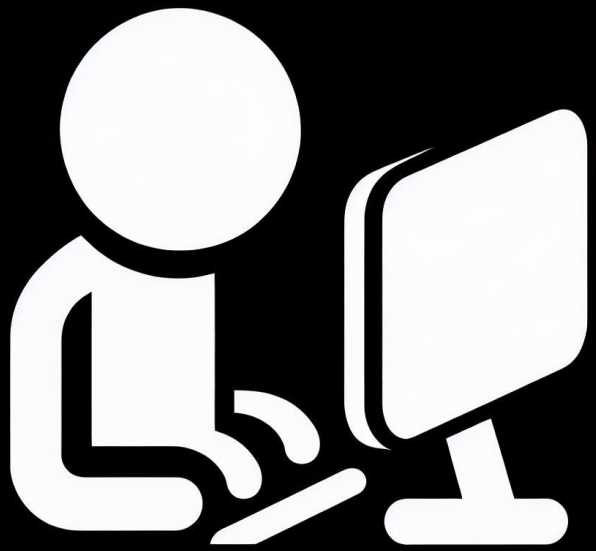
Estimating the growth potential of bank branches using economic, demographic and social data

02.04.2025
Cluj-Napoca

About me



Experience

2017 ----------2021 ----------present

Data Analyst---------- Team Leader ----------

Studies

2013----------2016 ----------2018

BSc
Finance and Banking
BBU

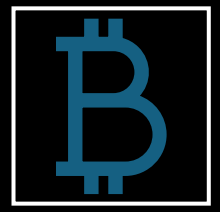
MSc
Econometrics and
Applied Statistics
BBU

Structure of the presentation

- INTRODUCTION & COURSE OVERVIEW
- KEY FACTORS INFLUENCING BRANCH GROWTH
- DATA ACQUISITION AND PREPROCESSING
- STATISTICAL ANALYSIS
- MACHINE LEARNING
- CASE STUDY
- ETHICAL CONSIDERATIONS AND LIMITATIONS
- CONCLUSION AND Q&A

The Importance of Branch Network Optimization

Evolving banking landscape: digital vs. physical presence.

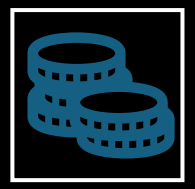


Physical branches: crucial for relationships & complex services (especially for complex financial products, building trust).

Data-driven decisions: essential for strategic branch placement to maximize profitability and market share.

Course objectives: data gathering, modeling, interpretation for effective branch network planning.

Understanding Growth Drivers



Economic

Demographic

Social

Competitive

Gathering and Preparing Your Data

Sources

Government agencies (e.g., census data), economic databases (e.g., World Bank), market research firms, internal bank data, local business registries, Chambers of Commerce, economic development agencies.

Data types

Geographic (latitude/longitude), time-series (economic indicators), categorical (demographics), and textual (social media sentiment).

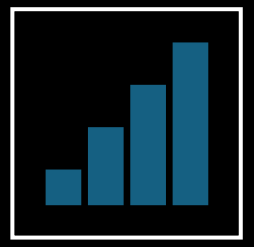
Preprocessing

Cleaning, handling missing values, feature engineering (creating relevant derived variables), spatial data alignment, and ensuring data quality and consistency.

Statistical Techniques

Regression Analysis

Identifies relationships between variables.



Correlation Analysis

Measures the strength of relationships.

Time Series Analysis

Analyzes data trends over time.

Machine Learning

Supervised Learning

Techniques like linear regression and decision trees.

Unsupervised Learning

Techniques like clustering for identifying patterns.

Neural Networks

Advanced models for complex predictions.

Case Study

Strategic Analysis and Grouping of Urban and Peripheral Regions for Growth Potential: A Case Study of Banca Transilvania's Branches

Clustering of Urban and Regions from the Perspective of Banca Transilvania's Expansion

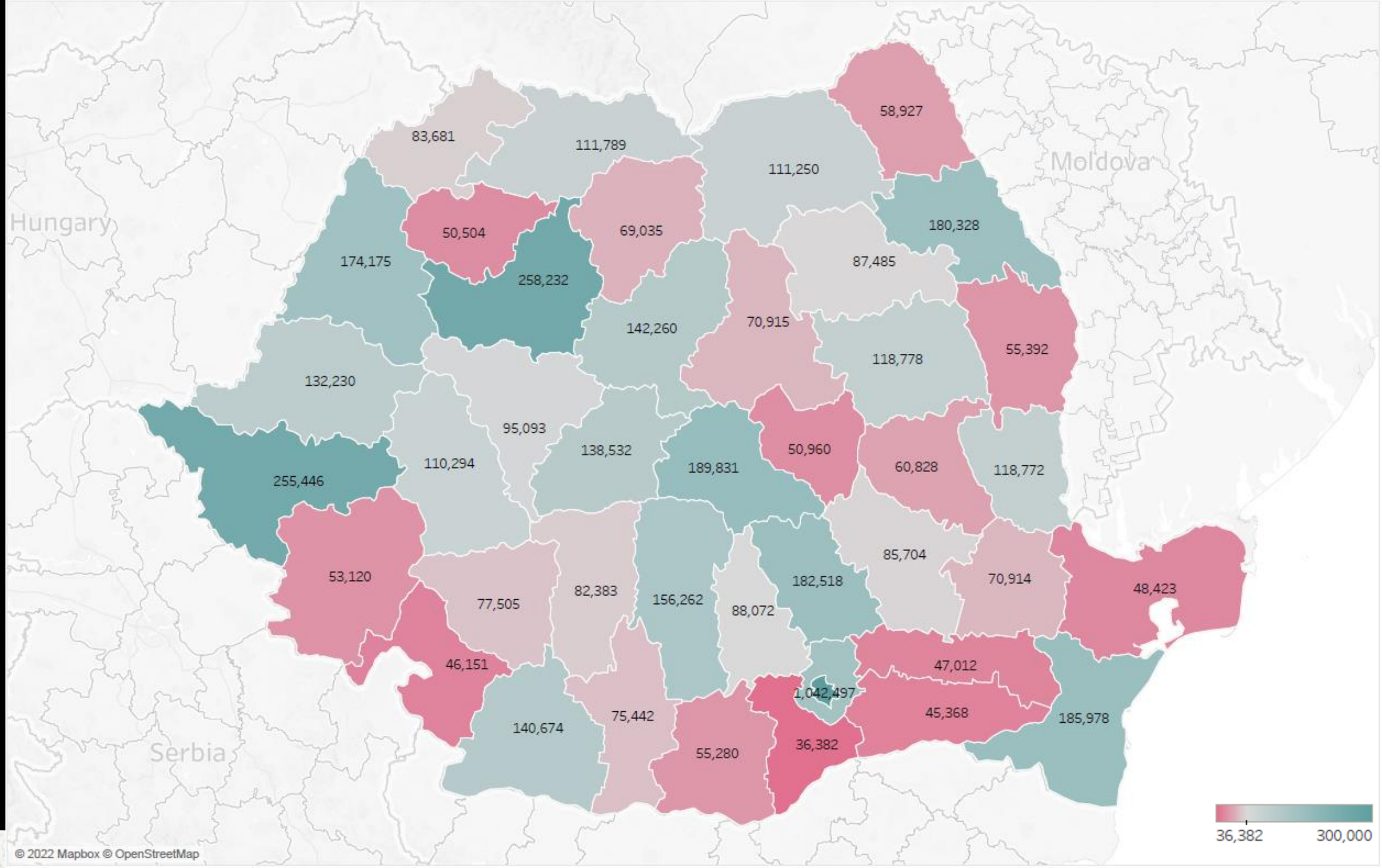
Growth Drivers Used

- Resident population by age group
- Resident population employed by occupation group
- Resident population by ethnicity
- Registered unemployed
- Average number of employees
- Labor force - Labor resources
- Average monthly net nominal wage earnings by activities of the national economy (sections and divisions)
- Permanent emigrants by counties and localities of departure
- Average annual number of pensioners
- Budget execution - Income and expenditure statement
- FOB exports
- Deaths
- Turnover
- Company registrations

Preparing Your Data

- %Young, %Elderly
- **Resident population employed by occupation group** - transition from county level to city level based on the Labor Force
- Percentage evolution of **registered unemployed** (y2 vs y1)
- Percentage evolution of **employees** (y2 vs y1)
- **Labor force - Labor resources** - transition from county level to city level based on population aged 15 to 64
- Average monthly wage earnings by activities - Percentage evolution (y2 vs y1)
- Percentage evolution of **permanent emigrants** (y2 vs y1)
- Company registrations - transition from county level to city level based on **Labor resources**
- Average annual number of pensioners - transition from county level to city level based on population and age
- Ratio income/expenditure
- Personal income tax (PIT)
- Percentage of **minorities**
- Percentage of expenditure (social assistance, goods and services, employees, health, education)
- Percentage of income (budget balance from revenue, subsidies from revenue)
- FOB exports - transition from county level to city level based on population
- Percentage evolution of deaths (y2 vs y1)
- Turnover - transition from county level to city level based on **employees**

Employees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Hungary
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180,328
174,175
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142,260
70,915
55,392
118,778
132,230
95,093
138,532
189,831
50,960
60,828
118,772
110,294
255,446
85,704
53,120
82,383
156,262
182,518
70,914
48,423
77,505
88,072
46,151
47,012
1,042,497
75,442
45,368
185,978
140,674
55,280
36,382
Serbia
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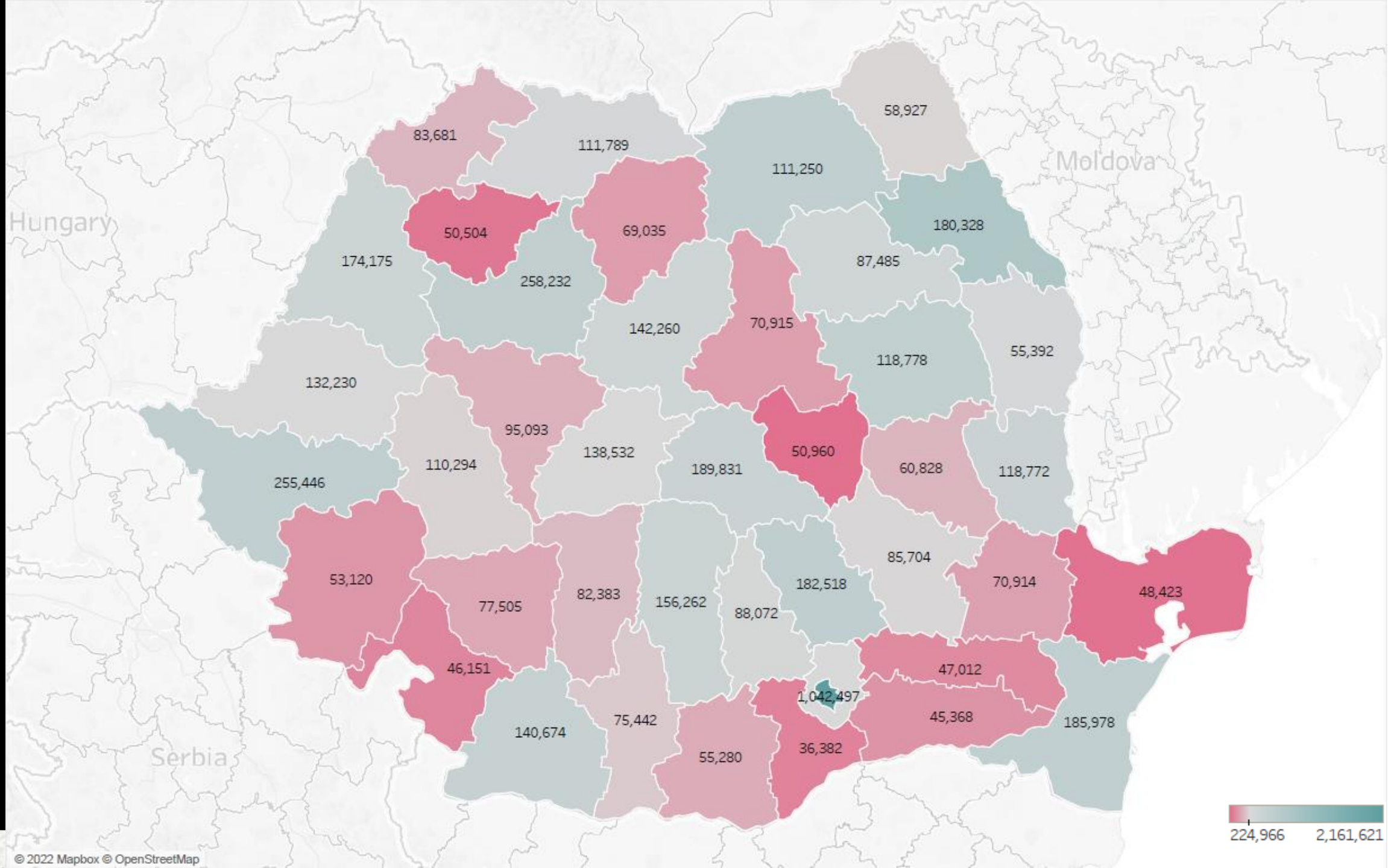
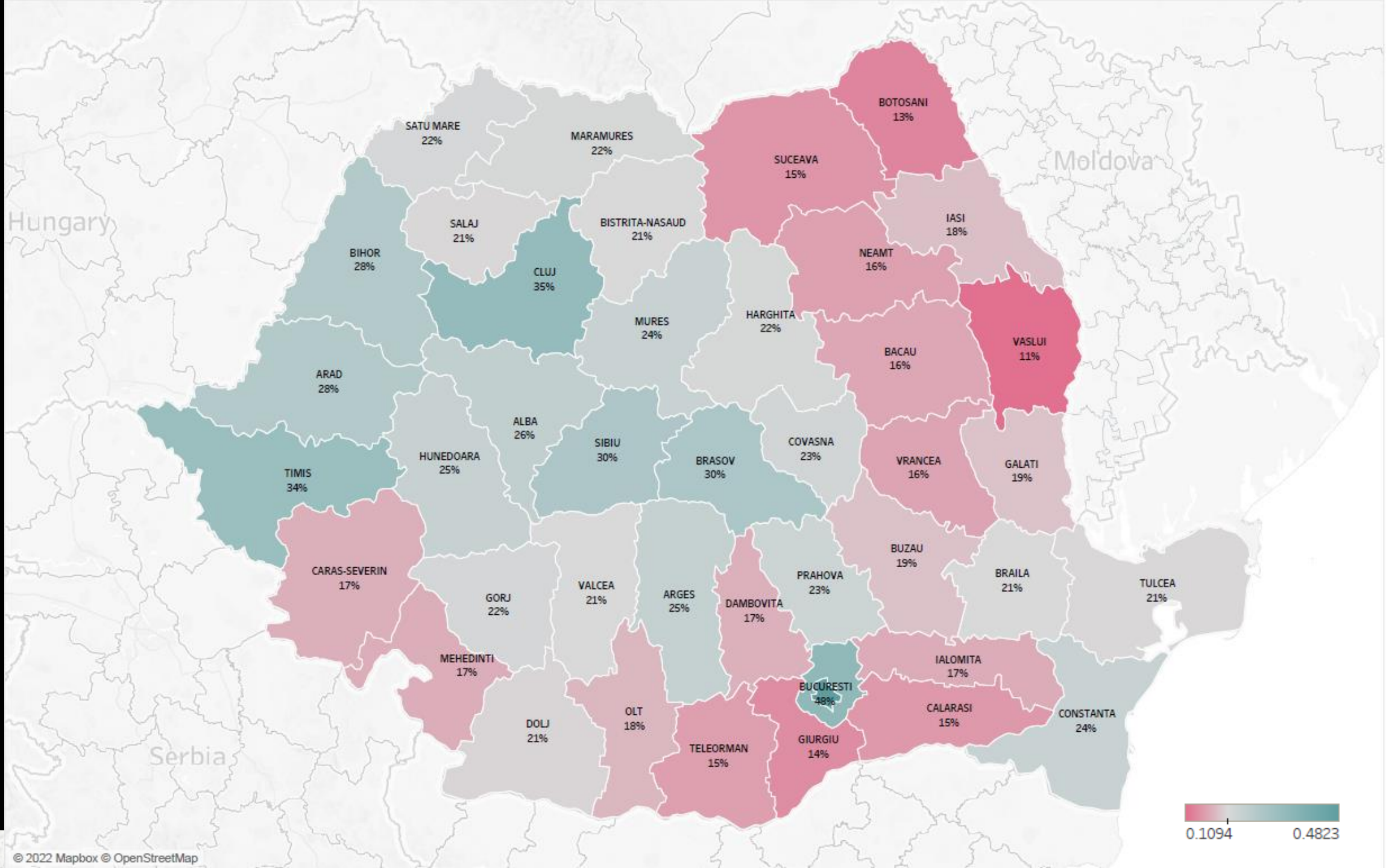
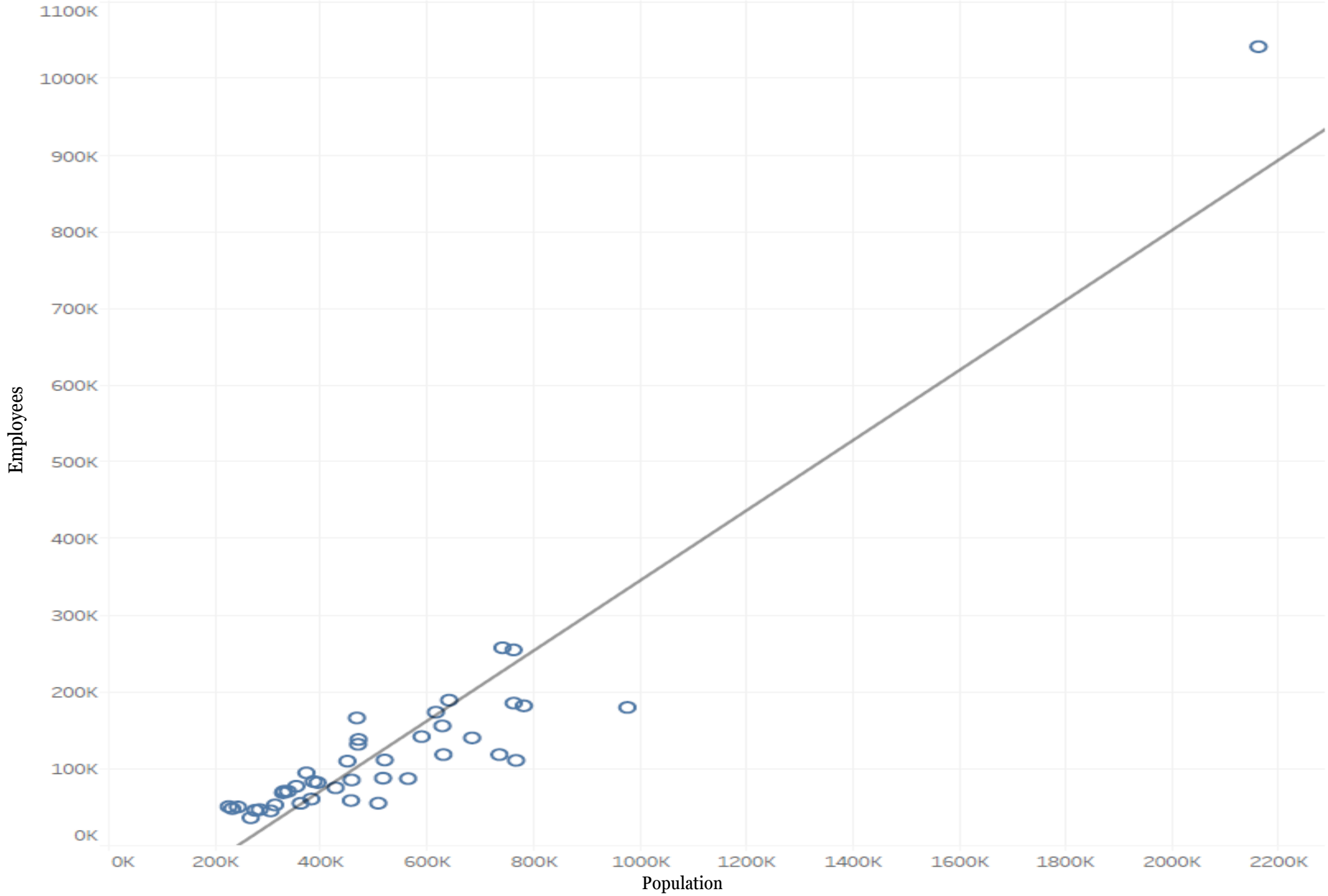
Employees VS Population



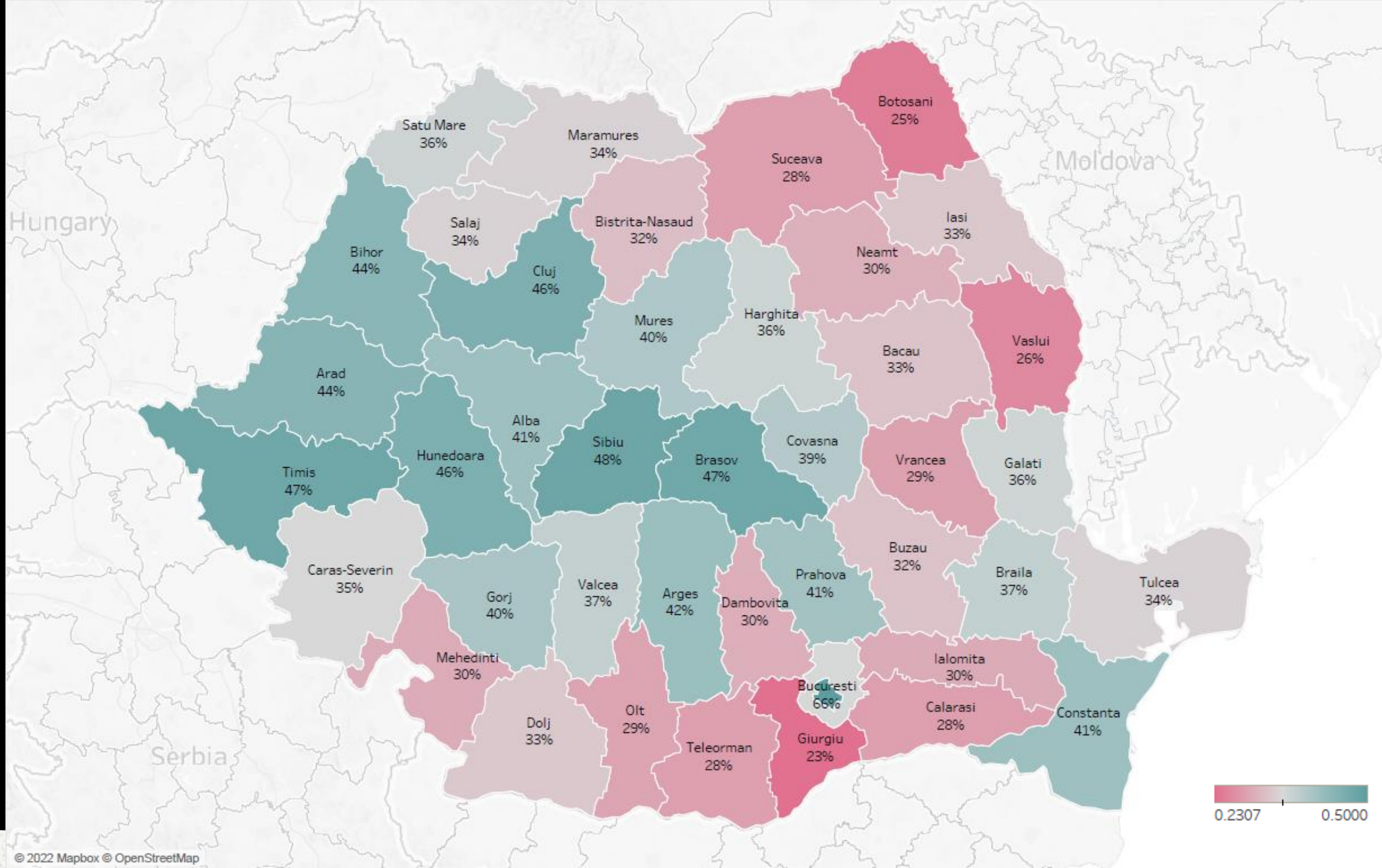
Employees VS Population



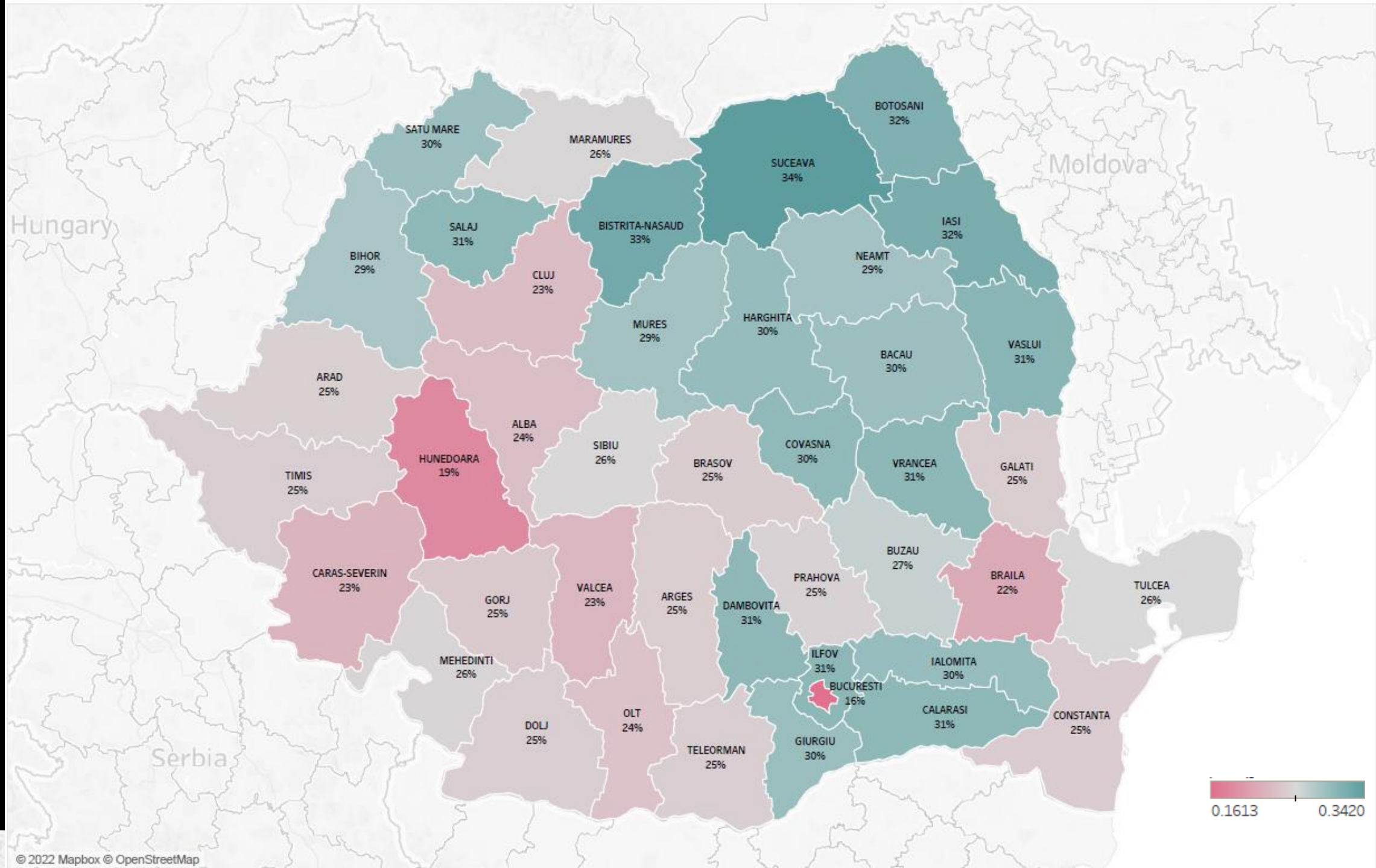
Employees VS Population



Employees VS Labor Force



%Young


SATU MARE
30%
MARAMURES
26%
BOTOSANI
32%
SUCEAVA
34%
Moldova
Hungary
SALAJ
31%
BISTRITA-NASAUD
33%
IASI
32%
BIHOR
29%
CLUJ
23%
NEAMT
29%
MURES
29%
HARGHITA
30%
VASLUI
31%
BACAU
30%
ARAD
25%
ALBA
24%
SIBIU
26%
COVASNA
30%
HUNEDOARA
19%
BRASOV
25%
VRANCEA
31%
GALATI
25%
TIMIS
25%
BUZAU
27%
CARAS-SEVERIN
23%
PRAHOVA
25%
BRAILA
22%
TULCEA
26%
GORJ
25%
VALCEA
23%
ARGES
25%
DAMBOVITA
31%
ILFOV
31%
IALOMITA
30%
MEHEDINTI
26%
BUCURESTI
16%
CALARASI
31%
CONSTANTA
25%
OLT
24%
DOLJ
25%
TELEORMAN
25%
GIURGIU
30%
Serbia
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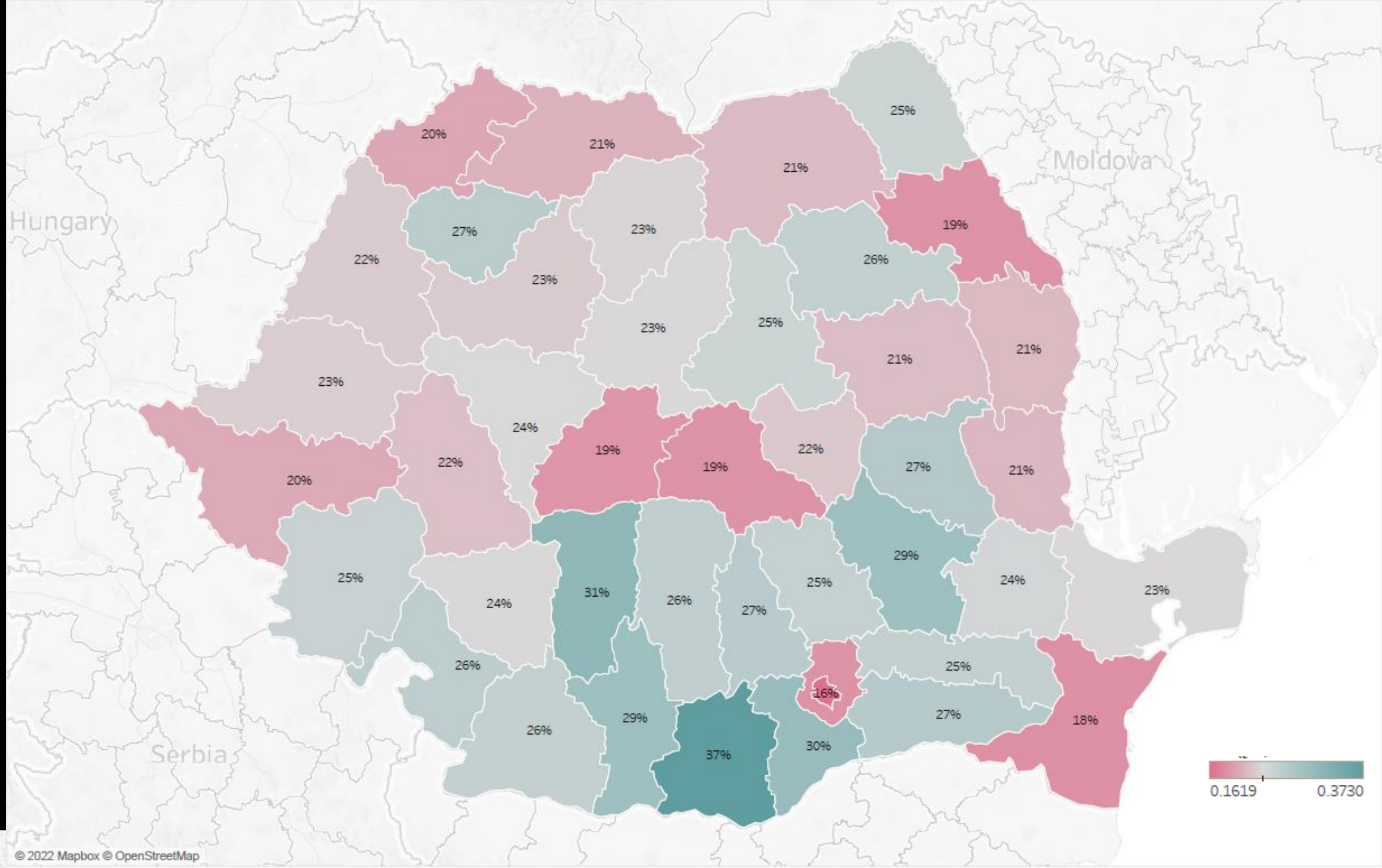
%Elderly


Hungary
Moldova
Serbia
20%
21%
25%
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26%
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37%
30%
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0.3730
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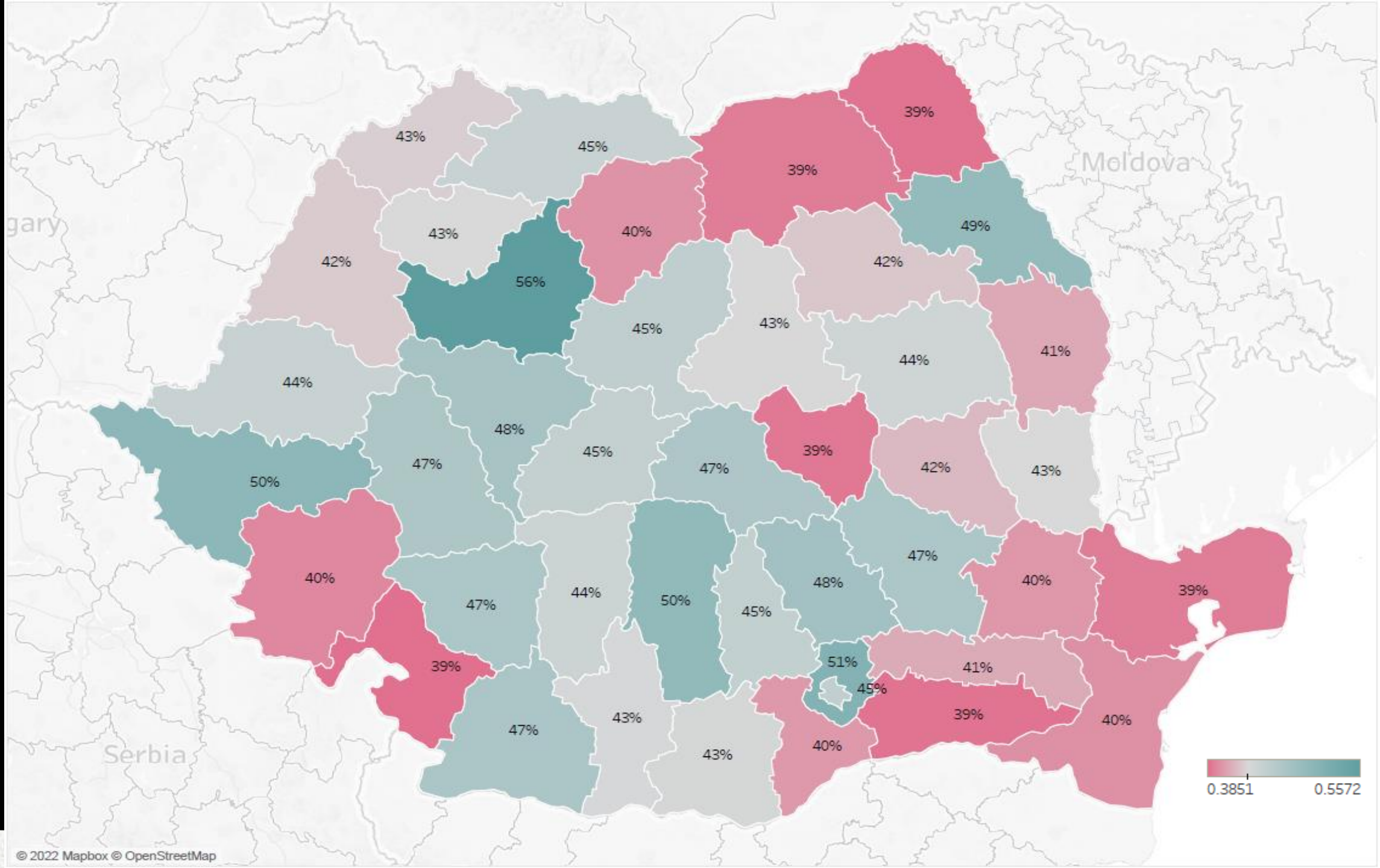
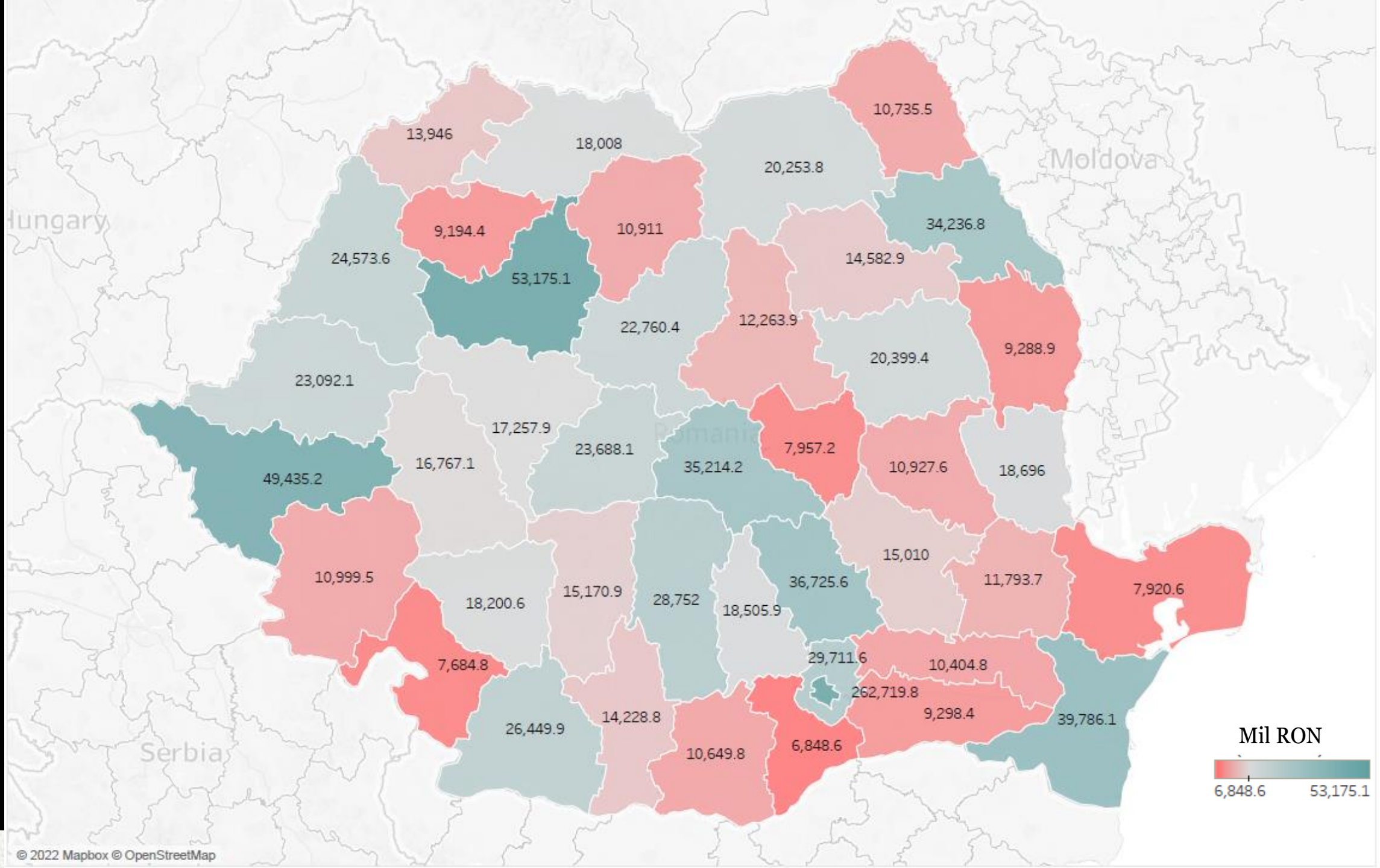
PIT VS Own Income



GDP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Hungary
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10,911
34,236.8
24,573.6
53,175.1
14,582.9
22,760.4
12,263.9
9,288.9
20,399.4
23,092.1
17,257.9
23,688.1
7,957.2
16,767.1
35,214.2
10,927.6
18,696
49,435.2
15,010
10,999.5
18,200.6
15,170.9
28,752
36,725.6
11,793.7
7,920.6
18,505.9
29,711.6
10,404.8
7,684.8
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9,298.4
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26,449.9
14,228.8
10,649.8
6,848.6
Serbia
Mil RON
6,848.6
53,175.1
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Strategic Identification and Delimitation of Service Areas for Optimal Branch Coverage

Clusters

176 observations

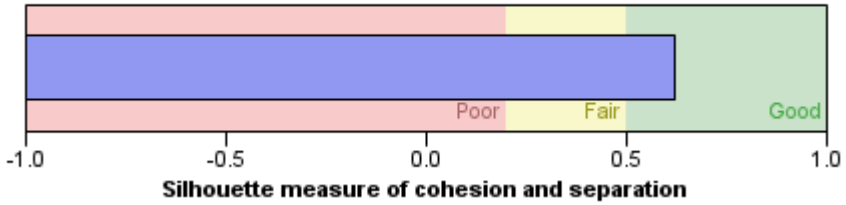
Inputs:

- %Young
- Percentage evolution of **employees**
- FOB exports per capita
- Ratio income/expenditure
- Personal income tax per capita
- Employees/Resident population
- Active population/Resident population
- Turnover per capita
- Health expenditure per capita
- Percentage of expenditure with employees
- Percentage of budget balance
- Social assistance expenditure per capita

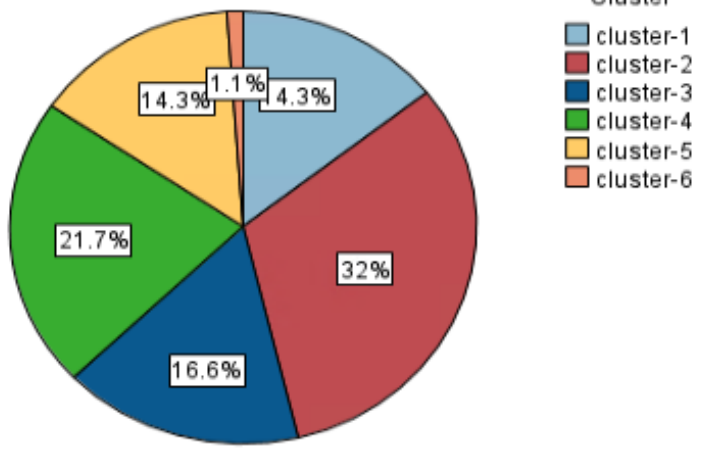
Model Summary

Algorithm	TwoStep
Inputs	12
Clusters	6

Cluster Quality



Cluster Sizes



Size of Smallest Cluster	2 (1.1%)
Size of Largest Cluster	56 (32%)
Ratio of Sizes: Largest Cluster to Smallest Cluster	28.00

Responsible Data Use and Limitations

Data privacy and security

Potential biases in data and models

Importance of human judgment

Model limitations, changing banking world

Need to consider social equity and avoid discriminatory outcomes

Key Takeaways and Future Directions

Summary of key concepts and techniques.

Importance of continuous monitoring and refinement.

Emerging trends in banking and data analytics (e.g., AI, machine learning, real-time analytics).

Q&A session.