Demographic Changes and Economic Consequences: Demo-Economic Multiplier for Austria

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Summary: The demo-economic multiplier which we used in our computations, is a measure for the influence of the demographic pattern on the economy. In the first part of our paper the demo-economic multiplier is derived, which indicates the total (direct and indirect) deliveries of the sectors of the economy for the different types of households.

The following section is devoted to an evaluation of the impact of the population size and structure on the economy. To achieve this, we use a rate of sensitivity which is defined on a special matrix norm.

The derived demo-economic multiplier is added to a multisectoral model of the Austrian economy MUSEM A78. The main conclusion of our computation is the fact that a change in the demographic pattern shows only little effect on the overall economic development. The structural effect, however, is significant and would certainly be more interesting, if more disaggregated data could be used.

I. Introduction

Demographic variables play a dual role in the economic development of a country. Firstly, in man-power analysis the labour force, its age- and sex structure, its level of education and skills are the important factors in this respect. Secondly, through its effect on the level and structure of household demand for consumption goods, the demographic pattern exerts an influence on the overall and sectoral economic development. Thus, the knowledge of these effects is important for various aspects associated with economic policy decisions.

The choice of the term "demo-economic" in the title of this paper shows our intention to underscore the relationship between the demographic and economic systems. The aim of our paper is the development of the demo-economic accounting linkage (demo-economic multiplier) between population development and the production of goods and services in the context of a comparative static analysis. To be more specific, we analyze the economic consequences of a change in the exogeneously given

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4) For a survey see Luptáčik [1977].
demographic variables. The influence of economic variables on the demographic pattern ("economics of the family" see Coad [1976] and Schultz [1974]), however, is not a subject of our analysis.

Based on the theory of "ill-conditioned" linear equation systems [see e.g. Forsythe/Meier or Björck/Dahlquist] we derive the "global" sensitivity of our model to (i) "small" changes in the population and (ii) "small" changes in the demo-economic multiplier due to changes in technology coefficients and/or changes in the consumption and/or demographic pattern.

The rate of sensitivity as defined for our analysis is such that it expresses the impact of demographic changes on the economy.

2. Demo-Economic Multiplier Analysis

We consider the open Leontief input-output system

\[ A x + y = x + m \]

or

\[ x = (I - A)^{-1} (y - m) \]  

where \( A = (a_{ij}) \) is an \( n \times n \) matrix of technological coefficients, \( x \) is an \( n \)-dimensional gross production vector, \( y \) and \( n \)-dimensional final demand vector and \( m \) an \( n \)-dimensional import vector. For the purpose of our analysis, the final demand vector \( y \) is decomposed into three distinctive components:

\[ y = c + y^D + y^{ND} \]  

where \( c \) is the final demand generated by households (i.e. private consumption), \( y^D \) is that part of public consumption which depends on size and structure of the population (schools, hospitals, etc.) and \( y^{ND} \) that fraction of final demand which is not directly affected by the demographic structure (investment, part of public consumption and exports) and which is classified as exogeneous variable for the model to be discussed.

Let us start with private consumption \( c \). The individual consumers live in different types of households. These households can be classified according to the different number of adults, children, and income receivers. The number of the households of type \( k \) (\( k = 1, 2, \ldots, h \)) is described by a vector \( d = (d_1, d_2, \ldots, d_h) \), which is determined by the exogeneously given demographic pattern.

The structure of consumption expenditures in the different households is described by the matrix \( C^H \). The coefficients of this matrix \( c_{rk} \) indicate the proportion of consumption of commodity group \( r \) (\( r = 1, 2, \ldots, m \)) to the total consumption of the household types \( k \). The total expenditures per household depend on the disposable income of households. For reasons of simplicity and availability of data we restrict our analysis to wages as income source of the households.

\[ \text{The development of eco-demographic multiplier see Schinnar [1976, 1977].} \]