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A revision of a traditional multiregional model to better capture international migration: the MULTIPOLES model

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Contents

1. Aims of the study:

- To construct a a cohort-component female-dominated, multilevel multiregional supranational model of population dynamics and assess its performance
- The model should have an improved handling of migration, based on occurrence-exposure rates wherever it is possible and net migration everywhere else
- To assess the quality of the model

1. Criticism of the state of the art:

- Existing models are not suitable for handling multinational multiregional projections
- Varied quality of international migration data suggests that we should incorporate these data into the model differently
- For large residual populations (Rest of the World) it is impossible to calculate occurrence-exposure rates as in most cases we know neither the nominator - number of events (migration) nor the denominator – the stocks of population at risk

2. The MULTIPOLES model:

the MULTIstate POpulation model for multiLEvel Systems (Kupiszewski & Kupiszewska 1998, 1999; Kupiszewski 2004)

Model assumptions:

- Capacity to forecast/project simultaneously the whole population system: Multi-regional model of population dynamics
- Three levels of migration:
  - internal intra-regional (rates)
  - International intra-system (rates)
  - International with the „Rest of the World" (net migration)

2. Model and data

Data:

- Demographic data: National Statistical Institutes and fellow researchers (see acknowledgements)
- Age schedules of migration assumed to follow German patterns for flows to/from a particular country

2. Model and data

Model structure:

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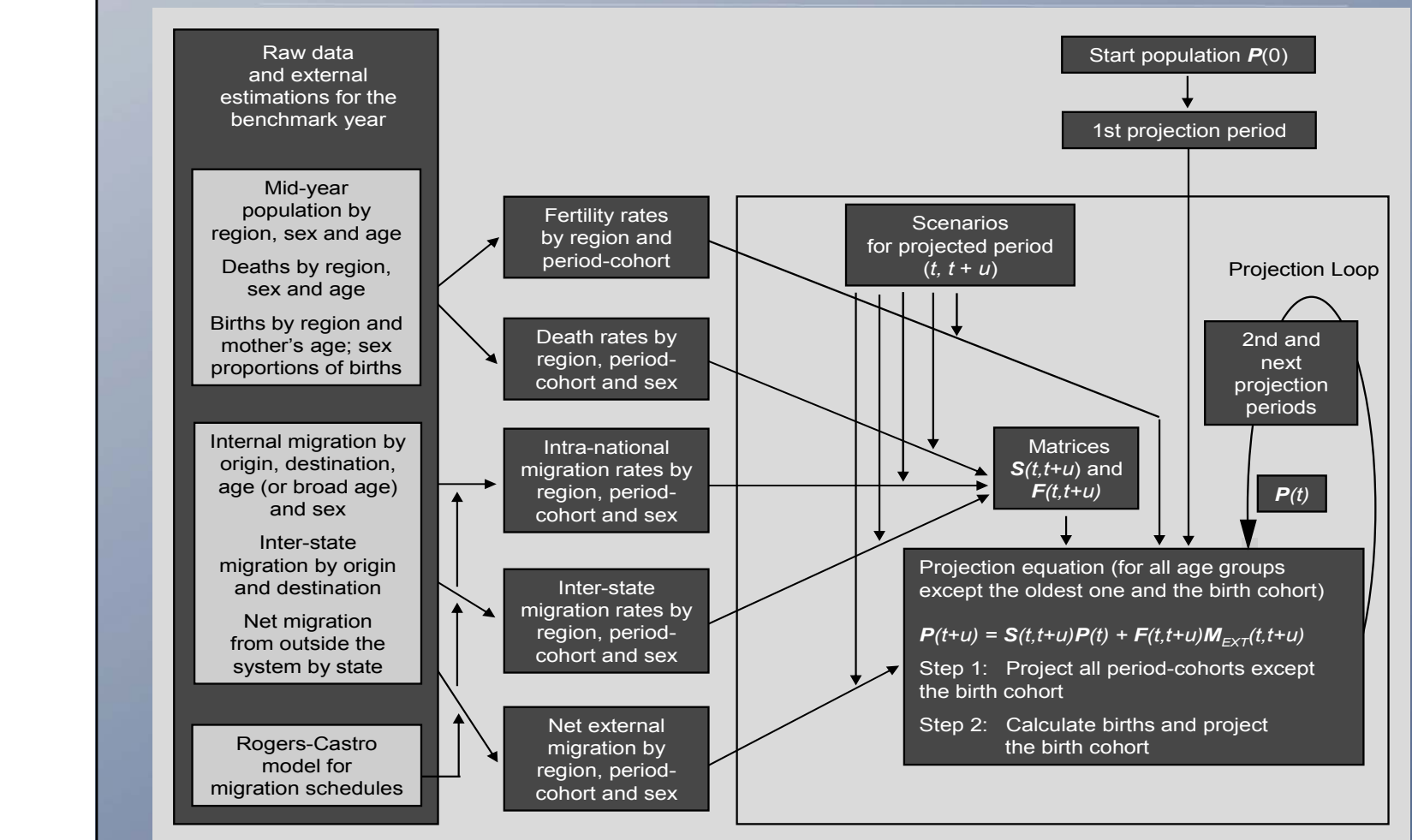

Examples of applications

- Projection of population in Central and Eastern Europe (Kupiszewski and Kupiszewska, 1997);
- Forecasting elderly population in Central and Eastern Europe (Kupiszewski and Kupiszewska, 1999);
- Forecasting the labour force supply in Central and Eastern Europe (Kupiszewski 2001);
- Assessing the impact of international migration on the development of the regional populations in Central and Eastern Europe (Kupiszewski 2002);
- Forecasting the subregional population in Austria and the surrounding states, and for
- Calculating replacement migration for Europe (Bijak et al 2005).

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Forecasting elderly population in Central and Eastern Europe 1994-2019

(Kupiszewski and Kupiszewska, 1999)

Assumptions on fertility

There will be a limited convergence in the values of total fertility rates, reducing the gap between the highest and the lowest values from 0.8 observed in 1994 to 0.4 in 2019. The values adopted are lower than those from de Beer and van Wissen's (1999) uniformity scenario and similar but not identical as those from the IDB (U.S Census Bureau 1999).

Assumptions on mortality

Target life expectancies for post socialist countries and mature capitalist economies were calculated based on the assumption of either a continuation of the reduction of mortality observed in the last decade or an occurrence of such a reduction.

Assumptions on mortality

For low mortality countries it was assumed that the decrease will slow down over time, in order to express the belief that the higher the life expectancy the more difficult a further reduction of mortality. Countries with a high mortality will increase their gains in life expectancy as their economic situation will improve.

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Assumptions on internal migration

As observed in 1994

Assumptions on international migration

A temporary reduction in international migration between the modelled states will be offset partially by the admission of applicant countries to the European Union. No changes in intrasystem international migration are expected after 2009

Assumption on international migration

Migration from the outside of the modelled system will be slowly reduced. No rapid changes are expected. After 2014 international migration numbers are assumed to be constant.

Forecasted changes in older populations

- Focus on age structures
  - Simple measure - old age dependency ratio
  - Impact on the social security services
- Focus on numbers
  - Simple measure - number of aged 85+
  - Impact on the health and care services

Results of the forecast

- There are two parallel patterns of the dynamics of elderly population in Central and Eastern Europe.
  - The Central European pattern encompassing all countries except Moldova, Ukraine and Belarus
  - The East European pattern (Belarus, Ukraine, Moldova)

Results of the forecast

- The Central European pattern is characterised by a high level of advancement of the process of ageing of population measured both by the change of the old dependency ratio and the number of very old old. The degree of ageing in Central Europe has a regional dimension and is different for male and female populations.

Results of the forecast

- Very significant increase in the old dependency ratio and the 85+ populations analysed above should make social security planners think of the allocation of resources early enough to absorb the ageing shock.

Results of the forecast

- The East European pattern (Belarus, Ukraine, Moldova) is characterised by high mortality which effectively prevents the ageing process.

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Assessment: Percentage errors of the population forecast for the period 1994-2004.

	Forecasted total population	Observed total population including post-census corrections	Error of the forecast	Post-Census correction	Total population excluding post-census corrections	Error of the forecast when corrections were removed
			%			%
Austria	8154229	8140122	0.17		8 140 122	0.17
Belarus	9765761	9849062	-0.85		9 849 062	-0.85
Czech Republic	10304212	10211455	0.91	-51621	10 263 076	0.40
Estonia	1365174	1350792	1.06		1 350 792	1.06
Germany	83950316	82531671	1.72		82 531 671	1.72
Hungary	10140106	10116742	0.23		10 116 742	0.23
Latvia	2264463	2319203	-2.36		2 319 203	-2.36
Lithuania	3618679	3445857	5.02		3 445 857	5.02
Moldova	4314175	3607435	19.59	-643750	4 251 185	1.48
Poland	39120887	38190608	2.43	-395553	38 586 161	1.39
Romania	22061348	21226120	3.93	-558168	21 784 288	1.27
Slovak Republic	5396621	5380053	0.31	-23764	5 403 817	-0.13
Slovenia	1961138	1996433	-1.77		1 996 433	-1.77
Ukraine	45921027	47442079	-3.21		47 442 079	-3.21
Average unweighted error			3.07			1.50

Conclusions

- The MULTIPOLES model proved to be an effective tool, tested in a number of research projects. The ex-post errors generated in the forecasts using the model are low. Obviously, forecast errors depend not only on the quality of the model but also on the correctness of the input data and the assumptions. Therefore, reliable statistics are crucial for producing meaningful short-term and long-term forecasts.
- In 1989, Philip Rees noted that “The multistate model has proved to be an adaptable beast and is likely to live on into the 1990s” (Rees 1989). Today, we can add that it is likely to thrive in the twenty first century, in parallel to the new modelling approaches.