# Anticipated expansions of life expectancy and their long-run growth effects

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We analyse the long-run economic growth effects of an anticipated rise of longevity and a simultaneous drop of fertility within the general equilibrium of an R&D-based endogenous growth model with horizontal innovations and overlapping generations.

**The problem**

Most industrialized countries have aging populations due to decreasing birth rates and increasing life expectancy. All G7 countries experienced substantial demographic changes during the last 60 years resulting in an older population structure. R&D-based endogenous growth models predict that population aging fosters long-run growth. These models consider the reaction of economic agents to unexpected changes in demographic parameters, such as mortality and fertility, and convergence to a new balanced growth path. However, agents in developing countries may predict these changes by observing the situation in developed countries such that they could adjust the consumption/saving decision in advance. In order to describe such behaviour, one needs a model with rational expectations and predicted demographic changes. We pose the question of whether a sudden unanticipated drop of mortality and fertility by the same amount leads to same change of the GDP growth rate as the anticipated change.

**The research approach**

In this contribution, we extend the overlapping generations (OLG) model of Prettner (2013) that builds upon the R&D-based endogenous growth model of Romer (1990) such that it accounts for anticipated changes of mortality and fertility. We consider the Romer (1990) benchmark case in which population growth is zero such that fertility adjusts to equal mortality. The balanced growth path is derived as the only feasible stationary solution. We assume that the solution of the model stays in the vicinity of the balanced growth path, so that we evaluate changes in the solution by the changes in the balanced growth path due to increased longevity.

We assume mortality $μ\left(t\right)$ and fertility $β\left(t\right)$ to be independent of age. For the sake of simplicity, we consider only synchronous changes in fertility and mortality such that $β\left(t\right)=μ\left(t\right)$ holds and the population size $N$ stays constant.

**The main results**

We find that anticipation makes the change in the balanced growth path smooth before the drop in fertility and mortality but that there is still a discontinuous change at the time of the drop. If the population is aging, i.e. mortality $μ$ and fertility $β$ become lower, then the economic growth rate $g$ increases. If aging is anticipated, then the increase of the growth rate starts slowly in advance, but it still jumps at the moment, $t=0$, of the decreases of $μ$ and $β$, see the following figure.



Balanced growth rate $g$ as a function of time is depicted in the figure with solid line. Dashed line denotes what would the balanced growth rate be without unticipation.

**The novelty of the obtained results**

**The central strength of the model** is that it allows the analysis of **anticipated** changes in mortality and fertility. In anticipation of the rise in longevity consumers increase their savings and reduce consumption, long before the rise of longevity actually happens. Nevertheless, the change of the balanced growth path is not smooth; **there is still a small sharp change** of growth rate because of the drop in fertility.

**References**

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