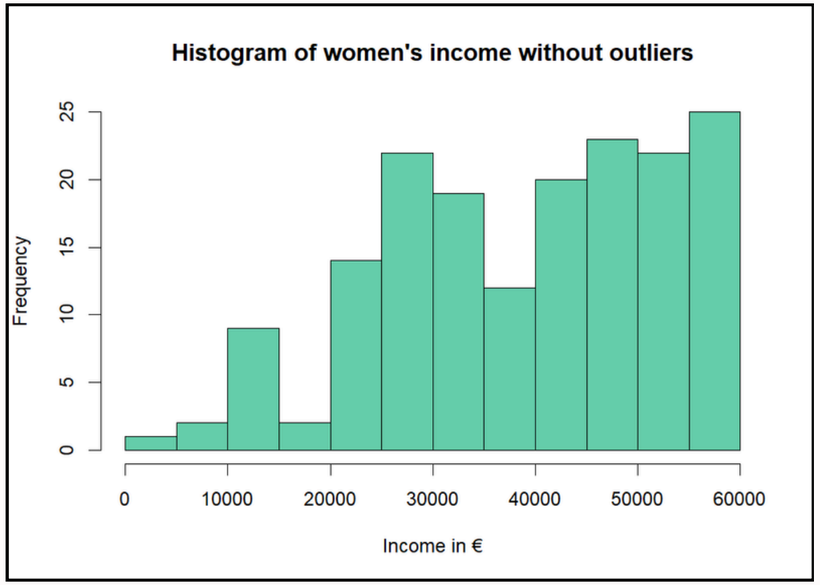
SHAPIRO WILK TEST RESULTS
W = 0.6406
p value < 2.2e-16

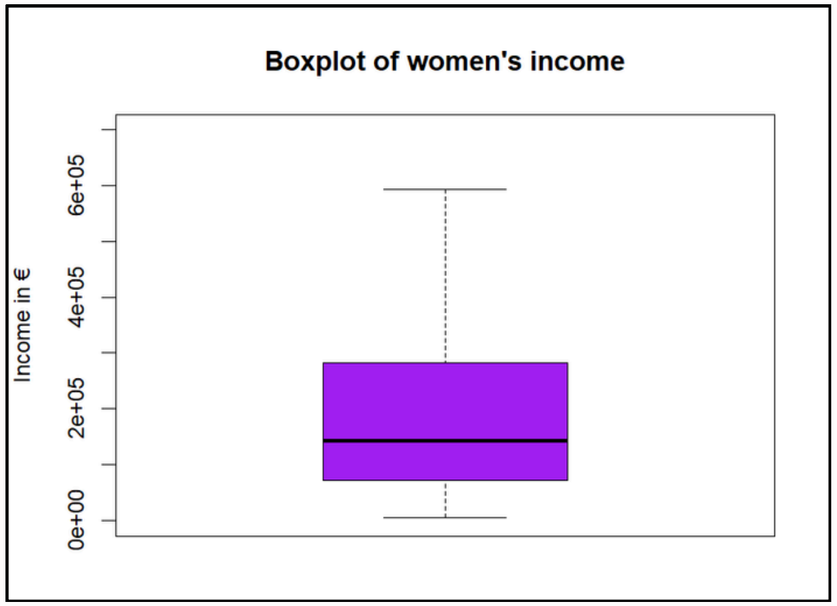
- **Eliminated outliers** for **Female Farmers' Revenue**

SHAPIRO WILK TEST RESULTS
W = 0.6406
p value < 2.2e-16


Histogram of women's income with outliers
Frequency
0
200
400
600
800
1000
0e+00
1e+06
2e+06
3e+06
4e+06
Income in €


Boxplot of women's income
Income in €
0e+00
1e+06
2e+06
3e+06
4e+06


Histogram of women's income without outliers
Frequency
0
5
10
15
20
25
0
10000
20000
30000
40000
50000
60000
Income in €

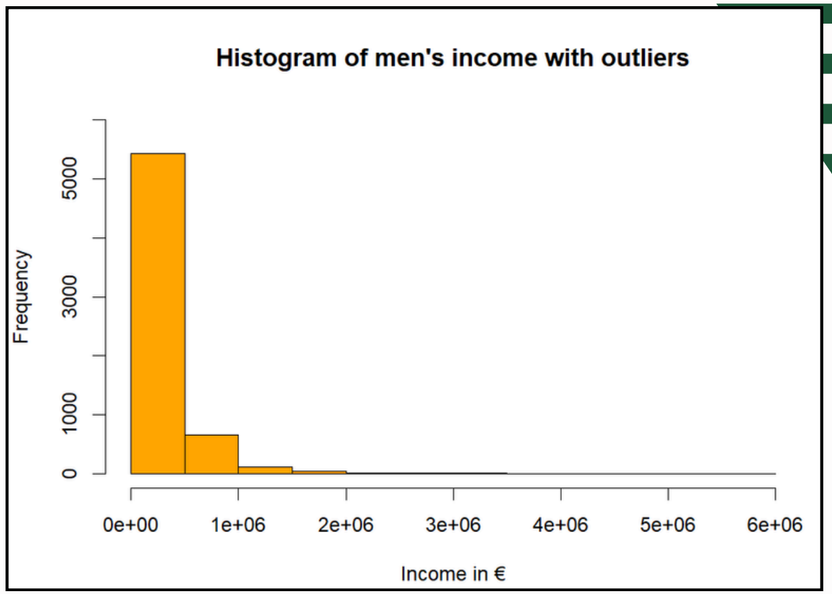

Boxplot of women's income
Income in €
0e+00
2e+05
4e+05
6e+05

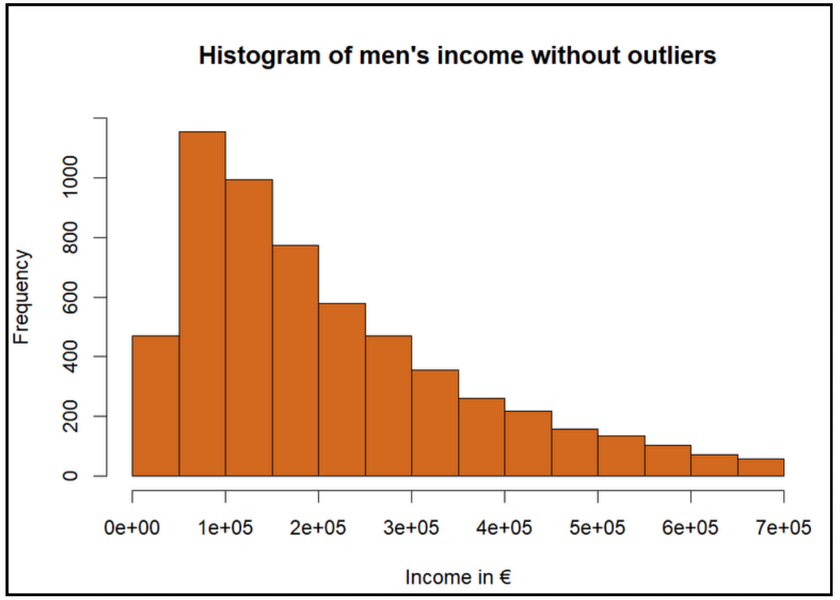
Cleaning - Revenues

- Conducted a **Similar protocol on Male Farmers' Revenue** for outliers

- Conducted the **Kolmogorov-Smirnov Test**
  - Distribution still non-normal

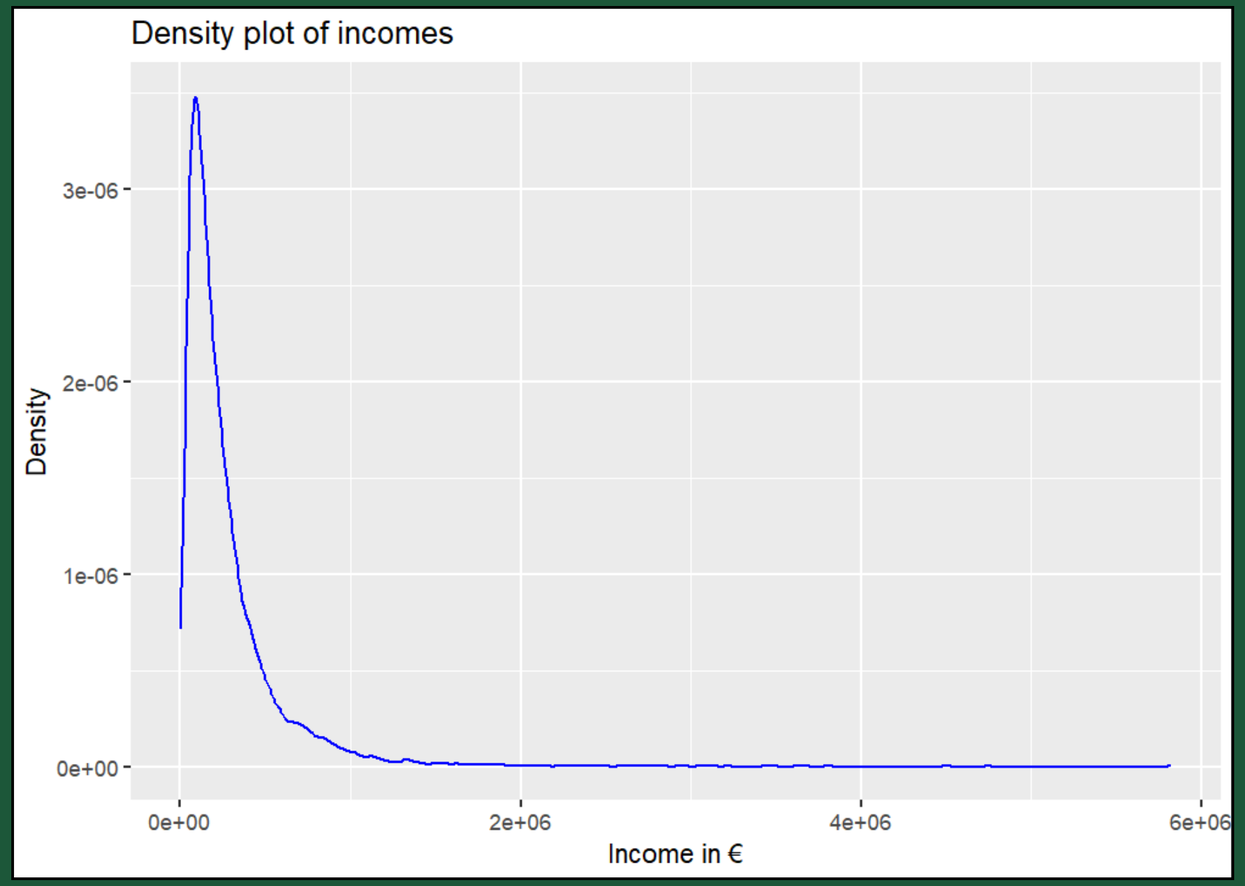
KOLMOGOROV - SMIRNOV TEST
D = 0.10247
p-value < 2.2e-16





REVENUE

INITIAL DATA EXPLORATION

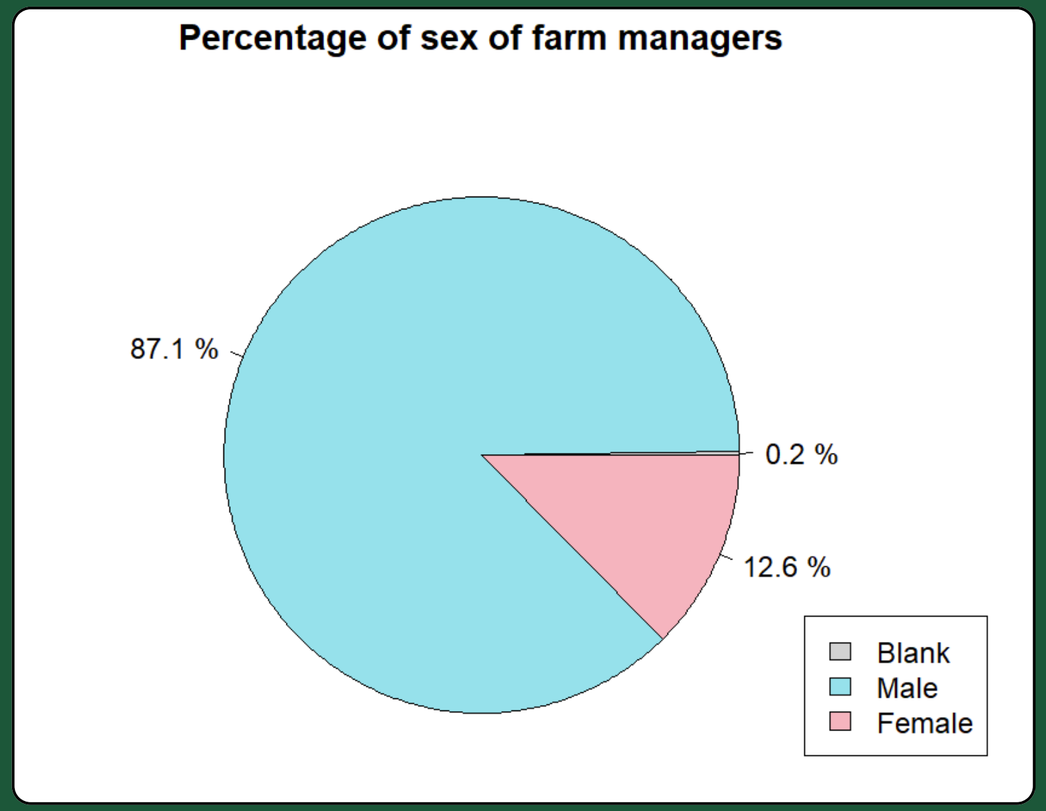


Highly skewed distribution of farm revenues

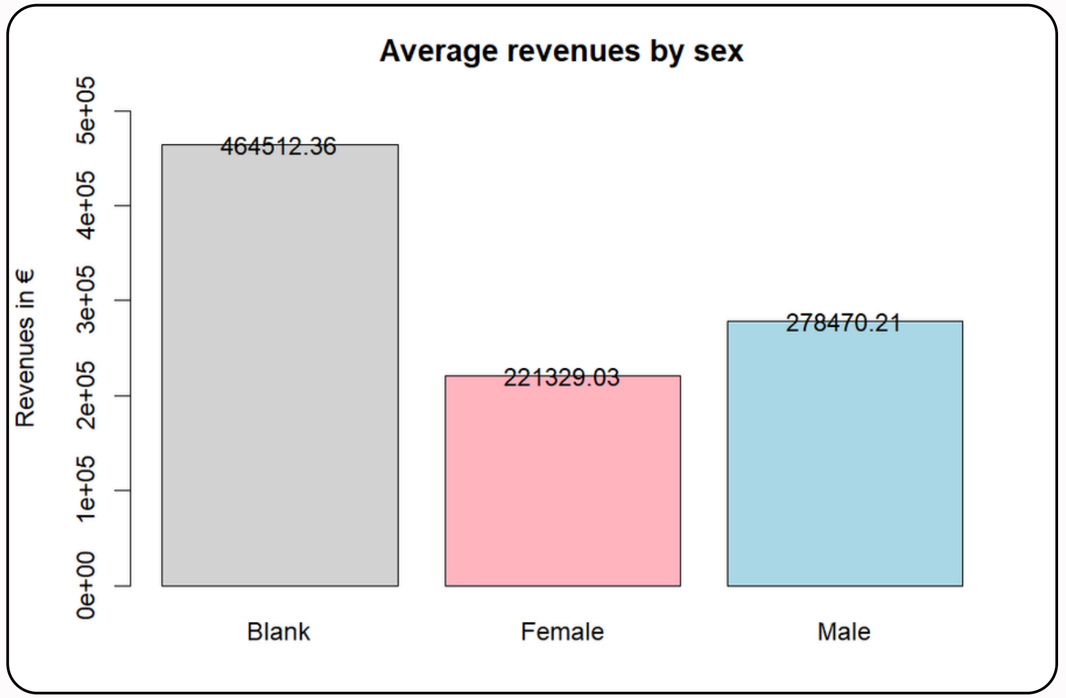
- Most farms earn relatively low revenues
- There are a few outliers with very high revenues
- Peak around 250 000 €

Question & Analysis

1 How does sex affect the profitability of agricultural businesses?



Predominance of male Farm Managers



SEX REVENUE GAP

Females earn roughly 79% of what males earn

BLANK CATEGORY

Notably higher than both male and female categories but represents a very small, potentially non-representative sample of data

Question & Analysis

1 How does sex affect the profitability of agricultural businesses?

- Revenue data is not normally distributed
- Used alternative non-parametric test

WILCOXON RANK SUM TEST RESULT

W = 24382820

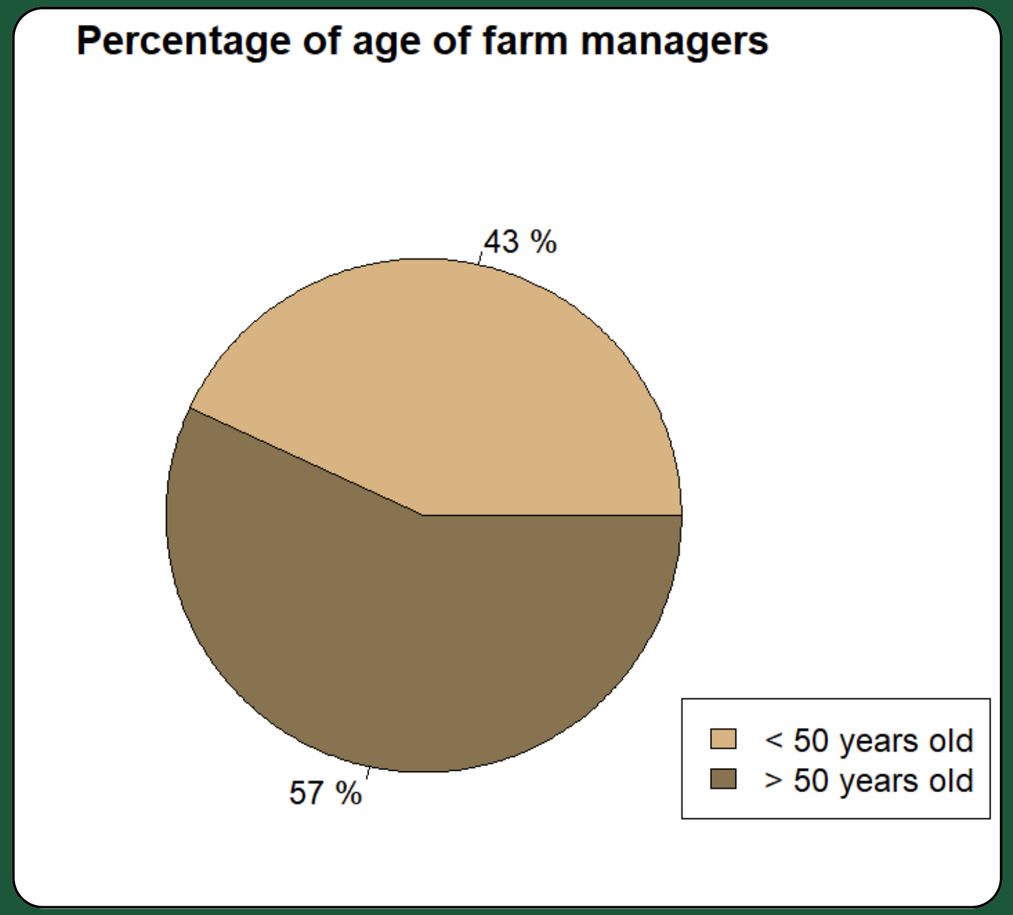
p-value = 6.909e-13

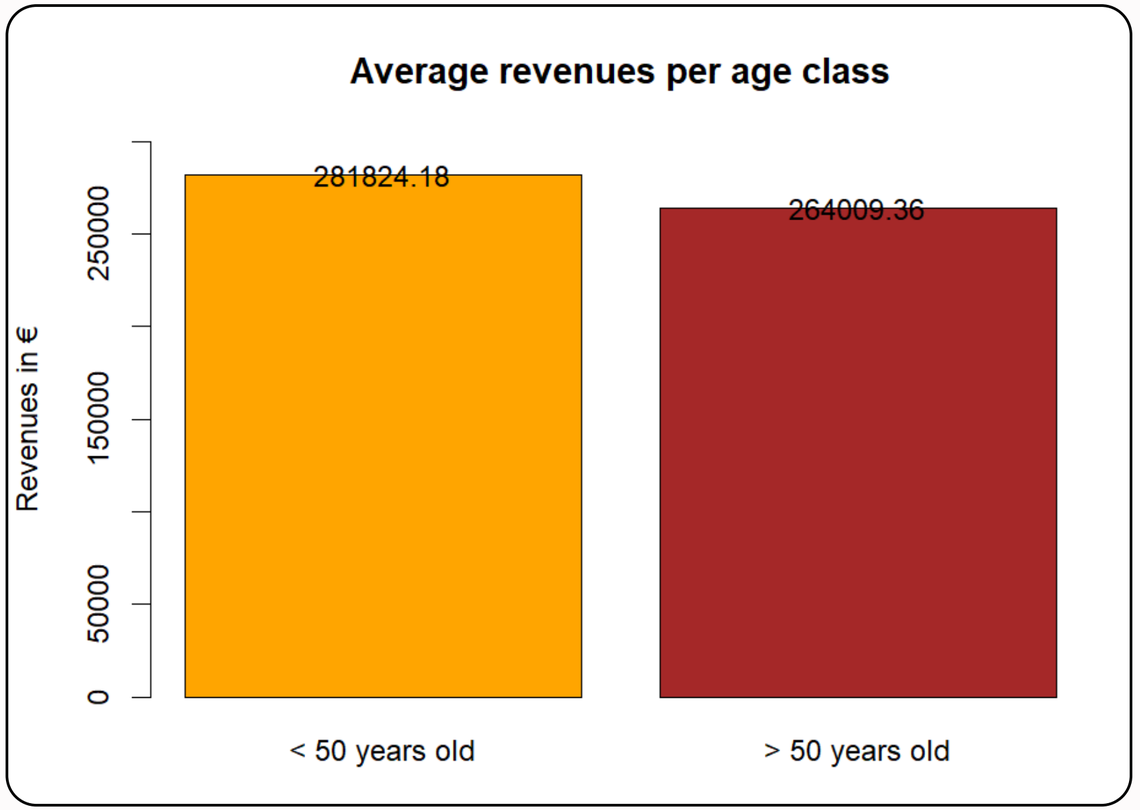
On average, males have significantly higher revenue than females.

Question & Analysis

2

How does the age of farm managers affect its profitability?





Younger farm managers are generating more revenue compared to older farmers

Question & Analysis

2 How does the age of farm managers affect its profitability?

KRUSKAL WALLIS TEST

chi-squared = 69.423

df = 13

p-value = 1.025e-09

This shows that on average the original 14 age groups make significantly different revenues in comparison to each other

WILCOXON RANK SUM TEST RESULT (ONE-TAILED)

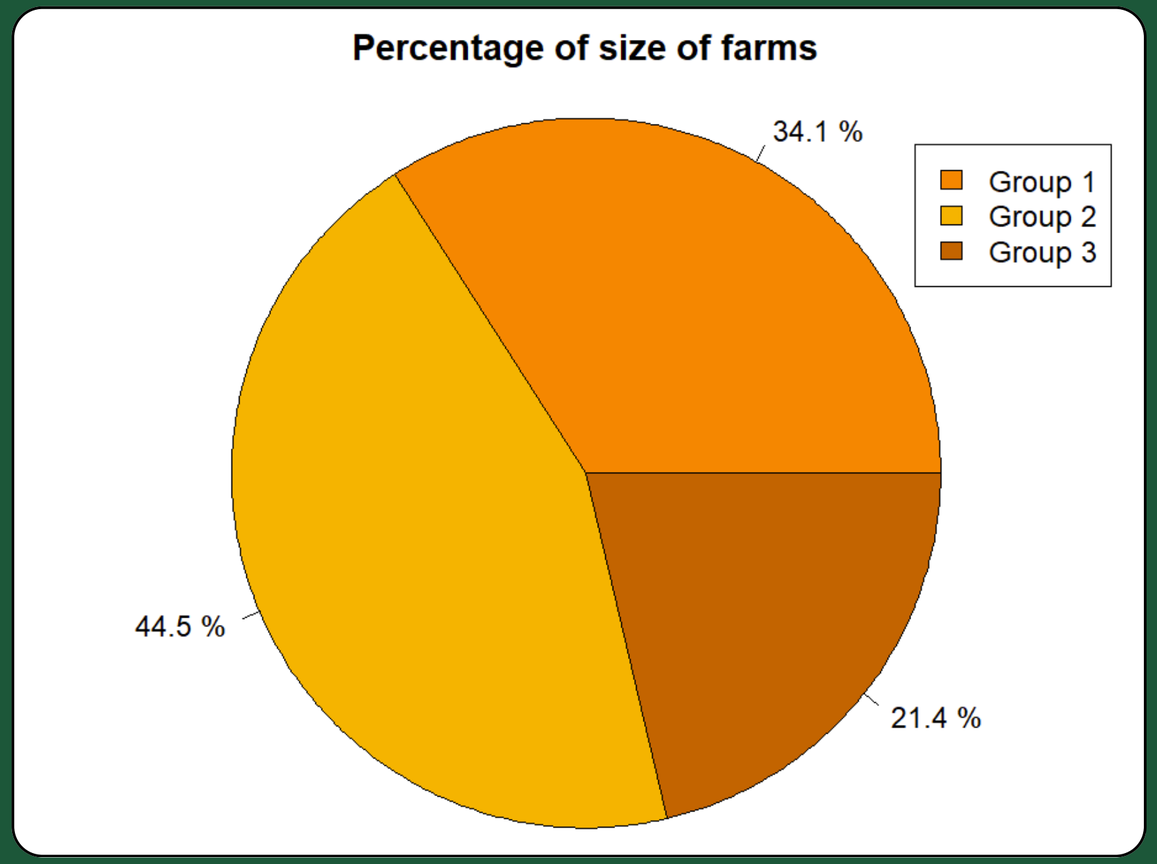
W = 5955642

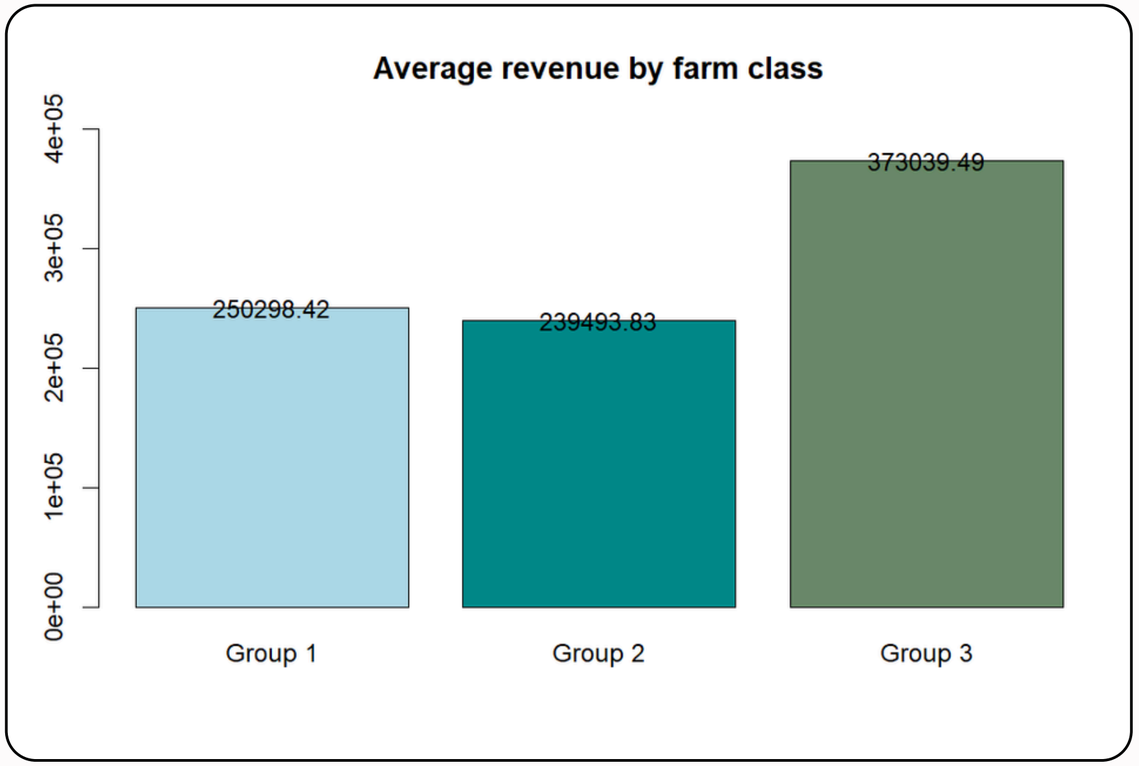
p-value = 1.655e-06

Farmers younger than 50 make significantly more revenue on average than farmers older than 50

Question & Analysis

3 Does the size of the farm impact its profitability?





Groups 1: 0 to 10: 0-50 ha farms
Groups 2: 11 to 20: 50-150 ha farms
Groups 3: 21 to 30: 150-400+ ha farms

Group 2 is the most common farm size, yet on average they make less revenue

Question & Analysis

3 Does the size of the farm impact its profitability?

WILCOXON RANK SUM TEST RESULTS

Group 1 > Group 2

W = 3882680

p-value = 0.8239

→ Group 1 = Group 2

Group 3 > Group 2

W = 3841692

p-value < 2.2e-16

→ Group 3 > 2

Group 3 > Group 1

W = 2629795

p-value < 2.2e-16

→ Group 3 > 1

Question & Analysis

4* Is the age of farmers associated with the size of their farm?

PEARSON'S CHI SQUARE TEST

Chi-squared = 18453

df = 7202

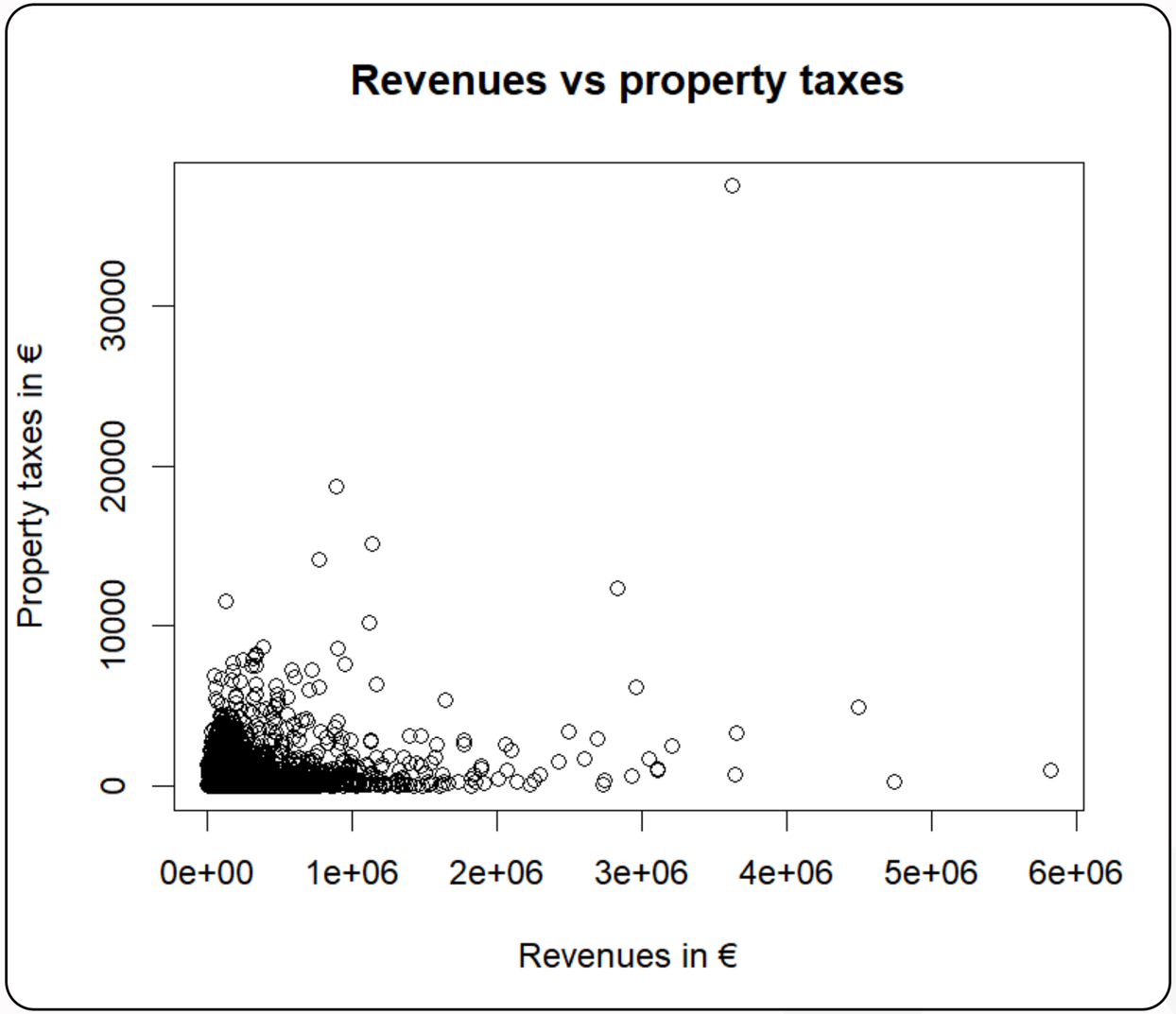
p-value < 2.2e-16

There is a significant association between farmer age group and farm size group

Question & Analysis

5* Is revenue correlated to property tax?

This graph displays a slight negative trend between revenues and property taxes



Question & Analysis

5* Is revenue correlated to property tax?

- Revenue data is not normally distributed
- Used alternative non-parametric test

SPEARMAN'S RANK CORRELATION

S = 6843805103

p-value = 4.006e-10

sample estimates: rho = -0.1080316

KENDALL'S RANK CORRELATION

z = -0.11213

p-value = 0.9107

sample estimates: tau = -0.0012959

Both Non-Parametric correlation tests convey a WEAK correlation

CONCLUSION

- The tests performed frequently found significant differences, associations, and correlations between the examined variables
- There are likely a myriad of other variables that may influence profitability
- A more intensive study would need to be done in order to make draw any truly significant conclusions

Citations

Chambres d'agriculture - France. (2023). LES CHIFFRES 2023 DE L'AGRICULTURE FRANÇAISE. Retrieved from www.chambres-agriculture.fr: https://chambres-agriculture.fr/publications/toutes-les-publications/la-publication-en-detail/actualites/les-chiffres-2023-de-lagriculture-francaise/

Chambres d'agriculture - France. (2024). LES CHIFFRES CLÉS 2023 DE L'AGRICULTURE FRANÇAISE. Chambres d'agriculture - France.