Accounting for Heterogeneity in the Official Austrian Population Projection

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Motivation
Migration drives population growth in Austria


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Motivation

Background
• The demographic behavior of migrants will influence the future size and composition of the Austrian population.
• The foreign-born population is highly diverse, as evidenced by the variation in emigration risks based on country of birth and length of residence.

Objectives
• Account for heterogeneity among migrants to improve accuracy and add detail to the official Austrian population projection.
• Incorporate information on country of birth and length of residence in the projection.
Methods

• **Cluster analysis** to group countries of birth based on similarities in emigration patterns.

• **Hazard regression**, capturing differences in emigration risks based on age, sex, province, country of birth and duration of stay.

• **Dynamic competing risk microsimulation**, incorporating these detailed emigration hazards in the population projection.
Microsimulation model features

- Dynamic competing risk microsimulation with continuous time
- Case-based
- Simulated events: Births, deaths, migration
- Regional breakdown: Austria and federal provinces (NUTS-2)
- Programming language: Modgen¹

Data

Administrative (micro) data for the Austrian population, available at Statistics Austria

→ Base population: Resident population as of January 1st of the starting year by age, sex, province of residence, duration of residence, country of birth (clustered)
→ Main parameters are derived from Vital Statistics, Migration Statistics and Population Statistics
→ Country clusters are determined using additional data from Asylum Statistics and Register-based Labour Market Statistics
Results
Country clusters

• Administrative data aggregated at country level:
  – age,
  – sex,
  – duration of stay,
  – % of university students,
  – % in active employment,
  – % with children,
  – applications for asylum and subsidiary protection

• Total of 17 clusters worldwide
Emigration hazards

• Estimate piecewise constant hazards for emigration by sex and country cluster

• Input variables: age, federal province of residence, duration of stay

→ Does not require much additional data, but more data analysis necessary

→ Relevant because emigration patterns differ based on individual characteristics
Differences in emigration behaviour by country of birth and duration of stay

Example: 18 year old male immigrates to Austria and lives in Vienna

Born in Syria

Hazard
Survival

Born in a high-income EU member state in Northern/Western Europe (e.g. Denmark)

Hazard
Survival

Hazard: Rate at which a person emigrates in a given time interval.
Survival: Proportion of individuals who do not emigrate until a given point in time.
Model validation
Comparing the cohort-component method with the microsimulation model in an ex-post validation
Projected and observed population of Austria 2013-2021, based on the cohort-component method vs. the microsimulation model.
Projected and observed emigration from Austria 2013-2021, based on the cohort-component method vs. the microsimulation model
Concluding remarks

• Emigration risks differ by country of birth and decrease with the duration of residence.

• Accounting for these differences impacts the projected number of emigrants as well as the size and composition of the Austrian population.

• Retrospective projection demonstrates the efficacy of the model in capturing emigration patterns, as evidenced by the close alignment with the observed emigration levels from 2013 to 2021.
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Backup
Modelling scenarios and dynamic processes
Example: Refugee migration from Ukraine

Three phases:

1. Increased immigration and reduced emigration

2. Increased emigration and family reunification → Inclusion of assumptions about the future immigration of male partners of female Ukrainian refugees based on survey data (UkrAiA Survey²)

3. Emigration behaviour as before the war, higher immigration in the medium term than before the war due to larger Ukrainian community in Austria

Differences in emigration patterns: Cluster Eastern Europe vs. Refugees from Ukraine

Example: 30 year old female immigrates to Austria and lives in Vienna

Hazard: Rate at which a person emigrates in a given time interval.
Survival: Proportion of individuals who do not emigrate until a given point in time.