

Estimating replacement demand

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Introduction

- Replacement demand is the demand for labour caused by turnover due to retirement, disability, temporary leave of married women, occupational mobility etc.
- Besides expansion demand, replacement demand is a relevant component of job openings. See for example the ageing of the labour market



Outline presentation

- Net versus gross replacement demand
- General overview of estimating replacement demand
- Estimating replacement demand for ROA prognoses (occupations)
- Additional features replacement demand for education types
- Evaluation replacement demand



Net / Gross replacement demand

Gross replacement demand: outflow of individuals from occupation O (given that outflow is replaced)

| | <i>To at time t</i> | | | |
|-------------------------|---------------------|---|--------------|----------------------|
| <i>From at time t-n</i> | Occupation O | Other occupations | Unemployment | Outside labour force |
| Occupation O | A | B | C | D |
| Other occupations | E | } Gross outflow = Gross replacement demand if outflow is replaced | | |
| Unemployment | F | | | |
| Outside labour force | G | | | |



Net / Gross replacement demand

Net replacement demand: Outflow of individuals from occupation O, net of individuals who enter this occupation

| <i>From at time t-n</i> | <i>To at time t</i> | | | |
|-------------------------|---------------------|-------------------|--------------|----------------------|
| | Occupation O | Other occupations | Unemployment | Outside labour force |
| Occupation O | A | B | C | D |
| Other occupations | E | | | |
| Unemployment | F | | | |
| Outside labour force | G | | | |

Net replacement demand
 $= (B+C+D) - (E+F+G)$
 Given that outflow is replaced



General discussion: estimating replacement demand

- Three main methods for estimating replacement demand:
 - Tracking individuals over time and measuring the extent to which they leave their occupation: Longitudinal flow method
 - Asking people in retrospective
 - Cohort component method: Used to calculate net replacement demand



Longitudinal flow method

- Method used by BLS on CPS data. Also, UK Labour force Survey used. LSF also used for retrospective questions
- Although preferred method, sample size is problem:
 - Too many occupations and education types for a panel database. Replacement demand estimations on higher aggregate levels are not useful for determining labour market position



Cohort component method

- Cohort component method (CCM) used in USA (BLS, 2006), Netherlands (ROA), Australia (Shah and Burke, 2001) and Ireland (Sexton et al., 2001).
- CCM uses the size of a population age group at two different points in time to estimate number of leavers of this group (net replacement demand)
- Not tracking the same individuals, but drawing inferences from relative numbers in two groups



Cohort component method

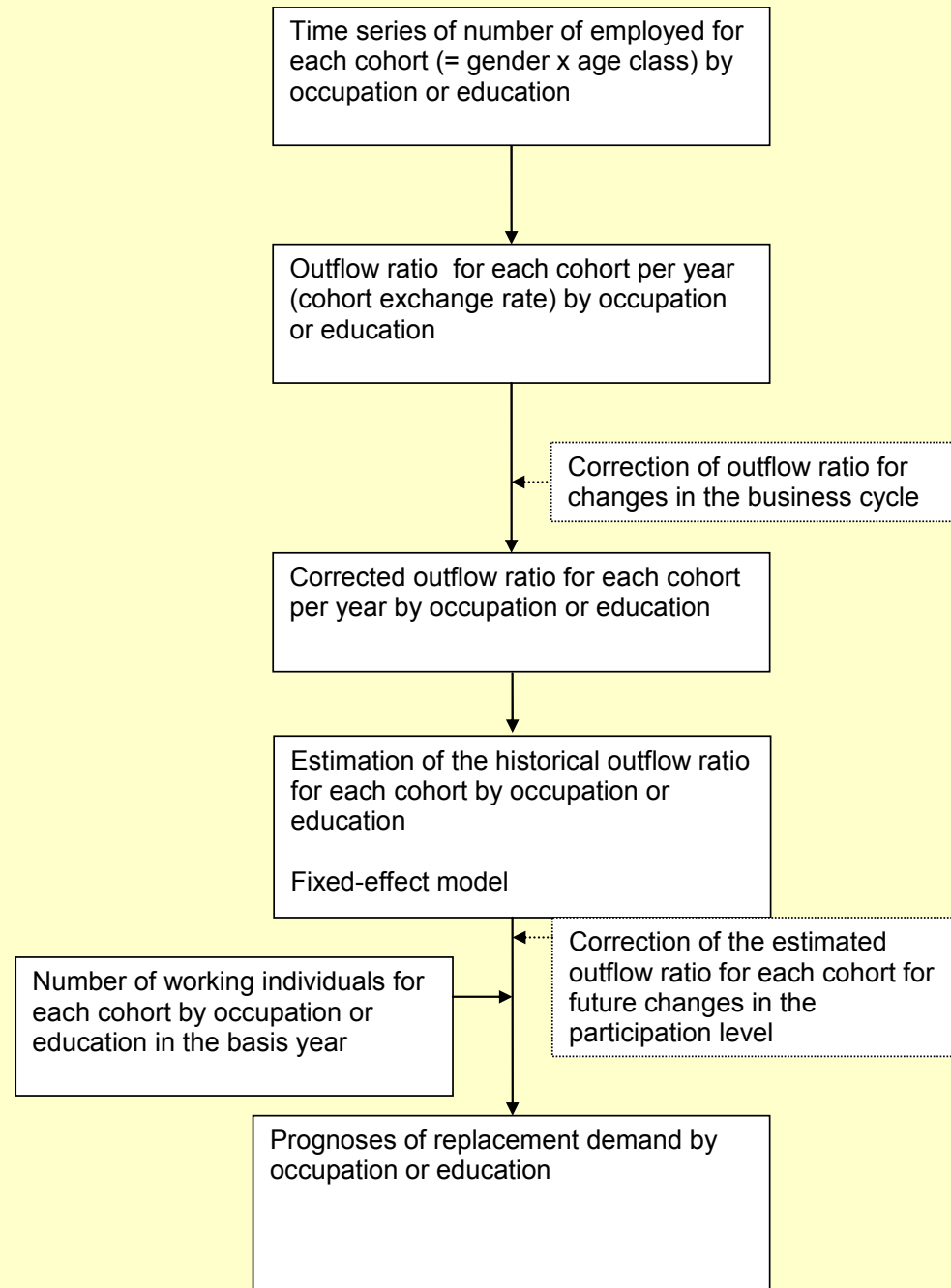
- Method is using summation of all net outflows over all age groups: Gives total net replacement demand for specific occupation
- Benefits: suitable when no large longitudinal datasets are available
- Drawback: possible underestimation of replacement demand: outflow in the same cohort which is filled by entrants in the same cohort is not visible. Follows logically from estimating the net replacement demand



Estimating replacement demand for ROA forecasts

- We use cohort component method. Data available from 1996 (EBB)
- Cohort combination of gender and age classes (5 years)
- Gender differences because flows may differ (re-entry after child birth and increasing labour force participation of women)
- Year by year comparison of demographic construction for a certain occupation gives the net in or outflow:

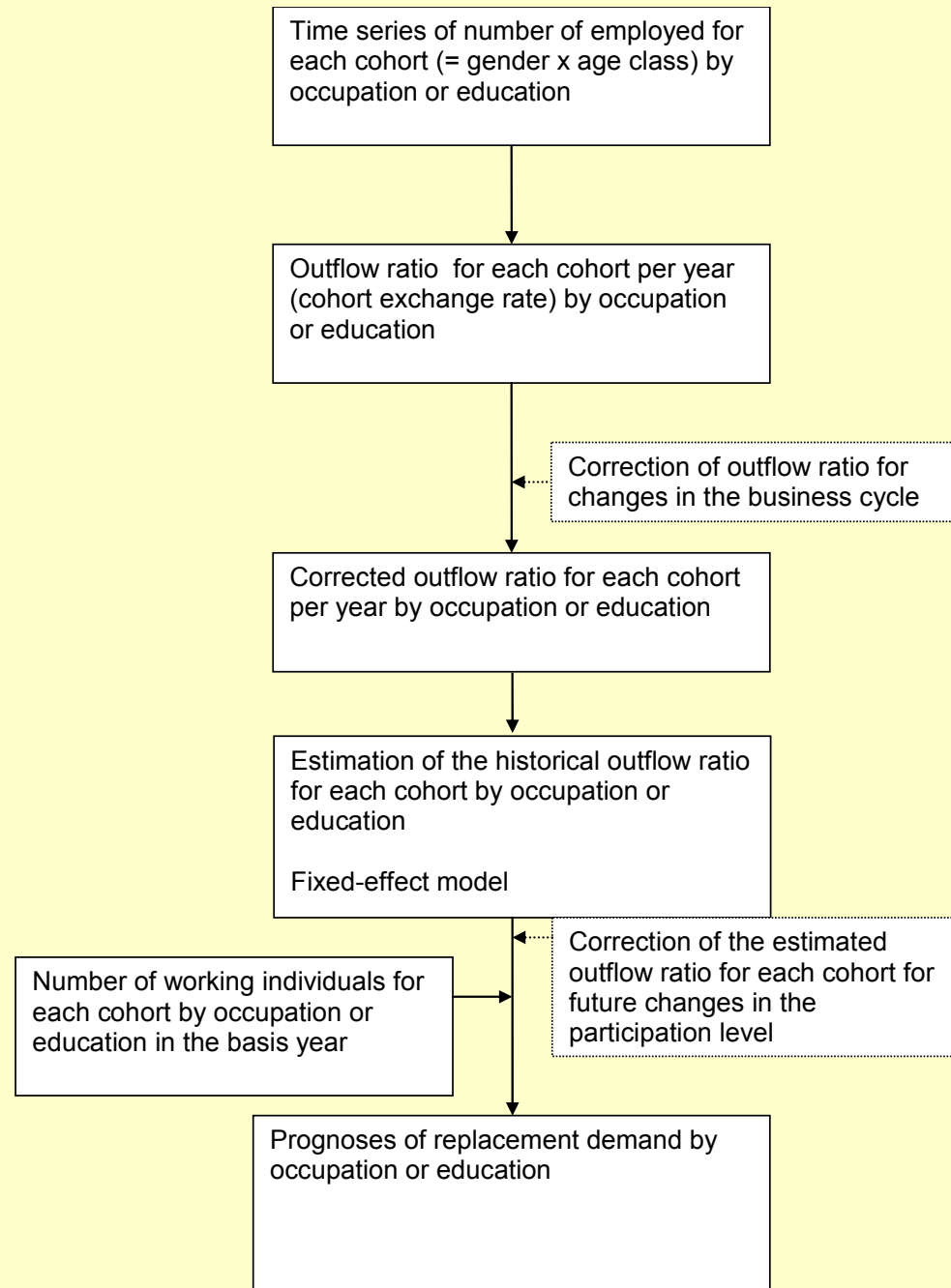




ROA forecasts

- Cohort change rates: $\dot{F}_{bx}^{t-1} = \frac{W_{bx+1}^t - W_{bx}^{t-1}}{W_{bx}^{t-1}}$
where:
 - \dot{F}_{bx}^{t-1} = net in- or outflow ratio of the working people in occupation b with age class x at time $t-1$, during the period $(t-1, t)$;
 - W_{bx}^t = the number of working people in occupation b with age class x at time t
- If $\dot{F}_{bx}^{t-1} > 0$, there exists a net inflow, if $\dot{F}_{bx}^{t-1} < 0$, there exists a net outflow

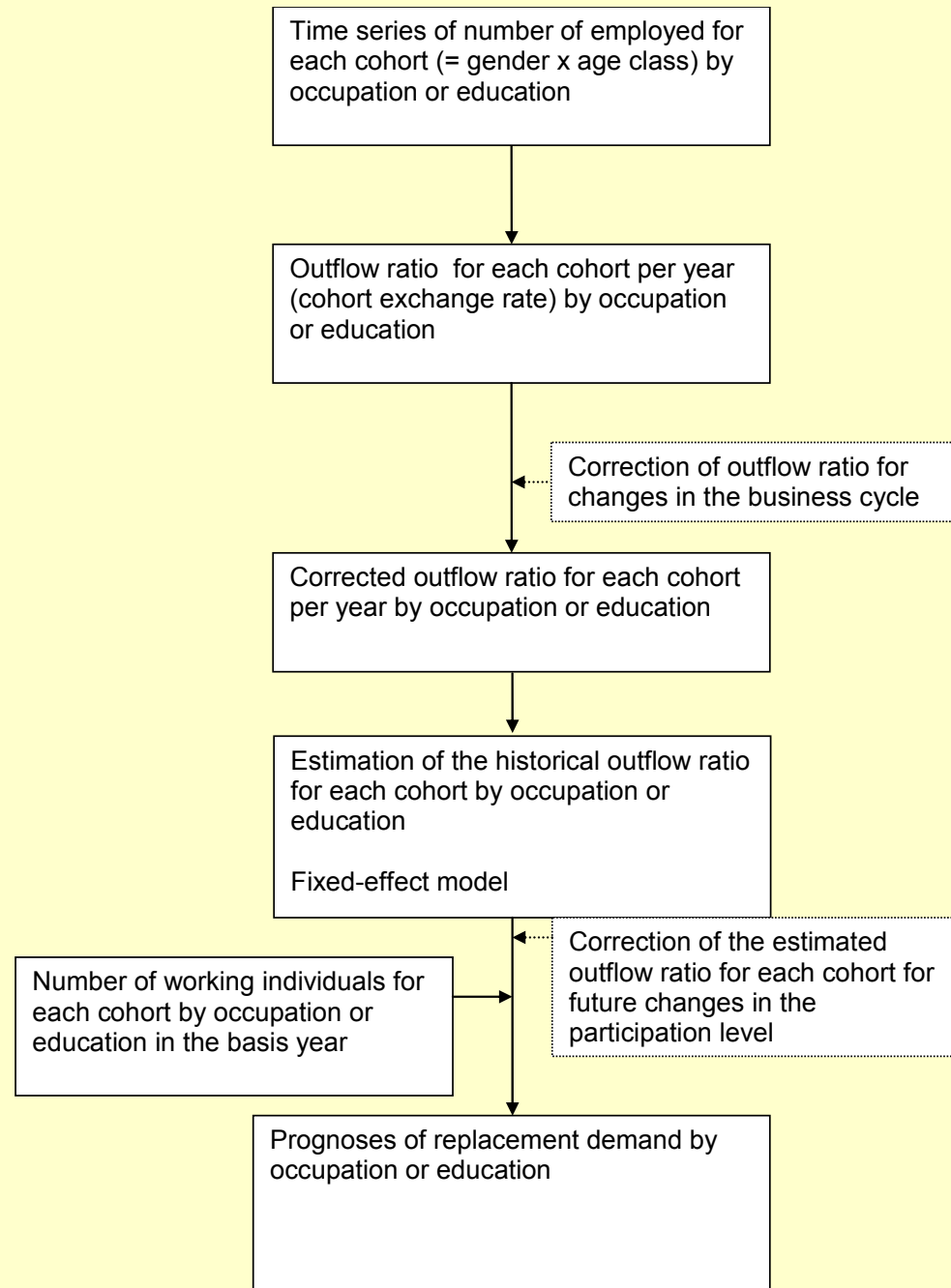




ROA forecasts

- Next step is correction outflow ratio for business cycle: difference in the change in the total number of working people and the change in the labour force in the historical period
- Correction compensates the outflow of working people for business cycle fluctuations in the employment level





ROA forecasts

- Next step is estimation of fixed effects model of the historical outflow ratio for each cohort by occupation or education type
- In this model: net- in or outflows explained by cohort deviations from the total working labour force

$$\dot{F}_b = \dot{F} + \sum_x \beta_{bx} D_x$$

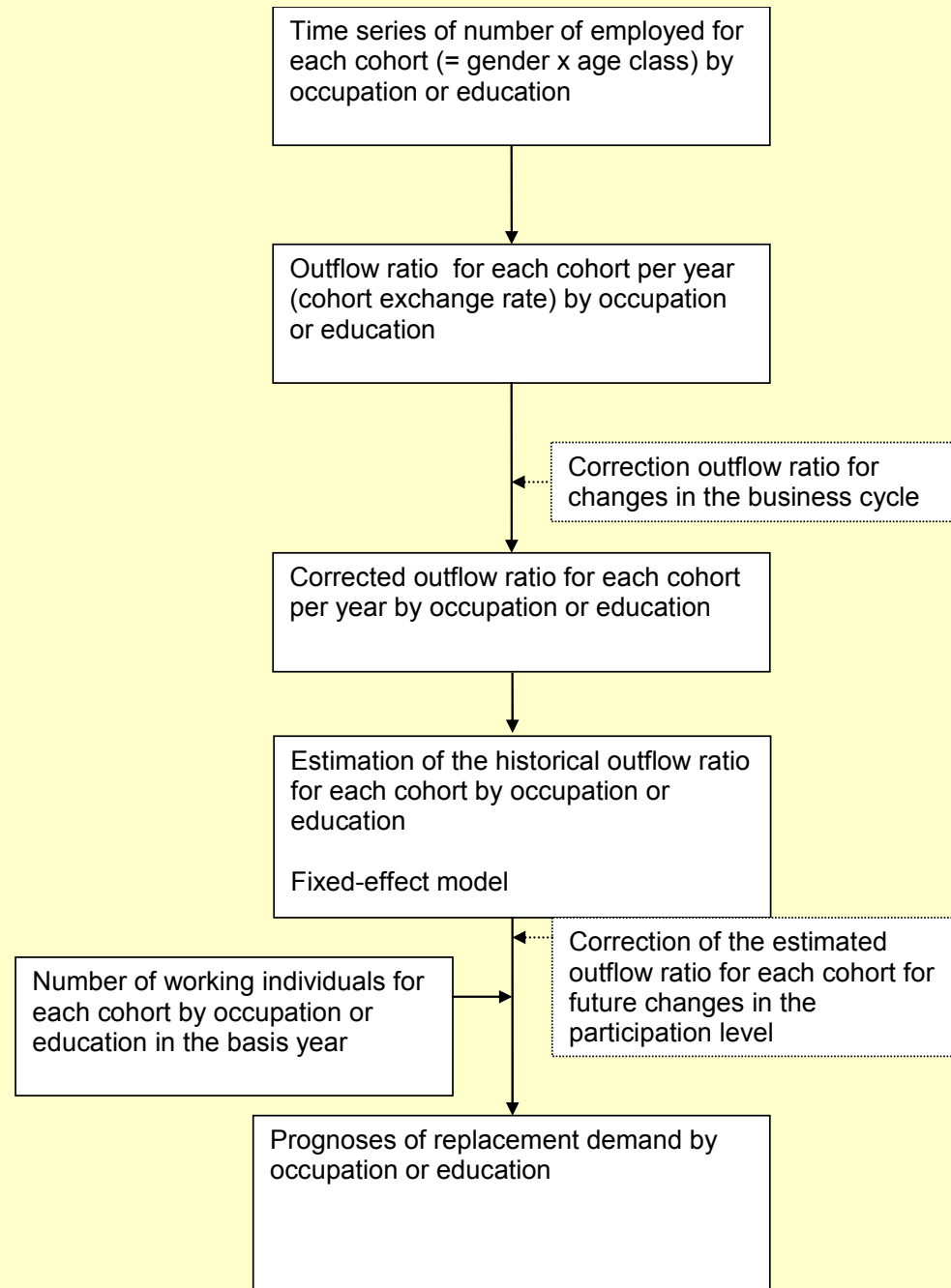
- \dot{F}_b = vector of net in- or outflow ratio's for occupation b , with observations per gender, age class and year;
- \dot{F} = the same, but for the entire working labour force;
- D_x = matrix with dummy-variables; values equal to 1 for cohort x and 0 otherwise;
- β_{bx} = random parameters.



ROA forecasts

- The equation shows that flows from the labour market per cohort are equal to the average flow from that cohort, except from the occupation specific deviations per cohort
- If an in- or outflow coefficient is deviating strongly for a specific occupation or education type, the estimated parameter, who gives the deviation from the average, will be significant





ROA forecasts

- Correction for changes in the participation level: Relevant because of ageing work force and the increasing labour force participation of women
- Correction based on scenario analyses from CPB.
- We take the Transatlantic Markets scenario (relatively conservative): More private markets + emphasizes on national economies



ROA forecasts

- Last step before forecasts: Calculation of number of working people for each cohort per occupation and education type in the basis year
- Extrapolating future outflow using the in- and outflow coefficients and the corrections for the business cycle and the participation level



ROA forecasts

- The estimated future outflow is:

$$\begin{aligned}\dot{W}_{bx}^{t,m} &= \dot{W}_{bx}^{t,n} - \dot{WP}_x^{t,n} + \dot{LF}_x^{t,n} + \dot{LF}_x^{t,m} - \dot{LF}_x^{t,n} \\ &= \dot{W}_{bx}^{t,n} - \dot{WP}_x^{t,n} + \dot{LF}_x^{t,m}\end{aligned}$$

- $\dot{W}_{bx}^{t,m}$ = the expected average yearly net in- or outflow ratio of working people in occupation b , in cohort x at time t during the estimation period $(t, t+m)$;
- $\dot{W}_{bx}^{t,n}$ = the expected average yearly net in- or outflow ratio of working people in occupation b , in cohort x at time $t-n$ during the period $(t-n, t)$;
- $\dot{WP}_x^{t,n}$ = the average yearly growth ratio of the total number of working people in cohort x at time $t-n$ during the period $(t-n, t)$;
- $\dot{LF}_x^{t,n}$ = the average yearly growth ratio of the labour force in cohort x at time $t-n$ during the period $(t-n, t)$;
- $\dot{LF}_x^{t,m}$ = the average yearly growth ratio of the labour force in cohort x at time t during the estimation period $(t, t+m)$;

ROA forecasts

- If employment is increasing for an occupation: outflow ratio equals replacement demand
- If employment is decreasing: replacement demand = zero



Additional features replacement demand for education types

- Summation replacement demand over all educational types does not have to equal the summation over all occupations
- For educational types: individuals can decide to continue learning: causes replacement demand for the initial education type of individuals
- A problem is the relatively high level of inflow which complicates the measurement of the replacement demand
- Solution: Use of EBB data for individuals who continue learning and who due to finishing their post-initial education change their education background



Evaluation replacement demand forecasts

- Last evaluation shows that for 127 occupational classes, 80% has the right characterization (or almost)
- For 113 educational types, 84% has the right characterization (or almost)



Conclusion

- Replacement demand relevant component of the forecasting model
- Use of principal component analysis with correction for participation and business cycle effects
- Forecasts give a good qualitative indication of the replacement demand for occupations or educational types

