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How does education change the relationship between fertility and age-dependency under environmental

constraints? A long-term simulation exercise

By [Erich Striessnig](#), [Wolfgang Lutz](#)

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Abstract

Background: When asked what a desirable fertility level for populations might be, most politicians, journalists, and even social scientists would say it is around two children per woman, a level that has been labelled by demographers "replacement-level fertility." The reasons given for considering this level of fertility as something to aim at usually include maintaining the size of the labour force and stabilizing the old-age-dependency ratio.

Objective: In this paper, we scrutinize this wide-spread view by introducing education in addition to age and sex as a further relevant source of observable population heterogeneity. We consider several criteria for assessing the long-term implications of alternative fertility levels and present numerical simulations with a view on minimizing the education-weighted total dependency ratio and complement this with the goal of reducing the amount of greenhouse gas emission in the context of climate change.

Methods: We perform thousands of alternative simulations for different fertility levels (assumed to be constant over time) starting from empirically given population structures and derive the rate of fertility which yields the lowest level of our education-weighted dependency ratio. We study the sensitivity of our results to different parameter values and choose to focus on the actual populations of Europe and China over the course of the 21st century.

Results: The results show that when education is assumed to present a cost at young age and results in higher productivity during adult age, then the fertility rate that on the long run keeps dependency at a minimum turns out to lie well below replacement fertility both in Europe and in China under a set of plausible assumptions. The optimal fertility level falls even lower when climate change is factored in as well.

Conclusions: We conclude that there is nothing magical or particularly desirable about replacement level fertility.

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