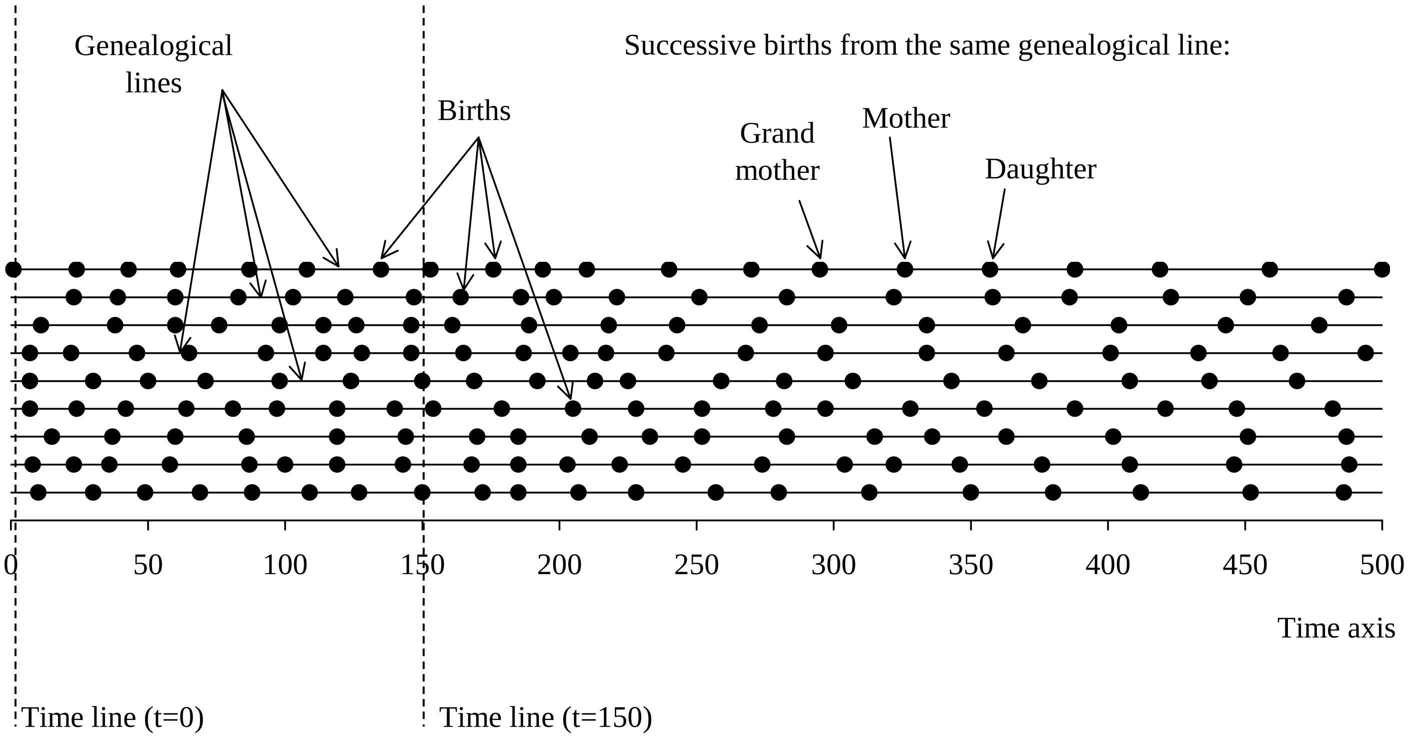
Cohort paramount?
Long-term effects of the childbearing postponement

Dalkhat M. Ediev

Vienna Institute of Demography

Genealogical Lines and Births
(Simple Replacement of Cohorts)



Births intensity:

$$B(t) = \frac{G(t)}{\mu(t)}$$

$G(t)$ is the number of genealogical lines crossing the time line t,

$\mu(t)$ is the mean age at childbearing

Fig.1. Simplified genealogical chart depicting the population reproduction process (simple replacement)

The Population Size

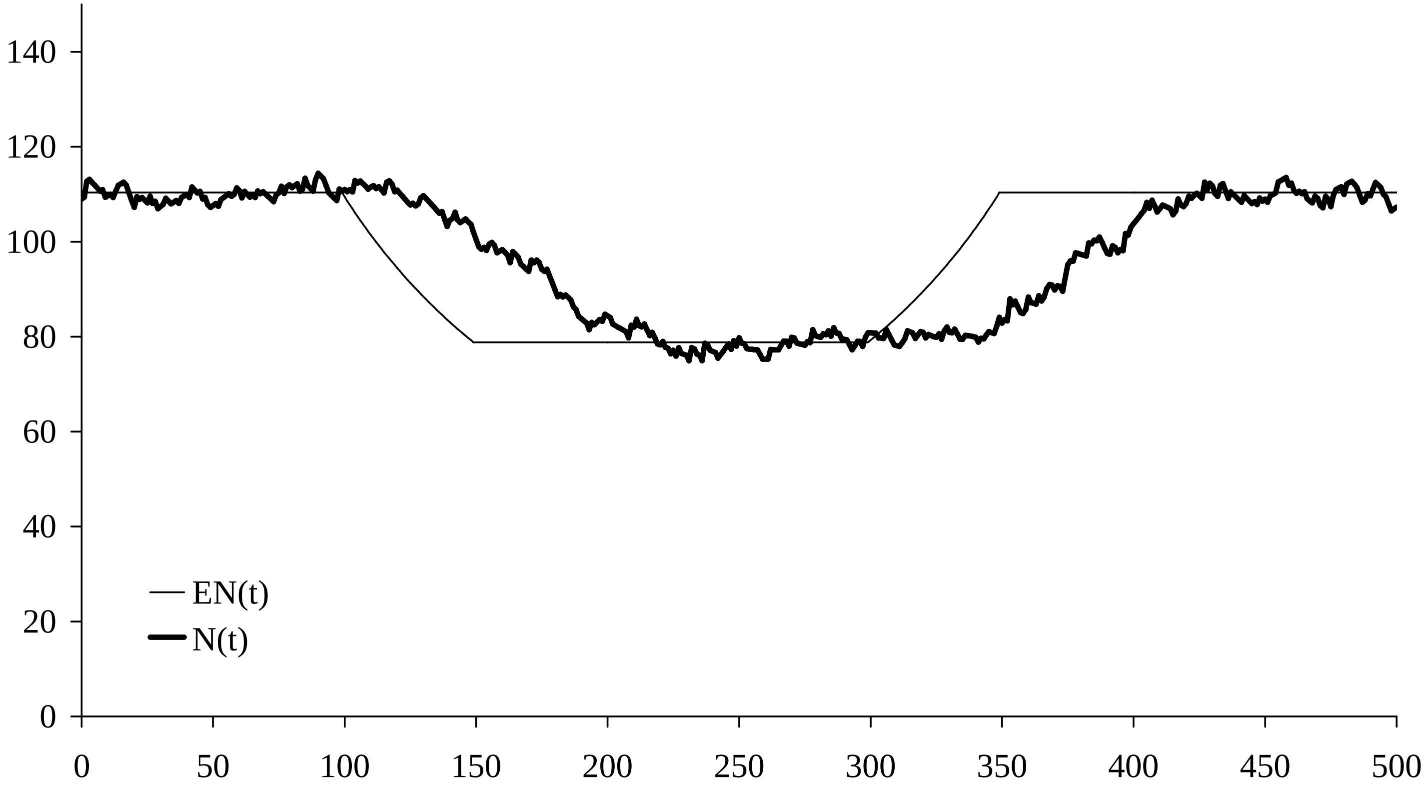


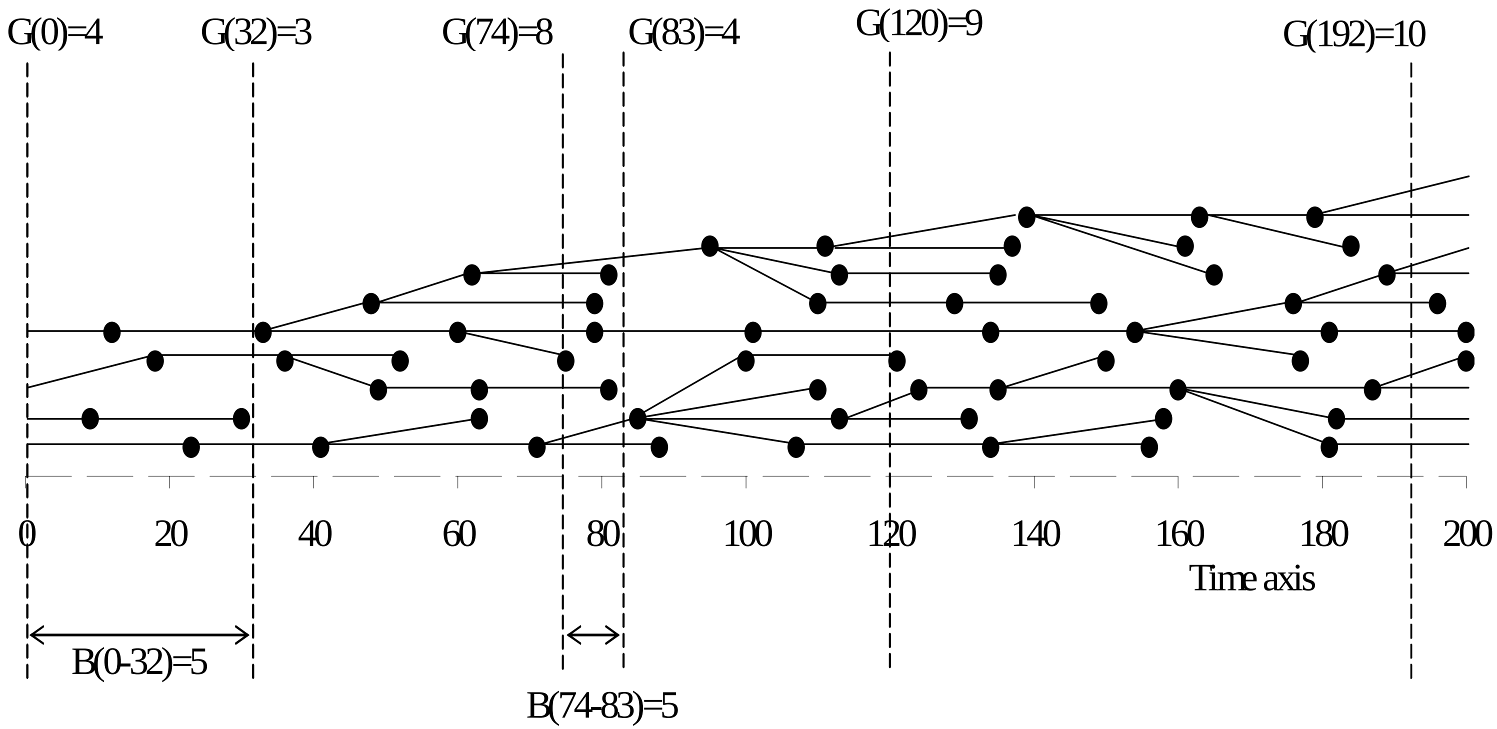
Fig.2. Simulated dynamics of the population size for the scenario of childbearing postponement (years 100-150) followed by childbearing advancement (years 300-350).

Stationary population's size:

$$N(t) = \frac{e_0(t) \cdot G(t)}{\mu(t)}$$

$e_0(t)$ is the life expectancy at birth for those born at time t

Effects of the Childbearing Postponement in the General Case



Births intensity:

$$B(t) = \frac{1}{NRR(t)-1} \cdot \frac{dG(t)}{dt}$$

$NRR(t)$ is the net reproduction rate of the cohort born at time t

Stable population:

$$B(t) = \frac{\ln NRR(t)}{NRR(t)-1} \cdot \frac{G(t)}{T(t)}.$$

$T(t)$ is the generation length for the cohort born at time t

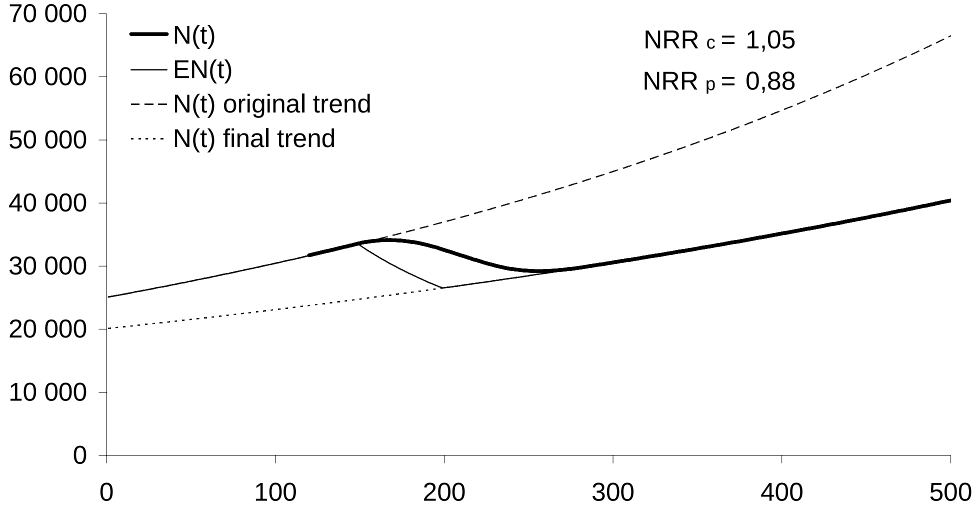
Stable population's size:

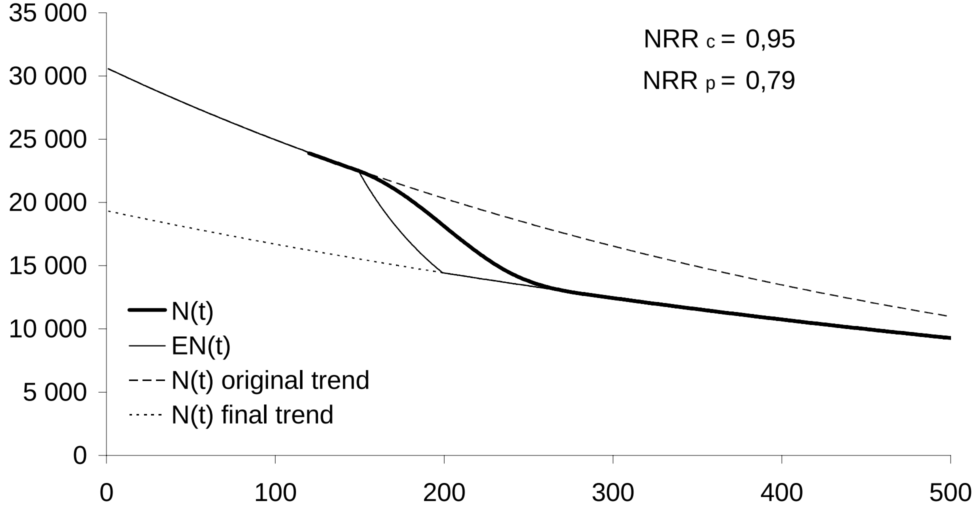
$$N(t) = \frac{\ln NRR(t)}{NRR(t)-1} \cdot \frac{G(t)}{T(t)} \int_0^X l(x,t) e^{-rx} dx$$

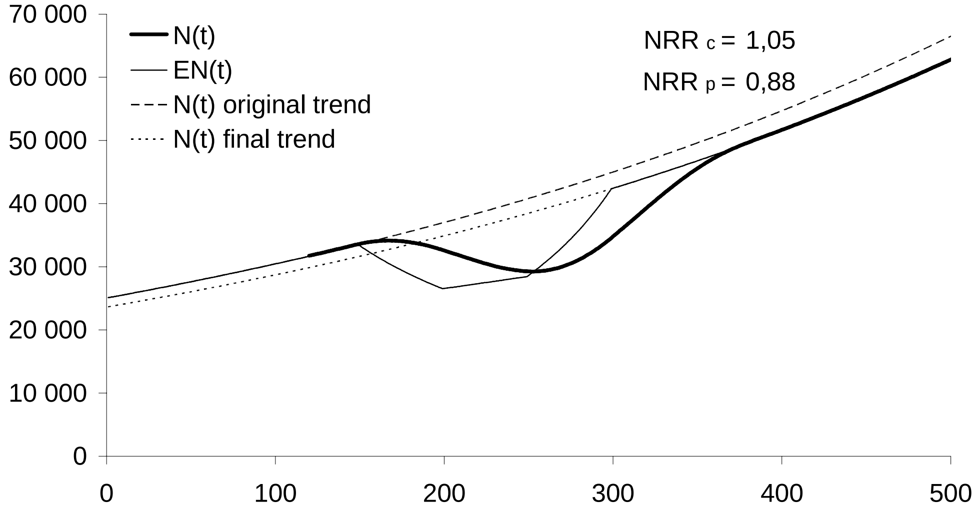
$l(x,t)$ is a survivorship function for the cohort born at time t

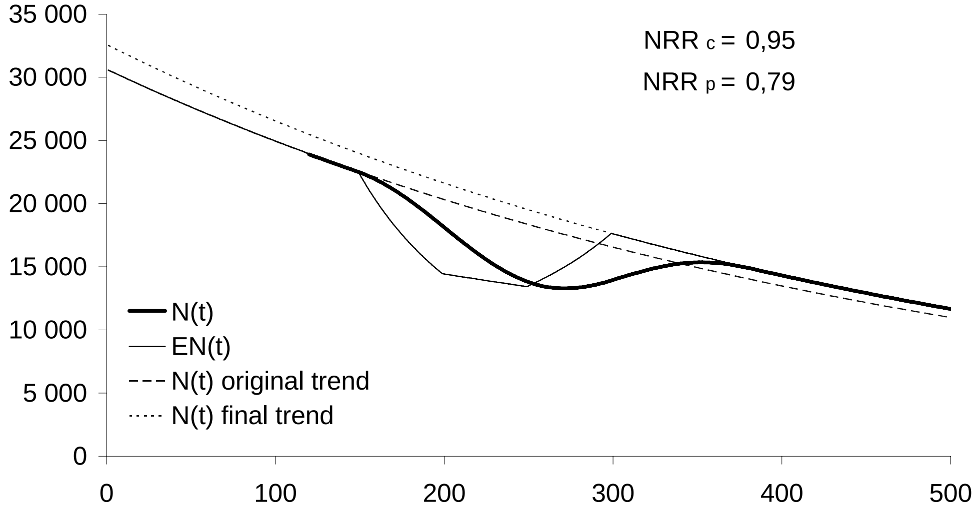
Simulation Results

(childbearing postponement)







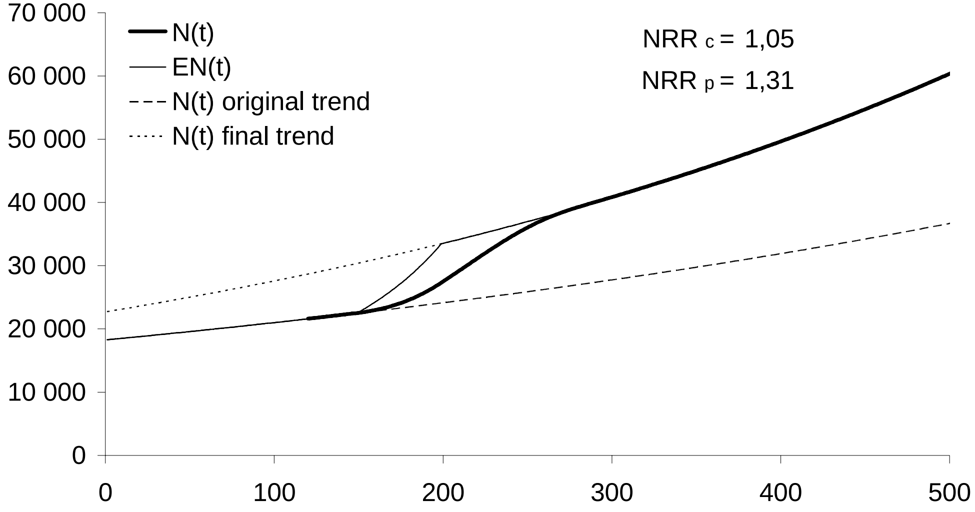


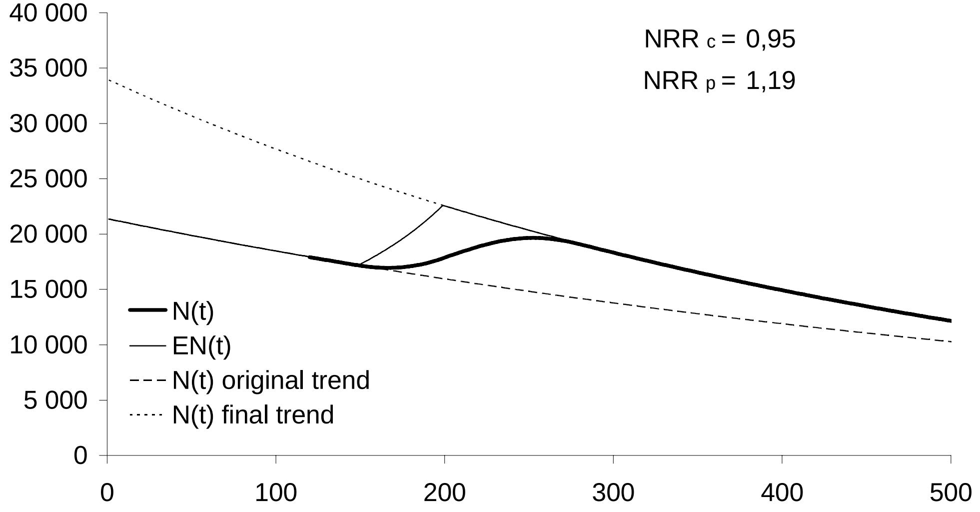
Main findings

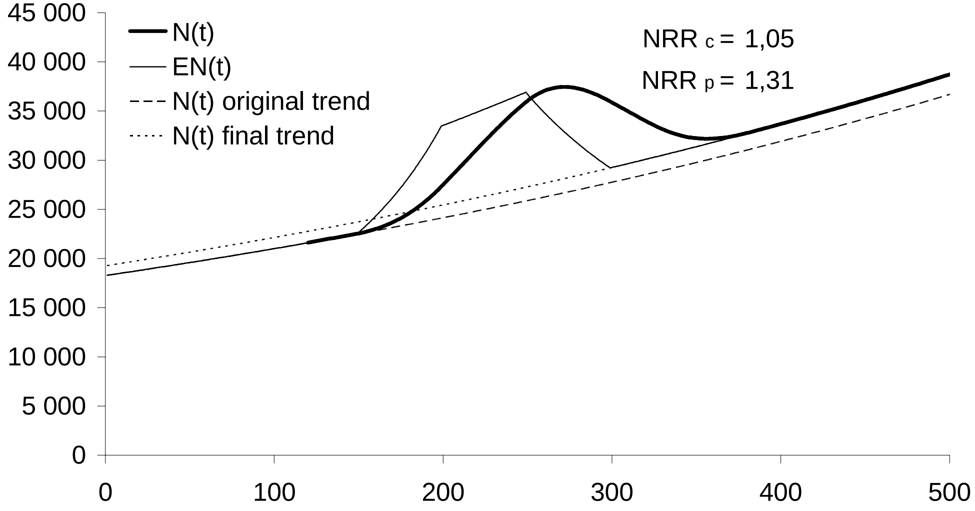
- These are cohort characteristics and genealogical lines dynamics, which determine the final population dynamics
- Duration and intensity of the transition have no effect on final population trend, except for moderate effect in the case of NRR different from unity. Intensity of the transition determines only how fast the population will pass from one global trend to another
- Period indicators are important for analyzing the “short”-term population prospects with keeping in mind the long-term dynamics determined by the cohort indicators
- General relations are obtained for the population dynamics

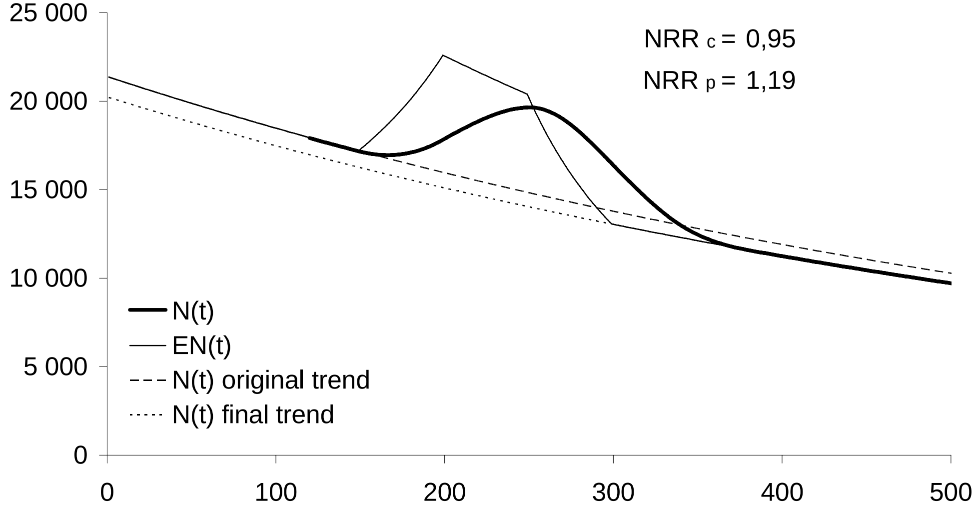
Simulation Results -2

(childbearing advancement)

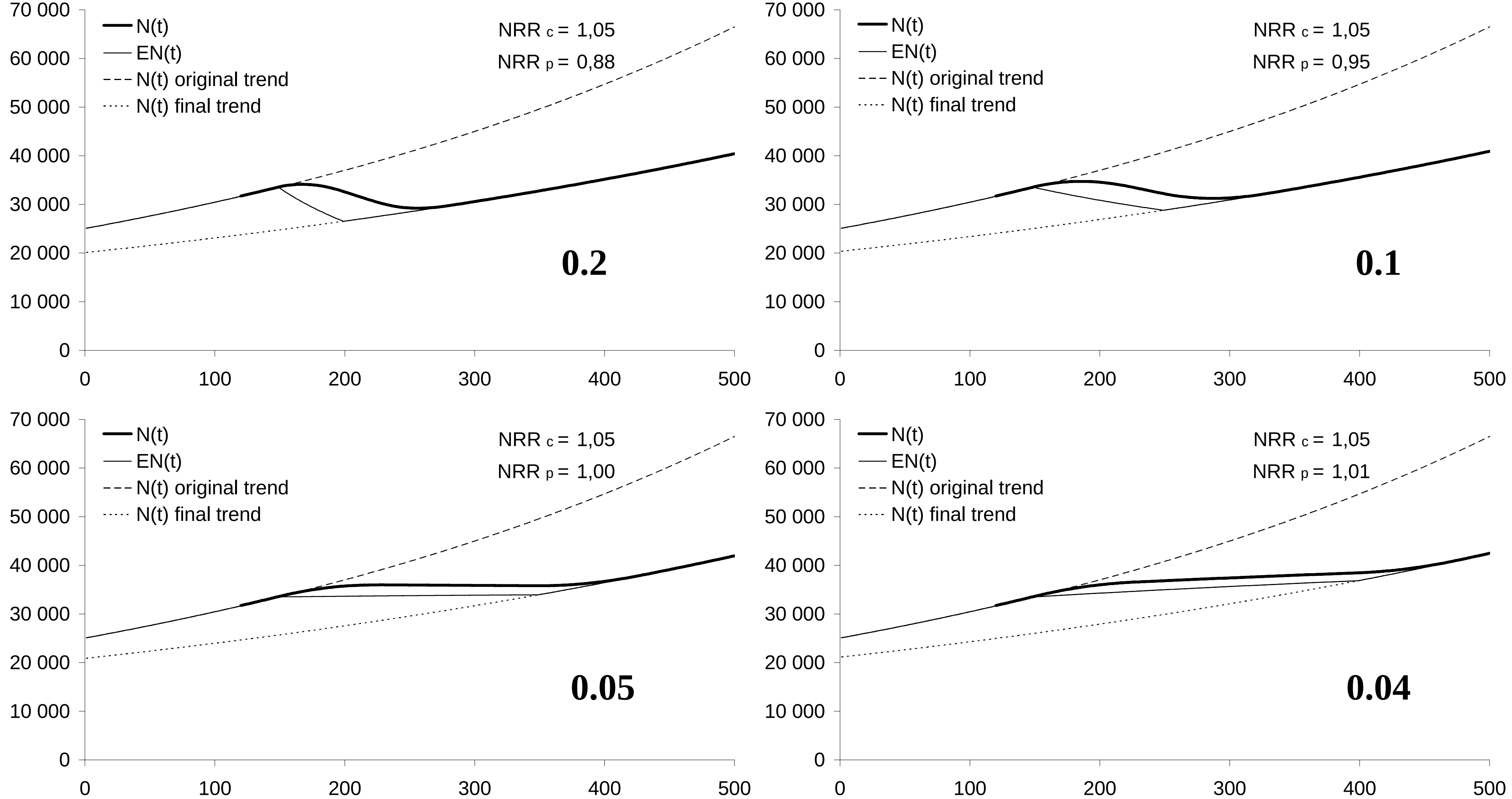






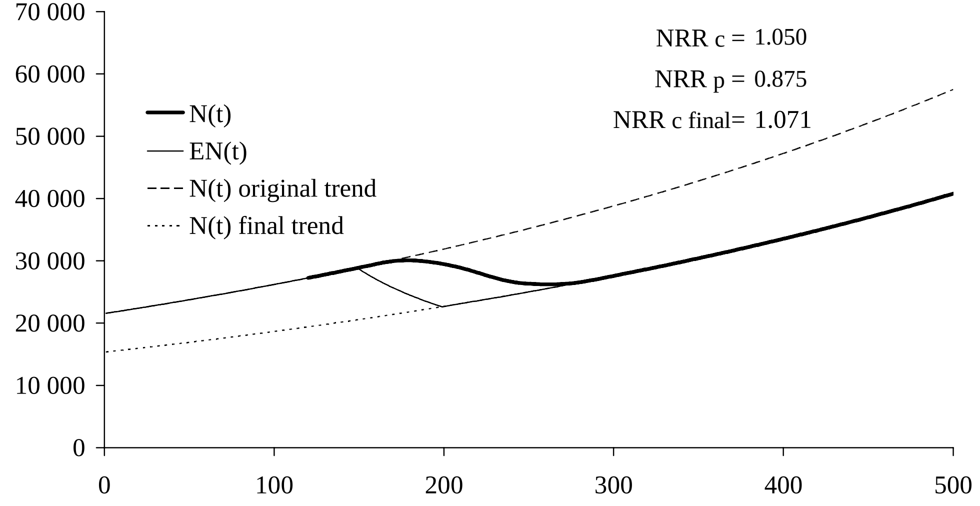


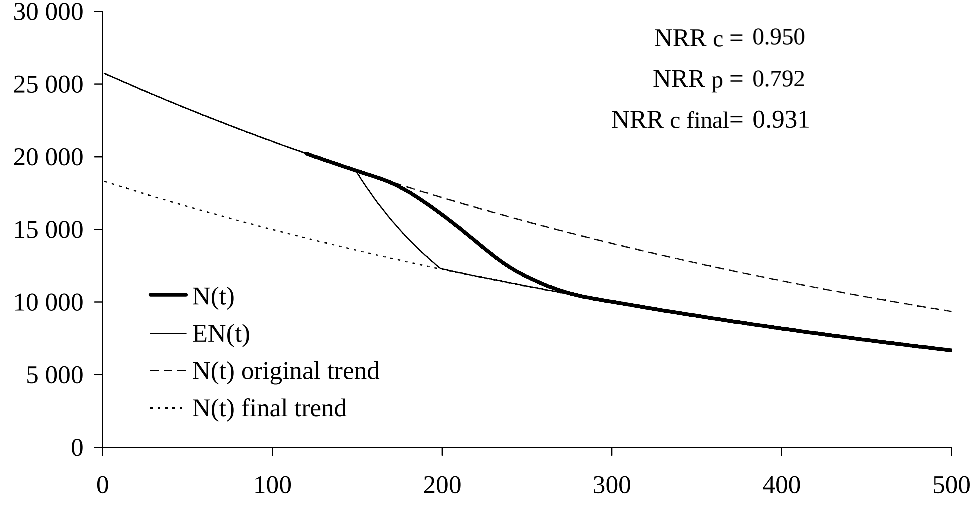
Simulation Results -3
(childbearing postponement at different speeds)

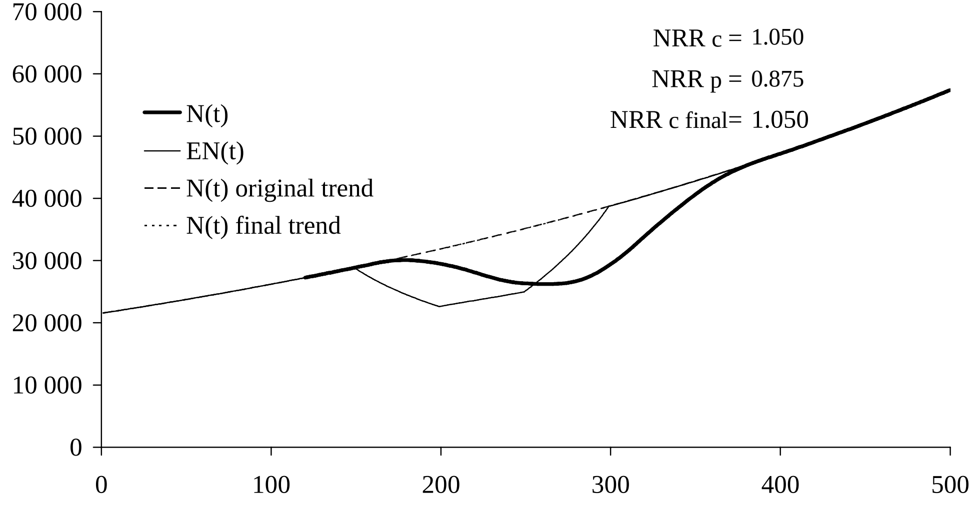


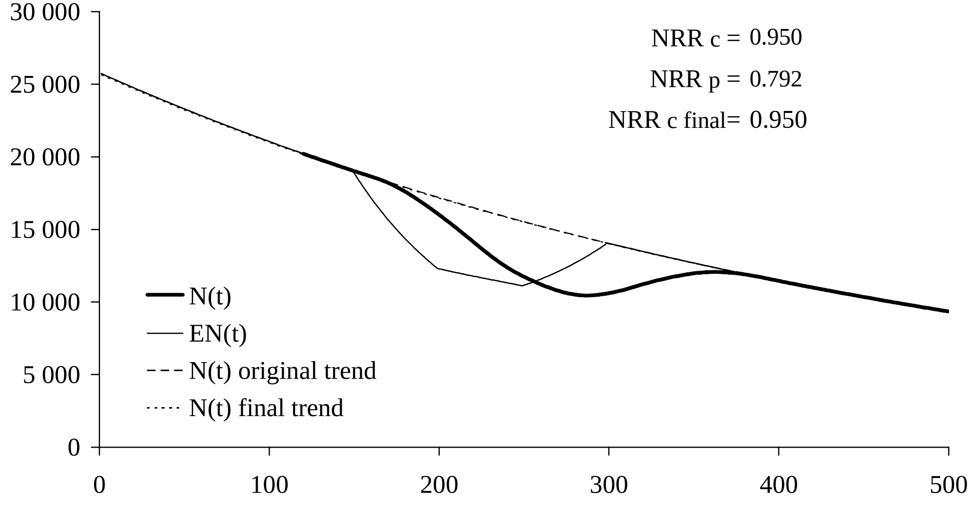
Simulation Results -4

(childbearing postponement with constant cohort Lotka's *r*)

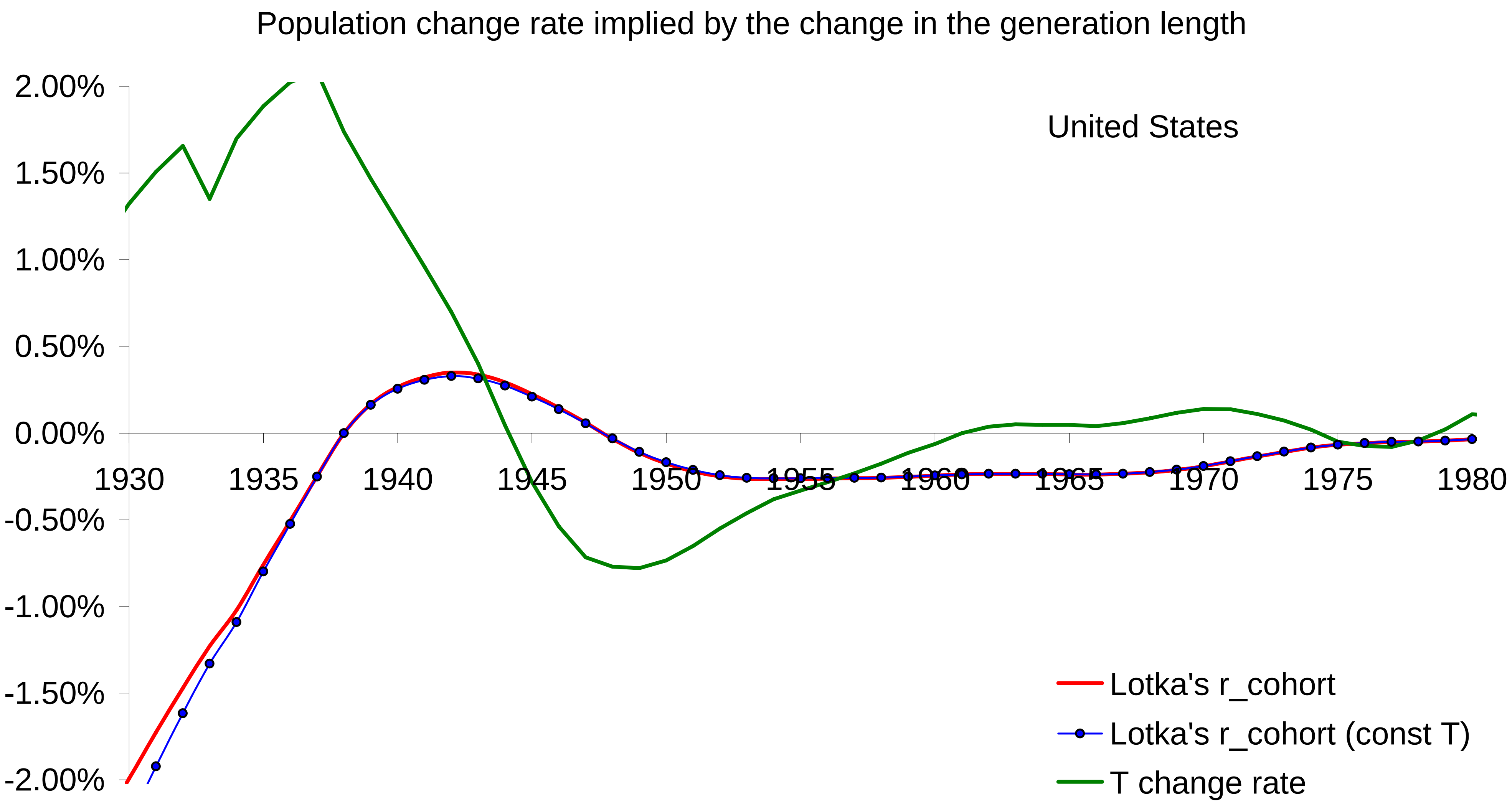




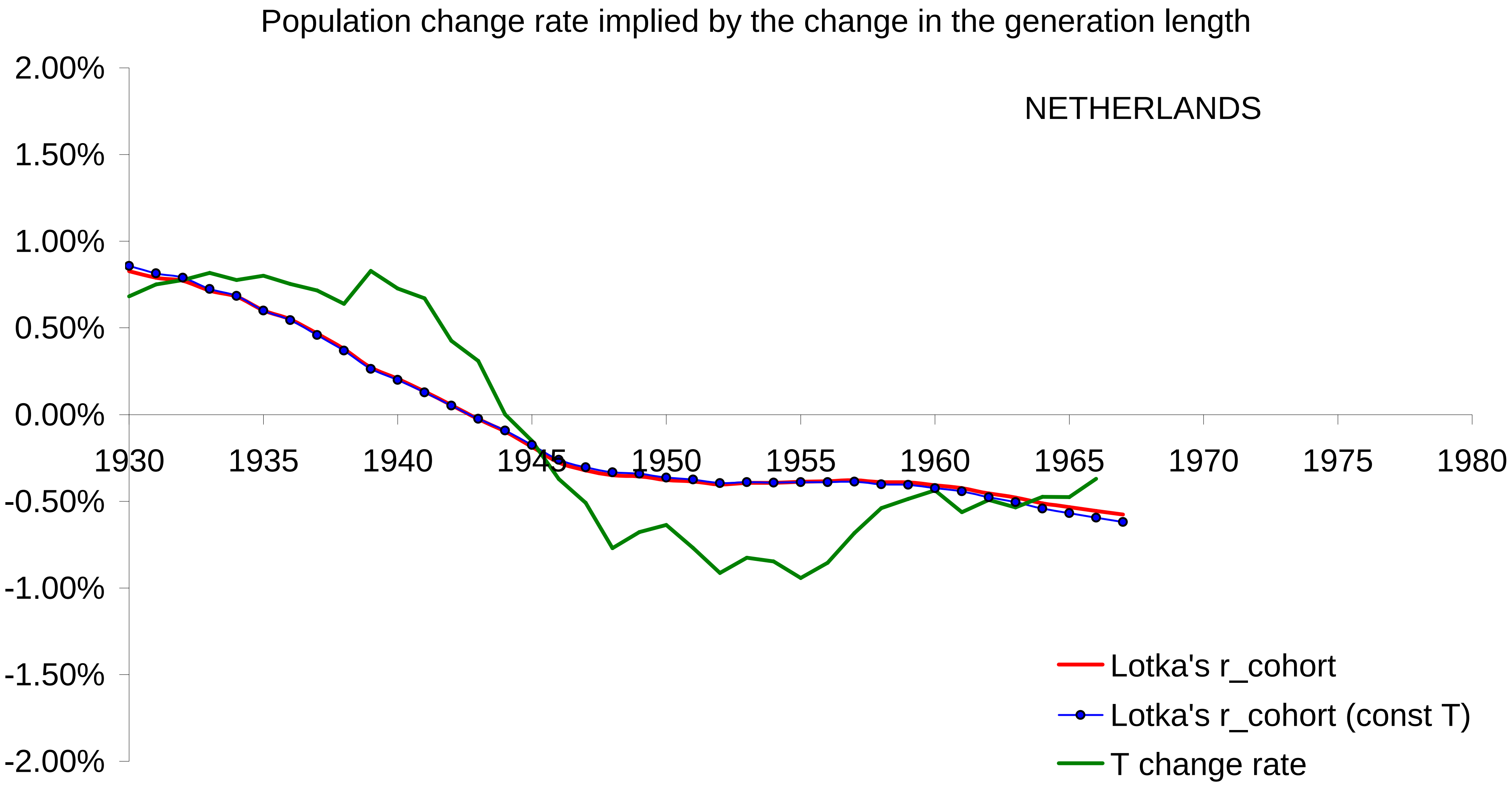




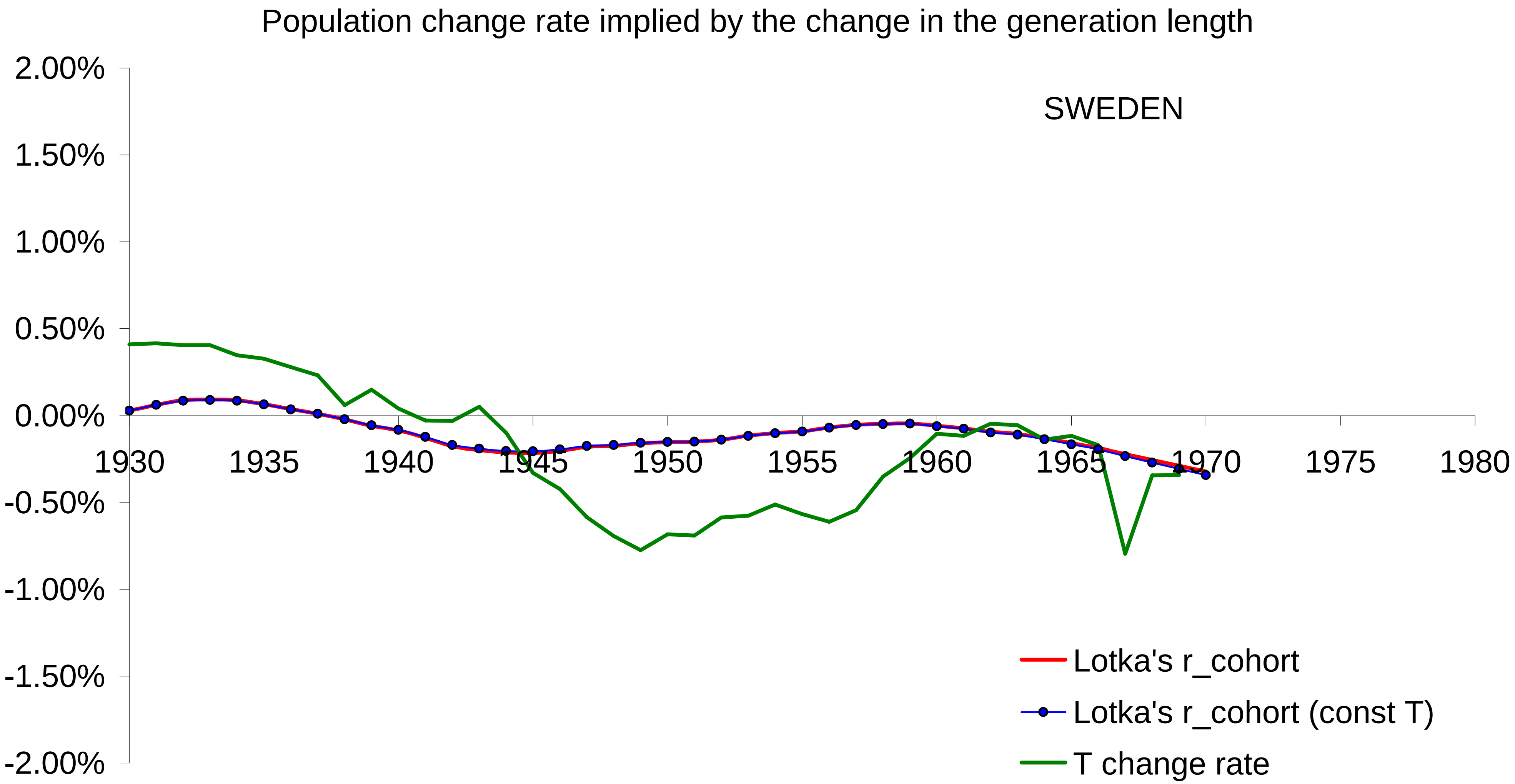
Impact of the generation length changes on population size compared to that of Lotka's *r*
(United States)



Impact of the generation length changes on population size compared to that of Lotka's *r* **(Netherlands)**



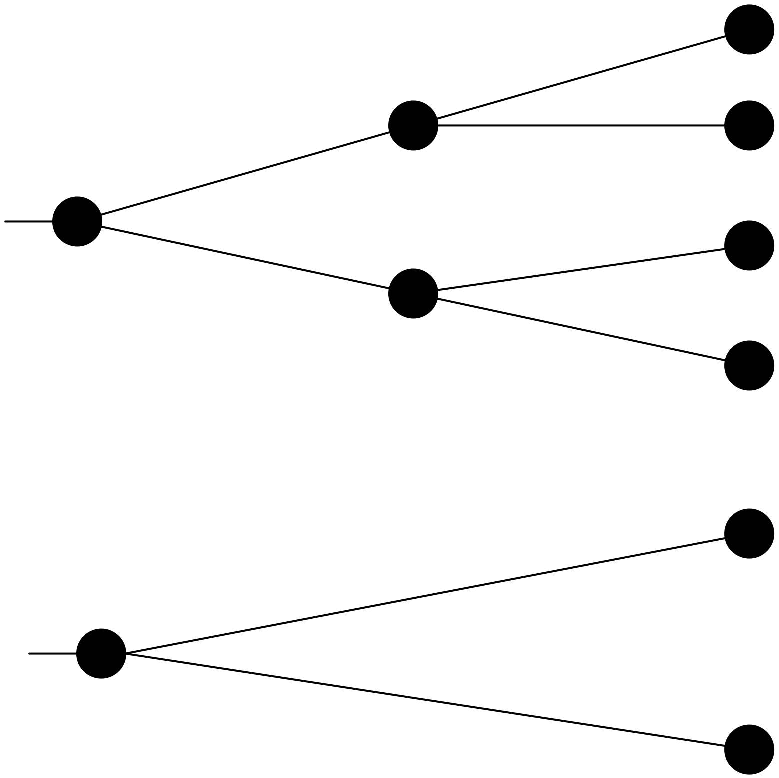
Impact of the generation length changes on population size compared to that of Lotka's *r* (Sweden)



Why G(t) changes at rate equal to the cohorts Lotka's *r*?

T increases, NRR is constant

(Lotka's ***r*** decreases, and so does the G(T))



T increases, Lotka's *r* is constant

(NRR increases, but G(T) is constant as well as the Lotka's ***r***)