Origin and destination of Estonian immigrants in Finland

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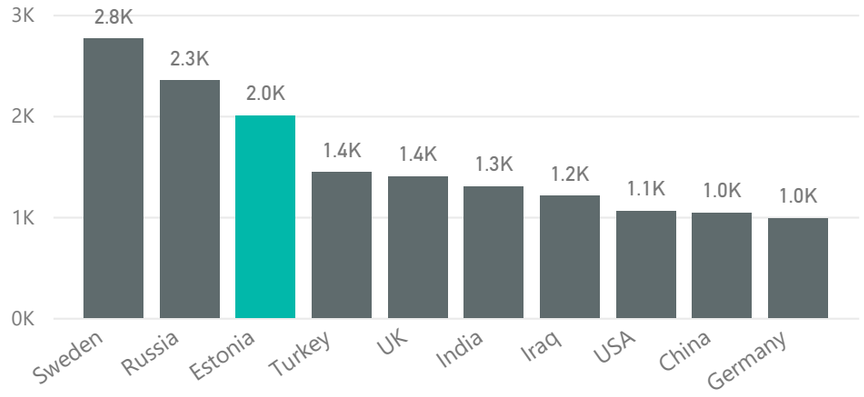
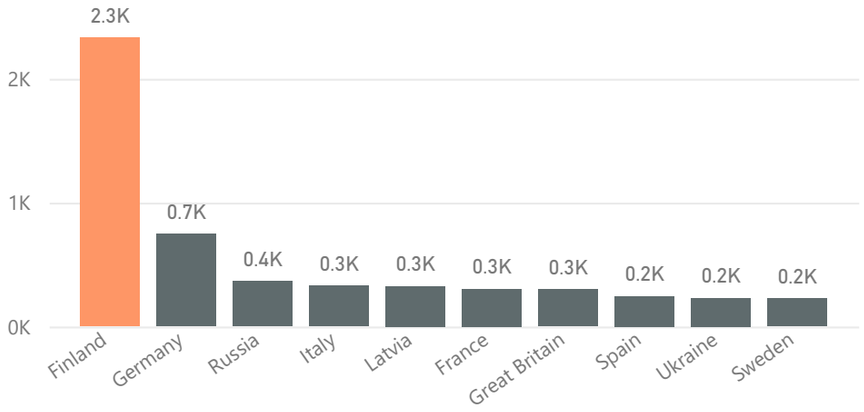
GEOG-325: Applied Spatial Statistics and Urban Modelling

Introduction

Top 10 countries: Immigration to Finland in 2019



Top 10 countries: Emigration from Estonia in 2019



Finland is a key destination for Estonian migrants. In 2019, Finland received almost 33,000 migrants. About 2,000 of those immigrants (6%), arrived from Estonia. In 2019, approximately 13,000 people emigrated from Estonia. About 2,300 (18%) of those migrants moved to Finland.

This project ***separately*** examines two social processes:

1. Immigration to Finland
2. Emigration from Estonia

Migration is understood to have important spatial components. Unemployment, education levels, finances, gender, age, and accessibility are also important themes in migration literature. These are explored in our research questions:

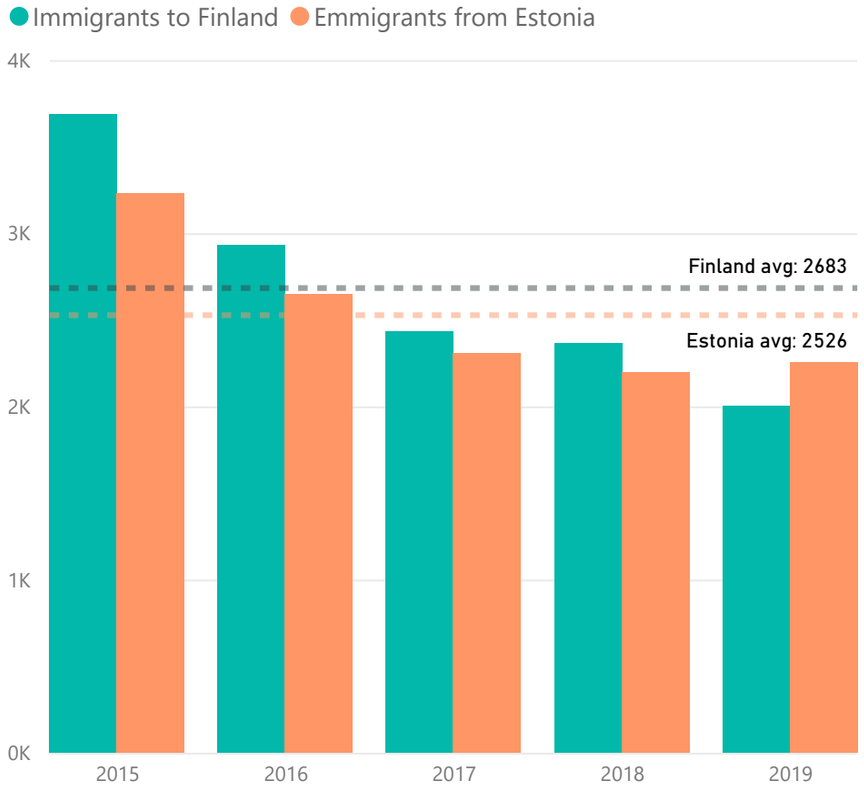
Hypothesis 1: In Finland, the unemployment rate, GDP per capita, proximity to Helsinki, age, and gender can be used to model immigration at a regional level.

Hypothesis 2: In Estonia, the unemployment rate, GDP per capita, proximity to Helsinki, age, and education can be used to model emigration at a county level.

Analysis is performed at the regional level (maakunta) for Finland and at the county level (maakond) for Estonia.

Data

Migration from Estonia to Finland (2015 - 2019)



Summary

Q1	Median	Q3	Mean	2019
2238	2398	3007	2604	2128

Finland dependent variable: Annual count of Estonian immigrants by region

11ab: Immigration and emigration by country of departure or arrival, origin and region, 1990-2019

Finland independent variables	Description	Geographic division	Year
1. Unemployment	Unemployment rate (%)	By region	2019
2. GDP per capita	GDP per capita (Euros)	By region	2018
3. Proximity	Distance to Helsinki (km)	From centroid of region to point	2020
4. Age	Population over 65 (%)	By region	2019
5. Gender	Proportion of male migrants (%)	By region	2019

Source: Statistics Finland

Estonia dependent variable: Annual count of Estonian emigrants by county

RVR051: External migration by county and country, 2004-2019

Estonia independent variables	Description	Geographic division	Year
1. Unemployment	Unemployment rate (%)	By county	2019
2. GDP per capita	GDP per capita (Euros)	By county	2019
3. Proximity	Distance to Helsinki (km)	From centroid of region to point	2020
4. Age	Population over 65 (%)	By county	2019
5. Education level	Population with higher education (%)	By county	2019

Source: Statistics Estonia

Geographic data: NUTS 3 Europe

Finland's 19 regions or provinces (maakunta) and Estonia's 15 counties (maakond).

Source: Eurostat NUTS Maps

Analysis

Data preparation: See GitHub repo

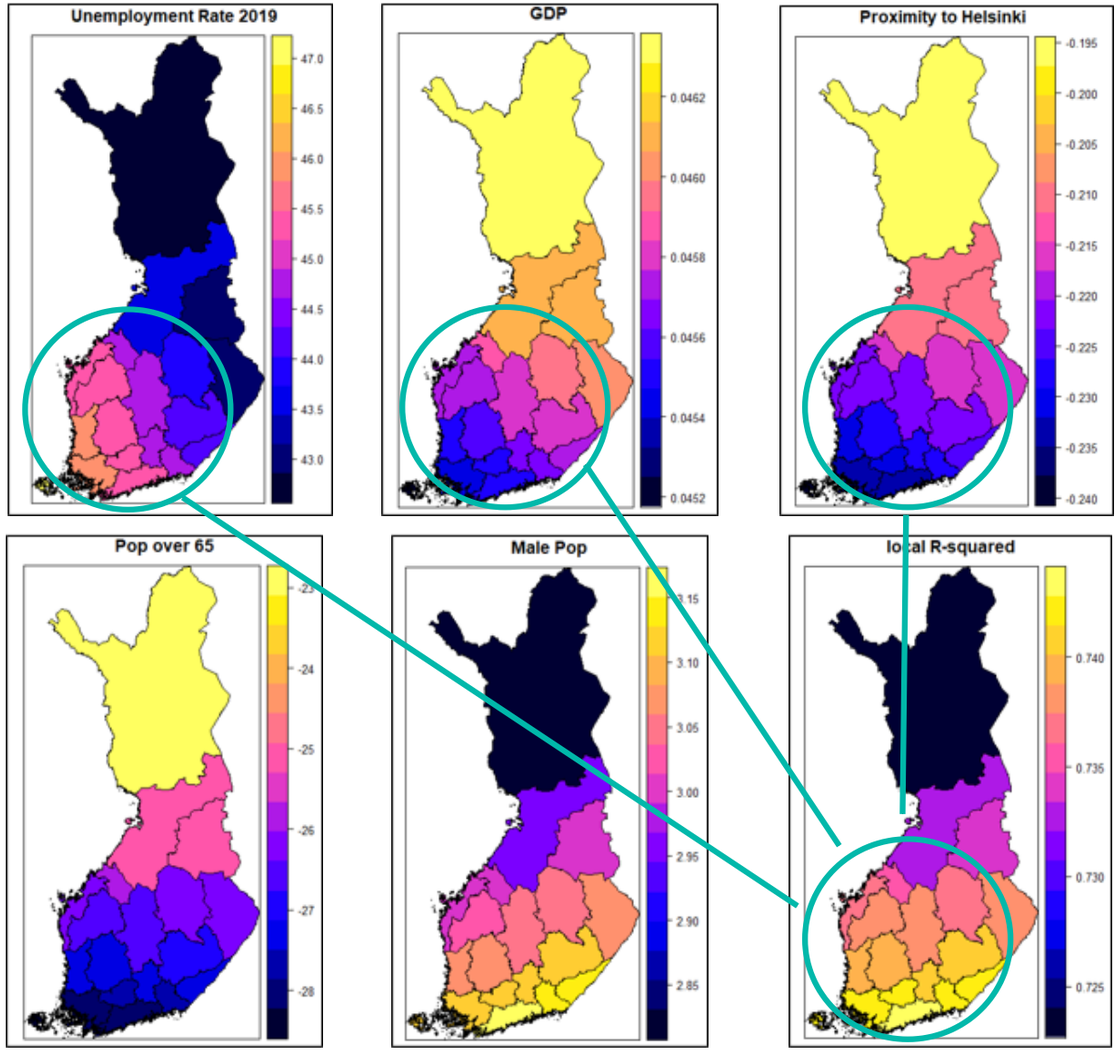
Finland Workflow

1. Plot dependent variable
2. Ordinary least squares
3. Spatial weights - Gabriel graph
4. Lagrange multiplier diagnostics
5. Spatial error model
6. Spatial Durbin model
7. Direct, indirect, and total impacts
8. Generate bandwidth
9. Geographically weighted regression
10. Visualization

Estonia Workflow

1. Plot dependent variable
2. Ordinary least squares
3. Spatial weights - Sphere of influence
4. Lagrange multiplier diagnostics
5. Spatial error model
6. Spatial Durbin model
7. Marginal equilibrium effects
8. Generate bandwidth
9. Geographically weighted regression
10. Visualization

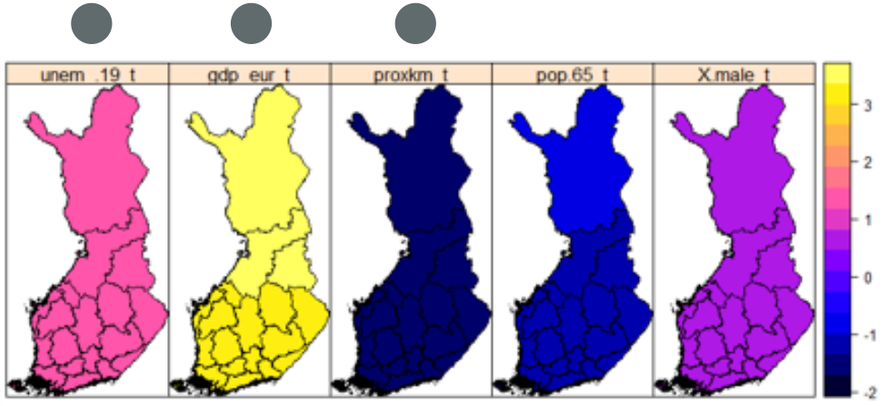
Finland



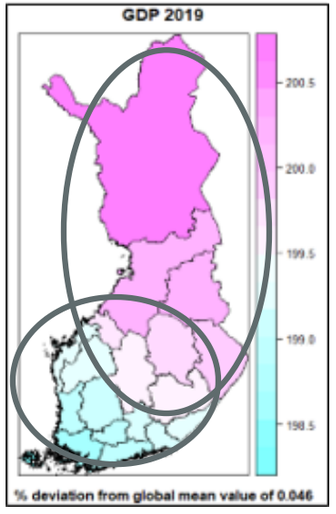
Heterogeneity

GWR

T-values into P values 95%



1. GDP 2. Proximity 3. Unemployment



Non-stationary effect

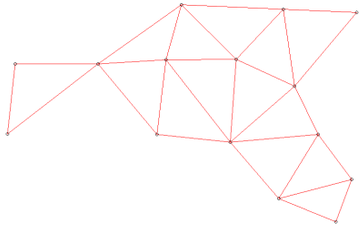
Regionalization by socio-economic factors which affect different the Immigration from Estonia.

Estonia

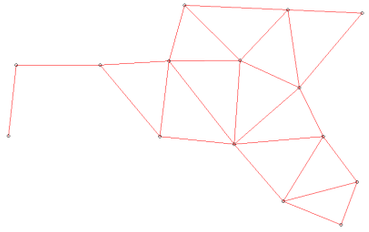
OLS

Model is significant but only one independent variable is significant alone. Model explains 90% of variance in emigration (p=0.0002346).

SOI spatial weights



Gabriel graph spatial weights



LM

LM error model (p=0.593) and LM lag model (p=0.4068) are not statistically significant.

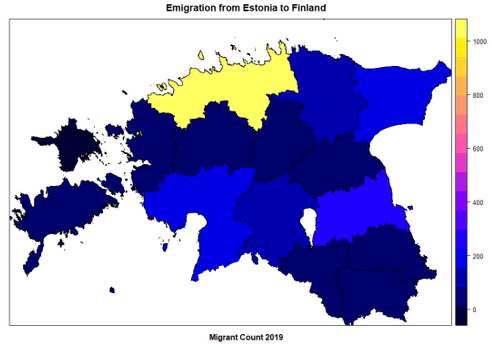
SEM

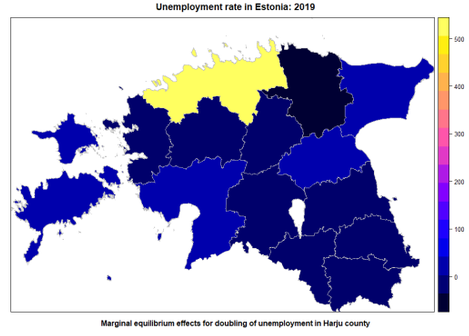
Explanatory power did not change much compared to OLS, with an increase in the pseudo R-squared from 90% to only 91%.

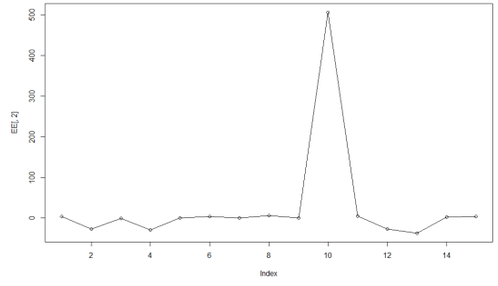
SDM

CFH and all independent variables have a highly statistically significant P-value. Pseudo R-squared explanatory power 99%.

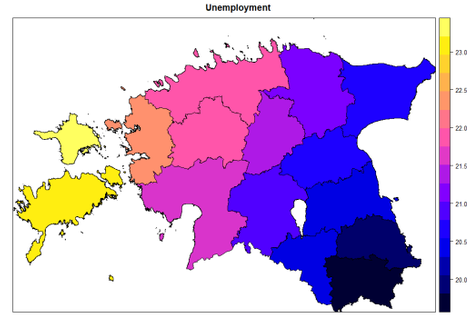
Marginal Equilibrium Effects

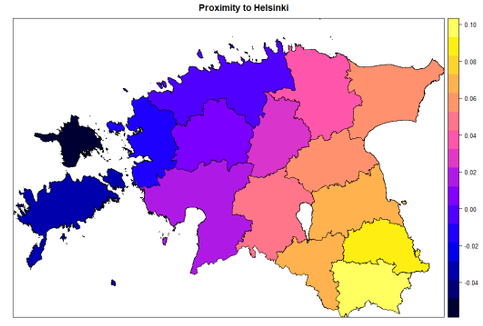


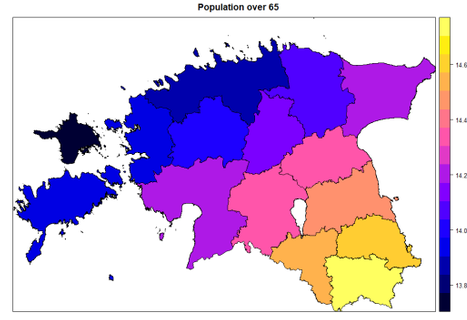




GWR







Discussion

Theory

Socioeconomic factors interact through spatial dependence in regional studies.

Data

-GDP gives the better explanation for immigration.
-Unemployment can be a dichotomy (immigration and emigration considerations).
-Migration trends are unique from place to place (e.g. expectations about a migrant's education levels or gender).

Tools

GWR is a powerful tool. It can help reveal regionalization + socioeconomic interaction between individual regions. Can be used to explore spatial phenomena, such as migration from Estonia.