

The Uncertain World of Migration Forecasts: A European Perspective

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 - Uncertain World of European Migration
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Background

- Uncertainty in migration forecasting:
 - Measurement
 - Different concepts, definitions, data collection mechanisms, incomplete reporting...
 - Theories
 - Assumptions, selection of covariates...
 - Forecasts
 - Model formulation, parameters...
 - Immanent uncertainty about the future
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Background

- What is 'migration' and who are 'migrants'?
 - An increasingly more complex picture
 - Permanent and long-term (settlement) migration
 - Various short-term migration arrangements
 - Seasonal migration (e.g. agriculture), circulation, declining travel costs \Rightarrow flexible forms of mobility
 - Irregular migration
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Uncertain Measurement

- UN (1998) ‘Gold Standard’ recommendations
 - Long-term migration over 12 months
 - Short-term migration for 3–12 months
 - In practice, many countries use other criteria:
 - Germany & Spain: *none* (compulsory registration)
 - Denmark (mostly) and Lithuania: *6 months*
 - Netherlands: *4 out of 6 or 8 out of 12 months*
 - Poland & Slovakia: *permanent migration* (legal)
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Uncertain Measurement

Example: Migration flows from Poland to Germany

Year	Polish data	German data
1990	11,200	300,700
1995	10,800	99,700
2000	20,500	94,100
2005	12,300	159,200
2009	7,800	122,800
<i>Definition</i>	<i>Permanent migration only</i>	<i>No length-of-stay criterion</i>

The same holds for flows in the opposite direction

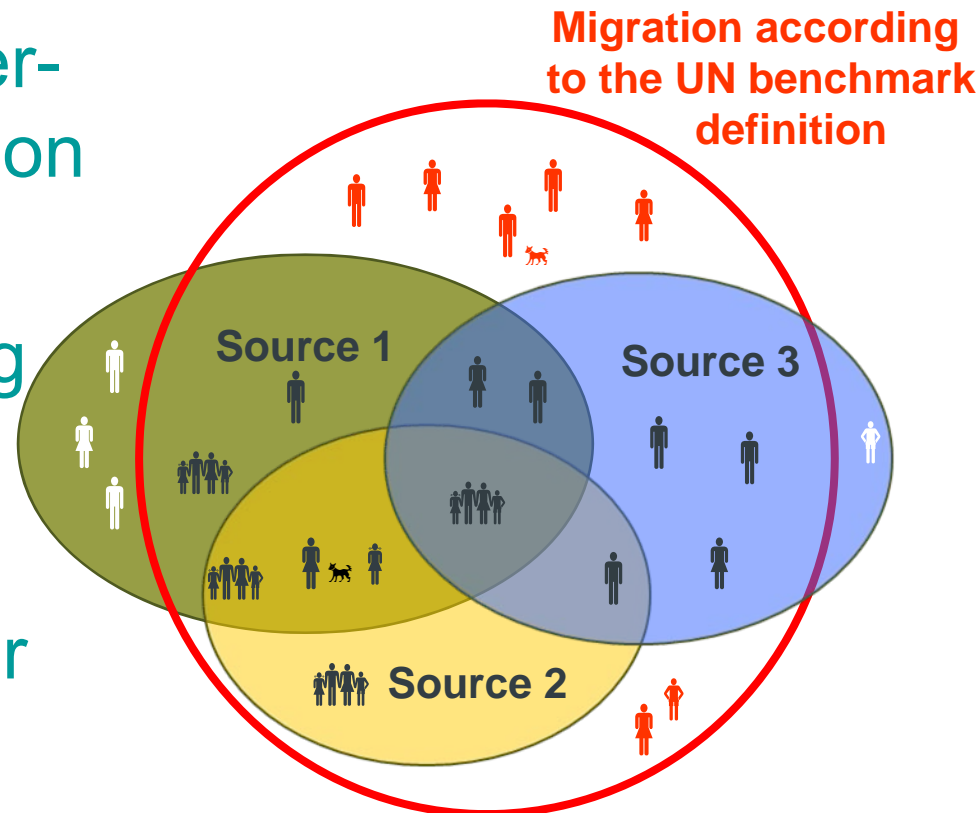
Source: Eurostat, national statistical offices (2009)

Uncertain Measurement

- Sources of migration data (all flawed)
 - **Censuses:** rare, limited information
 - **Registers:** incomplete, more so for emigration
 - **Surveys:** can be biased (we may not know the sampling frame), bearing non-response errors...
 - **Alternative sources:** often partial – school registers, work permits, electoral rolls...
 - Problem of **actual** vs **intended** duration of stay
 - Imprecise terminology (e.g. ‘migration potential’)
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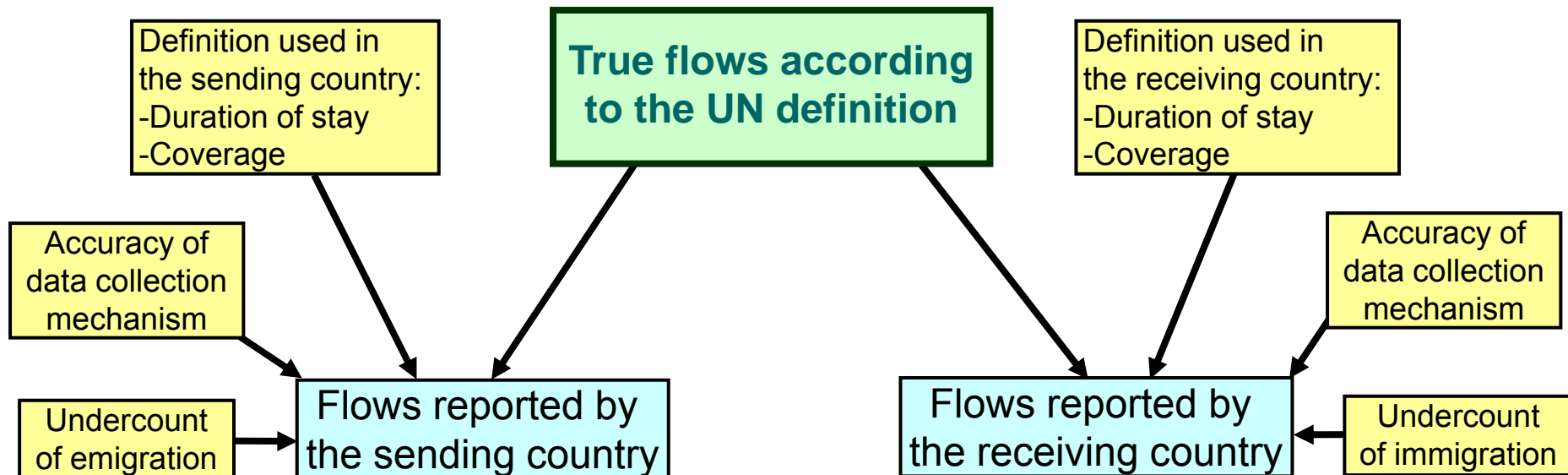
Uncertain Measurement

- Migration – input for population estimates
 - Non-conformity to international (UN) standards
 - Both under- and over-estimation of migration is possible
 - Estimates of sending and receiving countries differ
 - Presence of irregular migration



Uncertain Measurement

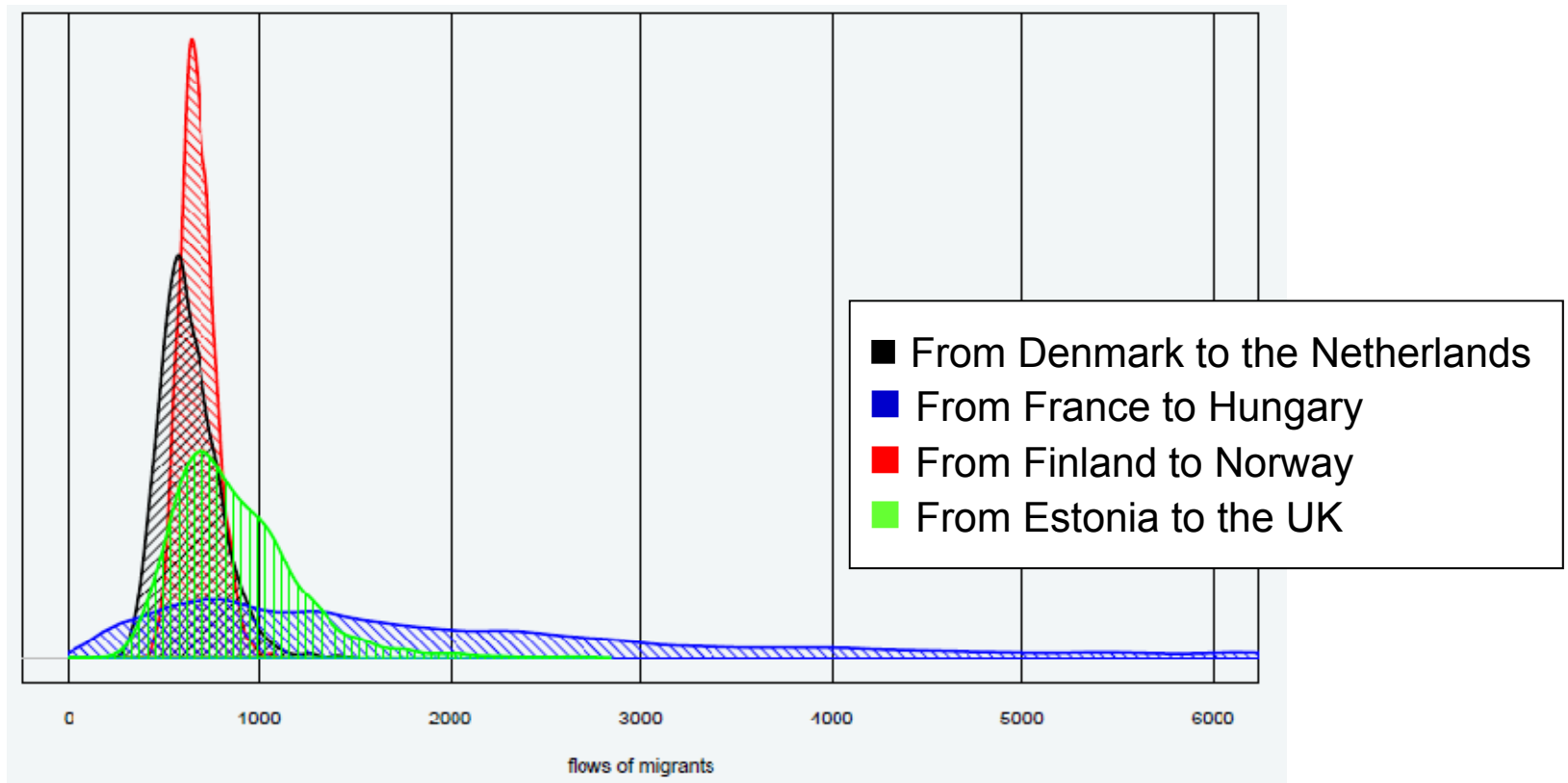
- A conceptual scheme for measurement uncertainty



(Adapted from Raymer *et al.* 2010)

Uncertain Measurement

- Example: selected migration estimates for 2006



(IMEM project, by courtesy of Arkadiusz Wiśniowski)

Uncertain Theories

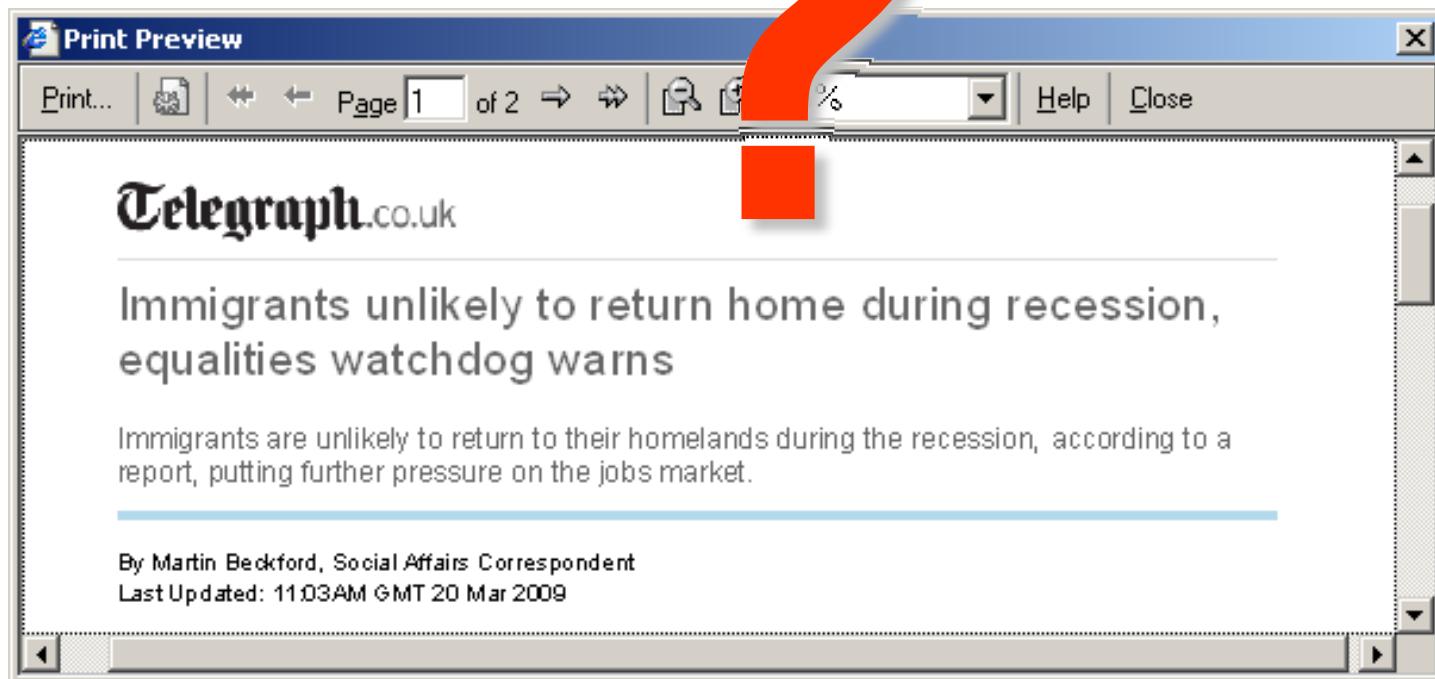
- Various explanations of migration:
 - Economic factors: income, unemployment...
 - Political factors: armed conflicts, persecutions...
 - Environmental factors: catastrophes, climate...
 - Policy factors: migration schemes/restrictions...
 - Social factors: migrant networks, institutions...
 - Geographic factors: distance, contiguity, spatial interactions...
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Uncertain Theories

- These factors have impact on migration, but:
 - It can be very hard to measure
 - It can be very uncertain to predict
 - Main problems with migration theories:
 - Too fragmented (or migration too diverse)
 - Entrenched in particular disciplines
 - Useful mainly *ex post*, not for predictions
(Öberg & Wils 1992; Arango 2002)
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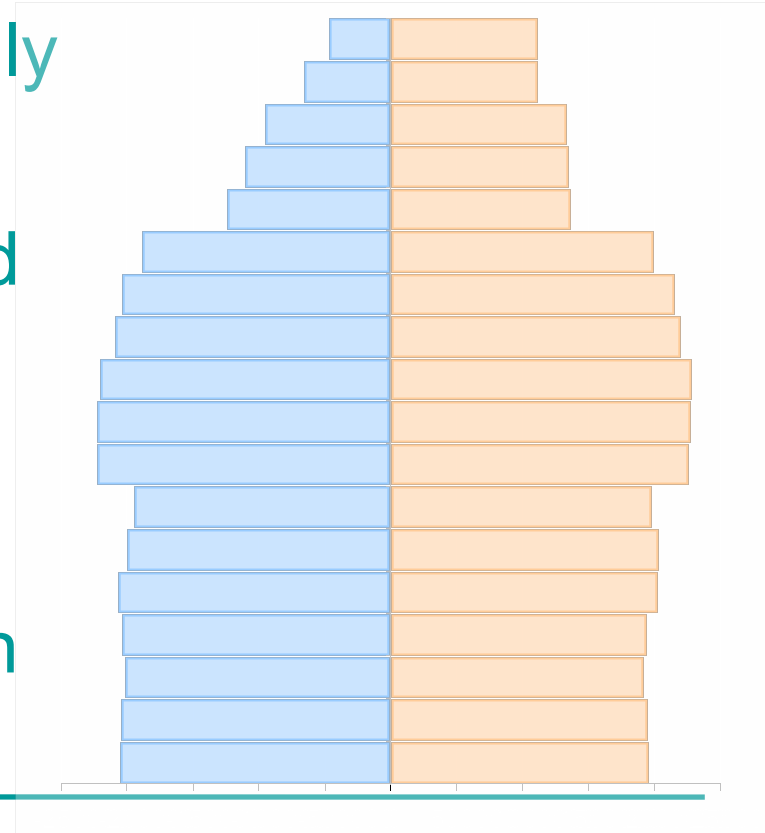
Example: Recent economic crisis

- In theory, migrant workers affected by the crisis might be expected to return
 - Problem: in times of a downturn, uncertainty is generally **higher**, not lower
 - We do not know, how many migrants there are
 - We do not know, how long the crisis will last
 - We do not know, how the migrants will react
 - ‘Intentional unpredictability’ strategy (Eade *et al.* 2006)
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Uncertain Forecasts

- Why forecast migration?
 - Increasingly important part of population change, especially in developed countries
 - Through population size and composition, migration has impact on planning, public services, etc.
 - *Per se* of interest to decision makers in many areas



Uncertain Forecasts

- We **know** the deterministic mechanism underlying population change (*'population accounting'*)

$$Pop_{t+1} = Pop_t + Births_t - Deaths_t + Immigration_t - Emigration_t$$

This can be extended to include age, spatial regions, etc.

- We **do not know** how the components will change
 - **Mortality:** most stable, best predictable
 - **Migration:** most volatile, worst predictable
 - **Fertility:** probably somewhere in the middle
-

Uncertain Forecasts

- Current state of affairs
 - Many forecasts of migration (e.g. after the EU enlargement) often ignore uncertainty, **and miss**
 - Official forecasts often present different scenarios (variants) with unknown probability of realisation
 - In reality, migration uncertainty is very high and likely to increase over time
 - Ignoring uncertainty does not make the problem disappear – ‘ostrich strategy’ (Rees and Turton 1998)
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Uncertain Forecasts

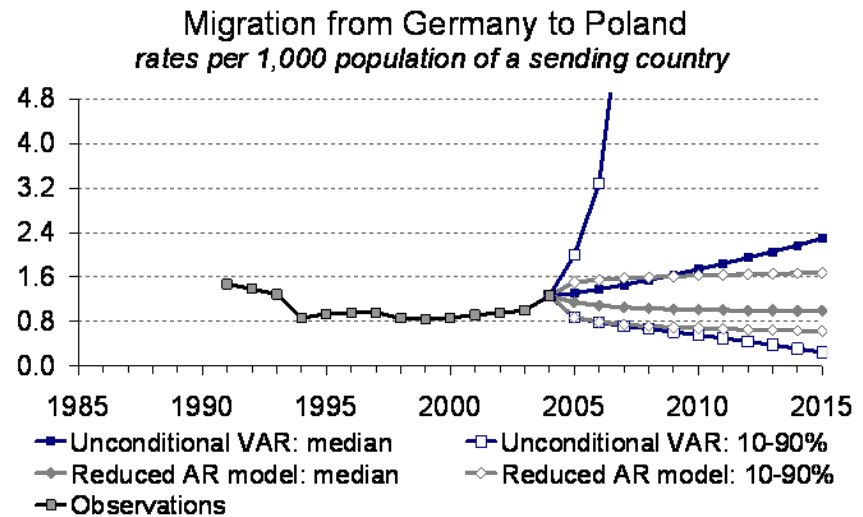
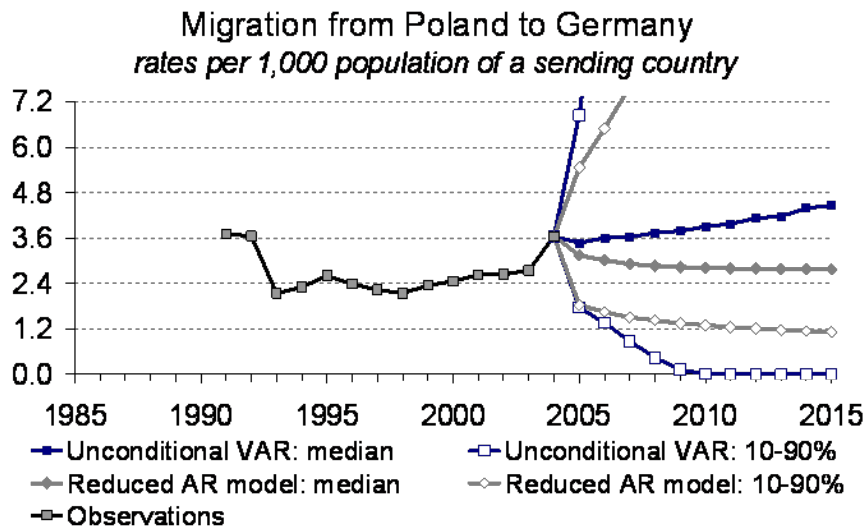
- Ongoing change of perspective in population forecasting (Keilman 2001, Alho & Spencer 2005)
 - Deterministic point forecasts or projections: Almost certainly will **NOT** come true
 - Variant projections (Base / High / Low) do not have probabilities associated with the variants
 - **Solution** – Probabilistic forecasts, but:
 - How to quantify the uncertainty?
 - How to deal with inadequate data?
 - How to use the output?
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Uncertain Forecasts

- Problems with theory-based forecasting
 - Migration theories too weak and fragmented; European data series too short to test them
 - The future of migration determinants is itself uncertain
 - Estimation of relations between covariates and migration: another source of error
 - **Result:** If all these problems are combined, the forecast is almost pure uncertainty
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Uncertain Forecasts

- **Example:** models involving GDP ratios and unemployment rates in the sending country



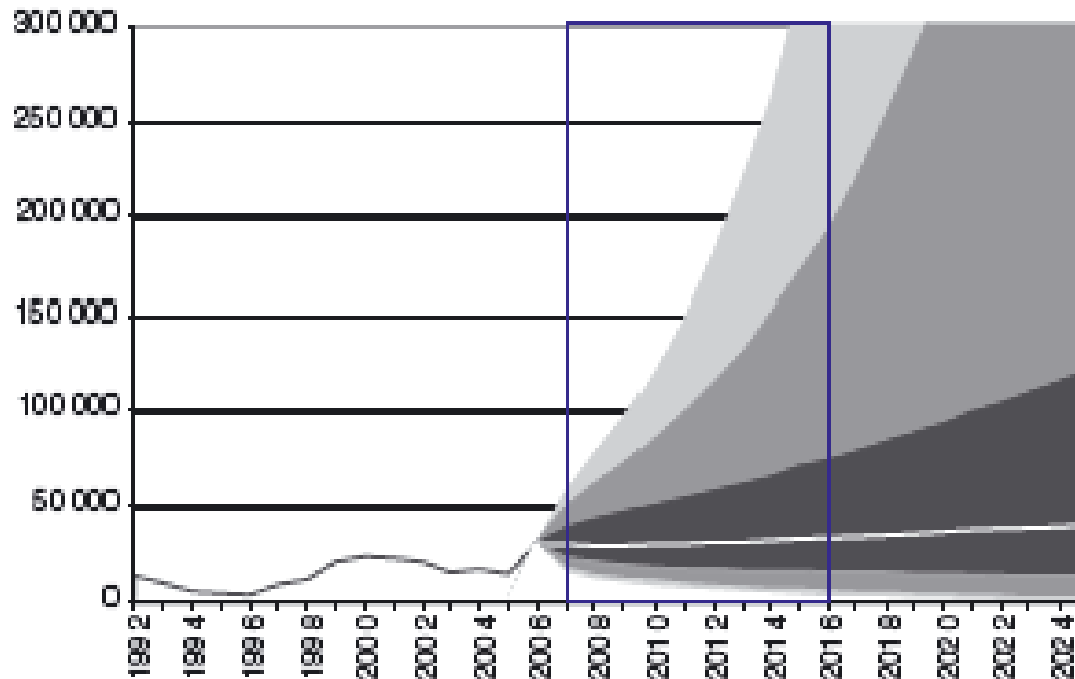
(Source: Bijak 2010)

- **Practical** way forward: reduction of multivariate forecasting models to univariate time series

Uncertain Forecasts

- Expert-based probabilistic (Bayesian) forecast of immigration: Example of Portugal

Immigration to Portugal: ■ 50%, ■ 80% and ■ 90% predictive intervals



(Bijak & Wiśniowski 2010)

Digression: Expert judgement

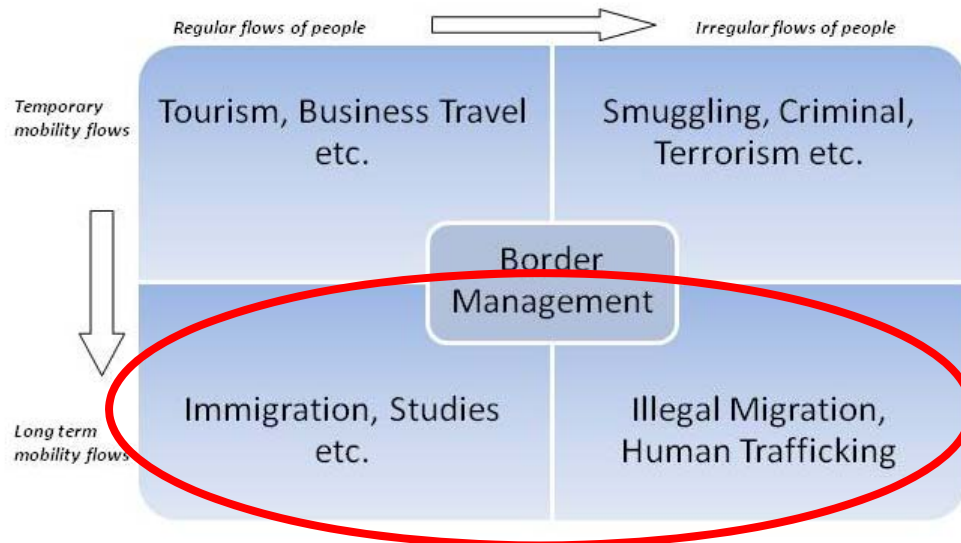
- Both estimation and prediction can explicitly take advantage of knowledge of experts in the field
 - Elicitation of expert judgements: big challenge
 - Heterogeneity of expert opinion
 - Another source of uncertainty
 - Can be mitigated by multi-stage framework (Delphi)
 - Challenges of finding a common language
 - Straightforward, yet precise formulation of questions
 - Avoiding statistical jargon (cf. Bijak & Wiśniowski 2010)
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- Results so far – migration forecasting:
 - Very likely non-stationary and thus hardly predictable character of immigration
 - For forecast horizons over 10 years, uncertainty span too high to be useful (cf. Holzer, 1959; Keyfitz, 1982)
- Implications for the users of forecasts:
 - Description of uncertainty and decision support probably possible in a relatively short horizon
 - Beyond that, other tools needed: back to scenarios

- Scenario analysis within futures studies
 - Coherent qualitative narratives, based on the analysis of underlying factors and drivers
 - For the long term, complementary to formal models
 - Their aim is not to predict, but to provide insights into what might happen, and help plan accordingly
 - Usually several scenarios of various levels of plausibility and potential impact
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Scenarios: example

- A recent study for Frontex – the EU external borders agency



Migration / integration issues

Four scenarios:

- *Probable*
- *Alternative*
- *Plausible*
- *'Wildcards'*

Scenarios: example

- Scenarios prepared for Frontex:

Excerpts from Ariely et al. (2011)

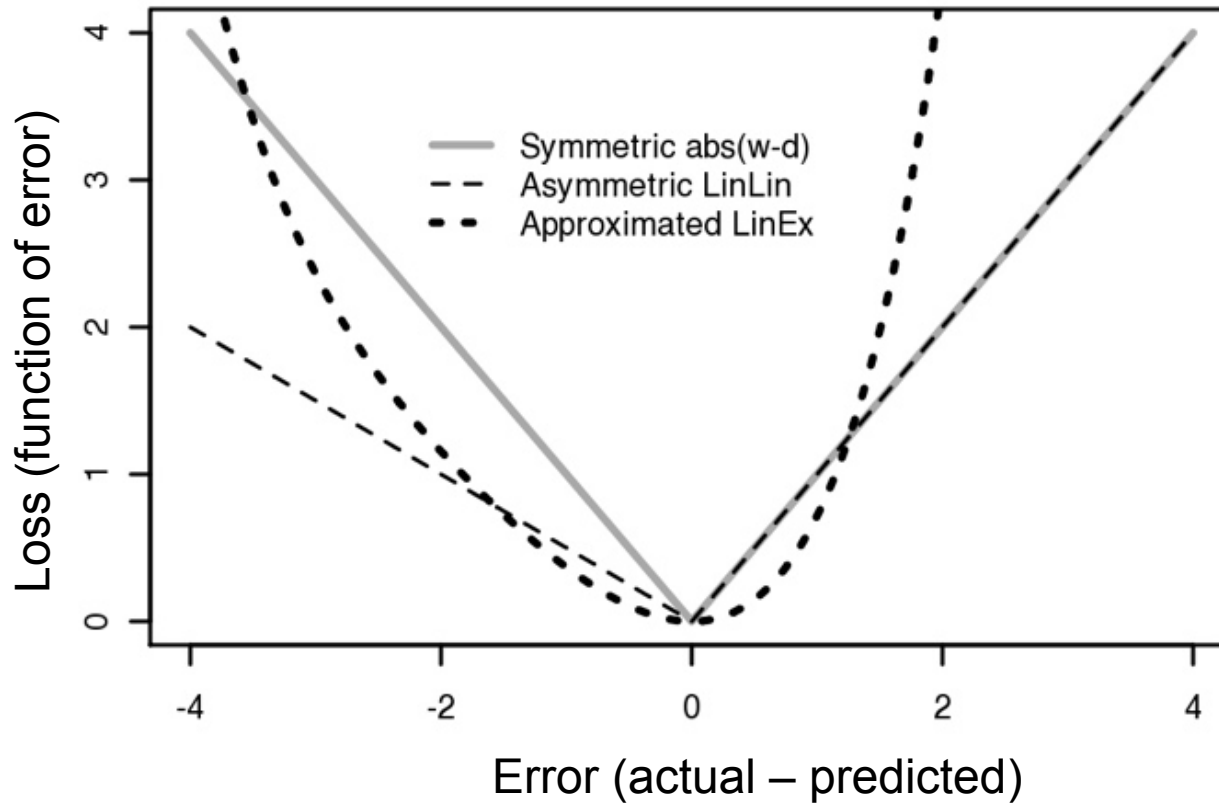
Drivers \ SCENARIO	“More of the Same” (Probable)	“Back to the Future: A Perfect Storm” (Alternative)	“Borders Eurotopia” (Plausible)	“Here be Dragons” (Wild Card)
Economic	Fair economic growth in Europe (GDP per capita increasing by around 2% per annum)	Continuing economic decline, growth of ‘Black Economy’	Rapid economic convergence of developing and developed countries (led by the BRIC countries)	Collapse of Euro and European economy
Geopolitical/ External	No major turmoil, some localised low-intensity conflicts in various parts of the world	Violent conflicts and unrest worldwide leads to ‘splendid isolationism’ and breakdown in goodwill in Europe	Multi-polar world order, political stability worldwide	A number of member states pull out of the EU and the Union breaks apart
Demographic / Ethnic	Population ageing in the developed world continues at its current pace	Population ageing in developed world continues, stalling fertility in the developing world, especially Sub-Saharan Africa	Total fertility rates of 2.1 children per woman on average, ‘Glocalisation’	Population ageing accelerates quickly
Environmental	No significant long-term effects of climate change yet	First signs of forthcoming problems, some ‘environmental refugees’ to EU	Climate change has no impact	Mass displacement of people worldwide due to floods and drought

Decision support

- **Problem:** Which estimates / forecasts to choose for decision making and planning?
 - Statistical decision theory potentially helpful, at least in some instances (cf. Alho and Spencer 2005)
 - Scope for Bayesian decision analysis – can extend estimation and forecasting
 - Prerequisites:
 - *Loss function* known (or approximately known)
 - Existence of the solution
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Decisions: Example

Examples of various loss functions

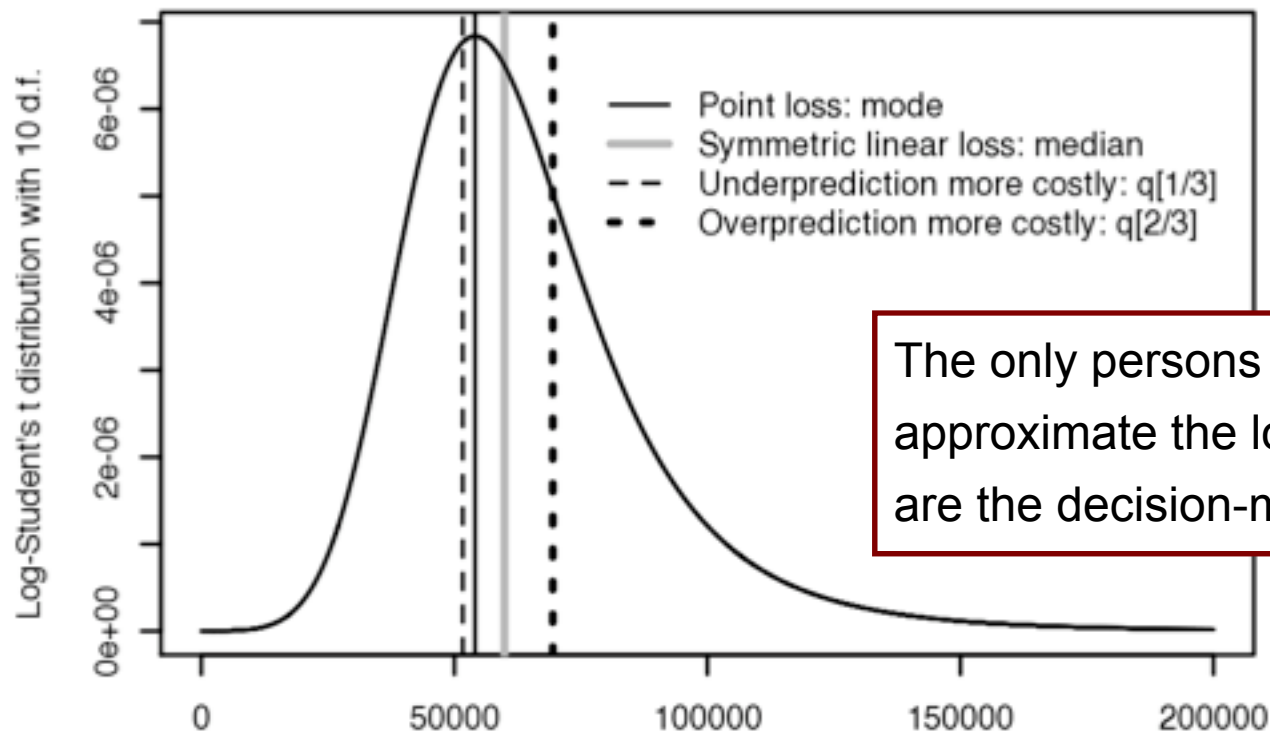


Source: own elaboration

Decisions: Example

Stylised migration forecast (log- t distribution)

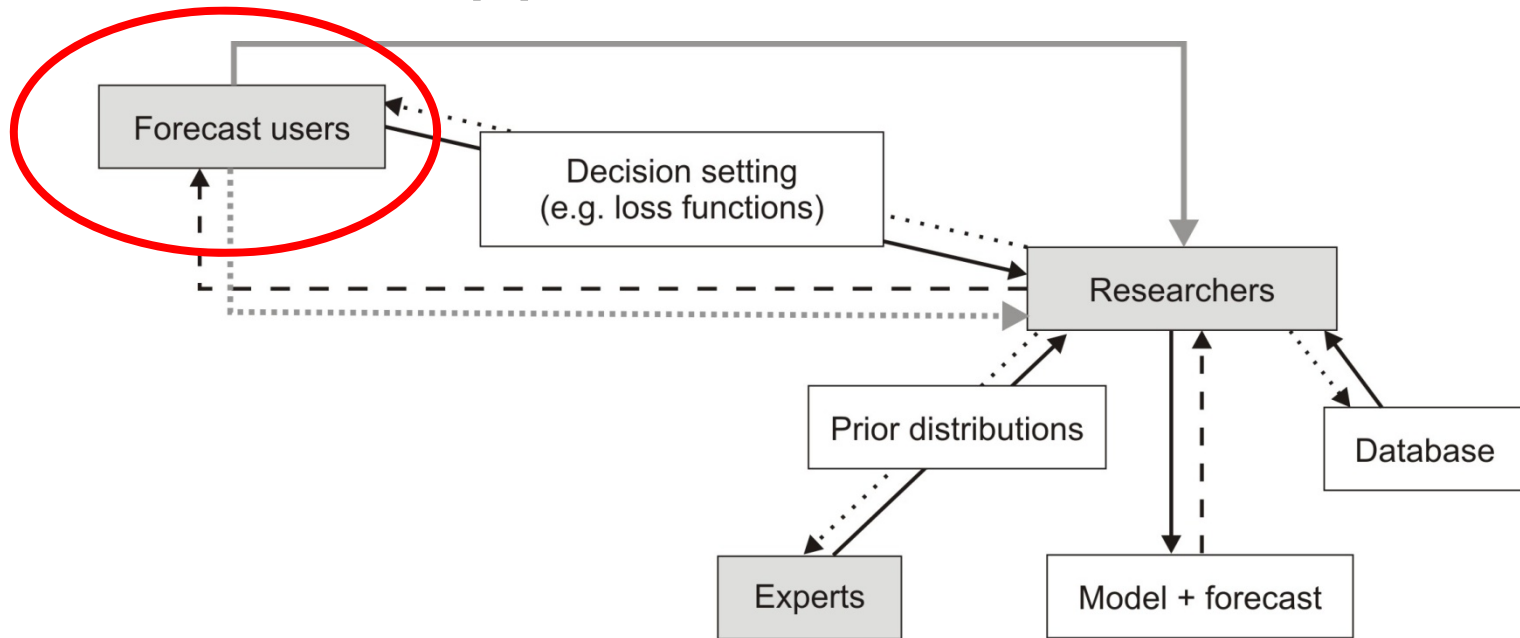
Examples of optimal statistical decisions



The only persons who can approximate the loss function are the decision-makers!

Challenges Ahead

- Decision support



Key to arrows (in the order of information flow):

—▶ Problem formulation ·····▶ Elicitation / enquiry —▶ Input - - -▶ Output ·····▶ Feedback

Decisions: Limitations

Bayesian decisions	Loss function: linear	Loss function: non-linear
Light-tailed distributions	Solutions based on quantiles	Some solutions usually exist
Heavy-tailed distributions		Solutions likely do not exist

(See also: Taleb, 2009)



Migration likely here

Challenges Ahead

- Harmonisation of migration statistics (e.g. the European Communities Regulation 862/2007)
 - Use of multiple and varied data sources
 - Research on complexity of migration and limits of its predictability
 - Bringing together the quantitative and qualitative analysis, e.g. within the Bayesian framework
 - Need for a common dictionary
 - Greater – and **realistic** – involvement of both users and forecasters in the decision analysis
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Thank you!

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Special credit to Prof. Jacques Poot (Waikato) – co-author of the seminal paper on Bayesian forecasting of Trans-Tasman migration (Gorbey et al. 1999) – which inspired much of the forecasting work presented in this talk.

All views are those of the author only.
