Forecasting the age structure of the scientific workforce in Australia

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Labour force model

$$P_{x+1,t+1} = P_{x,t}(1 - m_{x,t} - r_{x,t}) + G_{x,t} + N_{x,t}$$

x = Age

t = Year

$P_{x,t}$ = number of equivalent full-time workers

$m_{x,t}$ = probability of death

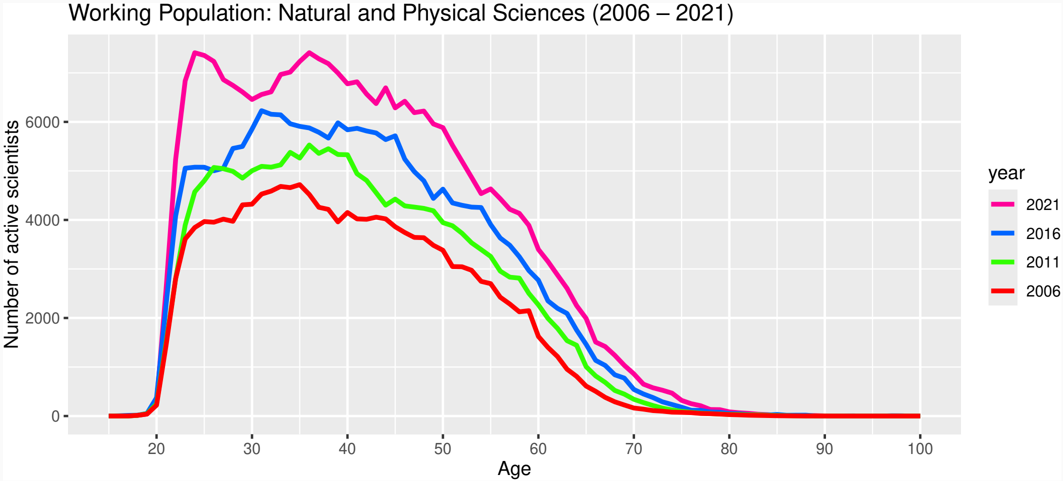
$r_{x,t}$ = probability of retirement

$G_{x,t}$ = number of graduates

$N_{x,t}$ = net number of migrants

Working population: $P_{x,t}$

$$P_{x+1,t+1} = P_{x,t}(1 - m_{x,t} - r_{x,t}) + G_{x,t} + N_{x,t}$$



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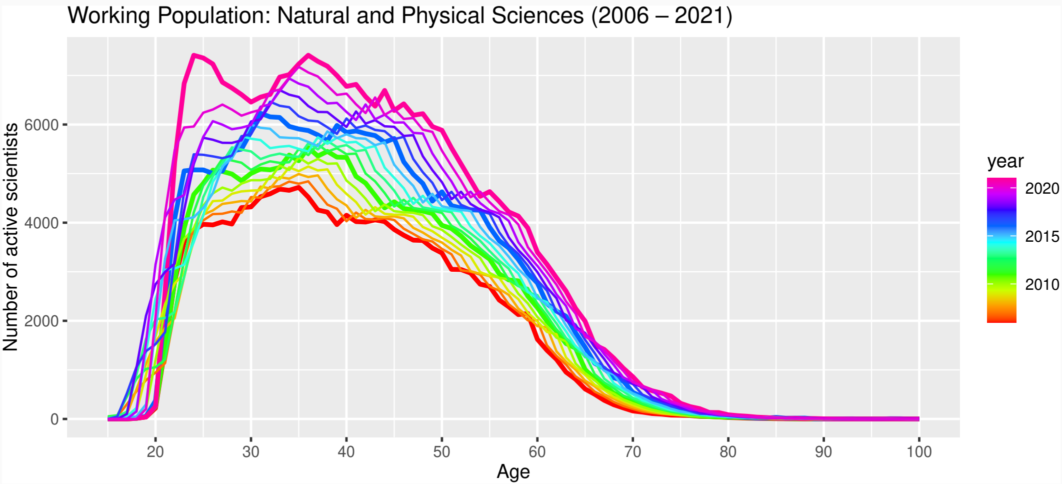
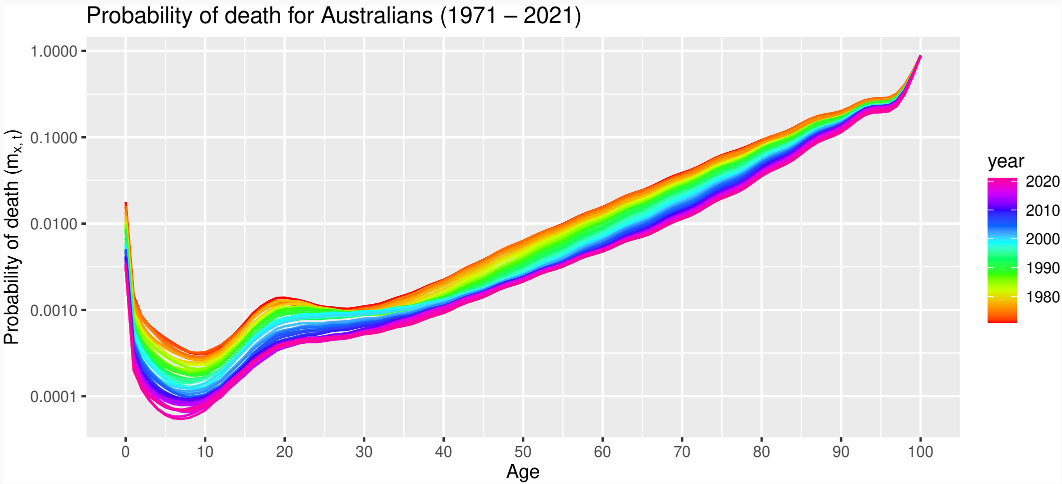


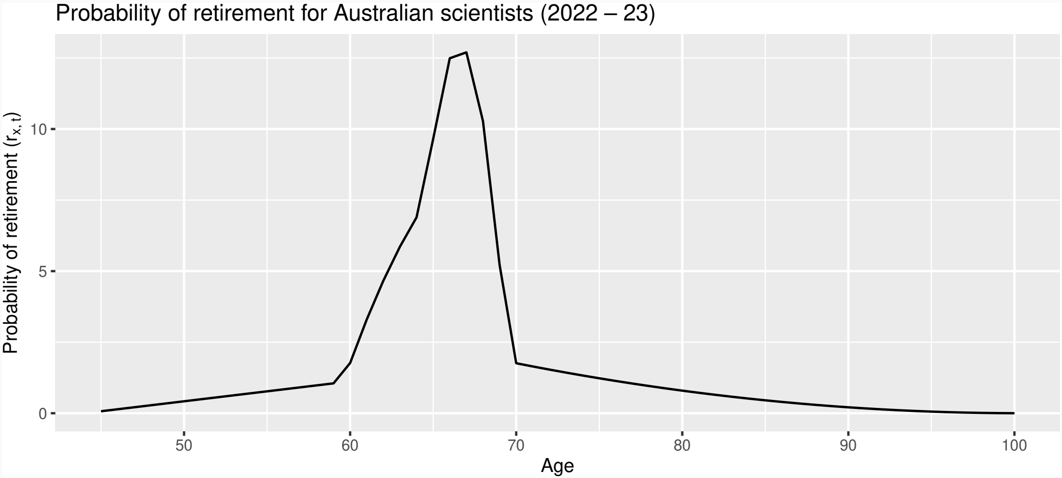
Death rates: $m_{x,t}$

$$P_{x+1,t+1} = P_{x,t}(1 - m_{x,t} - r_{x,t}) + G_{x,t} + N_{x,t}$$



Retirement rates: $r_{x,t}$

$$P_{x+1,t+1} = P_{x,t}(1 - m_{x,t} - r_{x,t}) + G_{x,t} + N_{x,t}$$



Graduate completions: $G_{x,t}$

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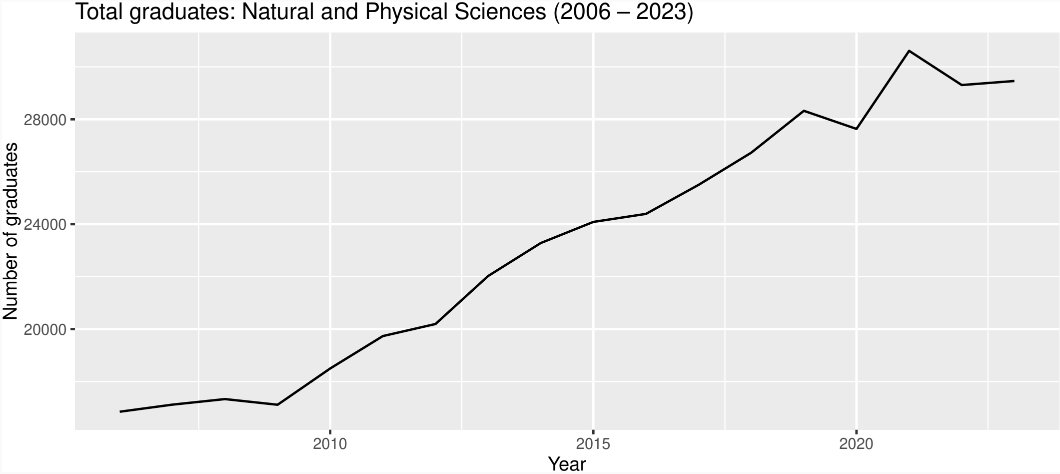

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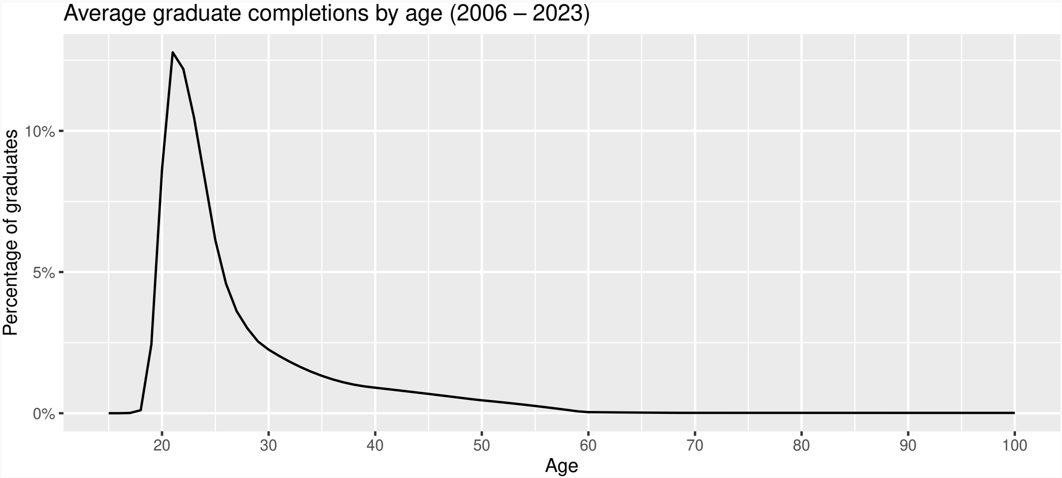

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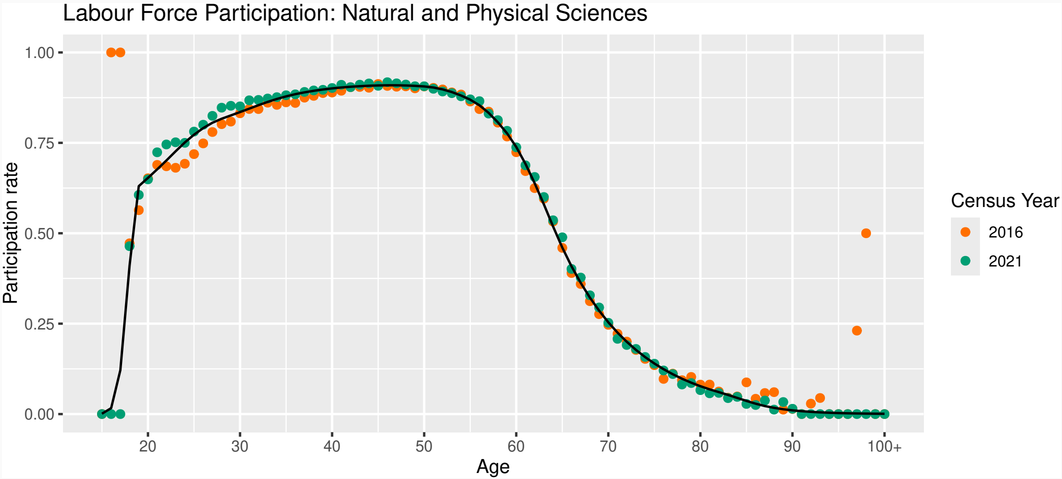

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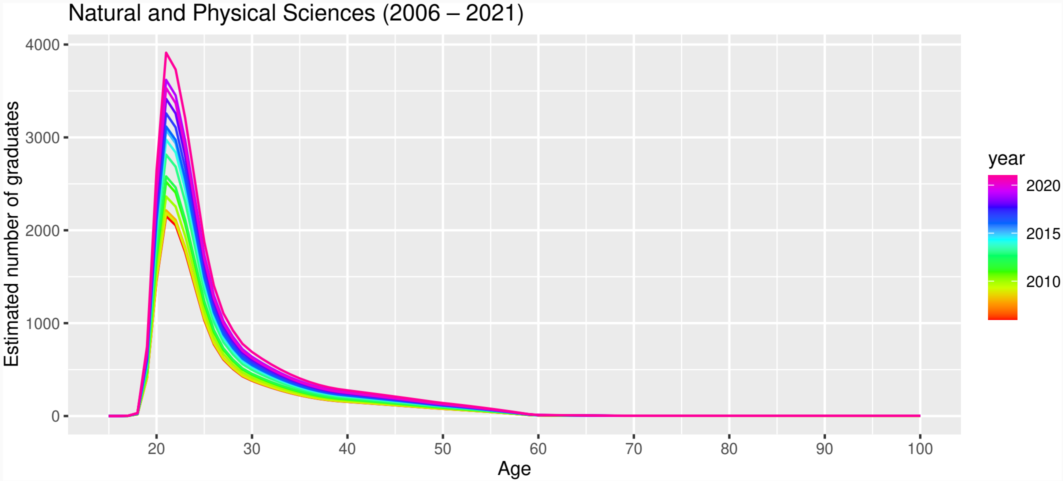


Net migration: $N_{x,t}$

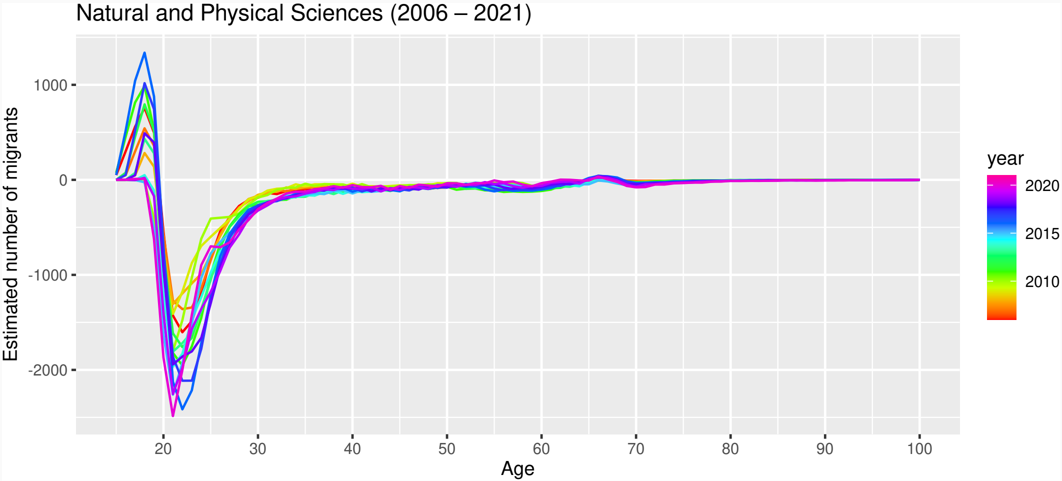
$$P_{x+1,t+1} = P_{x,t}(1 - m_{x,t} - r_{x,t}) + G_{x,t} + N_{x,t}$$

Net migration: $N_{x,t}$

$$N_{x,t} = P_{x+1,t+1} - P_{x,t}(1 - m_{x,t} - r_{x,t}) - G_{x,t}$$

Net migration: $N_{x,t}$

$$N_{x,t} = P_{x+1,t+1} - P_{x,t}(1 - m_{x,t} - r_{x,t}) - G_{x,t}$$



Forecasting models

$$P_{x+1,t+1} = P_{x,t}(1 - m_{x,t} - r_{x,t}) + G_{x,t} + N_{x,t}$$

$m_{x,t}$: a functional time series model

$r_{x,t}$: assumed constant over time

$G_{x,t}$: ARIMA model of total graduates by year, disaggregated by age using constant functions of age (for graduate age distribution and labour force participation distribution)

$N_{x,t}$: a functional time series model