The impact of demographic change on human capital accumulation

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ABSTRACT

This paper investigates whether and to what extent demographic change has an impact on human capital accumulation. The effect of the relative cohort size on educational attainment of young adults in Germany is analyzed utilizing data from the German Socio-Economic Panel for West-German individuals of the birth cohorts 1966 to 1986. These are the cohorts which entered the labor market since the 1980s. Particular attention is paid to the effect of changes in labor market conditions, which constitute an important channel through which demographic change may affect human capital accumulation. Our findings suggest that the variables measuring demographic change exert a considerable though heterogeneous impact on the human capital accumulation of young Germans. Changing labor market conditions during the 1980s and 1990s exhibit a sizeable impact on both the highest schooling and the highest professional degree obtained by younger cohorts.

1. Introduction

During the last fifty years all European societies have transformed their demographic composition to a considerable extent. European economic and political integration together with an intense immigration experience have been additional relevant factors in this development. The most remarkable influence on European demographics, however, has been exerted by post-war baby booms and baby busts. The demographic burden induced by population ageing constitutes long-term societal challenges for all European countries, though with some heterogeneity regarding the precise timing (see e.g. Fertig and Schmidt (2003) for a more detailed discussion). In this context, Germany provides an interesting case study. According to the Federal Statistical Office (2006), Germany will soon have one of the highest shares of older people in all industrialized countries. The proportion of elderly relative to the labor force is projected to rise from 34% in 2010 to 64% in 2050, due to a pronounced decline in fertility rates and a simultaneous rise in life expectancy. It is uncontroversial that this demographic change will have a direct impact on the pay-as-you-go pension system (Börsch-Supan, 1999). Furthermore, it seems safe to argue that social security systems on the whole, most notably

the public health care system will be affected directly by ageing societies as well.

However, the discussion on the consequences of demographic change often neglects other, similarly important potential consequences of population ageing. In general, an ageing society implies not only a reduction of overall labor supply and an increasing old-age dependency ratio, but also a decline in the *relative* labor supply of younger workers. Thus, population ageing might affect the level and composition of the labor force in a much more complex way than is often recognized. This relative shift in labor supply might impinge upon a variety of different aspects of individual and societal welfare, among which educational attainment is of special interest. Börsch-Supan (2002), for instance, argues that it is unlikely that the decline in the relative labor supply of the young will be offset by higher capital intensity so that labor productivity has to increase considerably to keep production on its current level. An increase in productivity, however, typically requires higher human capital accumulation. Thus, the educational attainment of young cohorts is of vital interest for any economy coping with demographic change.

This paper, therefore, investigates whether and to what extent demographic change has an impact on the human capital accumulation of younger cohorts. In this endeavor, we utilize data from the German Socio-Economic Panel (SOEP) for West-German individuals of the birth cohorts 1966 to 1986 who entered the labor market since the 1980s. In addition to the direct measure of demographic change (i.e. the relative cohort size of 18–21 year old individuals relative to

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the total population), we consider labor market variables which capture important indirect effects of demographic change on human capital accumulation. It will become transparent that the variables measuring demographic change have a substantial impact on the human capital accumulation of young Germans. However, there is also remarkable heterogeneity in these effects for different cohorts. Our findings further suggest that both the highest schooling and the highest professional degree obtained by younger cohorts were determined by changing labor market conditions during the 1980s and 1990s.

The remainder of this paper is organized as follows. Section 2 discusses the relationship between relative cohort size and educational attainment with a special focus on the German case. In Section 3 the empirical strategy and the utilized data are described in detail. Section 4 reports and discusses the empirical results and Section 5 offers some conclusions.

2. Demographic change and human capital accumulation

This section provides an overview on demographic and labor market developments in Germany since the 1970s and discusses their potential consequences for the human capital accumulation of younger cohorts. It is well documented that Germany experienced a remarkable decline in birth rates during the 1970s. The number of life births (per 1000 people) in (West) Germany declined from 13.4 in 1970 to 10.1 in 1980, 10.0 in 1990 and 9.4 in 2000 (see Fertig and Schmidt, 2003). The most pronounced drop in birth rates happened after 1972. Since 1973 death rates exceed birth rates in Germany. During this period, Germany also experienced a steady decline in child and old-age mortality rates and, correspondingly, an increase in life expectancy. Together, these developments resulted in a considerable shift in the population-age structure. Most notably, the population share of younger cohorts declined remarkably. Columns (1) and (2) of Table 1 depict the population and labor force share of 18–21 year olds between 1984 and 2007, which demonstrate the falling share of young individuals over time. This process results in a sharp increase in predicted old-age dependency ratios for Germany (as well as almost all other European countries, see e.g. World Bank (1999)).

In terms of its economic repercussions, population ageing is first and foremost equivalent to a decline of the labor supply of younger relative to that of older workers, and also to the number of retirees. It is rather uncontroversial that this relative shift in labor supply has a direct effect on the German social security systems, especially the pension systems but also the health and old-age care insurance (see e.g. Börsch-Supan (1999) for a more detailed discussion of this issue). This is the principal reason for the attention given both in the public discussion and the academic literature to the effects of demographic processes on old-age dependency ratios. Yet, ageing also affects the composition of the economically active population, and thus might exert important influences reaching far beyond increasing social security contribution rates.

After all, even if members of large birth cohorts exhibit the same life-cycle behavior concerning human capital acquisition and labor supply as members of small birth cohorts, their sheer prevalence might change their economic prospects (and perhaps also the aggregate outcome). However, it is very likely that demographic change will also display indirect effects via behavioral responses of individuals. The following labor market related outcomes might response to population ageing by changes in the behavior of agents: (i) the structure of wages, the income distribution and savings; (ii) the level and structure of employment and unemployment; (iii) the organization of work; (iv) the structure of product demand and (v) the human capital accumulation of smaller cohorts. These various direct and indirect effects are intimately related and might exert repercussions on demographic change itself, i.e. specifically on family formation and fertility, as well as on the (early) retirement decisions of older workers. The following

Table 1
Descriptive statistics: population and labor force share of 18–21 year olds, relative income of full-time working 18–21 year olds and unemployment rates, 1984–2007.

Year	Population share (1)	Labor force share (2)	Relative income (3)	Overall unempl. rate (4)	Youth unempl. rate (5)
1984	0.052	0.080	0.595	0.045	0.044
1985	0.051	0.078	0.475	0.046	0.044
1986	0.049	0.075	0.513	0.044	0.039
1987	0.047	0.072	0.550	0.044	0.036
1988	0.044	0.067	0.572	0.043	0.029
1989	0.042	0.063	0.580	0.039	0.022
1990	0.038	0.058	0.614	0.036	0.020
1991	0.035	0.054	0.612	0.049	0.034
1992	0.033	0.050	0.641	0.056	0.033
1993	0.031	0.048	0.635	0.064	0.035
1994	0.031	0.048	0.589	0.070	0.036
1995	0.031	0.048	0.548	0.068	0.037
1996	0.032	0.049	0.540	0.074	0.041
1997	0.032	0.050	0.578	0.082	0.043
1998	0.033	0.051	0.518	0.080	0.040
1999	0.034	0.053	0.525	0.077	0.036
2000	0.035	0.054	0.509	0.073	0.036
2001	0.034	0.054	0.534	0.073	0.035
2002	0.034	0.053	0.488	0.077	0.035
2003	0.034	0.053	0.459	0.083	0.030
2004	0.034	0.054	0.433	0.084	0.027
2005	0.035	0.055	0.468	0.093	0.043
2006	0.036	0.057	0.440	0.087	0.037
2007	0.036	0.057	0.520	0.073	0.028

Note. The descriptive statistics presented in columns (1), (2), (4) and (5) are derived from the Yearbook of the Federal Statistical Office. Column (3) reports labor income of 18–21 relative to 18–65 year old full-time employed individuals from SOEP data in % (based on real Euros of 2000). The overall unemployment rate reported in column (4) is defined as the number of unemployed persons relative to the population of 18–65 year olds. The youth unemployment rate reported in column (5) is defined as the number of unemployed persons below 20 years relative to the population of 18–21 year olds.

discussion concentrates on the last of these potential responses, i.e. on the human capital accumulation decision of the young.

More formally, it is instructive to view each birth cohort as a different production factor. The typical life-cycle of a specific cohort comprises human capital acquisition and labor market entry in younger years, household and labor market production in medium age, and at some point exit of the labor market. In this process, large birth cohorts experience generational crowding throughout their complete lives, unless large-scale immigration of a subsequent birth cohort counteracts this pattern. However, given the current immigration policy in Germany, it seems to be very unlikely that this will happen.

Thus, for the purposes of our analysis, we model demographic change by variations in the population-age structure reflected in the relative cohort size of individuals who are in the prime age of entering the labor market or pursuing post-secondary education, i.e. 18–21 year old individuals. In this context, workers of different age are assumed to be different factors of production which are imperfect substitutes. Thus, changes in relative cohort size of this specific age group directly translate in shifts of relative labor supply (see e.g. Welch, 1979).

In a completely competitive setting in which all factors are fully employed, more abundant factors exhibit a relatively low marginal productivity. Hence, the relative shift in labor supply induced by an ageing population might have an effect on the relative wages of younger and older workers and, therefore, on the income distribution of a society. All other things equal, population ageing implies that young workers become scarcer which might result in a rise of their relative wage. The precise extent to which wages of the young increase decisively relies upon the degree of substitutability between different age groups in the production process and the institutional framework of the labor market. More precisely, in a system of unionized wage bargaining, like for instance in Germany, it is easily