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Generational Accounting in European Health Care Systems*

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Abstract

Growing shares of health care sectors in national income in the OECD countries have been observed for decades. Rising demand for health care coupled with medical advances may generate a significant burden on public finance in the ageing Europe in the coming years. We explore European public health care systems from the perspective of intergenerational solidarity using the generational accounting method. The following countries have been selected as representatives of the European health care systems: the Czech Republic, Denmark, Estonia, France, Italy, the Netherlands, and the United Kingdom. We conclude that if the growth of demand for health care is to be satisfied and the ratio of taxation remains constant, significant debts in health care will be generated by the current generation. A worse situation was found in systems financed mainly through health insurance or income taxes and in countries with high current expenditure on health.

1. Introduction

Public expenditure on health reached 6.4% of GDP, or approximately 72% of overall expenditure on health, on average in the OECD countries in 2007 (OECD, 2009b). This is 1.4 percentage points higher than in 1990 and comprises more than 15% of total public sector expenditure. Medical advances enabled by technological progress coupled with growing expectations of individuals concerning health care are important drivers of the growth of health expenditure. Additionally, ageing of the European population, characterized by falling fertility rates and increasing life expectancy, may contribute to the process in the future, as numerous long-term projections of health expenditure suggest (European Commission, 2009a; OECD, 2006).

As Ginsburg (2008) summarizes, the growth of the share of health care sectors in GDP observed in the past may result from several factors. In particular, technological progress – bringing either better but more costly methods, or even cheaper methods but enabling larger use of health care – seems to have been the major driver of health expenditure growth in the past.[1] The impact of ageing on health expenditure has been minor so far, but it may foster growth of demand for health care in the future, as demographic change seems to be inevitable in developed countries. The other drivers of health expenditure worth mentioning include the income elasticity of health

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[1] For more discussion see Dormont, Grignon, and Huber (2006), Cutler (1995), and Newhouse (1992).

care and the Baumol effect, which results from different labor productivity growth across sectors amid almost identical wage growth (see Pomp and Vujic, 2008).

The current health care financing systems in Europe, which draw most resources from the working population, generate unequal distribution of taxes paid to finance health care and care received over an individual's lifespan, as health care needs are concentrated in old age. Such a lifetime distribution of taxes and benefits is in accordance with the life cycle hypothesis. However, in the context of population ageing combined with the kind of pay-as-you-go schemes used to finance health care, intergenerational solidarity is likely to be harmed. Given the ever-increasing health expenditure, the question of intergenerational equity is becoming a major topic of the day.

The main task of this article is to show the growing burden of selected European health care systems on public finance as well as to demonstrate the lifetime distribution of payments between government and individuals. We use the generational accounting method, which allows us to quantify the size of the notional burden generated by each individual in health care during his life. The Czech Republic, Denmark, Estonia, France, Italy, the Netherlands, and the United Kingdom were selected as being representative of different cultural and institutional settings of the European health care systems.

The article is structured as follows. First, we introduce the method of generational accounting, including some of its limitations. We then give a detailed description of the long-term projection technique, together with descriptive statistics of the main variables. This part is divided into sections according to macroeconomic fields. The third section then summarizes the results, and the conclusion discusses the implications for policy-makers.

2. Methodology

The model we use to assess public health care sector sustainability is based on generational accounting. First of all we would like to point out that all calculations in the model are based on demographic and macroeconomic projections, which more or less might predetermine the results. Estimates of the future path of variables, such as participation and unemployment rates, labor productivity growth, life expectancy, and mortality and total fertility rates, play an important role in the correctly calibrated model and its output. One should bear in mind that studies of this kind do not produce an accurate forecast of the future. Rather, they present the possible path stemming from the trend evolution of the projected variables and their mutual relationships. In addition, they are based on a "no-policy-change scenario", which means that no future corrections and changes, for example, to tax bases, tax rates, and transfer policies, or any other policy measures, are taken into account, i.e., they are based on the status quo.

2.1 Generational Accounting

The generational accounting method, originally developed by Auerbach et al. (1991), was designed to evaluate and compare the burdens of current and future generations stemming from recent government policy and provides a useful tool for public finance sustainability assessment. The main idea behind the concept is the fact that every individual is both a taxpayer and, on the other hand, a transfer beneficiary during his life. In the life cycle hypothesis, the various burdens and transfers arising out of the government sector are age and gender specific. For example, personal income taxes are, in a simplified way, paid only when an individual is working. Moreover, the amount of tax collected differs according to the amount of the wage. Young and elderly people are assumed not to pay these taxes. Alternatively, the higher life expectancy of women implies that old-age pensions will be paid to women for a longer time than to men. Nonetheless, the average old-age pension paid to men is supposed to be higher due to the higher levels of their previously earned wages. In the health care sector the situation is in many aspects similar. Retirees, who pay only consumption taxes, are at major risk to a range of illnesses and health difficulties, whereas people of working age bear the most costs connected with health care.

Broadly speaking, "generational accounts indicate, in present value, what the typical member of each generation can expect to pay, now and in the future, in net taxes (taxes paid net of transfers received)" (Auerbach et al., 1994, p. 75). Considering the age dependency, generational accounting takes into account the age profile of an average person, presenting "whether the tax and transfer-policy of a selected base--year can be maintained into the indefinite future or whether sooner or later adjustments will be necessary in order to meet the government's intertemporal budget constraint" (European Commission, 1999, p. 1).

Generational accounting proceeds from the government intertemporal budget constraint, which compares the present values of the net tax payments of existing and future generations together with the present value of total future government consumption and government net wealth. More precisely, the intertemporal budget constraint can be written as follows:[2]

$$\sum_{x=0}^{D} N_{t,t-x} + \sum_{x=1}^{\infty} N_{t,t+x} + W_t^g = \sum_{x=t}^{\infty} G_x (1+r)^{t-x} \tag{1}$$

where $\sum_{s=0}^{D} N_{t,t-x}$ denotes the total present value of net remaining payments to the government of generations born between year $t-x$ and t (where t represents the year and x denotes age) discounted to t, D in the upper index of the summation stands for the maximum length of life, $\sum_{s=1}^{\infty} N_{t,t+x}$ is the present value of all net payments to the government of the future generations born between year t and $t+x$ and discounted to t, W_t^g stands for the government's net wealth in year t, G_s stands for government consumption expenditure in year x, and r is the discount rate. Furthermore, $N_{t,k}$ stands for $N_{t,k} = \sum_{x=\max(t,k)}^{k+D} T_{x,k} P_{x,k} (1+r)^{t-x}$, where $T_{x,k}$ denotes the average net payments to the government made in year x by a representative agent born in year k, and $P_{x,k}$ expresses the number of living cohort members in year x born in year k.

[2] According to Auerbach et al. (1994).

Generational accounting is probably the most suitable instrument for assessing intertemporal imbalances in public finance facing demographic changes. It indicates how today's political decisions affect future inter- and intra- generational redistribution (Bonin and Patxot, 2004). In comparison with other forward-looking approaches to fiscal sustainability, such as long-term projections and synthetic indicators, generational accounts "do not only signal sustainability problems but also clearly show their potential implications in terms of intergenerational fairness" (Langenus, 2006, p. 7). The calculations are thus made for every age and gender cohort instead of for every year. Notwithstanding its significant contributions, this method also has some limitations, which we briefly discuss next.

We have already mentioned that generational accounting, just like all other model approaches, simplifies the reality and projects current trends into the future. Generational accounting is fairly data demanding, as it takes the whole life cycle of the generations into account. Therefore, the approach requires us to focus on long-term projections.

Some benefits or taxes cannot be simply assigned to a specific age and gender. Capital income taxes represent one example. A variety of studies presume that capital income taxes are treated in the same way as personal income tax (Cardarelli et al., 2000; van Ewijk et al., 2002; Gál et al., 2005; Dybczak, 2006). In other words, they assume these types of taxes can be divided according to the nominal wage, thus they are fully borne by employees. This would cause a constant labor-to-GDP ratio if the nominal average wage was driven by labor productivity growth. Nonetheless, there are some circumstances, which complicate this decision, since capital taxes may be partly included in the price of current or old assets and tax payments may differ from the income on assets. In addition, the tax incidence view of both the theoretical and empirical literature is not unambiguous. Other unattributed elements are dealt with in section 2.6 "Revenue Projection."

Another particularity of generational accounting is the measurement of government net wealth, usually defined as the value of government assets less government gross debt (liabilities). The former, however, is not easy to estimate (see European Commission, 1999, pp. 23–24). The problem of measuring government assets is typically overcome by adopting the assumption that net wealth is identical to net public debt – gross public debt net of present or expected privatization revenues. In our case there is no need to express government net wealth since we do not use all the net payments to government, just those that are health care related.[3]

Net tax payments and government wealth are calculated in present values. For that reason one must choose an appropriate discount rate, or rather discount rate path. There is a consensus among papers that the discount rate is constant over the projected span, and it is set somewhere between the government bond long-term interest rate and private sector capital returns. Typically, analyses of sensitivity to different discount rates are made.

Last but not least, the System of National Accounts distinguishes between individual and collective consumption, such as research and development, safety and order, and national defense, which are not included in individual transfers from gov-

[3] We deal with these issues in more detail in sections "2.5 Expenditure Projection" and "2.6 Revenue Projection".

Table 1 Assumptions for Eurostat's EuroPop 2008 Demographic Projection (situation in 2060)

Country	Total fertility rate	Life expectancy at birth		Migration assumptions[a]
		Males	Females	
Czech Republic	1.52	83.2	87.8	13.0
Denmark	1.85	84.3	88.4	6.5
Estonia	1.66	80.8	87.5	-0.1
France	1.93	85.1	90.1	6.0
Italy	1.55	85.5	90.0	19.9
Netherlands	1.77	84.9	88.9	3.0
United Kingdom	1.84	85.0	88.9	10.1

Note: [a] Annual net migration.

Source: Eurostat (2008a).

Table 2 Economic Dependency Ratios (in %, p.p., 2009–2110)

Country	2009	2010	2030	2060	2110	Change 2060-2009	Change 2110-2060
Czech Republic	41.3	42.1	57.0	88.4	89.0	47.2	0.6
Denmark	53.6	53.3	68.0	74.1	80.8	20.6	6.7
Estonia	47.4	47.7	60.1	82.8	90.1	35.4	7.3
France	53.4	53.6	69.9	77.6	82.9	24.3	5.3
Italy	51.6	51.8	64.0	84.9	87.3	33.3	2.4
Netherlands	47.9	48.2	67.9	76.7	83.6	28.9	6.9
United Kingdom	50.6	51.0	64.5	76.5	78.3	25.9	1.8

Notes: The economic dependency ratio is calculated as the ratio of the number of people aged 0–14 and 65 and older to those of working age (15–64). Since Eurostat's projection is always dated to January 1, annual averages are presented in the table. The ratios in 2010 are based on the Labor Force Survey population structure from Q1–Q3 2010.

Sources: For 2009 and 2010, Eurostat (2010). For 2011–2060, Eurostat (2008a). Beyond 2060, authors' calculations.

ernment. Thus, the generational accounts do not give a full picture of the benefits that a recipient receives from the government sector, mainly because of problems with the allocation of collective consumption.

Having given an overview of generational accounting together with its main drawbacks, we turn now to the projection model so that we can calculate all the variables needed for the purposes of generational accounting in public health care systems.

2.2 Demography

The overall "exercise" starts with a demographic projection, in our case based on Eurostat's EuroPop 2008 migration convergence scenario. The projection assumes that the socio-economic and cultural differences between the EU Member States will fade out in the very long run, on account of which the year of convergence of demographic values was set to 2150 (see *Table 1* for Eurostat's assumptions). In *Table 1* it is worth noting that the fertility rates are below the natural population replacement rates required to maintain the population at the current level.

Additionally, for the purposes of generational accounting we had to prolong the demographic projection to 2110, while maintaining EuroPop's assumptions. *Table 2* gives a simple data description where economic, i.e., young and old-age, de-

Table 3 Non-Accelerating Wage Rate of Unemployment (in %, 2000–2110)

Country	2000	2005	2008	2009	2010	2011	2015	2020–2110
Czech Republic	7.1	7.1	6.4	6.4	6.6	7.0	6.7	6.4
Denmark	5.1	4.5	4.2	4.1	4.1	4.1	4.1	4.2
Estonia	10.8	8.3	8.4	9.8	11.7	13.8	11.1	8.4
France	9.6	9.1	8.9	9.0	9.0	9.0	9.0	8.9
Italy	9.0	8.4	7.9	7.9	7.9	7.8	7.9	7.9
Netherlands	3.2	3.1	3.4	3.7	4.3	4.6	4.1	3.4
United Kingdom	5.7	5.1	6.1	6.6	7.0	7.4	6.8	6.1

Sources: For 2000–2011, European Commission (2010). For 2012 and beyond, authors' assumptions.

pendency ratios are displayed. The economic dependency ratio reflects the decreasing share and ageing of the working-age population. From the current level, ranging between 41.2% in the Czech Republic to 53.5% in Denmark, the dependency ratio is supposed to change dramatically. High increases in the Czech Republic (by 47.2 p.p. to 88.4% in 2060), Estonia (by 35.4 p.p. to 82.8%) and Italy (by 33.3 p.p. to 84.9%) anticipate rising ageing. Even though the figures vary somewhat, each country is confronted with a similar problem.

2.3 Labor Market

The demographic projection is then used to calculate the age and sex-specific labor force. We use the European Commission's participation rate projections, defined as the ratio of economically active men/women in a given year to the total number of men/women of this age:

$$EA_t^{s,x} = pr_t^{s,x} \cdot POP_t^{s,x} \tag{2}$$

where $EA_t^{s,x}$ stands for the age (x) and sex (s) specific labor force, $pr_t^{s,x}$ corresponds to the participation rate in year t, and $POP_t^{s,x}$ is analogously the age (x) and sex (s) specific part of the population. In order to proceed further we had to decompose the labor force into employment and unemployment.

Several assumptions concerning employment and unemployment had to be made. First, we hold constant the share of employees and the self-employed over the projection span. Second, we do not distinguish between part-time and full-time work and all data are taken for or recalculated to the full-time employment equivalent in the process. Next, we presume that hours worked and the full-time and part-time ratios do not change. And finally, the European Commission's (2010) Non-Accelerating Wage Rate of Unemployment (NAWRU) values were considered as a proxy for structural unemployment rates (Carone, 2005). Current unemployment rates converge to these structural levels in the medium term, with the speed of convergence derived from the historical trends of unemployment rates. The past and future estimated NAWRU values are summarized in *Table 3*.

The economic crisis in 2008/2009 hit the labor markets as well. However, we presume the crisis will not change the structural characteristics of the selected economies, so we take the assumption that NAWRU will reach the 2008 values sooner or later, depending on the difference between the 2011 level and the 2008 level, but not later than in 2020.[4]

Table 4 Labor Productivity Growth – Baseline Scenario (in %, 2008–2110)

Country	2008	2009	2010	2011	2020	2030	2050–2110
Czech Republic	0.9	-2.8	2.2	2.0	2.0	1.9	1.7
Denmark	-2.0	-1.9	3.7	1.9	2.4	2.1	1.7
Estonia	-3.7	-5.1	2.4	2.6	2.3	2.1	1.7
France	-0.1	-0.4	2.1	1.1	1.6	1.6	1.7
Italy	-0.9	-2.1	1.1	1.0	1.2	1.3	1.7
Netherlands	0.8	-4.4	2.4	2.5	2.2	2.0	1.7
United Kingdom	-0.2	-2.6	1.8	0.5	1.1	1.3	1.7

Sources: For 2000–2011, European Commission (2010). For 2050, European Commission (2008). Authors' calculations.

In order to preserve the NAWRU values over time, the age and sex-specific unemployment rates were derived as follows (European Commission, 2008b, p. 79):

$$un_t^{s,x} = \frac{NAWRU_t \cdot \sum_{x=1}^{2} \sum_{x=15}^{75} EA_t^{s,x}}{\sum_{x=1}^{2} \sum_{x=15}^{75} un_{2008}^{s,x} \cdot EA_t^{s,x}} \cdot un_{2008}^{s,x} \tag{3}$$

where $un_{2008}^{s,x}$ is the fixed unemployment rate for age x and sex s in year 2008 and $un_t^{s,x}$ is the desirable sex and age-specific unemployment rate in year t. Therefore, the structure of unemployment in 2008 is kept constant. The age and sex-specific employment rate is then easily the product of the sex and age-specific participation rate, one minus the unemployment rate, and the number of persons in the age-sex category:

$$L_t^{s,x} = pr_t^{s,x} \cdot \left(1 - un_t^{s,x}\right) \cdot POP_t^{s,x} \tag{4}$$

Total employment is calculated as the sum of all of the specific employments.

2.4 Labor Productivity and Gross Domestic Product

By multiplying total employment and labor productivity, we are able to compute GDP in real terms. For simplicity, we adopted the EC's hypothesis about labor productivity growth converging to 1.7% in all countries in 2050 (see European Commission, 2008, p. 94). For the short and medium term, we used the EC's forecast (2010) – see *Table 4*. The economic crisis will probably end up in a permanent loss of potential output in terms of level but not in terms of growth (see *Box 1*) in the long run, so we can count on the convergence hypothesis going forward. Therefore, beyond the forecast horizon, we apply a simple interpolation with a logarithmic trend. To respect possible diverse scenarios, a sensitivity analysis was conducted for different labor productivity growth rates.

Recapping the formula, GDP growth is determined by the growth of total employment and labor productivity, so the model does not assume any changes in the capital-labor ratio. Moreover, the evolution of labor productivity determines the progression of the average real wage, which is essential for labor supply income afterwards (see below). Nominal GDP is then the product of real GDP and the GDP de-

[4] See *Box 1* for the implications of economic downturns for long-term projections.

Box 1 Economic Downturns and Long-Term Projections

In 2008 and at the beginning of 2009 an unprecedented economic recession hit almost every developed country. This raises the question of to what extent the downturn might have affected long-term variables in terms of both their levels and their growth rates. Even though there is uncertainty about the nature and magnitude of the crisis, international think-tanks (European Commission, 2009b; IMF, 2009; OECD, 2009a) do not predict any durable implications for long-run potential output growth, whereas the level of potential output has in all likelihood been reduced. Short and perhaps medium-term potential growth will be probably lower, but persistent adverse impacts are dependent on the duration of the recovery period and on the policy responses.

Decomposing potential output as defined by the Cobb-Douglas production function, the problem breaks down into three issues: the labor force, the capital stock, and total factor productivity. The labor force might be affected by higher structural unemployment generated by the hysteresis effect and lower participation rates, especially among individuals starting or ending the productive part of their life cycle. However, participation rates could be strengthened by the activity of second earners entering the labor market in times of economic difficulties in order to overcome the loss of income. OECD (2009a) estimates the cumulative effect of labor not to be of a long-term nature, with only a slight effect on potential output. Secondly, the reduced capital stock is assumed to have the most unfavorable impact on potential, owing to higher capital costs, which could worsen the capital-to-labor ratio and thus also productivity over the medium term. Nevertheless, much of this effect has already materialized, as investment has fallen sharply during the economic downturn. The role and the result of the behavior of the last component, total factor productivity, are ambiguous. The main total factor productivity drivers, such as research and development, innovation in technologies, and physical investment, fell in the recession and are likely to pick up only slowly if the financial and economic conditions remain impaired. Conversely, downturns generally serve as a "cleansing medium", driving resources to the new, most productive uses and correcting the misallocation at the peak of the business cycle. And IMF (2009), for instance, expects that "the level of total factor productivity recovers somewhat to its precrisis trend over the medium term" (p. 122).

The importance of setting "appropriate" values of the projected variables is underpinned by the fact that an overestimated impact of the crisis would accumulate into the future and spoil the results. The need to choose a middle or steady state path is satisfied by the nature of the long-term projections, which focus primarily on the trend path.

flator, which converges to the European Central Bank's inflation target, ensuring "inflation rates close to 2% over the medium term" (ECB, 2003).

2.4.1 Rationalizing Constant Shares of Factors of Production

Constant ratios of production factors to output are considered in the long term over the projection span. The stable shares assumption can be verified directly or derived indirectly via theories of growth models. We would like to point out that the information provided by all long-term time series of indicators is potentially misleading, as their content and definitions may have changed over time.

As far as the direct approach is concerned, Kaldor (1963) gives six basic "stylized facts" about economic growth, which also involve constant shares of labor and physical capital in national income. Barro and Sala-i-Martin (2003) then provide several other studies indicating the factors' long-term stability. Gollin (2002) revised Kaldor's "fact" and assessed that "factor shares give estimates that are remarkably consistent with the claim that factor shares are approximately constant across time and space". Moreover, he suggests using "models that give rise to constant factor shares" (p. 15). Gundlach (2007) also asserts that "the cross-country data on output per worker can be consistently summarized by a specification that allows for international variation in technology conditional on a constant capital output ratio" (p. 17).

Analogously, Bernanke and Gurkaynak (2001) find that "the time series of labor shares by country tend to be quite stable, with no systematic tendency to rise or fall over time" (p. 26).

Some growth model theories might also support the stable shares hypothesis – either those based on the neoclassical Solow growth model (both the basic one and the one encompassing Harrod-neutral technical change) or the later Ramsey-Cass-Koopmans model or Diamond's overlapping generations model. The convergence to steady state observed in reality is built into these models. The variables develop at constant rates in the steady state and do not change the capital-labor ratio. Later theories coping with endogenous growth of internalized technology can keep the ratio constant in the long run, but there are some theories (e.g. the pure "AK model") where the convergence to steady state is broken and thus the ratio might vary over time.

The empirical verifications of growth models, which should help with selection of the right model, are rather disputable. Some of them support the claim that the Solow model "is consistent with the international evidence if one acknowledges the importance of human as well as physical capital" (Mankiw et al., 1992, p. 433). Nevertheless, Bernanke and Gurkaynak (2001, p. 1) state that Mankiw et al.'s "basic estimation framework is broadly consistent with any growth model that admits a balanced growth path". Similarly, Gundlach (2007) concedes that his empirical results are "in line with the Solow model" (p. 17). Others, such as Okada (2006), conclude that the Solow mechanism serves as a good explanation of convergence in developed countries such as OECD members, but not if one takes into account less developed countries. On the contrary, the study of Arnold et al. (2007) suggests that the "estimated speed of convergence appears to be too high to be consistent with the human-capital-augmented version of the Solow model, but rather support the endogenous growth model" (p. 21).

Moreover, the verifications of the models with human capital seem to be problematic. Not only are they tremendously data-consuming, but they also often quantify qualitative categories to specify human capital, such as level of knowledge, quality of health care, education, and social security environment, substituted by questionable proxies in econometrical estimates.

Thus, to analyze developed countries, given convergence of their economies and taking into account the standard long-term projection methodology, we decided to develop the model on the neoclassical economic framework with constant factor shares.

Having described the major macroeconomic prerequisites, we can continue by introducing government health care expenditure and revenue projection techniques.

2.5 Expenditure Projection

The basic projection of health care expenditure crucially depends on the health care cost profiles. The age and sex-related profiles, expressed in percent of GDP per capita, denote average annual health care expenditure.[5] The first step in the projection is to smooth multi-year categories to one-year intervals and multiply the average

[5] The age and sex-related health care cost profiles for the selected countries are the same as those used by the European Commission's Ageing Report (European Commission, 2009b).

health care costs for an individual of age x and sex s in the initial year 2008 by the number of individuals of age x and sex s in every year of the demographic projection. The total spending of cohort x and gender s in a particular year can be easily described as:

$$C_t^{s,x} = c_{2008}^{s,x} \cdot POP_t^{s,x} \cdot \frac{GDP_t^N}{POP_t} \tag{5}$$

where $c_{2008}^{s,x}$ are the costs per capita for each sex and age that are given by the initial year of the projection, and $POP_t^{s,x}$ stands for the number of individuals in the defined age and sex categories in year t given by the demographic projection. Every expenditure profile is then multiplied by GDP per capita to get total nominal expenditure for each category.

The above-described method implies the "expansion of morbidity" hypothesis, first proposed by Grunenberg in 1977. According to the hypothesis, the number of years of life spent in good health will remain constant and all additional years gained by increases in life expectancy will be spent in impaired health status due to chronic illnesses (Parkinson's disease, arthritis, senile dementia, etc.) and other causes. Later on, more optimistic scenarios were proposed in the literature. The "compression of morbidity" hypothesis, published by Fries (1980), states on the contrary that the part of life spent in disease and disability will remain constant and the health status of the population will improve, as the time lived in ill health will be compressed with growing longevity. The middle way between the two hypotheses is the "dynamic equilibrium", according to which the proportion of life lived severely disabled will remain constant. In order to take into account possible improvements in the health status of the population we model the dynamic equilibrium hypothesis. Technically, in long-term projection exercises this hypothesis is modeled by shifting the age-related health care cost profiles along with the growing life expectancy (European Commission, 2009a, OECD, 2006):

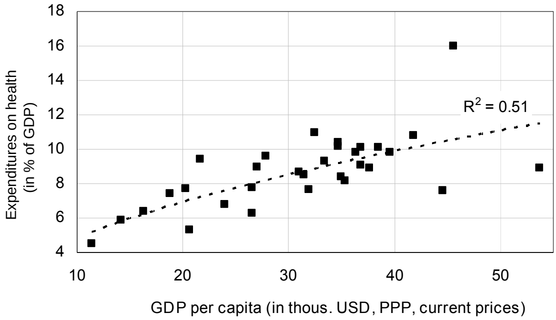
$$c_t^{s,x} = c_{2008}^{s,x-\Delta e_t^{s,x}} \tag{6}$$

where $\Delta e_t^{s,x}$ is the change in life expectancy of a given gender s and age x between year t and the base year 2008, hence $\Delta e_t^{s,x} = e_t^{s,x} - e_{2008}^{s,x}$.

Furthermore, there is another important driver of health care expenditure – Wagner's hypothesis of public expenditure growth, characterized here by the income elasticity. Although recent econometric studies (Costa-Font et al., 2009; Baltagi and Moscone, 2009), contrary to the original literature (Newhouse, 1987; Gerdtham and Johnson, 2000), suggest that the income elasticity of health care is lower than 1, a general conclusion on income elasticity has not yet been reached (Dybczak and Przywara, 2010). Nevertheless, a growing share of the health care sector in GDP in relation to the level of economic development has been observed in the OECD countries (see *Figure 1*).

Although the growth may be attributable to technological progress, no simple methodology can predict the future evolution of technological change and we are thus left with the historical trends. Simplifying the discussion, we assume the income

Figure 1 Health Care Expenditures and Economic Development in the OECD Countries (2007)



Note: In addition, Estonia and Slovenia were included and Luxemburg excluded.
Sources: OECD (2009a, 2009b). Authors' calculations.

elasticity of health care expenditure to converge in a linear manner from 1.1 to 1.0 in line with the European Commission (2008) reference scenario. The average health care costs for gender *s* and age *x* in year *t* are computed by multiplying the average costs for the given age and sex category from the previous year by the sum of one and the multiple of the elasticity and GDP per capita growth between the two periods:

$$C_t^{s,x} = C_{t-1}^{s,x} \cdot \left(1 + \varepsilon_t \left(\frac{GDP_t^N / POP_t}{GDP_{t-1}^N / POP_{t-1}} - 1\right)\right) \quad (7)$$

where ε_t represents the income elasticity of 1.1% diminishing linearly to 1.0% in 2060 and remaining stable thereafter. The final age and gender-specific health care expenditures for gender *s* and age *x* are obtained by simply substituting equation (6) into equation (7), thus the total specific expenditures $C_t^{s,x}$ can be described as follows:

$$C_t^{s,x} = c_{2008}^{s,x-\Delta e_{t-1}^{s,x}} \cdot POP_{t-1}^{s,x} \cdot \frac{GDP_t^N}{POP_t} \cdot \left(1 + \varepsilon_t \left(\frac{GDP_t^N / POP_t}{GDP_{t-1}^N / POP_{t-1}} - 1\right)\right) \quad (8)$$

Unlike in the standard generational accounting method we do not take into account any initial debt or surplus of the public health care systems. The choice results from the impossibility of measuring the health care debt in national health service systems financed directly from the general budget. This would end up in biased results in comparison with other countries. Moreover, health insurance systems usually manage resources based on a balanced budget.

2.6 Revenue Projection

The financing of public health care systems in Europe differs in terms of the mix of taxes used in the selected countries. Generally, two types of health care system can be distinguished: systems based on a kind of national health service, where health care is predominantly financed directly by the central government or

Box 2 Financing Public Health Care in the Selected Countries[a]

In the *Czech Republic*, social health insurance is compulsory and mostly employees, employers, and the self-employed pay the contributions. The state contributes to the system on behalf of special groups of non-wage earners, such as children, pensioners, parents on maternity leave, the unemployed, and asylum seekers. In addition to the state contribution on behalf of non-wage earners, the state finances capital investment in the hospitals it manages, training of medical personal, etc. Social security contributions thus cover less than 70% of public health care spending.

The public health care system in *Denmark* is financed by general and municipal taxes. Health care in the regions, which accounts for most of the health care spending, is financed by four kinds of subsidies: a block grant from the state (75%), a state activity-related subsidy (5%), a local basic contribution (10%), and a local activity-related contribution (5%). The part coming from the state is financed mainly by health contributions, which account for 8% of wages.

In *Estonia*, employees and the self-employed pay the social health insurance contributions mostly. The state contributes for less than 3% of non-wage earners (individuals on parental leave, the unemployed, people receiving social benefits, and other minor groups). Major groups of non-wage earners (pensioners, children, etc.) are covered by social health insurance without contributing themselves and without the state contributing for them.

In *France*, every working person and his/her dependants belong to a health insurance scheme according to occupation.[b] The revenues of the health insurance schemes are raised from social health insurance contributions paid by employees, employers, and the self-employed, from retirement pensions and invalidity and pre-retirement benefits and other replacement income, from investment income and property income, and from taxes on car insurance premia, some alcoholic drinks, tobacco, advertising for pharmaceuticals and medical products, etc.

The main source of finance of the *Italian* national health service is general taxation, but the regions and autonomous provinces are entitled to set the level of regional taxes, which account for 40% of public health care sector resources. The main regional tax dedicated mostly to health care is the tax on productive activities, which is a flat-rate tax on the value added generated by all types of business and self-employed activities. The second regional source is a personal income surcharge.

The *Dutch* public health care system has two components, the first of which is a statutory health insurance system financed by a mixture of social health insurance contributions and nominal premia paid by insurees and the second of which, covering long-term care, is the AWBZ (defined under the Exceptional Medical Expenses Act) raising funds purely from social health insurance contributions. The state contributes for the premia of children up to the age of 18 in the first component and a grant to the AWBZ.

In *Switzerland*, two-thirds of public health expenditure is financed through mandatory health insurance purchased on an individual basis. The nominal premia differs across funds and purchased policies and are not income-related. Children benefit from lower nominal premia. The remaining one-third of public expenditure is financed by the cantons from general taxation and consists mainly of subsidies to institutional providers (hospitals, nursing homes).

The *United Kingdom*'s National Health Service is funded mainly by general taxation (76%), but also by national insurance contributions (19%) and user charges (5%). National insurance contributions are paid by employers and employees and are counted as general government revenue in the National Health Accounts.

Notes: [a] Based on Zápal et al. (2009).

[b] In 2001, 84% of the population belonged to the general scheme (Régime Général), which covers employees in commerce and industry and CMU beneficiaries (CMU is a subsidiary system which provides medical coverage for persons who do not benefit from any other medical coverage schemes).

local authorities (Denmark, Italy, and the United Kingdom), and systems of social insurance, where the financing of health care is managed by one or more health insurance companies (the Czech Republic, Estonia, France, and the Netherlands).

However, as *Box 2* demonstrates, even in the systems based on social insurance, the state often contributes to the system either on behalf of some groups of

Table 5 Age Related Taxes Considered in the Model (in % of total tax revenues, 2008)

Country	Taxes on income of individuals	Social security contributions	Value added tax	Excises	Total age related taxes
	1100	2000	5111	5121	
Czech Republic	11.0	43.8	19.2	10.0	84.0
Denmark	52.8	2.0	20.9	8.9	84.5
Estonia	19.1	36.2	25.9	10.5	91.7
France	17.4	37.2	16.2	5.2	76.0
Italy	26.8	31.1	13.7	4.6	76.1
Netherlands[a]	20.4	36.2	19.8	8.3	84.7
United Kingdom	29.9	19.2	17.8	8.1	75.1

Notes: Four-digit numbers and the revenue categories refer to the OECD international government revenue classification.
[a] Figures for the Netherlands in year 2007.

Sources: OECD (2010). Ministry of Finance of Estonia (2010). Authors' calculations.

citizens, such as children and pensioners, or directly to some providers, such as public-operated hospitals. As the model requires sources of finance to be distinguished according to categories of taxes that can be associated with age, we decided to divide the public sector contributions in line with the sources of finance of the central budget if there are no special taxes designated for health care. As for government sector revenues affiliated with labor income assigned to every age and sex, we de-termined: "1100 Taxes on income, profits and capital gains of individuals" and "2000 Social security contributions."[6] The sum of the variety of indirect taxes – "5111 Value added taxes" and "5121 Excises" – is supposed to be borne fully by individuals, which allows restoration of their age profile. *Table 5* reveals the total amount of age-related taxes considered in the model.

Finally, *Table 6* gives the structure of all considered revenues of the public health care systems in 2007.[7] The logic of the distribution of revenues is as follows. First of all, social security contributions, nominal premia, and all taxes specially assigned to health care used in the particular system are considered and assigned to the age categories. In the second step, the revenues of the public health care system financed directly through central or local budgets are assigned to the age categories in line with the distribution of the central budget revenues (*Table 5*). The remaining part is considered as "other revenues" and distributed equally to the age categories. The structure of financing in 2007 is preserved over time in the projection.

Modeling labor income taxes first, we apply the effective tax rates of social security contributions (t_{SSC}) paid by employees, employers, and the self-employed, and personal income taxes (t_{PIT}) to the tax base in every following year. The average effective tax rates were calculated as the ratio of the tax part used for health care funding to its tax base. The tax base for every age and sex category is equal to the product of the number of employed persons in every age and sex category and the modeled nominal average wage in the age and gender category. Direct age and gender-specific income taxes ($DIT_t^{s,x}$) are thus:

[6] See OECD (2010) for the codes and tax classification.

[7] More up-to-date figures were not available at the time of writing.

Table 6 Structure of the Government Sector Sources Financing Acute and Long-Term Care (in %, 2007)

Country	Social security contributions	Nominal premia	Personal income tax	Value added tax and excises	Other revenues
Czech Republic	69.6	-	6.2	15.2	8.9
Denmark	0.0	-	51.1	31.4	17.5
Estonia	82.3	-	3.8	6.1	7.8
France	93.6	-	2.1	2.2	2.1
Italy	0.1	-	9.6	72.7	17.6
Netherlands	0.0	31.4	62.0	4.1	2.6
United Kingdom	0.0	-	35.7	32.4	31.9

Sources: OECD (2008), OECD (2010). Authors' calculations.

$$DIT_t^{s,x} = (t_{PIT} + t_{SSC}) \cdot W_t^{N,s,x} \cdot L_t^{s,x} \quad (9)$$

The age and sex-specific nominal wage[8] ($W_t^{N,s,x}$) is supposed to grow in line with the average nominal wage, which rises by the percentage change of labor productivity and the GDP deflator, which for the sake of simplicity is taken as the rate of growth of the price level.

The average effective tax rates are at the same time held constant over the projected period. Whereas indirect taxes are typically assumed to be proportional to their tax base (see André and Girouard, 2005; or European Commission, 2005), personal income taxes are usually constructed as progressive,[9] i.e., the higher the tax base, the higher the rate of the tax (the so-called marginal tax rate). In such a system of taxation, increasing the average wage would raise the effective tax rate, which might boost the total tax burden and the size of the government sector in the economy indefinitely. That is why we assume all effective tax rates to be constant in the projection, rather than using fixed statutory tax rates. A similar problem arises for gradual tax progressivity (tax brackets) and taxflation.

The age distribution of value added tax and excise revenues is calculated from the age distribution of consumption as defined by COICOP[10] per adult equivalent. The effective tax rates for age categories are applied to the demographic projection, whereas the change of the ratio of total consumption to GDP is assumed to be zero. Effective consumption tax rates were calculated by dividing the part of value added tax and excise revenues that serves for health care financing by the final consumption expenditure of households.

[8] The age and gender-specific profile of nominal wages, derived from Eurostat (2006) and national statistical offices, was fixed for the projection analysis.

[9] A statutory flat tax rate does not necessarily mean that the tax is proportional to its base. Flat taxes are usually computed as the product of a constant (the statutory tax rate) and the difference between income (or another tax object) and a stable deductible item (alternatively there is a deduction from the calculated tax). Thus, deductible items/tax deductions imply progressivity of the flat tax, since the higher the value of the object of the tax, the higher the relative tax base (see Kim et al., 2006, and Prušvic and Přibyl, 2006, for details).

[10] COICOP stands for Classification of Individual Consumption According to Purpose. The decomposition of individual consumption and assignation of taxes was made on the basis of the following sources: European Commission (2007), Eurostat (2008b), OECD (2008b), and European Commission (2009).

Other revenues, which are not connected with age or sex, are held constant to GDP over the projected span as well, proportionally allocated to the total population. Thus, we consider them to be a lump sum, proportionally divided per capita:

$$OR_t^{s,x} = \frac{OR_{2008}}{GDP_{2008}^N} \cdot \frac{POP_t^{s,x}}{POP_t} \tag{10}$$

where $OR_t^{s,x}$ denotes the age and sex-specific unit of the other revenues of the general government sector, OR_{2008} the total value of other revenues in 2008, and GDP_{2008}^N nominal GDP in the corresponding year.

We can now assemble the explicitly revealed age and sex general government revenues financing health care by simple summation of all three components:

$$T_t^{s,x} = DIT_t^{s,x} + IT_t^{s,x} + OR_t^{s,x} \tag{11}$$

where $IT_t^{s,x}$ stands for the product of the age and gender-specific effective indirect tax rate in year t and age and gender-specific household consumption at the same time.

2.7 Generational Accounts in Health Care

Finally, the total generational account of the selected cohort, which expresses in present value the total burden (if the outcome is negative) for public finance generated by a representative agent during his life in health care, may be expressed as follows:

$$ga^x = \sum_{t=2007}^{2107} \sum_{s=1}^{2} \left(T_t^{s,x} - C_t^{s,x} \right) \cdot \frac{1}{\sum_{s=1}^{2} POP_t^{s,x}} \cdot (1+r)^{t-x} \tag{12}$$

We have already noted that to apply sensitivity analysis to diverse discount rates is necessary for the model, as changes in the rates might have significant effects on the results. Specifying an interest rate that can be used for the discounting procedure is not a straightforward task. Therefore, we follow the standard recommendation and select the "Maastricht criterion bond yields", which represent long-term interest rates and form part of the convergence criteria for euro area accession. The 10-year average of this type of interest rate was 5% in the EU-27 in 2000–2009, whereas in the countries we deal with in this paper it was 0.2 p.p. lower. Our analysis of the results of the generational accounts is based on a 5% discount rate with 1 p.p. distinct values in both directions.

In the results, we also use summation of all cohort-specific health expenditures and revenues, which generally gives total health expenditures and revenues, respectively, in a given year.

3. Results

Given the assumptions we adopted concerning the evolution of future health expenditures and revenues, the model suggests important fiscal imbalances in the future in all analyzed countries. On average, the share of health expenditure in GDP

Table 7 Health Care Expenditures and Deficits (in % of GDP, 2007–2107)

Country	Expenditures							Deficits	
	2007	2020	2040	2060	2080	2100	2107	2060	2107
Czech Republic	6.3	6.6	6.9	7.2	7.4	7.5	7.5	0.9	1.2
Denmark	7.7	8.0	8.4	8.8	9.0	9.1	9.2	1.1	1.5
Estonia	5.1	5.3	5.6	5.8	6.0	6.1	6.1	0.7	1.0
France	8.8	9.1	9.6	10.0	10.3	10.4	10.4	1.2	1.6
Italy	6.9	7.2	7.5	7.8	8.0	8.1	8.1	0.9	1.2
Netherlands	7.6	7.9	8.3	8.7	8.9	9.0	9.0	1.1	1.4
United Kingdom	7.2	7.4	7.8	8.1	8.3	8.4	8.4	0.9	1.2

Note: As at the beginning all systems were made balanced and the revenues are kept constant in relation to GDP, the revenue ratio equals the expenditure ratio in 2007.
Source: Authors' calculations.

Table 8 Generational Accounts According to the Discount Rate (in % of GDP per capita)

	Discount rate		
Country	4.0	5.0 (baseline)	6.0
Czech Republic	-118.6	-80.0	-66.7
Denmark	-124.0	-82.9	-68.6
Estonia	-90.7	-53.0	-41.0
France	-163.8	-101.6	-82.8
Italy	-87.9	-72.3	-65.1
Netherlands	-126.8	-87.3	-74.3
United Kingdom	-93.0	-65.7	-55.0

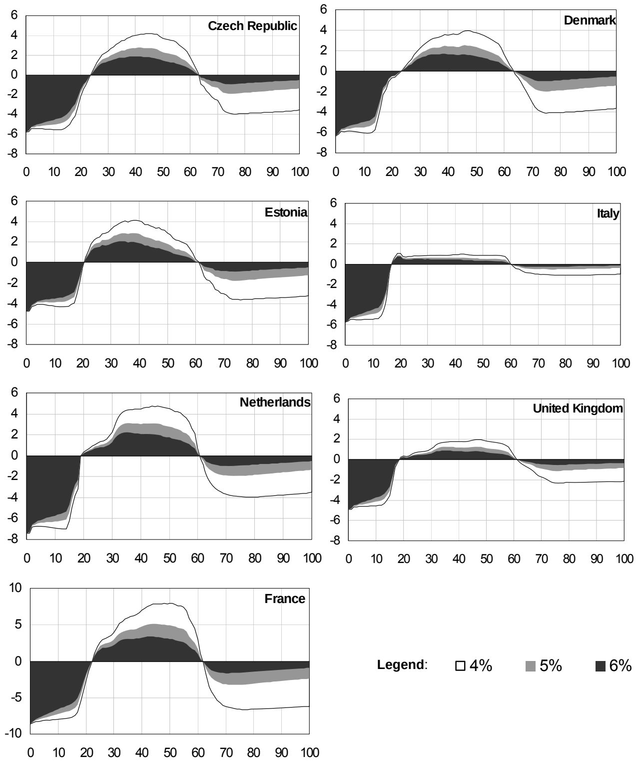
Note: Labor productivity growth in the long term was set to 1.7%.
Source: Authors' calculations.

would grow by 18%, i.e., by 1.3 p.p. of GDP. The assumption of constant factor shares coupled with a constant consumption-to-GDP ratio implies a constant revenues-to-GDP ratio. All the growth of the ratio of health expenditure to GDP thus creates the growth of the notional deficit. The growth of health expenditure is summarized in *Table 7*.

The generational accounts of the current generation show important burdens generated by the individual during his/her life. The size of the burden for various discount rates is shown in *Table 8* (the total generational accounts are expressed in GDP per capita for better comparability between the analyzed countries). The average burden in present value that a 2007 newborn generates in health care during his life equals 78% of GDP per capita in the analyzed countries if the 5% baseline discount rate is taken into account. The highest burden was found in France, where it reaches the value of GDP per capita (102%). At the other end of the spectrum, the lowest burden (almost half) was found in Estonia (53%).

The size of the burden results from several factors. First of all, the initial size of the health expenditure plays an important role in the final generational account. The higher the discount rate, the more pronounced the effect of the original health expenditure. However, the mix of taxes used to finance health care plays a significant role as well. In general, the more income taxes are used to finance health care, the higher is the burden generated by a newly born individual. We observe that the generational accounts in Italy and the United Kingdom, where consumption taxes

Figure 2 Generational Accounts for a 2007's Newborn in the Selected EU Health Care Systems (in % of GDP per capita)



Notes: Years of age are depicted on the horizontal axes; on vertical ones, the % of GDP per capita. Labour productivity growths at 1.7%.
Source: Authors' calculations.

play an important role in financing health care, are below those of the Czech Republic, where health care is financed mainly through social health insurance contributions, although health expenditure is higher in both countries.

Comparing the different systems of financing health care, higher burdens on future generations are generated by social health insurance systems (France, the Netherlands, and the Czech Republic) and lower burdens are generated by national health service systems (Italy and the United Kingdom), on condition that low initial health expenditure does not reverse the results as we observe in Estonia. The Danish national health system is another exception, as special taxes on income are assigned to finance health care. The differences between the financing systems in the selected countries are clearly visible in the shape of the generational accounts (see *Figure 2*). Whereas in France, where revenues are raised almost entirely from the working population, the shape of the generational account is highly humpy, in Italy it is rather flat. However, no general conclusion can be made from this finding, as the model does not take into account the specifics of the different systems, such as their ability to contain costs or their efficiency.

Table 9 Generational Accounts under Various Labor Productivity Growth Rates (in % of GDP per capita)

Discount rate	4.0			5.0 (baseline)			6.0		
Productivity growth	0.7	1.7	2.7	0.7	1.7	2.7	0.7	1.7	2.7
Czech Republic	-78	-119	-207	-65	-80	-115	-62	-67	-80
Denmark	-78	-124	-226	-66	-83	-124	-63	-69	-85
Estonia	-49	-91	-180	-38	-53	-89	-37	-41	-55
France	-94	-164	-305	-77	-102	-157	-76	-83	-103
Italy	-71	-88	-121	-65	-72	-87	-62	-65	-71
Netherlands	-82	-127	-225	-72	-87	-127	-70	-74	-89
United Kingdom	-64	-93	-149	-54	-66	-89	-50	-55	-65
Average	-74	-115	-202	-62	-78	-113	-60	-65	-78

Note: Labor productivity growth and discount rate are in %.
Source: Authors' calculations.

Changes from net benefits to net payments slightly differ among countries. These differences stem from the time youths start participating in the labor market and their contributions from earned wages outweigh average public health care expenditures. Although the age of 15 represents the lowest possible threshold, the real age of the representative agent varies in accordance with participation rates and the health care costs profile. In the Czech Republic and Denmark, net payment vis-à-vis the public sector starts at the age of 24 years, while in Italy it starts at 17 years (the sample average is 21). The same situation is envisaged for exiting the labor force due to retirement. However, the dispersion of the age at which the representative agent becomes a beneficiary is lower surrounding the age of 62, with the exception of the Czech Republic and Denmark again, where the sum of payments is lower than paid health expenditures at 64 years.

The results are highly sensitive to the discount rate used. For the 4% discount rate, the average generational account equals 115% of GDP per capita. For the 6% discount rate, the size is reduced to 64.8% of GDP per capita. This result is a consequence of the fact that an individual contributes to the system at working age and benefits from the system mostly at higher age. The more discounted are the future financial flows, the less important is the future drawing of benefits in old age.

An analysis was also conducted of the sensitivity of the total generational accounts to various labor productivity growth rates (*Table 9*). Generally, we can conclude that the higher the labor productivity growth, and thus the growth of potential output as well, the higher the generational imbalances created. This observation has its roots in the evolution of expenditure (see *Table 10* for different expenditure scenarios according to labor productivity growth), since health expenditure growth is driven by growth of GDP per capita (see equation 7). The constant revenue-to-GDP ratio does not compensate for the accumulation of health expenditures in terms of GDP.

Within the 5% baseline discount rate, the generational accounts deficit for a 2007 newborn would be 45% larger on average if labor productivity increased by 1 p.p. more. Conversely, if labor productivity grew by 0.7% annually, the accounts deficit would shrink to 81% of the size of the baseline scenario. Again, the relation of higher discount rates is valid, while at 6% discount rate the differences from the baseline productivity growth are nearly half.

Table 10 Expenditures and Deficits under Various Labor Productivity Growth Scenarios (in % of GDP)

	Expenditures						Deficits					
Year	2060			2107			2060			2107		
Productivity growth	0.7	1.7	2.7	0.7	1.7	2.7	0.7	1.7	2.7	0.7	1.7	2.7
Czech Republic	7.0	7.2	7.3	7.2	7.5	7.7	0.7	0.9	1.0	0.9	1.1	1.4
Denmark	8.6	8.8	9.0	8.9	9.1	9.5	0.9	1.1	1.3	1.2	1.5	1.8
Estonia	5.7	5.8	5.9	5.9	6.1	6.2	0.6	0.7	0.8	0.7	0.9	1.1
France	9.8	10.0	10.1	10.0	10.4	10.6	1.0	1.2	1.3	1.2	1.6	1.8
Italy	7.7	7.8	7.9	7.9	8.1	8.3	0.7	0.9	1.0	1.0	1.2	1.4
Netherlands	8.5	8.7	8.8	8.7	9.0	9.3	0.9	1.1	1.2	1.1	1.4	1.7
United Kingdom	8.0	8.1	8.2	8.2	8.4	8.6	0.8	0.9	1.0	1.0	1.2	1.4
Average	7.9	8.1	8.2	8.1	8.4	8.6	0.8	1.0	1.1	1.0	1.3	1.5

Note: Labor productivity growth is in %.
Source: Authors' calculations.

Regarding the differences in the size of deficits in public health care systems under the different productivity scenarios, our analysis indicates that the changes would range from 0.1 p.p. of GDP to –0.3 p.p. in 2060 and from 0.2 p.p. to –0.4 p.p. in 2107 relative to the baseline.

4. Conclusion

Growing demand for health care – stemming from growing expectations of society concerning health care – coupled with medical advances thanks to technological progress has been observed for decades in the OECD countries. Moreover, according to all available demographic projections, population ageing as a long-term process seems to be inevitable in the European economies in the coming years. The main subject of this paper has been to study the implications of population ageing for the financing of health care, with a special focus on intergenerational solidarity. Under the assumption of a constant capital-labor ratio, supporting the hypothesis of a constant tax-to-GDP ratio in the future, growing health expenditures imply noticeable fiscal imbalances. The notional deficit necessary to cover health care expenditure in 2100, if demand for health care is to be satisfied, varies from 0.9 to 1.5 p.p. of GDP in the baseline productivity growth scenario in the countries analyzed.

Having built a macroeconomic long-term projection model, we computed the notional generational accounts in health care, which characterize the size of the burden generated by a newborn in 2007 during his life in health care in seven selected countries representing different cultural and institutional settings of health care financing systems. According to the model, significant burdens on future generations – ranging from 53% to 102% of GDP per capita under a 5% discount rate – are generated by the current generations. The highest burden was found in France, where most of the resources are raised from the working population and where health expenditure is high in the initial year of the projection, and lowest burden was found in Estonia due to its extremely low current health expenditure.

All else equal, the systems financed by social health insurance or income taxes generate higher burdens on future generations. (Note: if the retirement age assumption is relaxed in such a way that the retirement age grows more or less in line with life expectancy, the evolution of the labor force will moderate the impact on direct-tax-financed health systems.) The effect is more pronounced the lower is the discount rate. This observation stems from the fact that systems based on social health insurance generate a less equal lifetime distribution of net taxes than systems financed to a large extent from consumption taxes paid by all individuals.

However, as we are dealing with health care, we have to bear in mind that all predicted deficits and burdens generated by the representative agents, unlike in the case of pensions, are subject to the condition that the demand for health care is satisfied, which in reality need not be true. The policy implication we can draw from our analysis is that more resources will be needed to cover the growing health expenditure if society does not agree to the rationing of health care. On the other hand, if society decides not to spend more on health care, adequate measures should be taken to ensure that health care is available for individuals with serious conditions. Such measures could include support for prevention, which could save scarce resources in the future, and institutional changes aimed at improving the efficiency of health care systems.

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