Optimal Education in Times of Ageing: The Dependency Ratio in the Uzawa-Lucas growth model

Anne Edle von Gaessler[a]

Thomas Ziesemer[b]

Abstract

The economic difficulties caused by the demographic change towards an ageing society have been discussed throughout the literature. Yet, the question remains of how these problems can be treated. With low birth rates and high life expectancy the population will grow older and the ratio between working and non-working citizens is likely to tilt towards the retired. The increasing share of retirees puts pressure on the shrinking working generation which will need to produce more output per worker to ensure a constant living standard. We investigate the influence a changing dependency ratio has on the time individuals spend in education and production. A higher education will increase productivity in the future, but will lower production in the short run, whereas an increase in labor input at the cost of education will provide us with more production immediately. We introduce an age-independent dependency ratio into a discrete-time Uzawa-Lucas model with capital movements, human capital externalities and decreasing returns to labor in education. The dependency ratio is defined as the fraction between inactive and active individuals in regard to work or education. By calibration of the model, we find multiple steady states indicated by a u-shaped relation between education time shares and the growth rate of the dependency ratio. The optimal response to higher growth of the dependency ratio turns out to be more education to enhance productivity.

Because of the importance of the empirical details for policy under multiple steady states we provide some empirical insights into the relationship between the growth rate of the dependency ratio and the time spent in education as defined in the model. The analysis is done for 16 OECD countries from 1985 to 2010. Because of its dynamic structure, we use the orthogonal deviations version of system GMM. We find evidence for the u-shaped relation between education and the growth rate of the dependency ratio as indicated in the theoretical model.

As we develop an open economy model, debt dynamics are analyzed separately. We extend the model to one with an interest rate increasing in debt to ensure stability in the debt market. The creditor may choose the lending rate to maximize profits based on the payment probability.

Key Words: Demographic Change, Education, Endogenous Growth, Human Capital Development

JEL codes: O15, J11

[a] Department of Economics, Maastricht University, P.O. Box 616, NL 6200 MD Maastricht
Email: A.Edlevongaessler@maastrichtuniversity.nl

[b] Maastricht University, Department of Economics, and UNU-MERIT P.O. Box 616, NL 6200 MD Maastricht
Email: T.Ziesemer@maastrichtuniversity.nl