Education in times of population ageing

Valorization Addendum

This valorization addendum discusses knowledge valorization in the context of the current dissertation and reflects the author's opinions regarding the topic "Education in Times of Population Ageing".

The main question to be asked when trying to valorize a research topic is under which circumstances academic work can be considered to be value adding. Alexander von Humboldt (1769-1859), who is considered to be one of the pioneers of academic work as we know it today, once said that all findings are just one step towards something higher (von Humboldt, 1869). In this sense, all knowledge, may it be obtained through academic research or discovered by chance, leads to a more complete picture. Drawing an ever better and a more precise picture of the world as we know it should be the highest objective for any researcher. The true value of any knowledge may not be immediately apparent, as this can only be evaluated by the way this knowledge is used to benefit, or harm society. It is not in the hands of a researcher to control, or influence how the knowledge provided by his or her research is put into practice, but he or she can give indications on how the research was intended. This is what this valorization addendum will try to achieve.

Research in the field of economics and business can be considered to be value adding, if it is of social and/or economic relevance. This dissertation aims at contributing to the question of how society can keep its consumption standards while facing a shift in population structure. The relevance of this topic has been analyzed in Chapter 1. Within the last decades the structure of the population has shifted from a pyramid form, in which there are more children and young adults than working age people and retirees, to a tree shaped figure, in which the share of children is relatively small compared to that of adults and retirees. Logically, such a shift in population structure must be followed by serious challenges when trying to support the entire economy. Fewer children lead to fewer adults who will be able to support the elderly. Adding to this effect is the growing group of retirees who no longer contribute to economic output, but rely on

the economy's support. Hence, there is a need for economic research to find proper policies to counteract this vicious circle. One possible answer is given in this dissertation. In order to discuss the added value of this dissertation, its opportunities and shortcomings must be identified.

Chapter 2 sets up a model that aims at explaining the dynamics behind the interaction between population development and time spent in education. The purpose of this chapter is to introduce the base model which, to my knowledge, has not yet been presented in this way. For this model, as for most models it holds that:

> "All the theory depends on assumptions which are not quite true. That is what makes it theory. The art of successful theorizing is to make the inevitable simplifying assumptions in such a way that the final results are not very sensitive" – Solow (1956), p. 65

Consequently, several simplifying assumptions have been made, one of which lies in the nature of the Uzawa-Lucas model. The population is deliberately not divided into several generations to show the effect of changing generation sizes. This would complicate the analysis and would not proportionally add to the significance of the results.

This dissertation addresses the question of how modern societies are able to deal with the challenges that arise with an ageing population. Given the latest developments in most OECD countries that show the continuing trend towards a strongly ageing population, it is of crucial importance to understand population dynamics on the one hand and to find ways to deal with them on the other. Whereas the answer to this question is by definition multi-dimensional, the focus of this dissertation lies on the balance between education and production. To be able to support an ageing population, the active population needs to produce more than they used to. This can be achieved in two ways, either the time spent in production is longer, which results in either longer working hours or a later retirement age, or the workers need to be more productive. It can be accomplished through a higher educated population with more individual human capital, which comes at the cost of having to spend time in education. The individuals in the economy then choose the allocation of their active time in education

and production. Naturally, neither extreme is optimal. No time in education leads to a society with only low skilled workers that are even unable to read, whereas the other extreme of 100% of the time spent in education leaves no time for production. If the possibility of an entirely debt financed economy is ruled out, this leads to no consumption. Hence, there must be an intermediate optimal time allocation. It is important to note that the time spent in education is not the equivalent of the average degree. Time spent in education is a much broader concept that also includes continuous vocational training and on-the-job training. This dissertation analyzes the changes in this allocation if an economy is faced with the recent demographic developments.

To be able to model demographic developments, the age independent dependency ratio that measures the proportion of people actively involved in education or production relative to the whole population is introduced into an Uzawa-Lucas growth model with international capital movements, human capital externalities and decreasing returns to schooling time in human capital formation in Chapter 2. By calibration two steady states were found of which the one with higher education is stable. This leads to the conclusion that the optimal reaction to an exogenous increase of the growth rate of the dependency ratio is an increase in the time spent in education. It follows a stepwise endogenization of the dependency ratio, by first endogenizing the choice of participation in the active population (Chapter 6) and then endogenizing the development of the total population based on empirical grounds (Chapter 8). The endogenization of the choice of participation in the active population, as done in Chapter 6, leads to a higher share of time spent in education for the same growth rate of the population and a fixed interest rate. The growth rate of the active population decreases compared to the model with an exogenous development of the dependency ratio. This leads to less time in production and more time in education, but also a higher dependency ratio. If the interest rate is endogenized and debt-dependent a similar effect can be obtained by reducing the debt to GDP ratio. This allows for a lower interest rate and reduces the optimal time spent in education to its original value. The growth rate of the active population decreases even further. In Chapter 8, the growth rate of the population is endogenized by making it dependent on the

time spent in education. This relation is hump-shaped, indicating that up until a certain point an increase in the time spent in education will increase the population growth rate, whereas it will be decreased by any further increase in the time spent in education. The analyzed countries are in the latter part. The steady state analysis shows that with a flexible interest rate the time spent in education increases slightly as compared to the previous two models. If the growth rate of the population is allowed to alter endogenously, its steady state is slightly above the previously set value, whereas the growth rate of the active population increases as well. This way, the growth rate of the dependency ratio is unchanged as compared to the model with exogenous population growth and endogenous labor force growth.

Along the way several important relations are estimated empirically. The relation between the growth rate of the dependency ratio and the time spent in education is estimated in Chapter 3 to validate the parameter choices of Chapter 2. For this analysis two new variables are constructed to fit the framework of the estimated model better. The time spent in education is constructed as a share of people in the active population that is currently engaged in education. This also includes on the job training. The second newly constructed variable is the growth rate of the dependency ratio, which is empirically constructed with the growth rate of the entire population and the growth rate of the active population as defined by the model. The analysis shows that the 16 chosen OECD countries follow a pattern similar to that of the model analyzed in Chapter 2. Additionally, to account for the fact that the analyzed countries are not in line with the originally assumed small price-taking countries, the assumption of a fixed and given interest rate is relaxed in favor of a debt-dependent interest rate. A country with higher debt has a higher risk of default and hence would be asked a higher interest rate by the creditor. The debt dependent interest rate, to later be used in the Uzawa-Lucas growth model is estimated in Chapter 4. It shows an increasing interest rate for an increasing debt to GDP ratio with diminishing returns. Chapter 7 takes an empirical glance at population development in which it compares two approaches. One takes many explanatory variables into account and the other is rather limited by only incorporating education and output, which makes it attractive for modeling

purposes such as an inclusion into the Uzawa-Lucas model. Both approaches show a similar fit to the data.

Overall, the models of this dissertation have shown that when analyzing the relationship between production and education in the context of ageing the best response to the ongoing demographic changes is to increase individual human capital. This is done by a high share of the population in education. This is not meant to say that there are no other measures beyond the ones dealt with in this dissertation to reduce ageing or deal with it.

References

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