Forecasting Mortality By Making Use Of The Best-Practice Life Expectancy

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The Aim

To obtain better forecasts for female and male life expectancy by taking into account the international context and male-female correlation within the country.

The Double-Gap Life Expectancy Forecasting Model

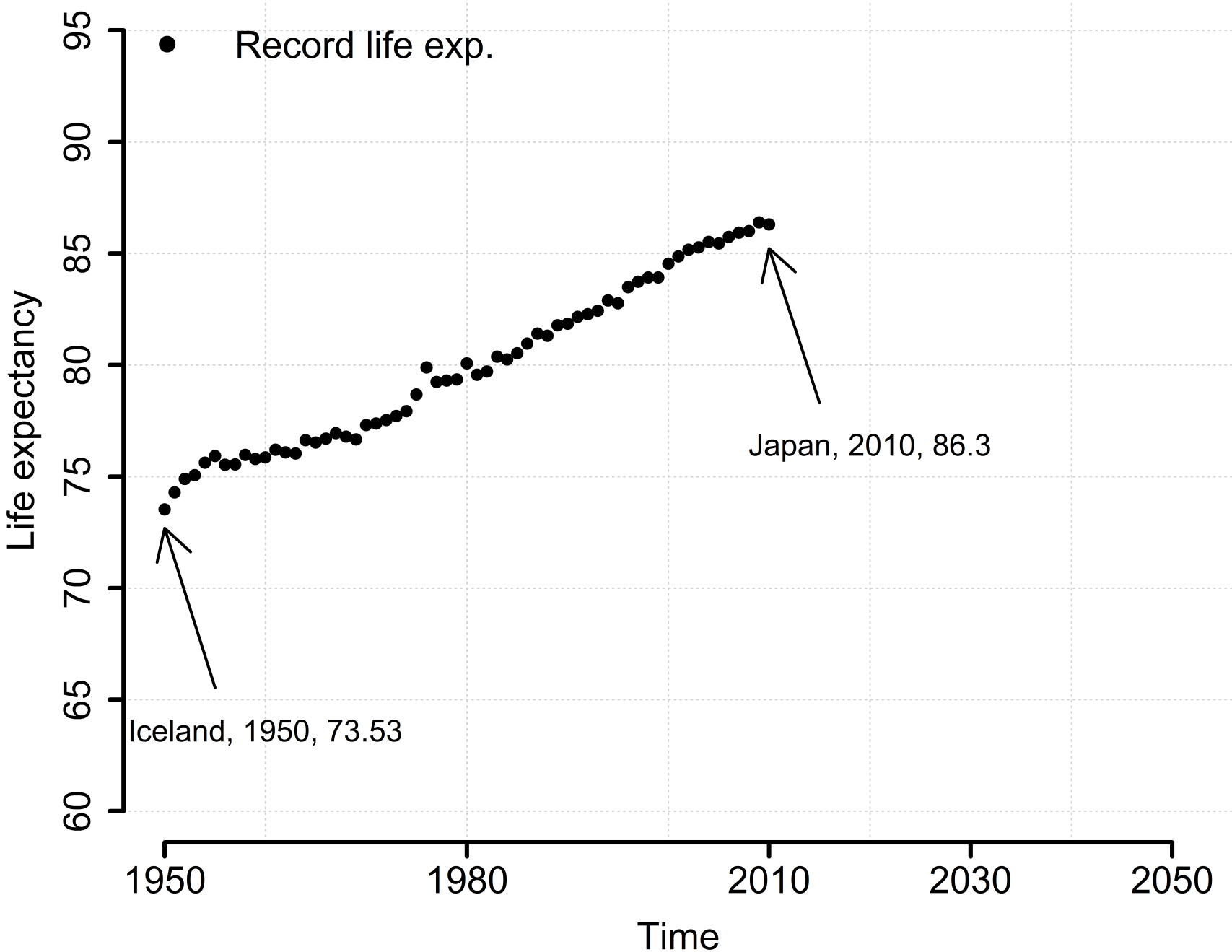
Why?

- Positively correlation between life expectancy levels
- Constant increase in record life expectancy
- Convergence effect

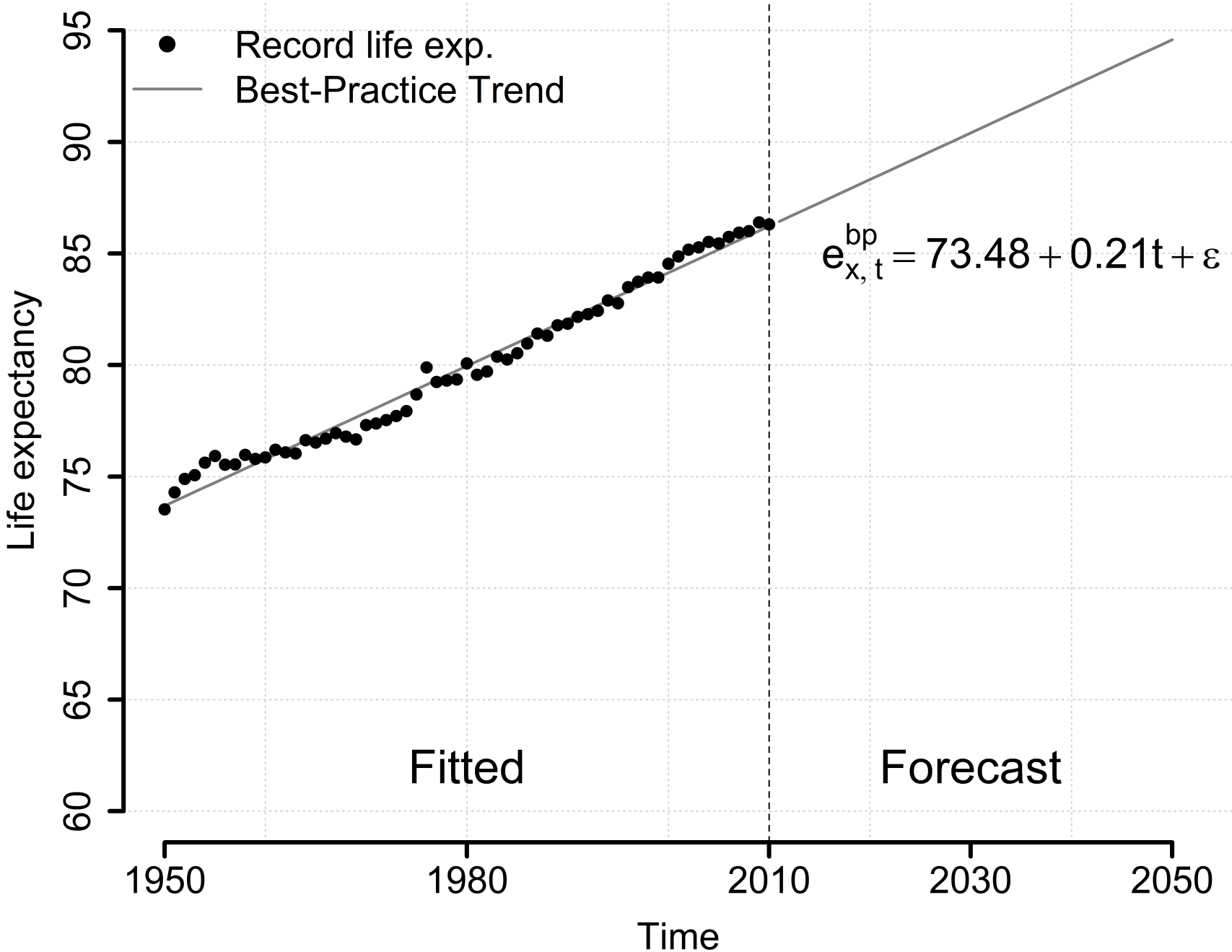
Data

- Human Mortality Database (2015)
- Historical period: 1950 - 2010
- Forecast period: 2011 - 2050
- Number of countries: 40

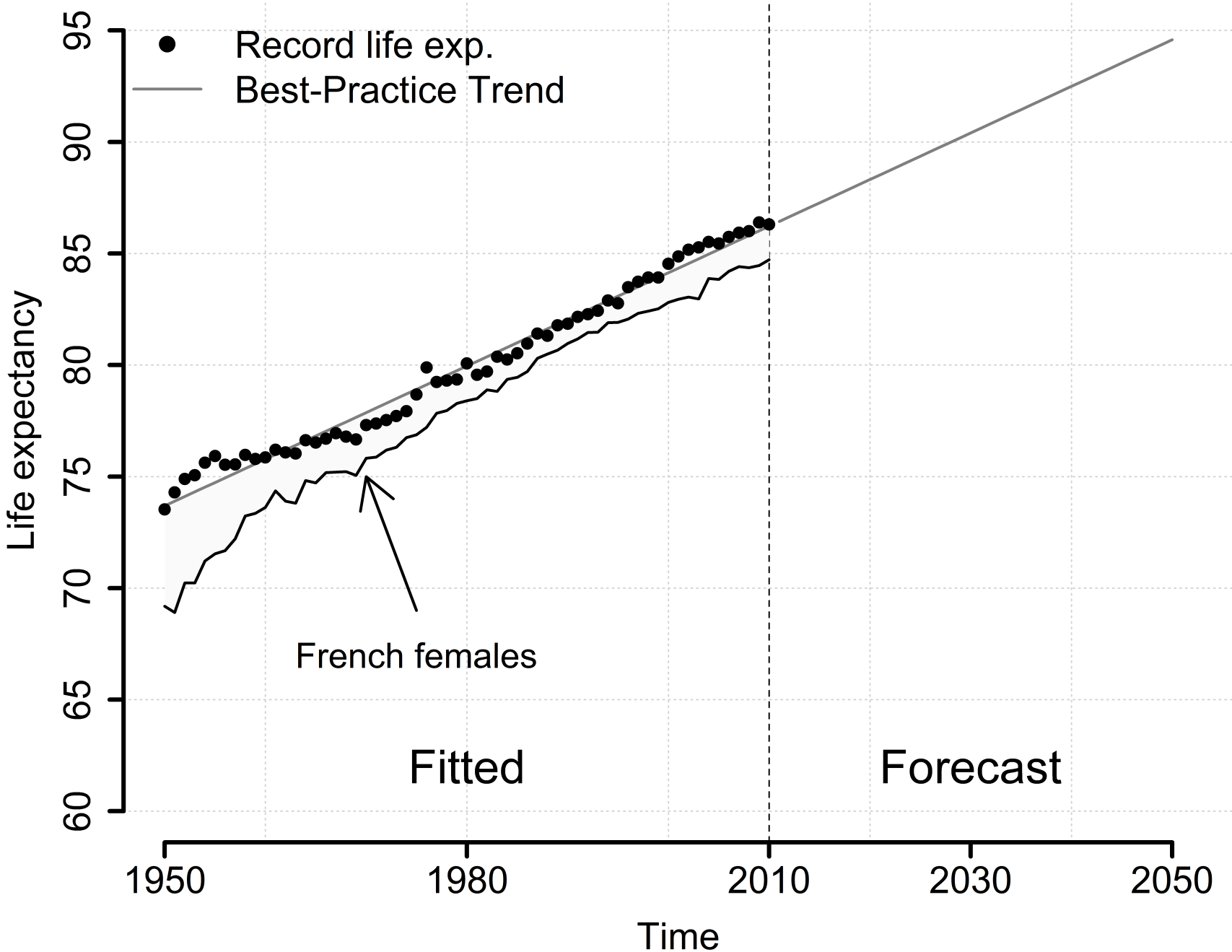
The Record Life Expectancy at Birth



The Best-Practice Trend



France, Age 0, 1950-2050



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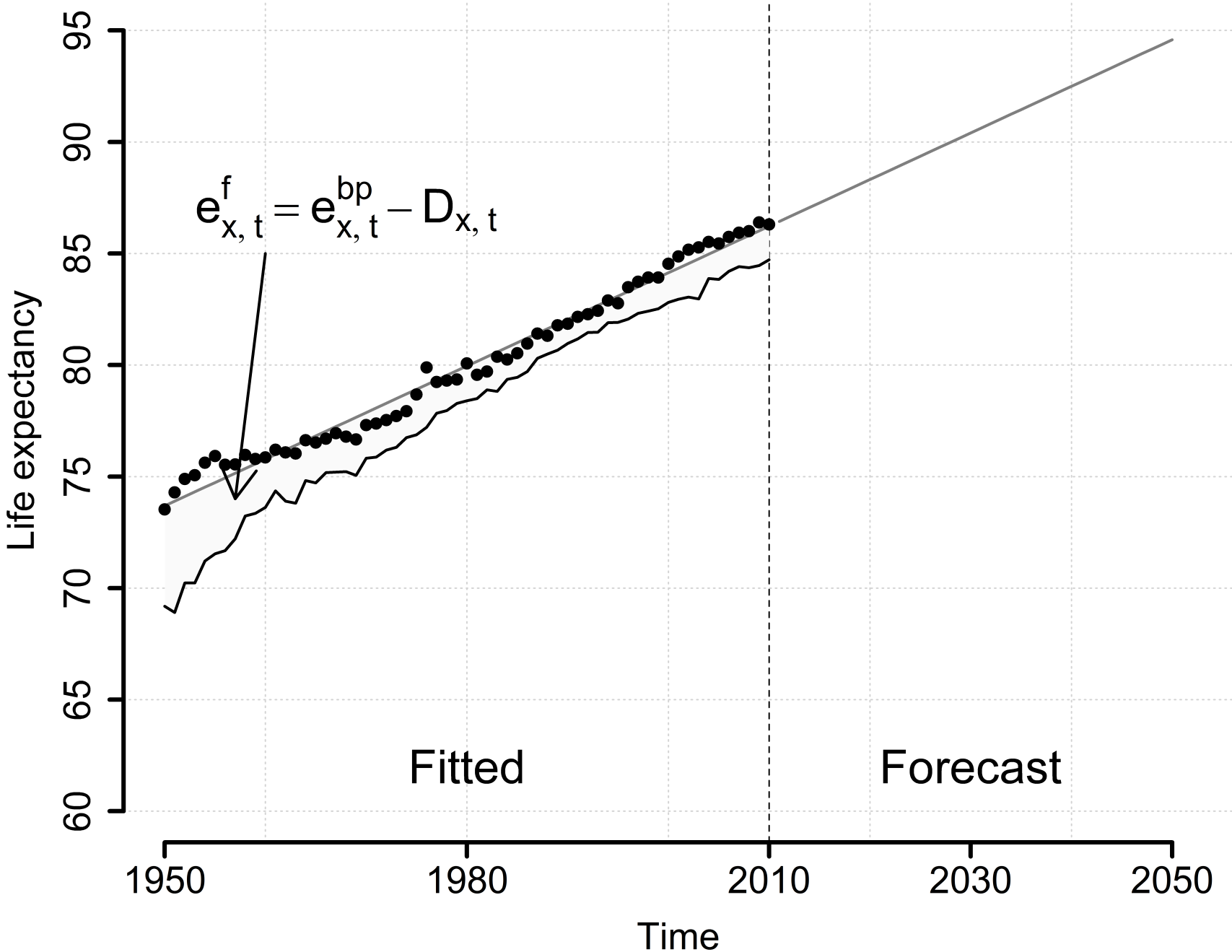
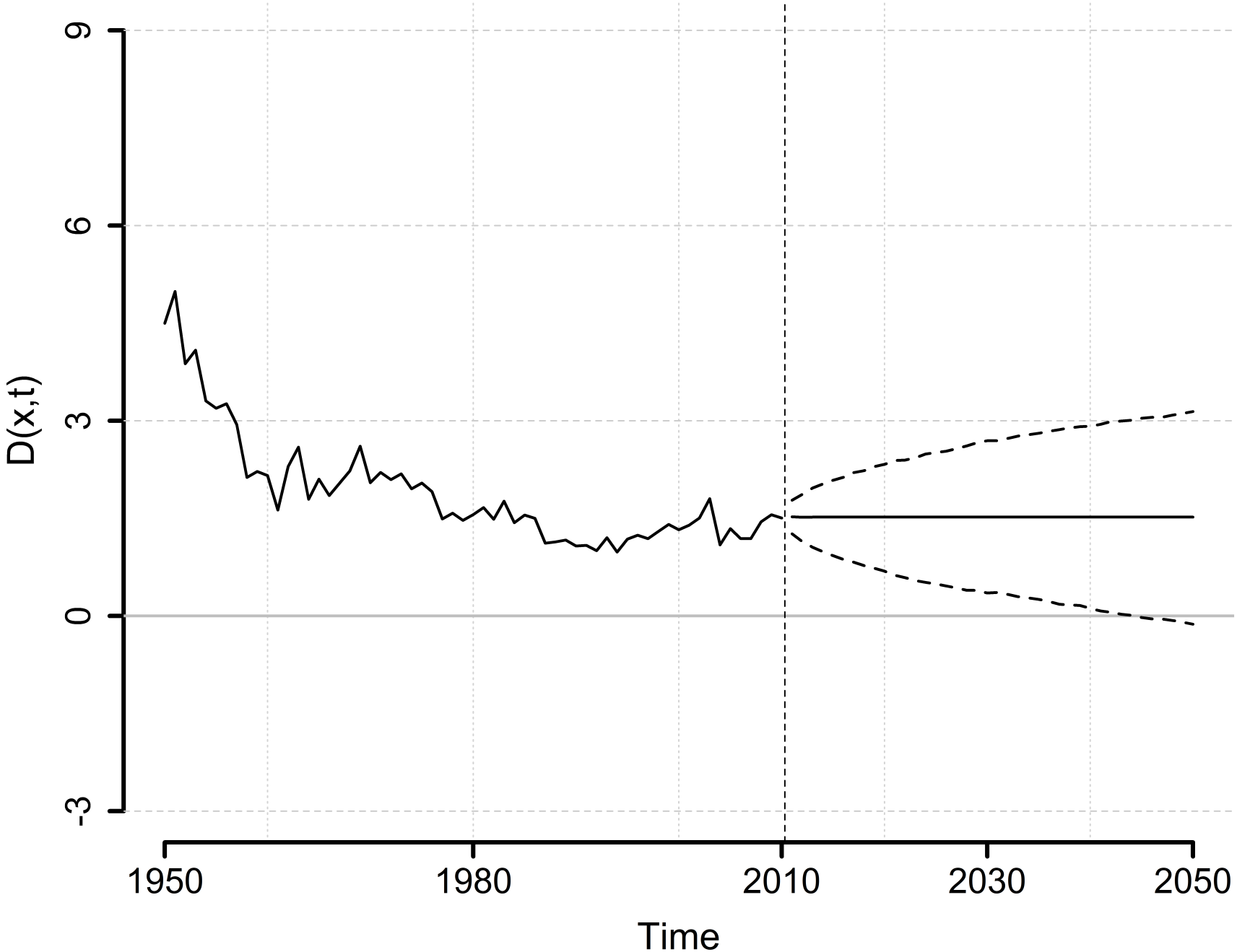


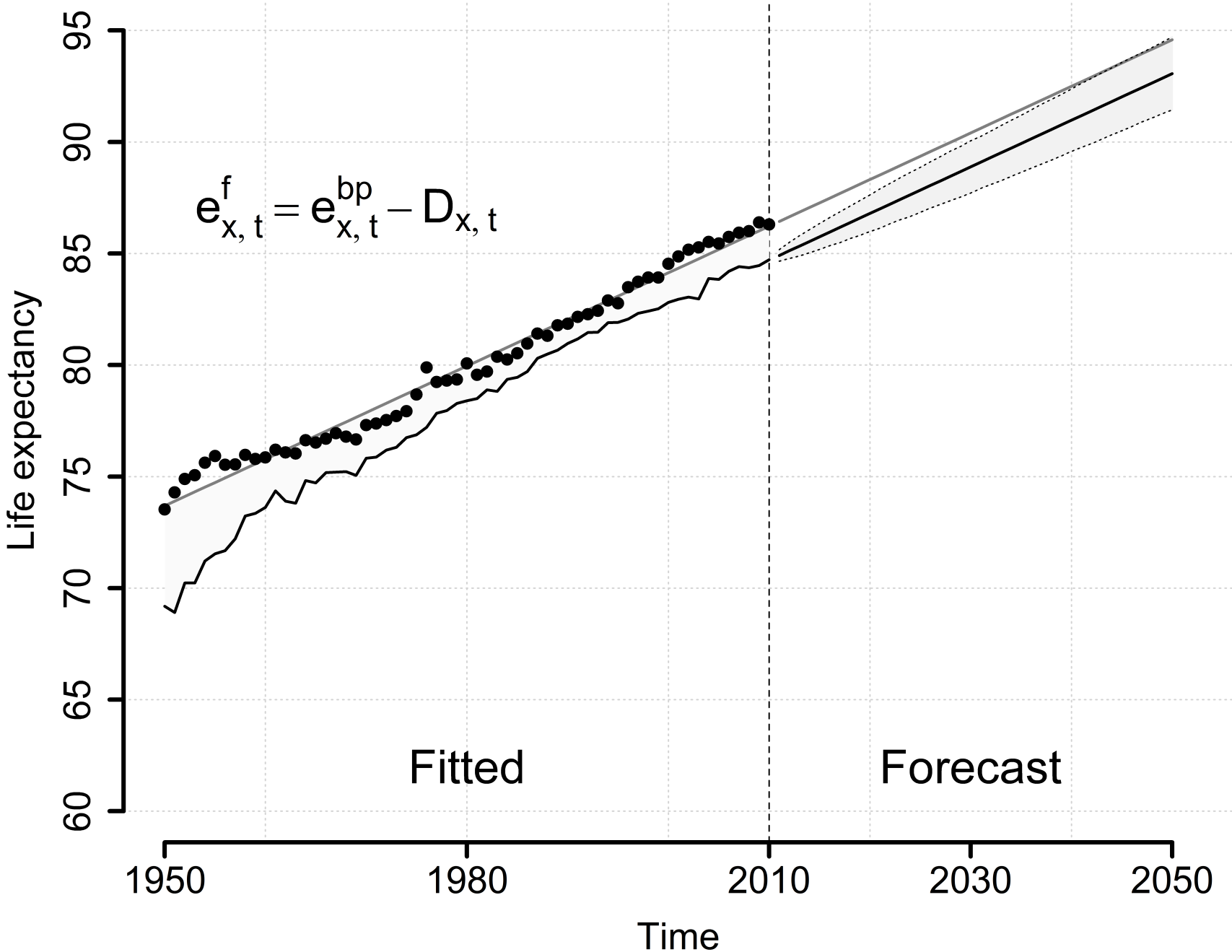
Forecasting $D_{x,t}$ - The ARIMA(p,d,q) model

$$\nabla^d D_{x,t} = \underbrace{\mu + \sum_{i=1}^{p} \phi_i \nabla^d D_{x,t-i}}_{\text{Regression}} + \underbrace{\epsilon_t + \sum_{j=1}^{q} \theta_j \epsilon_{t-j}}_{\text{Smoothed noise}}$$

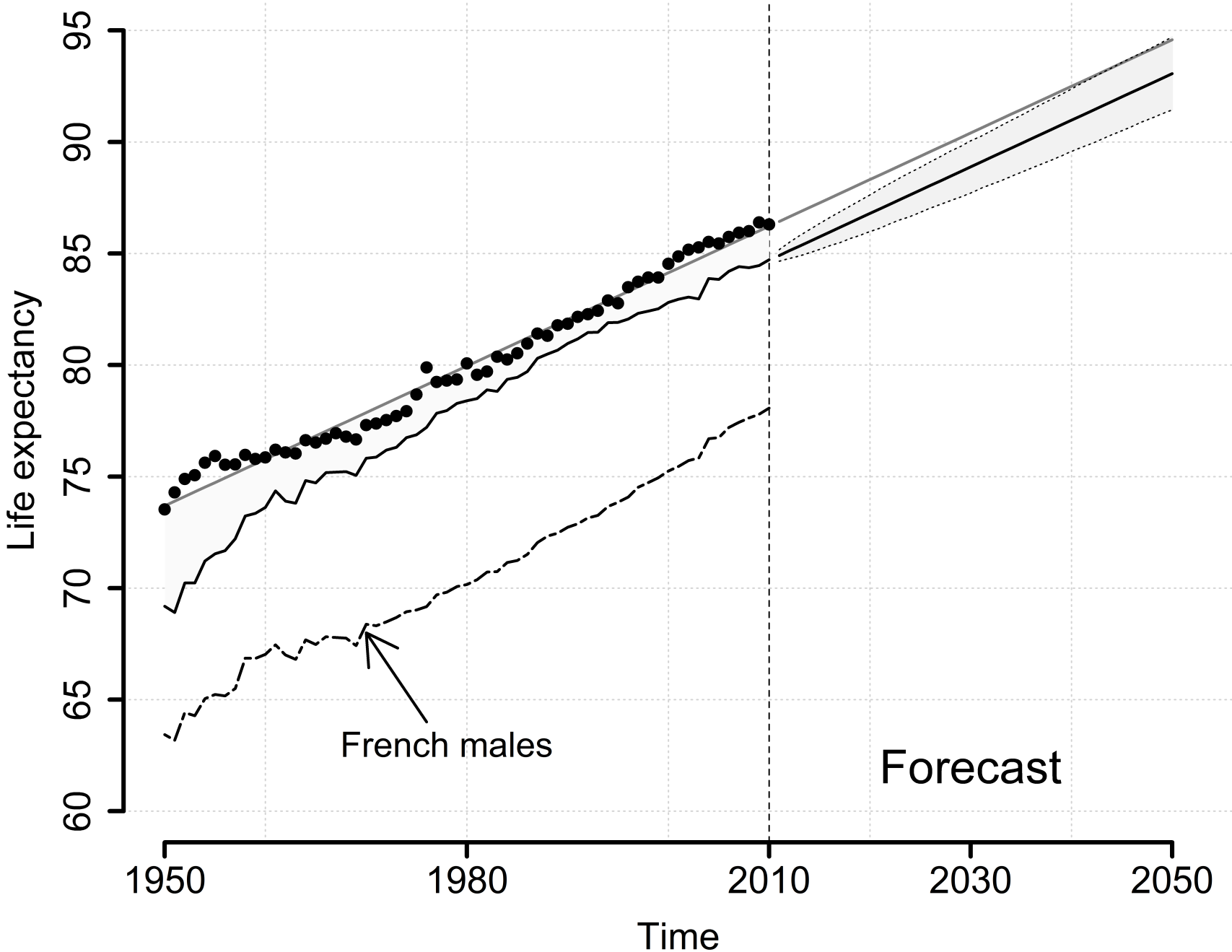
Forecasting $D_{x,t}$ - France



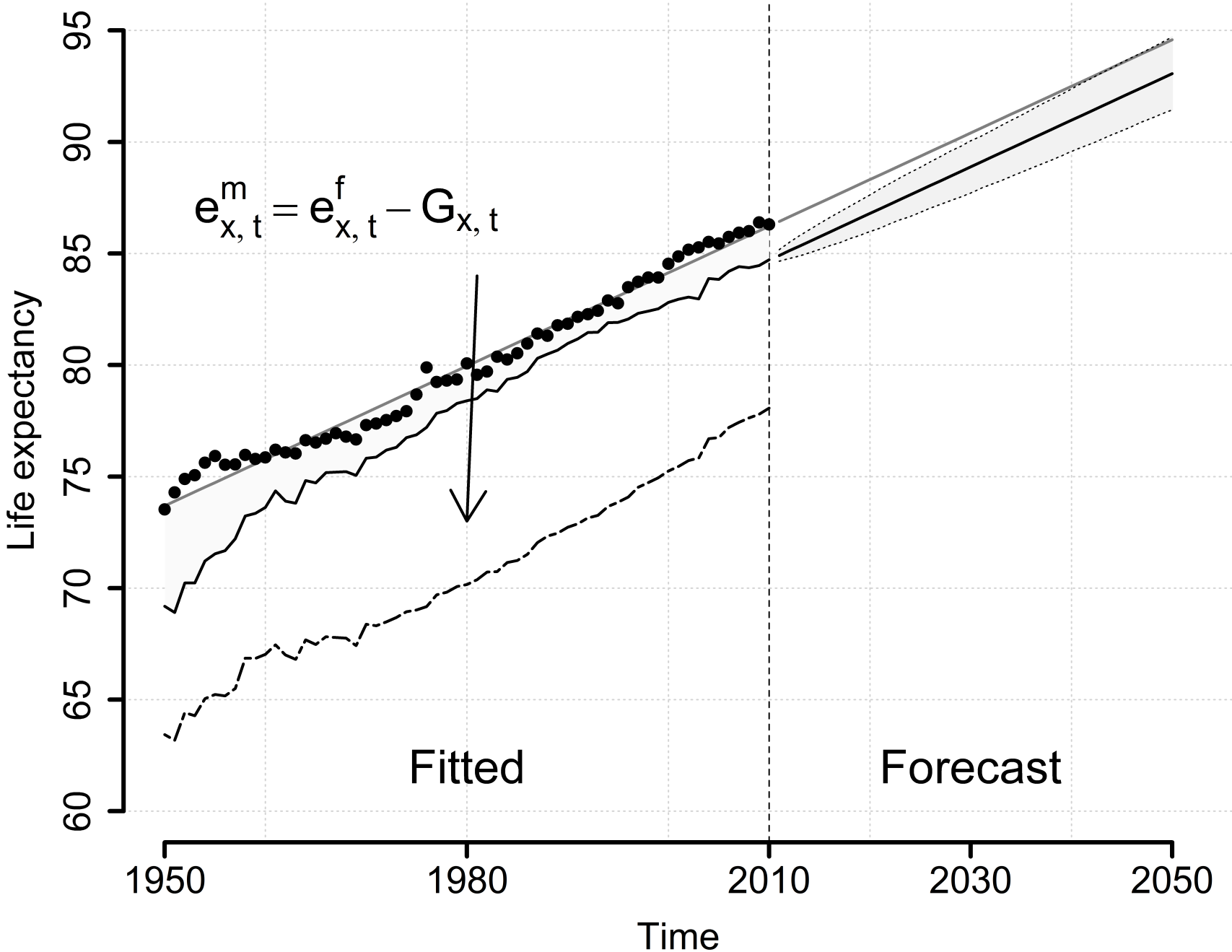
France, Age 0, 1950-2050



France, Age 0, 1950-2050



France, Age 0, 1950-2050



Forecasting $G_{x,t}$ - Raftery type model (2014)

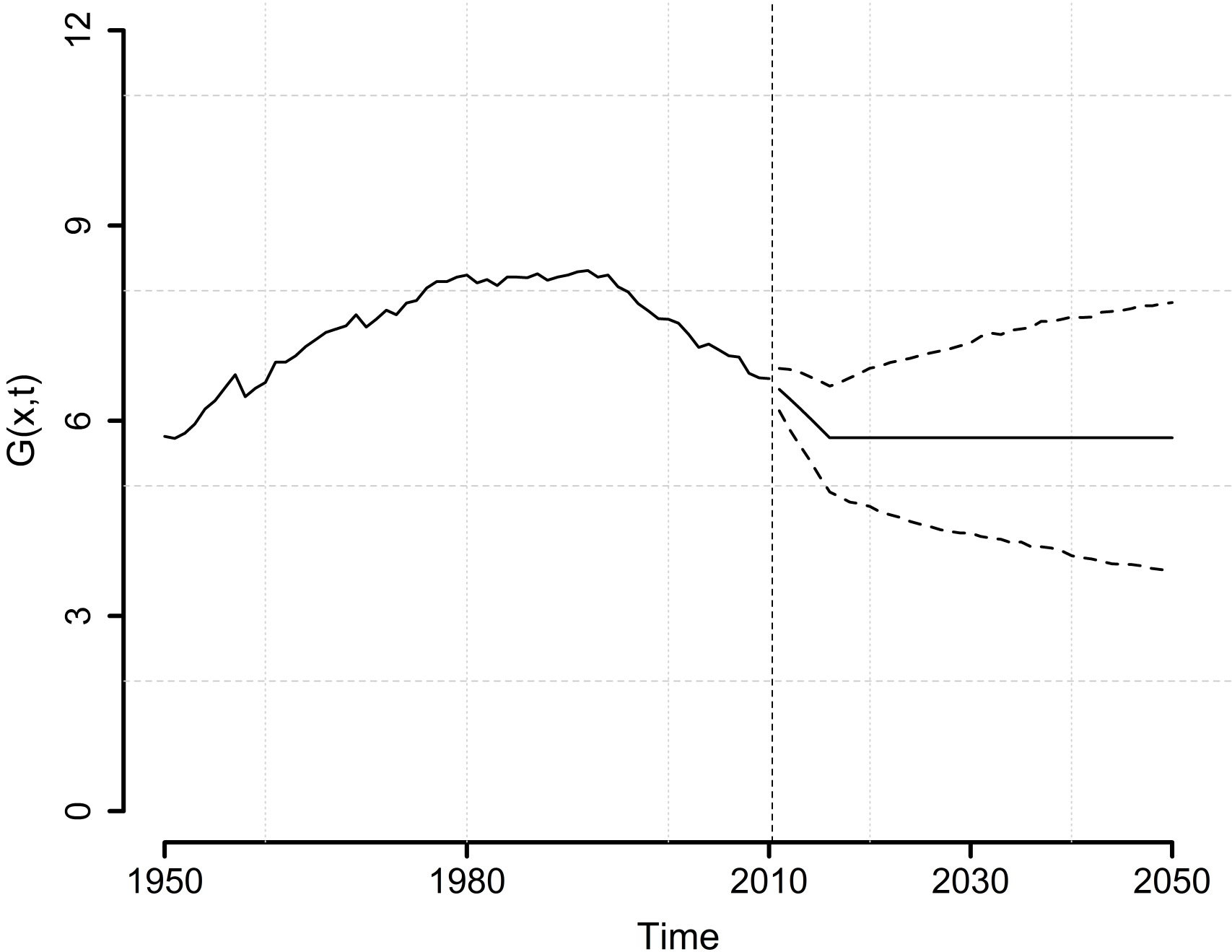
$$G_{x,t} = \beta_0 + \underbrace{\beta_1 G_{x,t-1} + \beta_2 G_{x,t-2}}_{\text{Previous gaps}} + \underbrace{\beta_3 (e^f_{x,t} - \tau)_+}_{\substack{\text{Level of life expectancy} \\ \text{where the gap} \\ \text{starts narrowing}}} + \epsilon_{x,t}$$

Forecasting $G_{x,t}$ - Raftery type model (2014)

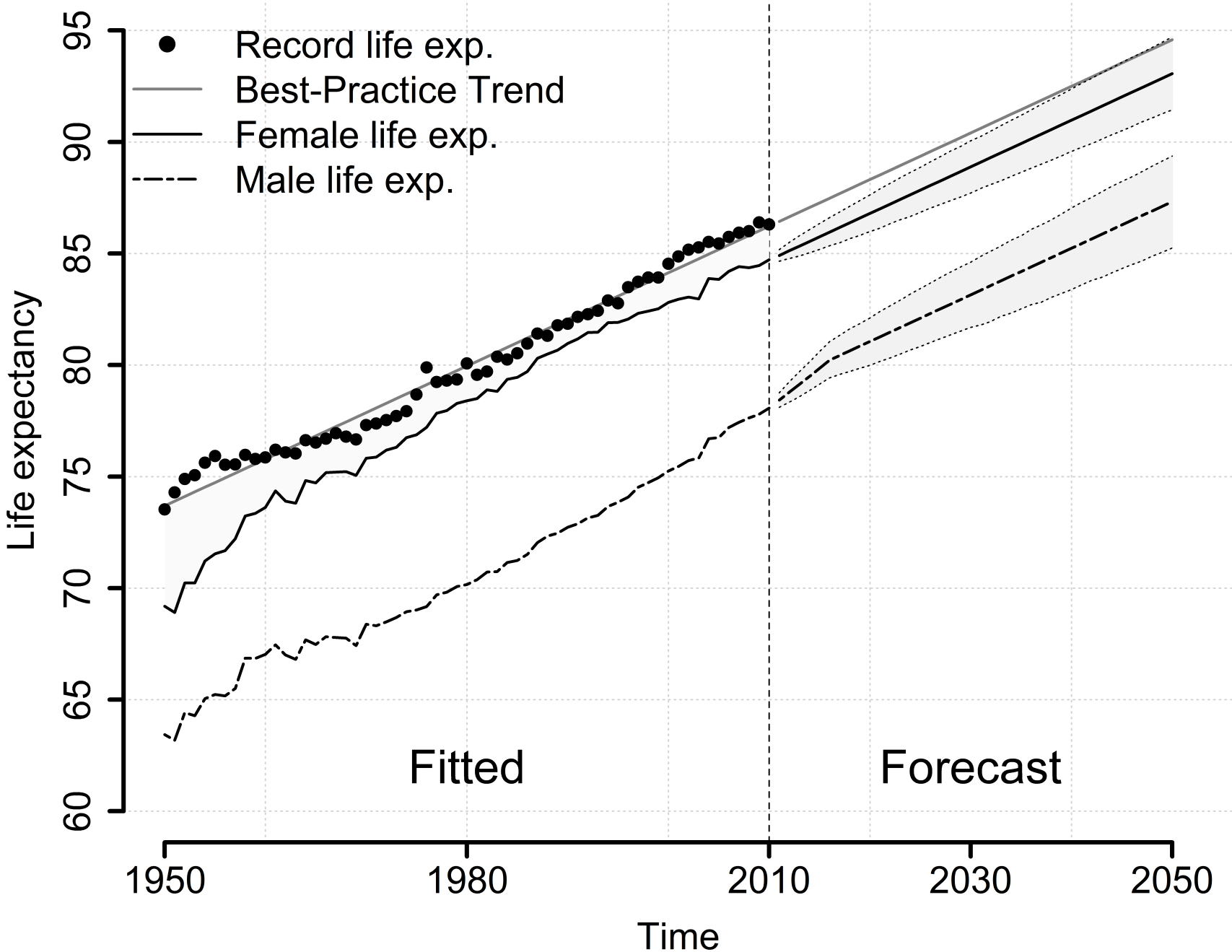
$$G_{x,t} = \beta_0 + \beta_1 G_{x,t-1} + \beta_2 G_{x,t-2} + \beta_3 (e^f_{x,t} - \tau)_+ + \epsilon_{x,t}$$

$$G_{x,t} = \underbrace{G_{x,t-1} + \epsilon_{x,t}}_{\text{Random walk}} \text{ for } \quad e^f_{0,t} > A$$

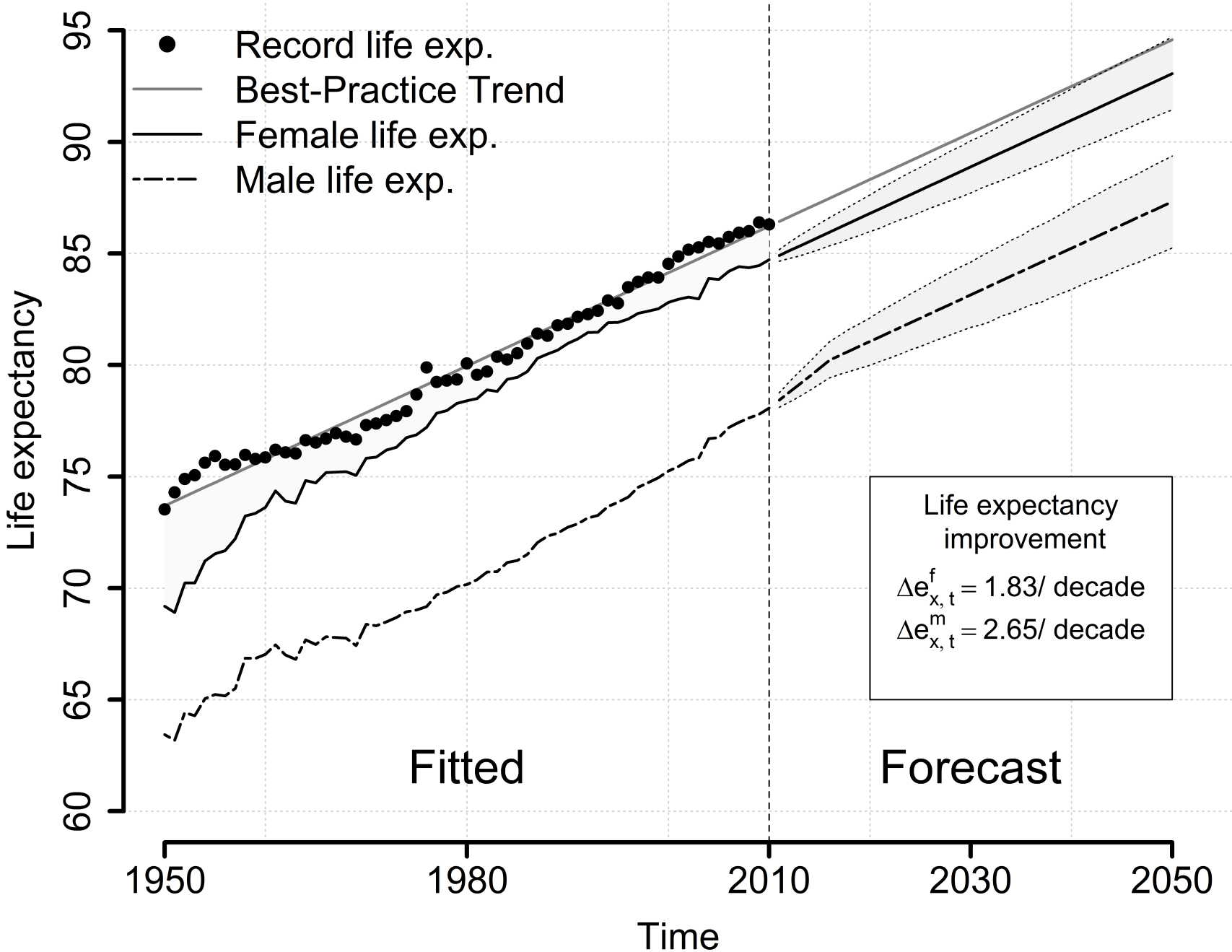
Forecasting $G_{x,t}$ - France



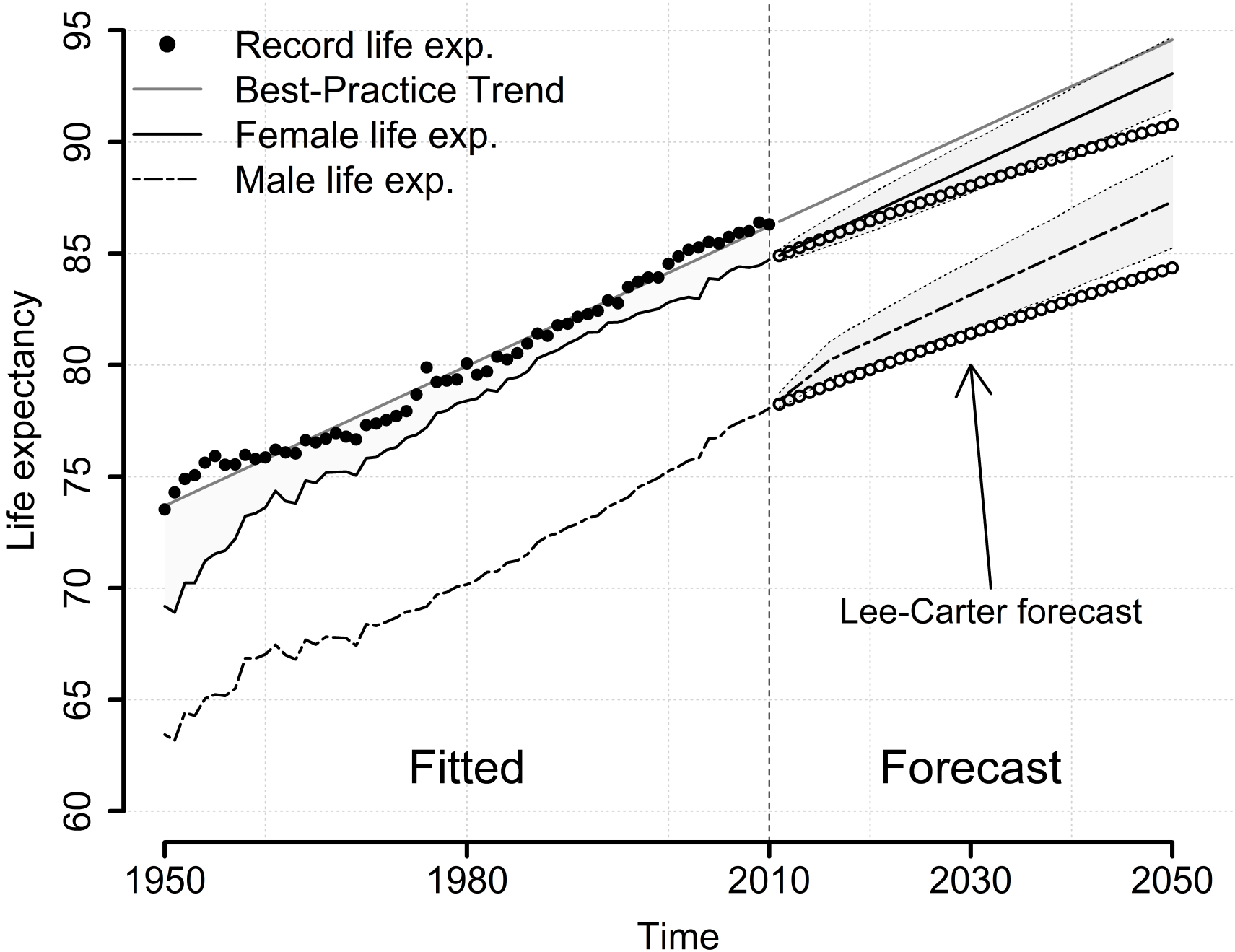
France, Age 0, 1950-2050



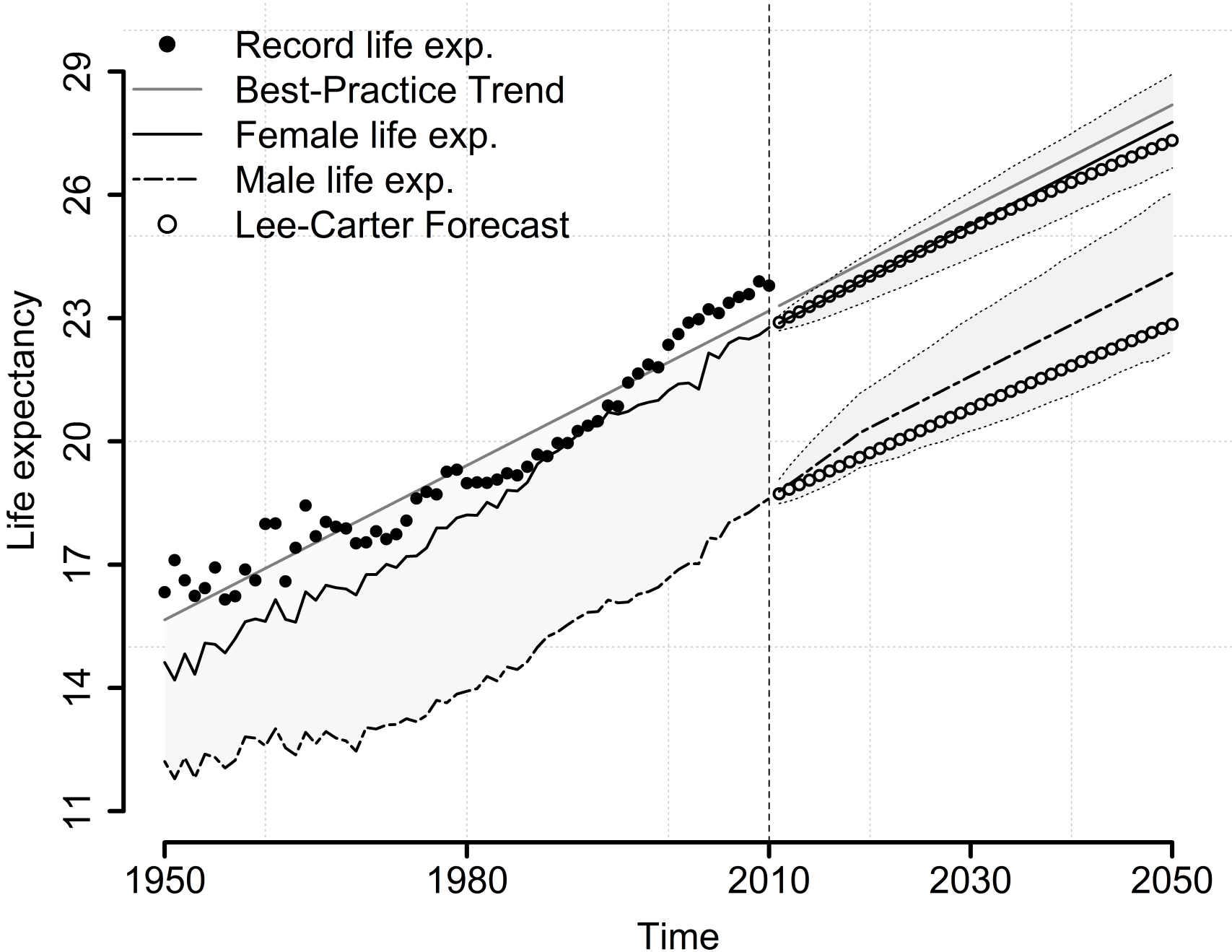
France, Age 0, 1950-2050



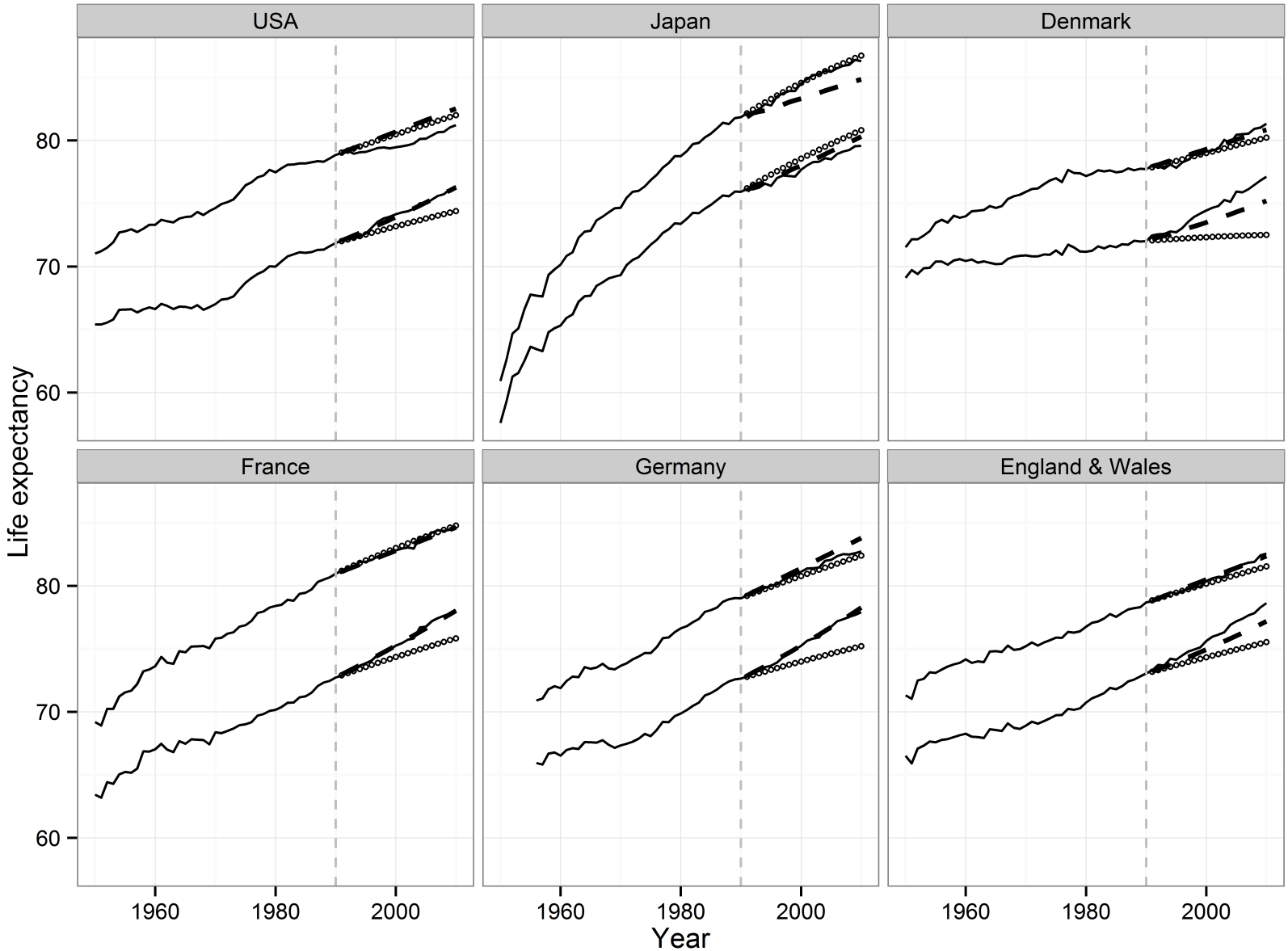
France, Age 0, 1950-2050



France, Age 65, 1950-2050



Backtesting, Life expectancy at birth, 1950-1990-2010



Conclusion

- The current approach combines separate forecasts to obtain the male and female life expectancy levels
- The results are coherent with the best-practice trend and correlated
- The model allows the female life expectancy to exceed the best-practice level

Thank you for your attention!