The Role of Education in Projecting Employment in Europe

Extended abstract for EPC 2010

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1. Motivation

A lot of research has been done on the potential economic consequences of population aging. One topic that has gotten a lot of attention is the expected shrinkage (in absolute and relative terms) of the working-age population (i.e. the population between 15 and 65 years). At the same time, the share of people above the age of 65 is going to increase significantly in all European countries (UN 2007). If employment patterns stay at current levels, a decreasing number of workers will have to produce a sufficient amount of output to support themselves and an increasing number of non-workers.[1] Or put differently: the ratio of the number of people who are not economically active to the number of people that are is going to increase.

Three of the often discussed options to cope with the expected financial strains due to an increasing share of economically inactive people are to increase the number of older workers (i.e. to increase the effective retirement age), to increase the labor force participation of women, or to increase immigration of people of working-age. Thus, projections of the future number of workers are usually based on assumptions about the development of these three parameters. Carone (2005) performs projections of labor force participation in the EU 25 countries until 2050. Burniaux, Duval and Jaumotte (2004) look at the same time horizon for all OECD countries. Besides these projections for a whole range of countries, institutions in many developed countries produce detailed labor force projections for their own country, e.g. Toossi (2007) for the US and the Australian Bureau of Statistics (1999) for Australia. Fuchs and Doerfler (2005) and Boersch-Supan and Wilke (2009) both project labor force participation for Germany until 2050.

What the just listed publications all have in common is that they disaggregate the population by age and sex and do not consider any further characteristics of the population.[2] The project at hand builds up on these previous studies, adding educational attainment as a further disaggregation variable besides age and sex. The reason for this approach is twofold. First, human capital is one factor that – through multi-factor-productivity – influences labor productivity and GDP. The level of educational attainment of a population is a proxy for human capital within a country. Second, employment varies significantly by educational attainment: It has been shown that people with higher education have higher employment

[1] The words "employee" and "worker" are used interchangeably throughout this text.
[2] Only Toossi (2007) includes race as a further break-down variable.

rates than people with less education (e.g. OECD 2009, p. 29). As the analysis will demonstrate, the educational attainment of a population, combined with education-specific employment rates, has an aggregate effect on the quantity of future workers and the quality of their labor.

Of course, there are many other factors that have an effect on labor productivity besides the quality of labor (namely the quality of capital, pure technical progress and capital deepening). However, since this is an analysis of the production factor *labor*, these other factors that relate to *capital* are not part of it.

2. Data and methods

The data source I use to obtain age-, sex- and education specific employment rates is the European Labor Force Survey (EU LFS). These data are suited well for comparisons across time and countries, because the data set's internationally harmonized terminology and design allows explicitly for comparative analysis (Eurostat 2005).

Population by age, sex, and educational attainment is obtained from a unique dataset: Researchers at IIASA and VID constructed projections of educational attainment from 2005 to 2050 for 120 countries (IIASA 2009).

Age-range

The ages I consider range from 15 to 69 years, arranged by 5-year age-groups. Existing projections of labor force participation end at the age of 64. Considering that many countries have already legislated a gradual increase of the normal retirement age to ages above 65, I find it crucial to include 65- to 69-year-olds in my project as well.

Educational attainment

The educational attainment categories I define are in line with the categorization K.C. et al. (2008) use for their population projections (see table 1).

Category	Definition
No education	No formal education or less than one year primary
Primary	Uncompleted primary, completed primary (ISCED 1), and uncompleted lower secondary
Secondary	Completed lower secondary (ISCED 2), uncompleted and completed higher secondary (ISCED 3/4), and uncompleted tertiary education
Tertiary	Completed tertiary education (ISCED 5/6)

Table 1: Categories of educational attainment (K.C. et al. 2008, p. 4).

Employment

The definition of employment is in accordance with the employment definition of the ILO and comprises everyone who is working for at least one hour per week for pay, profit or family gain or has a job where he/she is temporarily absent from, e.g. due to sickness or maternity leave, or because they are on vacation.

3. Projections of future employment – FROM HERE ON, EMPLOYMENT SCENARIOS AND RESULTS ARE ONLY PRESENTED FOR GERMANY. OTHER COUNTRIES WILL BE ADDED SHORTLY.

The employment rates in 2005 are the basis for future employment scenarios in 2050. Based on the literature, benchmarks and my best guess, I design four scenarios of future employment which will be presented in the next section.

Scenario 1: Constant rates from 2005 through 2050 (*status quo*)

In this scenario, constant rates throughout the whole projection period are assumed. It is highly unlikely that this is actually going to happen. This scenario is meant to represent a "worst case scenario".

This approach allows to demonstrate the "mechanical effect" (often also referred to as accounting effect) of population aging on total employment, since only the composition of the population varies over time and causes changes in aggregate employment.

Scenario 2: Increased employment rates for persons aged 45 and above (*45+*)

In 2005, employment rates started to decline for 50- to 54-year-old persons. Scenario 2 is based on the assumption that this decline will happen on average five years later in 2050. This is being simulated by applying the observed rates for 45- to 49-year-olds in 2005 to the 50- to 54-year-olds in 2050. Each subsequent age-group also receives the rates in 2050 that had been observed in 2005 for the next youngest age-group.

Scenario 3: Employment rates of Sweden in 2007 will be reached in 2050 (*Sweden 2007*)

The Scandinavian countries have long been praised for their higher employment rates of women and older people compared to other European countries. Scenario 3 applies the rates that have been observed in Sweden in 2007 to the German population in 2050. Differences between men and women are smaller in Sweden than in Germany and employment starts to decline only at age 55 to 59. And even for age-groups 60 to 69, employment rates stay at a higher level than in Germany.

Scenario 4: Employment rates of Sweden in 2007 will be reached already in 2025 (*fast Sweden 2007*)

In this scenario, I apply the same employment rates as in scenario 3. The difference, however, is that the Swedish level of employment is assumed to be reached already in 2025 and not in 2050. Between 2025 and 2050, rates remain constant.

4. Results

In the next step, the age-, sex- and education-specific projections of the population between 15 and 69 that were introduced in 2.2 are multiplied with the respective figures from the employment scenarios. Outcomes are compared by looking at the total and relative number of employees and their educational attainment. Some selected results:

- Total employment decreases until 2050 in every scenario. The assumptions in the scenarios *45 +*, *Sweden 2007* and *fast Sweden 2007* all lead to 30,3 millions of workers in 2050, compared to 37 millions in 2005. The scenario *status quo* leads to a decline to 27.3 millions of workers, which means an almost 50 % larger decrease then in the other two scenarios. Scenario *fast Sweden 2007* implies an increase in employment until 2025 before the decrease sets in. Scenarios *45 +* and *Sweden 2007* imply an almost immediate decrease, the decrease for the *status quo* scenario sets in right after 2005.
- Economic dependency (here defined as the ratio of the number of persons that are not employed to the number of persons that are employed) increases most in the *status quo* scenario (from 1.23 to 1.61) and equally much in the other three scenarios (from 1.23 to 1.36). Again, *fast Sweden 2007* has the most favorable trajectory, since economic dependency even declines until 2025 and though it increases afterwards, it stays below the level of the other scenarios until 2050. In the scenarios *45 +* and *Sweden 2007*, dependency reaches its peak in 2035 and declines afterwards. This means that even though the number of employed persons is projected to decline during the whole observation period in those two scenarios, economic decency ratios are not continuously getting higher since the number of people that are not employed decreases at well.
- Comparing the educational composition of present with future employees reveals that in 2050, workers will on average possess a significantly higher education than in 2005 (see figure 1): the share of male workers with tertiary education was 29 % in 2005; until 2050, it is projected to increase to roughly 40 %, irrespective of the scenario. For females, the increase is even more drastic: the respective numbers are 22 and 44 %, which equals a 100 % increase of female workers who possess tertiary education.

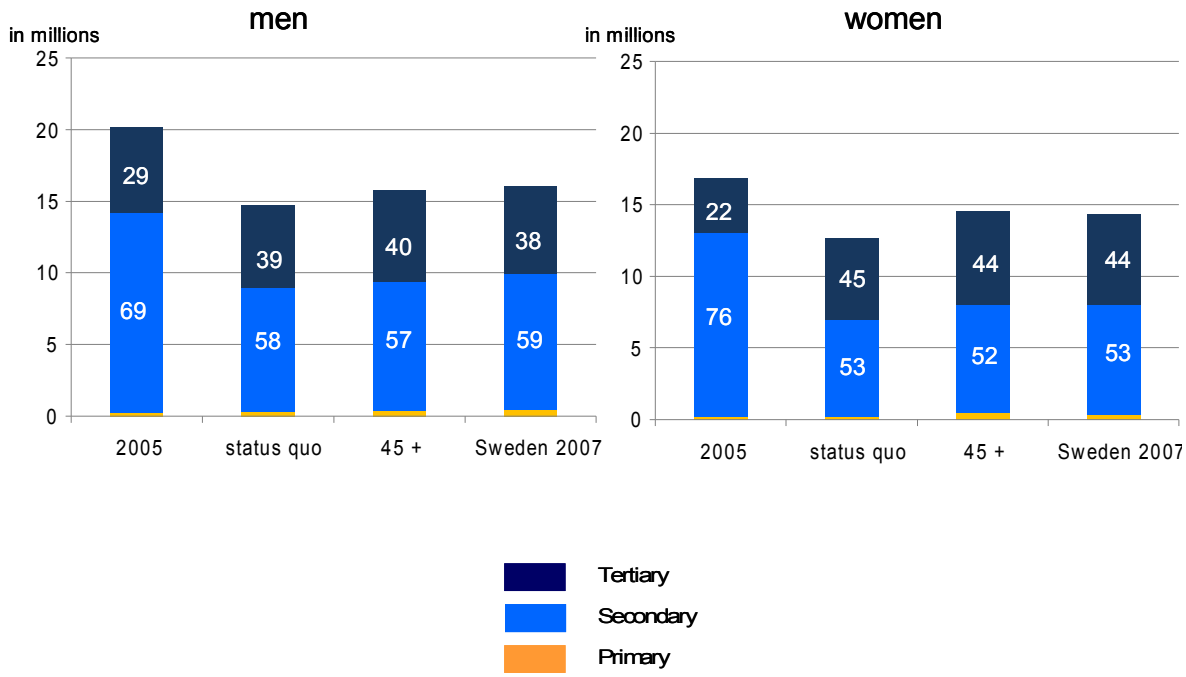

Figure 1: top: Employed population by educational attainment, 2005 vs. 2050.

5. Conclusion

The results are not meant to be interpreted as forecasts of future employment. They are projections of aggregate employment with the aim to demonstrate the effect of adding educational attainment as a further parameter, besides age and sex.

Previous studies have concentrated on the quantity of labour supply in European countries, showing that the number of workers will decline during the next decades. As this analysis demonstrates, there will not only be less workers in the future but they will also be different with respect to their educational attainment. This change in the quality of labour will have an effect on overall labour productivity. The crucial question is whether the increase in educational attainment can increase productivity to such a degree that GDP per capita will be growing in spite an increase in the economic dependency ratio and an aging labour force. A logical further expansion of the project is to quantify these effects, using an adequate model of economic growth that disaggregates labor productivity by educational attainment.

Only results for Germany were presented in this abstract. Comparable analyses will be performed for other European countries in order to explore differences and similarities. Presumably, a better education workforce will be able to alleviate some of the predicted negative economic consequences of population aging. This effect will potentially be greater in those countries where the share of people with tertiary education is still comparatively low (e.g. Spain, Hungary and Slovakia).

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