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WHO'S GOING BROKE?
COMPARING HEALTHCARE COSTS IN TEN OECD COUNTRIES

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ABSTRACT

Government healthcare expenditures have been growing much more rapidly than GDP in OECD countries. For example, between 1970 and 2002 these expenditures grew 2.3 times faster than GDP in the U.S., 2.0 times faster than GDP in Germany, and 1.4 times faster than GDP in Japan.

How much of government healthcare expenditure growth is due to demographic change and how much is due to increases in benefit levels; i.e., in healthcare expenditures per beneficiary at a given age? This paper answers this question for ten OECD countries -- Australia, Austria, Canada, Germany, Japan, Norway, Spain, Sweden, the UK, and the U.S. Specifically, the paper decomposes the 1970 – 2002 growth in each countrys healthcare expenditures into growth in benefit levels and changes in demographics.

Growth in real benefit levels has been remarkably high and explains the lions share – 89 percent – of overall healthcare spending growth in the ten countries. Norway, Spain, and the U.S. recorded the highest annual benefit growth rates. Norways rate averaged 5.04 percent per year. Spain and the U.S. were close behind with rates of 4.63 percent and 4.61 percent, respectively.

Allowing benefit levels to continue to grow at historic rates is fraught with danger given the impending retirement of the baby boom generation. In Japan, for example, maintaining its 1970-2002 benefit growth rate of 3.57 percent for the next 40 years and letting benefits grow thereafter only with labor productivity entails present value healthcare expenditures close to 12 percent of the present value of GDP. By comparison, Japans government is now spending only 6.7 percent of Japans current output on healthcare.

In the U.S., government healthcare spending now totals 6.6 percent of GDP. But if the U.S. lets benefits grow for the next four decades at past rates, it will end up spending almost 18 percent of its future GDP on healthcare. The difference between the Japanese 12 percent and U.S. 18 percent figures is remarkable given that Japan is already much older than the U.S. and will age more rapidly in the coming decades.

Although healthcare spending is growing at unsustainable rates in most, if not all, OECD countries, the U.S. appears least able to control its benefit growth due to the nature of its fee-for-service healthcare payment system. Consequently, the U.S. may well be in the worst long-term fiscal shape of any OECD country even though it is now and will remain very young compared to the majority of its fellow OECD members.

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I. Introduction

As is well know, government healthcare expenditures in developed countries have been growing much more rapidly than have their economies. What is less well known is how much of this expenditure growth is due to demographic change and how much is due to increases in benefit levels, i.e. health expenditures per person at a given age.[1] The distinction is important. Benefit levels are determined by government policy, whereas demographics are largely outside government control. Policymakers who ignore or misjudge the growth in their benefit levels do so at their county's risk. They are left with only a vague understanding of why their health expenditures grew in the past and very little ability to project how they will grow in the future.

This study uses OECD demographic and total health expenditure data in conjunction with country-specific age-health expenditure profiles to measure growth in real healthcare benefit levels between 1970 and 2002 in ten OECD countries -- Australia, Austria, Canada, Germany, Japan, Norway, Spain, Sweden, the UK, and the U.S. Among these nations, Norway, Spain, and the U.S. recorded the highest growth rates in benefit levels. Norway's rate averaged 5.04 percent per year. Spain and the U.S. were close behind with rates of 4.63 percent and 4.61 percent, respectively. Canada and Sweden had the lowest growth rates -- 2.32 percent and 2.35 percent, respectively.

Benefit growth, even among countries with the lowest benefit growth rates, has played the major role in raising total government healthcare spending in recent decades. Over the 32-year period covered by our data, total healthcare spending grew 2.5 times faster than GDP, on average, across the ten countries.[2] Had there been no benefit growth, healthcare

[1] Breyer and Ulrich (2000) and Seshamani and Gray (2003) examine growth of health expenditures in Germany, Japan, and the UK.

[2] This 1.8 factor is obtained by averaging the ten country-specific ratios of A to B, where A is the 1970-2002 growth rate of real healthcare expenditures and B is the 1970-2002 growth rate of real GDP.

spending would still have grown because of demographics, specifically changes in the age-composition of healthcare beneficiaries and increases in the total number of beneficiaries. But with no benefit growth, healthcare spending in our ten countries would have grown, on average, only one fifth as fast.

Going forward, benefit growth will continue to play the key role in determining overall increases in healthcare spending. In 2002 the share of the population 65 and older in our ten countries averaged 14.8 percent. By mid century it will average 25.9 percent – a 75 percent increase. Table 1 shows how the population share of the elderly will change in our ten countries through 2070. Japan, which is currently the oldest of our countries, will retain that ranking, ending up in 2070 with 37.7 percent of its population age 65 or older. The U.S. will also retain its ranking as the youngest of the ten countries. Its 2070 elderly share is projected at 21.6 percent –not much greater than the current elderly share of the Japanese population.

Since healthcare benefit levels are much higher for the elderly than they are for the young, continuing to let benefit levels grow as a country ages will accelerate the increase in healthcare spending. In the U.S., for example, real government healthcare spending increased by a factor of 6.9 between 1970 and 2002. If real benefit levels continue to grow at historic rates, real U.S. healthcare spending will increase by a factor of 7.5 over the next 32 years. Absent past benefit growth, the U.S. total real healthcare expenditures growth factor would have been 1.6 between 1970 and 2002. And absent future benefit growth, the factor will be 1.8 over the next 32 years. So demographics matter to overall healthcare spending, but they are swamped in importance by benefit growth.

In Japan maintaining its 1970-2002 annual real benefit growth rate of 3.57 percent for the next 40 years and at the rate of labor productivity thereafter entails present value healthcare expenditures totaling almost 12 percent of the present value of all future GDP. By comparison, Japan's government is now spending only 6.7 percent of the nation's output on healthcare. In the U.S., government healthcare spending now totals about 6.6 percent of GDP. But if it continues to let benefits grow for the next four decades at past rates, it will end up spending almost 18 percent of its future GDP on healthcare.

The difference between the Japanese 12 percent and U.S. 18 percent figures is remarkable given that Japan is already much older than the U.S. and will age much more rapidly in the coming decades. The difference accentuates the obvious -- excessive growth in benefit levels can be much more important than aging in determining long-term healthcare costs. Moreover, the fact that the present value of projected U.S. healthcare expenditures is so high – indeed, the highest of any of our 10 countries when measured relative to GDP – suggests that the U.S. may be in the worst overall fiscal shape of any of the OECD countries even though its demographics are among the most favorable.

The paper proceeds by describing our methodology, presenting our data, discussing our findings, examining their long-term fiscal implications, and reiterating the importance of controlling growth in benefit levels.

II. Methodology

Let E_t stand for the value of real healthcare expenditures in a country in year t and write

$$\mathrm{E}_t = \sum \varepsilon_{i,t} \mathrm{P}_{i,t} \,, \tag{1}$$

where $\varepsilon_{i,t}$ indicates healthcare expenditures per head of age group i at time t and $\mathrm{P}_{i,t}$ represents the population age i at time t. OECD (2004a) provides past population counts for the age groups *0-14*, *15-19*, *20-49*, *50-64*, *65-69*, *70-74*, *75-79*, and *80* plus. The subscript i references these age groups.

We assume the profile of age-specific health spending is constant through time and normalize the age-profile of average expenditures by dividing by average expenditures of age group *50-64* in year *t*. This defines:

$$(2)\qquad \begin{aligned} &\frac{\varepsilon_{0-14,t}}{\varepsilon_{50-64,t}}=\alpha_{0-14};\frac{\varepsilon_{15-19,t}}{\varepsilon_{50-64,t}}=\alpha_{15-19};\frac{\varepsilon_{20-49,t}}{\varepsilon_{50-64,t}}=\alpha_{20-49};\frac{\varepsilon_{50-64,t}}{\varepsilon_{50-64,t}}=\alpha_{50-64}=1;\\ &\frac{\varepsilon_{65-69,t}}{\varepsilon_{50-64,t}}=\alpha_{65-69};\frac{\varepsilon_{70-74,t}}{\varepsilon_{50-64,t}}=\alpha_{70-74};\frac{\varepsilon_{75-79,t}}{\varepsilon_{50-64,t}}=\alpha_{75-79};\frac{\varepsilon_{80\,plus,t}}{\varepsilon_{50-64,t}}=\alpha_{80\,plus}\end{aligned}$$

In what follows we treat absolute average real expenditures of age group *50-64* as the country's benefit level. Letting *b* stand for the base year, 1970, and assuming benefit levels grow at a constant annual rate, we have

$$(3)\qquad \varepsilon_{50-64,t}=\varepsilon_{50-64,b}(1+\lambda)^{t-b}$$

Use (2) and (3) to rewrite (1) as

$$(4)\qquad E_t=\varepsilon_{50-64,b}(1+\lambda)^{t-b}\sum_i \alpha_i P_{it}$$

Note that in the base year, $t=b$, so given the value of base-year aggregate healthcare spending (E_b), knowledge of the age-health expenditure profile (the α_is), and the base year age-specific population counts (the P_{it}s), we can use (4) to determine $\bar{\varepsilon}_{50-64,b}$. Setting $t=2002$ in (4), we can determine the value for λ.

Alternatively, if aggregate healthcare expenditures are measured with error, we can take logarithms of both sides of (4) to arrive at (5),

$$(5)\qquad \ln E_t^m-\ln(\sum_i \alpha_i P_{it})=\ln\bar{\varepsilon}_{50-64,b}+(t-b)\ln(1+\lambda)+v_t,$$

where v_t stands for a measurement error and E_t^m stands for measured aggregate healthcare expenditures. By estimating (5) we can recover estimates of $\bar{\varepsilon}_{50-64,b}$ as well as λ. Given a value of λ for each country we can accomplish our paper's first two goals, namely comparing benefit growth rates across countries and decomposed total healthcare expenditure growth into the part due to benefit growth and the part due to demographics.

The recovered values of λ are also used to meet our third objective – projecting future aggregate government healthcare spending in the ten countries. In forming these projections we a) utilize Bonin's (2001) demographic program, which projects population by single age,[3] and b) use (4) to determine future values of E_t. In using (4), we a) take the base year b to be 2002, b) treat age group i as representing a single age of life, rather than as an age range, c) determine the value for $\varepsilon_{50-64,2002}$ by setting $t=b=2002$, and treat E_{2002} as measured with no error. Where sex- as well as age-specific relative healthcare expenditure profiles are available we also distinguish the age groups by sex. This is the case for Australia, Austria, Canada, Germany, Norway and the U.S.

We summarize the size of each country's projected future aggregate healthcare expenditures by comparing its present value with the country's present value of GDP, with both present values measured over the infinite horizon. In projecting GDP we assume that real per capita GDP grows in the future at the average rate observed in each country over our sample period -- 1970 through 2002.[4] In forming present values of both future healthcare spending and future GDP, we consider real discount rates of 3, 5, and 7 percent.

Unfortunately, we have only limited and recent data on healthcare expenditures by age for the ten countries. Hence, we are not in a position to investigate fully the extent to which healthcare expenditure profiles have changed through time and are likely to change in the future. If improvements in medical treatments and outcomes make the age-healthcare expenditure profile steepen over time, the overall benefit growth rate we calculate will

[3] Bonin's (2001) projection program is based on the component method proposed by Leslie (1945). The standard procedure has been extended to distinguish between genders and to incorporate immigration.
[4] This may overstate somewhat likely future growth in per capita output given the aging of the work force (see Benz and Fetzer (2004). If so, we will understate future healthcare expenditures as a share of future GDP.

overstate benefit growth at younger ages and understate it at older ages. If improvements in medical treatments and outcomes make the age-healthcare expenditure profile flatten over time, the opposite will be true.[5] In either case, it's not clear whether our calculated overall benefit growth rate will be biased up or down relative to the average we would otherwise be calculating with complete data.

III. Data

OECD (2004a) reports aggregate annual real public healthcare expenditures, valued at 1995 prices, for the years 1970 to 2002. As mentioned, the OECD also provides population counts for the eight age groups. We were able to obtain age-healthcare expenditure profiles for each country for either 2000 or 2001 from different academic and governmental sources. Data for Australia, Canada, Germany, the UK, and the U.S. come from the following respective government agencies: the Australian Institute of Health and Welfare (2004), the Minister of Public Works and Government Services Canada (2001), the German Federal Insurance Authority (2003), the United Kingdom Department of Health (2002) and the Centers for Medicaid and Medicare Services (2003). Austria's profile comes from Hofmarcher and Riedel (2002). Japan's profile comes from Fukawa and Izumida (2004). These authors also generated profiles for earlier years and conclude that the age-specific distribution of Japanese public health expenditure did not change significantly over the past decade. Norway's profile comes from Fetzer, Grasdal, and Raffelhüschen (2005) who analyze the Norwegian health sector within a Generational Accounting framework. Profiles for Spain and Sweden are based on the work of Catalán., et. al. (2005) and Ekman (2002), respectively.

[5] There is a growing literature on how medical advancements will affect healthcare spending at different ages and for different cohorts. See, for example, Buchner and Wasem (2004), Breyer and Felder (2004), Zweifel, Felder and Meiers (1999), Zweifel, Felder and Werblow (2004), Stearns and Norton (2004), and Miller (2001).

Age-Relative Expenditure Profiles

Figure 1 and table 2 present our age-relative expenditure profiles. The profiles decline with age at young ages. This reflects the costs of birth, vaccinations, infant care, and other treatments for young children. From age group 15-19 on, all profiles rise.[6] At older ages the slope of the profiles varies significantly across countries. In Austria, Germany, Spain, and Sweden, expenditures per head on those 75-79 and 80 plus are only twice the level of expenditures per head of the reference age group (50 to 64 years). At the other extreme, we have the U.S., where the oldest old receive benefits that average 8 to 12 times those received by members of the reference group. In between these two extremes we have Japan, Norway, the UK, Canada, and Australia, where the relative spending factors for the old range from 4 to 8.

Unlike the other countries, the U.S. government does not provide healthcare to the entire population.[7] Instead, it covers the lion's share of the healthcare costs of the very poor and of those over 65. It does this through its Medicaid and Medicare programs.[8] Medicare participants are primarily 65 and older, while Medicaid participants are primarily younger than 65. Hence, the shape of the age-government healthcare expenditure profile for the U.S. reflects, to a large extent, the fact that Medicaid covers a relatively small fraction of the population at any age, and certainly under 65, whereas Medicare covers everyone 65 and over. Stated differently, for age groups under 65, the average values of government health expenditures used to form the U.S. profile are averages over the entire population at a particular age, including those not eligible for Medicaid and, therefore, receiving no benefits.

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[6] In some of our profiles in figure 2 this is not the case. This is due to the structure of the reported data in some countries which is stated not per cohort but also per age group, sometimes very large ones (0 to 19 years). In such cases, the profile is flat for the first two age groups.

[7] Strictly speaking, Germany has no universal health insurance scheme. However, all but 10 percent of the population are insured by statute. Of those not statutorily insured, the largest group consists of civil servants whose "private" insurance plan is financed in large part by the government.

[8] For a detailed description of the U.S. public health insurance scheme see Iglehart (1999a, 1999b, 1999c).

If we consider the age-health expenditure profile simply of those over 65, we find the U.S. still spending a relatively large amount on the very old, but not dramatically more than several other countries. For example, the ratio of age 75-79 to age 65-69 average healthcare expenditure is 1.7 in the U.S. and 1.8 in the UK. That said, the fact that the U.S. profile is so steeply inclined compared to other countries and that so many people will be moving into the older age groups augers for very rapid overall healthcare expenditure growth in the U.S.

Population Projections

Our population projections incorporate age-specific mortality rates, age-specific fertility rates, net immigrations rates, initial age distributions of the population, age-specific net immigration rates, and assumptions concerning the future development of these variables. These country-specific data come from the website of the national statistic office or census bureau of the country in question as well as from the websites of Eurostat and of the Population Division of the UN. Our projections differ only slightly from the medium variant projections of the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2005).

IV. Findings

Tables 3 and 4 compare real levels and real growth rates of per capita government healthcare expenditures, benefits, and per capita GDP over our sample period. The benefit growth rates in table 3 are calculated assuming no measurement error in aggregate health expenditures. A quick glance at columns 3, 6, and 9 in table 3 shows two things. First, growth in per capita healthcare expenditures significantly outpaced growth in per capita GDP in all ten of our OECD countries. Second, the growth rate of benefit levels is very close to the growth rate of per capita expenditures in each country, indicating that growth in benefit levels (benefits at a given age), rather than changes in the age composition of the population or the fraction of the population eligible for benefits is primarily responsible for overall growth in expenditures per capita. Table 4 indicates that government healthcare expenditures now represent from 5.45 percent to 8.56 percent of GDP in the ten countries.

In 1970 Sweden recorded the highest level of per capita government healthcare spending, namely $940 measured in 2002 dollars. Norway's government, in contrast, spent almost one third less per person in that year. But by 2002, Norway's per capita expenditures totaled $3,366, surpassing Sweden's 2002 $2,128 amount by almost three fifths. This change reflects Norway's much higher benefit growth rate. Over the 32 year period, Norway's benefit level grew at an annual real rate of 5.04 percent, whereas Sweden's real benefit level grew at only 2.35 percent per year.

Norway recorded the highest growth in benefit levels over the period followed by Spain with a growth rate of 4.63 percent and the U.S. with a growth rate of 4.61 percent. A second set of countries -- Australia, Austria, Germany, Japan, and the UK – registered lower, but still very high, benefit growth rates, ranging from 3.30 percent to 3.72 percent. The remaining two countries –Canada and Sweden – had comparatively modest benefit growth rates, equaling 2.32 percent and 2.35 percent, respectively. The fact that Canada and Sweden appear at the bottom of the benefit growth ranking is not surprising given Canada's and Sweden's use of rationing to limit healthcare spending.[9]

Figure 2 compares growth in real per capita expenditures and real benefit levels in Japan and the U.S. The figure normalizes per capita expenditures and benefit levels by their respective 1970 values. Since Japan aged much more rapidly than did the U.S. during this period, one might expect per capital healthcare expenditures to have grown more rapidly in

[9] See for the Swedish situation for example Svenska Kommunförbundet (2004) and for the Canadian FN 26.

Japan.[10] But the reverse is true thanks to the much higher benefit growth rate recorded in the U.S.

What explains the high rates of benefit growth in these countries? The health economics literature connects benefit growth to costly product innovations.[11] A good example here is Spain's acquisition of CT scanners. As reported in OECD (2004a), Spain had only 1.6 CT scanners per one million inhabitants in 1984 compared with 11 per million in the U.S. By 2001 Spain had 12.3 CT scanners per one million inhabitants vs. 12.8 in the U.S.[12] Japan also expanded its use of medical technology over the 32 year period. Indeed, Japan appears to now have the largest number of CTs of any developed country.[13]

Of course, technology doesn't arise spontaneously. It is acquired, and at considerable cost. The willingness of developed economies to pay larger shares of income for advanced medical technology as well as medications suggests that health is a "luxury good," with an income elasticity greater than one.[14] If this is all the case, our estimator for λ, the growth parameter from equation (4), should be significantly larger than average GDP growth of the respective country. This, indeed, is the case. The income elasticity formed by taking the ratio of the benefit growth rates in column 6 of table 3 to the per capita GDP growth rates in column 9 range from 1.14 in Canada to 2.29 in the U.S. On average, this elasticity equals 1.73.

Table 5 indicates the share of total benefit growth over the 32 year period that's attributable to demographics. The table's first three columns present total healthcare

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[10] According to the OECD, the ratio of the Japanese population 65 years and older to the population under 65 tripled over our sample period.
[11] See Newhouse (1992) and Zweifel (2003).
[12] The number for this year is not reported for Australia. The most recent Australian number in OECD (2004a) is 20.8 CT scanners per one million inhabitants in 1995. This comparatively high number is probably due to Australia's special geographic situation.
[13] See also Reinhardt, Hussey and Anderson (2002) for this point.
[14] For a discussion and an overview about several studies concerning income elasticities of heatlhcare expenditures, see Roberts (1999).

expenditure growth rates, total healthcare expenditure growth rates absent growth in benefit levels, and overall GDP growth rates. The last two columns present ratios of healthcare expenditure growth rates to GDP growth rates with and without benefit growth.

Total real healthcare expenditure growth averaged 4.89 percent per year across the ten countries. Had there been no growth in benefits, this average would have equalled only 1.23 percent. Hence, three quarters of healthcare expenditure growth can be traced to growth in benefit levels.

During the same period that healthcare spending was growing at 4.89 percent per year in these ten countries, real GDP was also growing, just not as rapidly. The average annual real GDP growth rate growth averaged 2.87 percent. On average, the rate of healthcare growth exceeded the rate of GDP growth by a factor of 1.70. Absent benefit growth, this factor would have equalled only .42.

As the first column of Table 5 records, the U.S. clocked the highest annual average real growth rate of aggregate benefits at 6.23 percent per year. This growth rate is 2.01 times the corresponding 3.10 percent GDP growth rate. Had U.S. benefit levels not grown, U.S. government healthcare spending would not have grown twice as fast as the economy, but only half as fast. In addition to the U.S., Norway, Spain, Australia, and Spain all recorded growth rates of total real health expenditures in excess of 5 percent per year. Among all ten countries, Sweden had the most success in keeping healthcare spending from growing faster than the economy. But even in Sweden growth in healthcare spending outpaced growth in output by a factor of 1.45.

Accounting for Measurement Error

Up to this point we've treated our aggregate expenditure data as free of any reporting/measurement error. This may not be the case. Hence we now turn to estimating λ based on equation (5), rather than simply calculating it. Hansen and King (1996) show that health expenditure time series may not be stationary. So before estimating λ we test our dependent variable for stationarity using the Augmented-Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests. This analysis is preformed separately for every country.[15] Test statistics are reported in Table 6. Except for the cases of Canada and Sweden, the time series are trend-stationary, and we can estimate λ by OLS without any spurious interference.

Another potential problem is autocorrelation, which we address by using alternative techniques for estimating λ. As indicated in tables 7 and 8, these techniques are Prais-Winsten-estimation, Cochrane-Orcutt-estimation, and Maximum Likelihood estimation. For some countries we use a non-linear estimation approach where we include the autocorrelation error term in the estimation. This is necessary because some of the time series seem to have moving average autocorrelation disturbances.[16]

Our largest estimated benefit growth rate, assuming measurement error, is that of Norway with 5.0 percent, followed by Spain with 4.7 percent, and the U.S. with 4.5 percent. As in the previous section this could be considered as the high-growth-group. In the medium-growth-group with Australia, Austria, Germany, Japan and the UK λ ranges from 3.3 percent (UK and Germany) over 3.6 percent (Japan and Australia) to 3.8 percent

[15] See Dickey and Fuller (1979) and Phillips and Perron (1988). As independent variable we only have *time,* so only the regressand has to be tested.
[16] For an overview about these techniques see Greene (2003), Chapter 12.

(Austria). Canada and Sweden make up the low-growth-group with λ around 2.3 percent.[17] All estimated parameters are highly significant.

Sensitivity Analysis

How sensitive are our estimated benefit growth rates to the shapes of the age-benefit profiles shown in figure 1? This question is important, given that classification of health expenditures by age may differ across countries.[18] One way to examine this issue is to calculate benefit growth rates using an "average" profile. To produce such a profile, we estimated a polynomial using relative benefits by age for nine of our ten countries. We excluded the U.S. because it has no universal public health insurance system.

Figure 3 shows the estimated polynomial's fitted values. Table 9 compares the benefit growth rates implied by this polynomial age-benefit profile if one assumes that aggregate health expenditures are measured without error. As is clear from column 3, the use of this alternative profile does not materially alter calculated benefit growth rates. Indeed, the difference in computed growth rates differs at most by 0.3 percentage points. Take Australia, for example. Its value of λ is 3.66 percent using its own profile and 3.60 percent using the "average" profile. Spain has the biggest difference. Its calculated growth rate falls from 4.63 percent to 4.32 percent. Remarkably, even the U.S. calculated benefit growth rater remains largely unchanged in using what for the U.S. is clearly the wrong profile.

[17] Note that the regression results for Canada and Sweden may be spurious because the regressand is I(1) in both cases. However, the *t*-values of the estimated coefficient are 9.2 for Canada and 6.4 for Sweden, which are relatively high.

[18] See Reinhardt, Hussey and Anderson (2002).

Changes Over Time in Age-Benefit Profiles

As indicated, we are using quite recent profiles because earlier profiles are generally not available. An exception here is Canada, where data are available to construct age-benefit profiles for each year from 1980 through 2000. Figure 4 graphs these profiles, and table 10 presents the values of five of them. There is variation over time in the shape of the profile, but no clear trend. In 1980 average benefits for Canadians 85 plus were 14.4 times larger than Canadians age 50-64. This relation peaks in 1988 at a 16 to 1 ratio and then falls to a ratio of 14.3 to 1 in 2000.[19] Use of any of these profiles does not materially alter our estimate of Canada's benefit growth rate.

IV. Who's Going Broke?

Table 11 examines the present value budgetary implications of permitting benefit levels to continue to grow at historic rates. For reference, the second column presents 2002 healthcare spending as a share of 2002 GDP. The remaining columns show, for different discount rates, the present values of projected future healthcare spending relative to the present value of GDP. The four sets of columns assume that benefit levels grow at historic rates (see column 7 of table 3) for the number of years indicated at the top of the columns and then grow at the same rate as per capita GDP (see the last column of table 3). We consider real discount rates of 3, 5, and 7 percent. A 3 percent discount rate may be most appropriate given the low prevailing rates of long-term inflation indexed bonds in the U.S. and abroad. On the other hand, the spending streams being discounted are uncertain, which suggests using a higher discount rate to adjust for risk.

[19] Walker and Wilson (2001) and Naylor (1992) show that waiting times for certain treatments in Canada have changed through time, which, presumably, accounts in part for changes over time in the age-benefit profile.

Consider first columns 3-5 -- the case that benefit growth is immediately stabilized. Under this assumption Canada and Germany have the largest present value costs when scaled by the present value of GDP. The reasons are three. First, both countries have relatively high current benefits, which they provide to their entire populations. Second, both countries are slated to age very significantly. And third, and most important, both countries have very steep age-benefit profile.

Next consider the size of scaled healthcare costs if benefit levels continue to grow at historic rates for 40 years. In this case, the U.S. has the highest scaled costs for discount rates of 3 and 5 percent. At a 7 percent discount rate, Norway takes first place. Interestingly, Austria turns out to be the low scaled present value cost country at each discount rate. At a 3 percent discount rate, Austria's cost is 9.48 percent of future GDP. This is much lower than, for example, Germany's 14.99 percent cost figure. Since Austria and Germany have very similar demographics, historic benefit growth rates, and age-benefit profiles, what explains the difference? The answer is that Austria has a significantly higher historic growth rate of per capita GDP. Hence, the denominator in Austria's cost rate – the present value of future GDP – is relatively high compared to that of Germany.

At a 3 percent discount rate, the U.S. is projected to spend 18.85 cents of every present dollar the country produces on its two healthcare programs – Medicare and Medicaid. At a 7 percent discount rate, the figure is 14.98 cents on the present value dollar. Given that the U.S. government is now spending 6.57 percent of GDP, this projection implies a huge additional fiscal burden on the American public. Norway is in similar shape in terms of its healthcare costs, but Norway does not have to bear the burden of paying for a large military. In addition, it has significant oil wealth to help cover its costs.

The comparison between Japan and the U.S. is quite interesting. At a 3 percent discount rate Japan's costs are 12.95 percent of future GDP compared with 18.85 percent. At a 7 percent discount rate the respective figures are 10.17 percent and 12.51 percent. How can the U.S. have so much higher present value costs when Japan is already so old and will end up much older than the U.S. will end up? The answer is that Japan has a lower benefit growth rate, a higher per capita GDP growth rate, and a much flatter age-benefit profile.

Turn next to the 20-year benefit growth figures. In the case of the U.S., for example, letting benefit grow at historic rates for just 20 years leads to a 13.24 percent cost at a 3 percent discount rate. This figure is quite high on its own and also quite high relative to the 18.85 percent cost that arises with 40 years of benefit growth. The message then is that letting benefits grow at historic rates even on a relatively short-term basis is extremely expensive. It locks in high benefit levels for years and generations to come.

Finally, consider the 60 benefit growth scenario. In this case, at a 3 percent discount rate, the U.S. ends up spending 26.42 cents of every present dollar the economy generates on its government healthcare programs. Not far behind are Norway, which spends 22.99 cents, Germany, which spends 17.44 cents, and Australia, which spends 17.15 cents. The lowest costs, again, are those of Austria, which spends 11.05 cents.

V. Conclusion

Growth since 1970 in aggregate healthcare spending by our ten OECD governments reflects first and foremost growth in benefit levels (healthcare spending at any given age). Indeed, three quarters of overall healthcare expenditure growth and virtually all of growth in healthcare expenditure per capita reflect growth in benefit levels. Although OECD countries are projected to age dramatically, growth in benefit levels, if it continues apace, will remain the major determinant of overall healthcare spending growth.

The very rapid growth in benefit levels documented here is clearly unsustainable. No country can spend an ever rising share of its output on healthcare. Benefit growth must eventually fall in line with growth in per capita income. The real question is not if, but when, healthcare benefit growth will slow down. Raising benefit levels is one thing. Cutting them is another. If OECD governments spend the next three decades expanding benefit levels at their historic rates, the fiscal repercussions will be enormous.

The fiscal fallout is likely to be particularly severe for the United States. Like Norway and Spain, its benefit growth has been extremely high. But unlike Norway, Spain, and other OECD countries, the U.S. appears to lack both the institutional mechanism and political will to control its healthcare spending. America's elderly are politically very well organized, and each cohort of retirees has, since the 1950s, used its political power to extract ever greater transfers from contemporaneous workers. The recently legislated Medicare drug benefit is a case in point. Although the present value costs of this transfer payment is roughly $10 trillion, not a penny of these costs is slated to be paid for by the current elderly.

There is, of course, a limit to how much a government can extract from the young to accommodate the old. When that limit is reached, governments go broke. Of the ten countries considered here, the U.S. appears the most likely to hit this limit.

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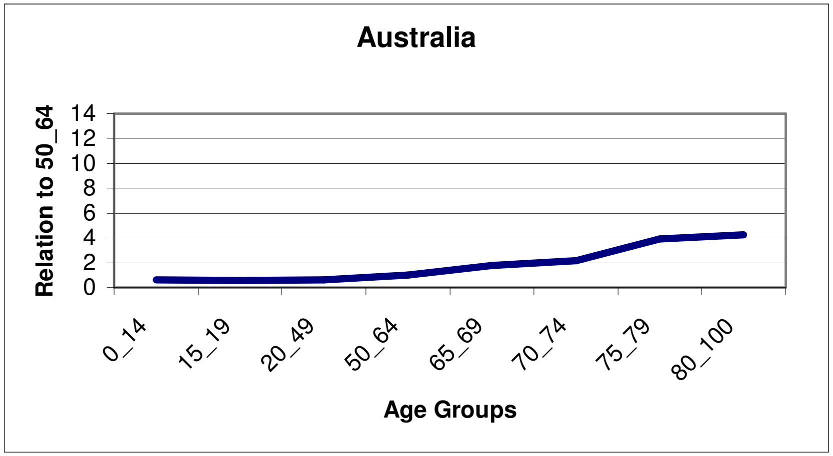
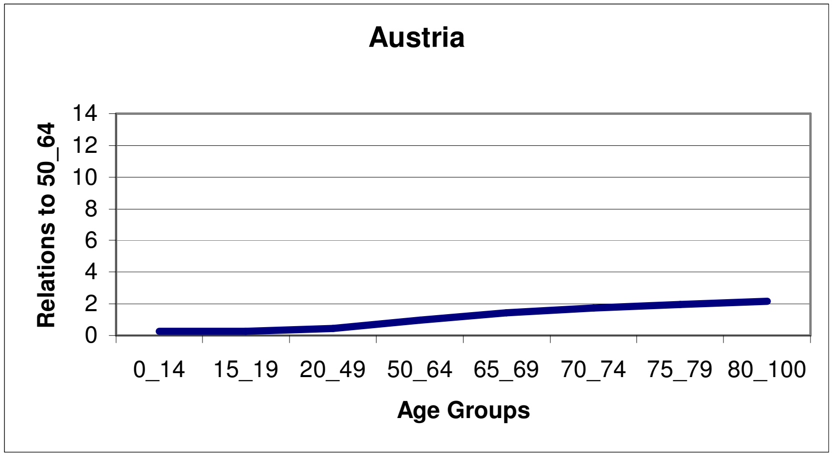
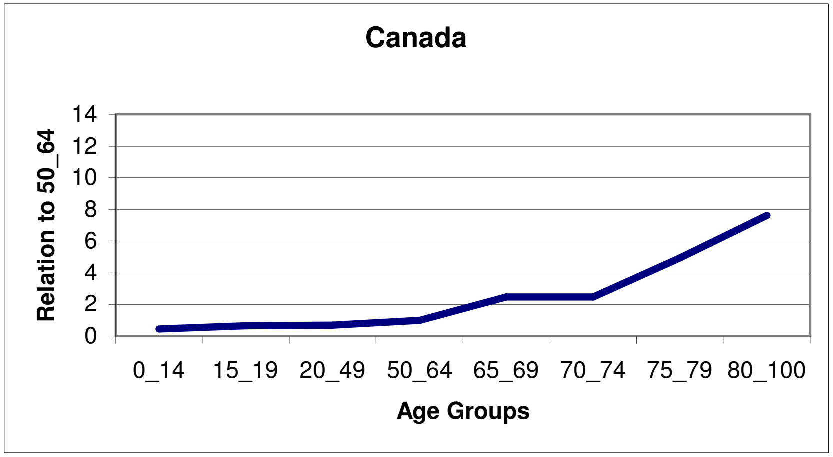
Figure 1 – Healthcare Benefit Age Profiles



Source: Australian Institute of Health and Welfare (2004), own calculations



Source: Hofmarcher and Riedel (2002), own calculations



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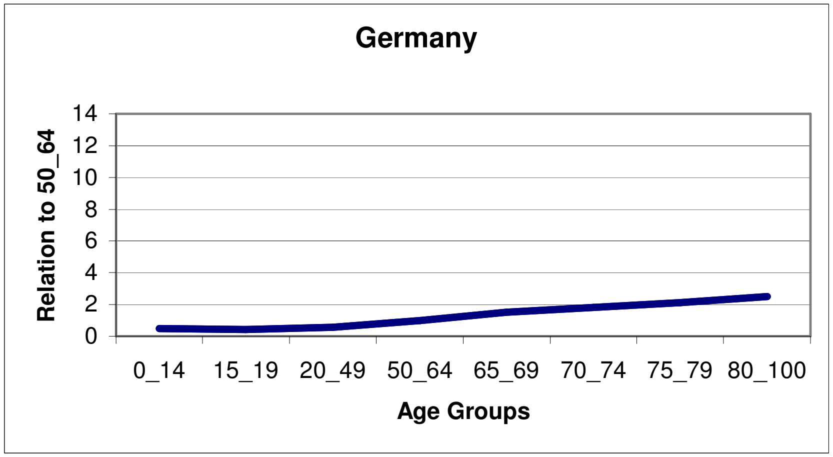
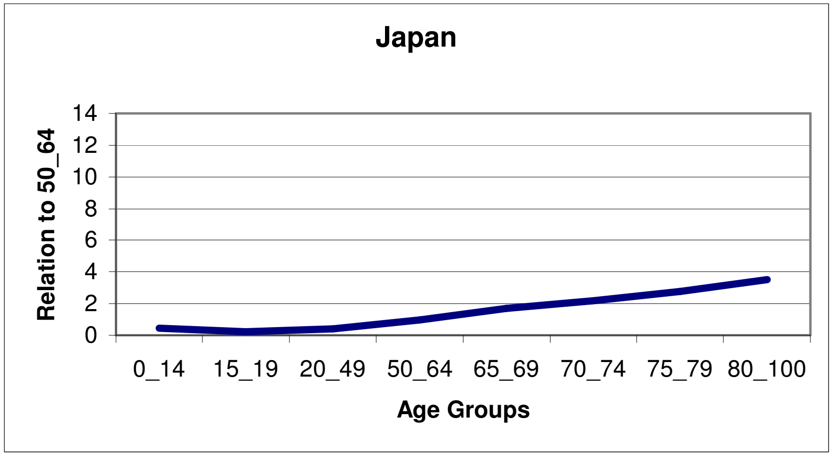
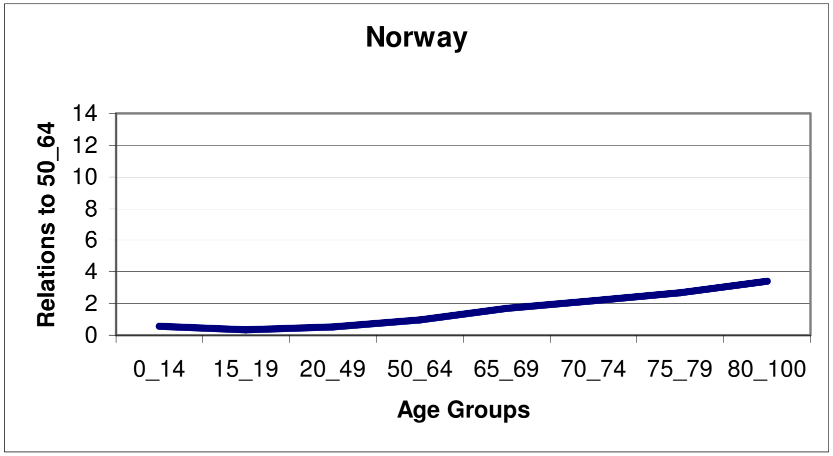


Source: German Federal Insurance Authority (2003), own calculations



Source: Fukawa and Izumida (2004), own calculations



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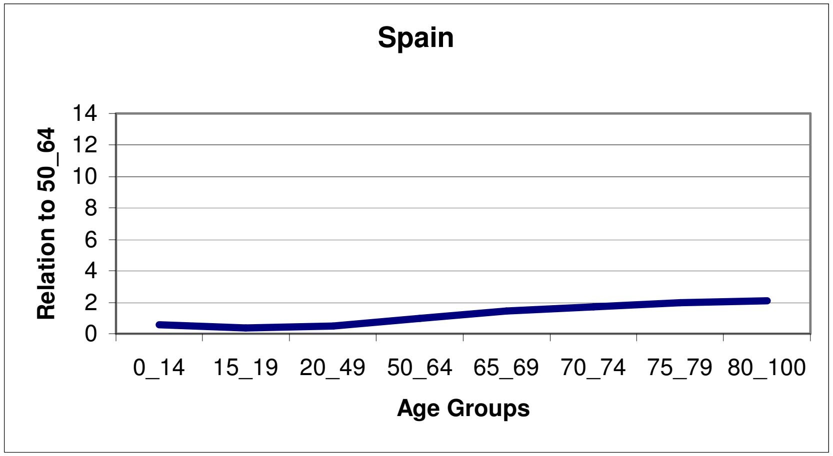
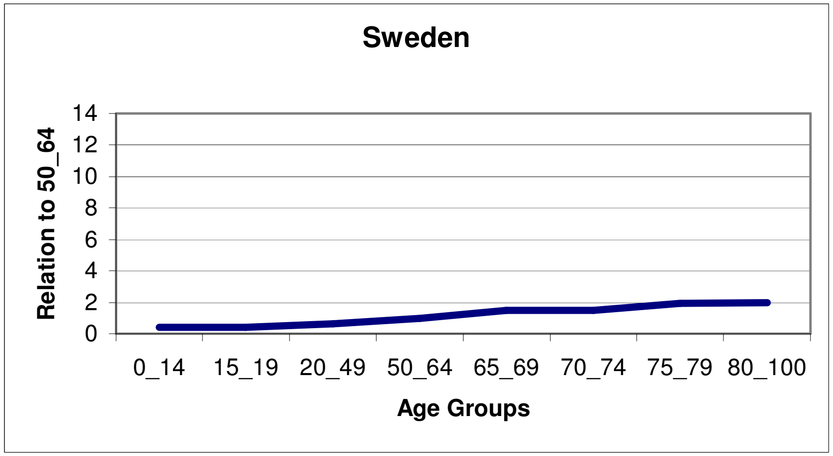
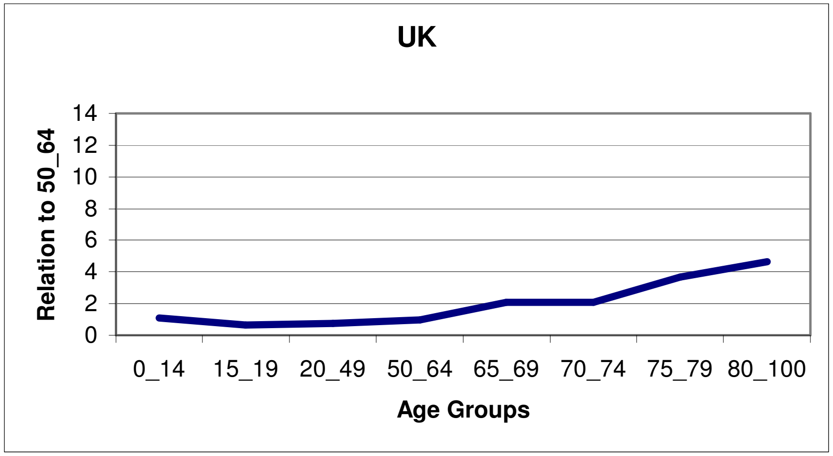


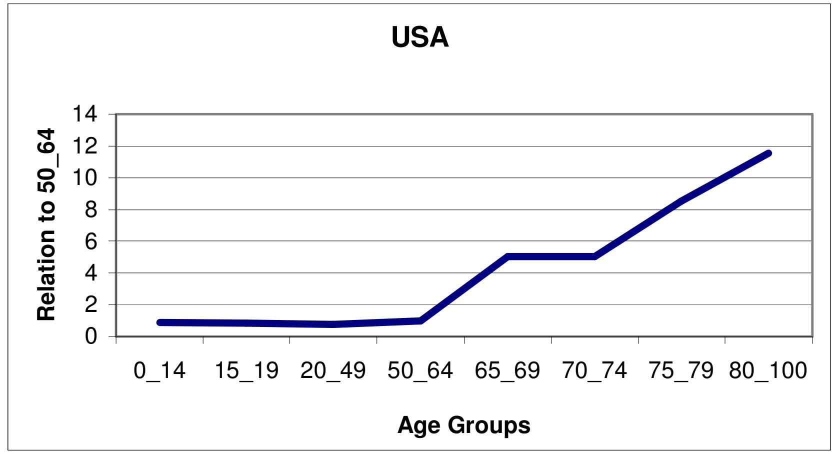
Source: Catalán et al. (2005), own calculations



Source: Ekman. (2002), own calculations



Source: Department of health UK (2002), own calculations



Source: Centers for Medicaid and Medicare Services (2003), own calculations

Table 1

Elderly Share of the Population

(percent)

Country	2002	2030	2050	2070
Australia	12.2	20.4	24.0	25.2
Austria	15.5	24.4	29.1	31.1
Canada	13.0	23.6	26.7	27.1
Germany	17.1	26.3	30.6	31.3
Japan	18.0	29.9	36.8	37.7
Norway	15.1	21.0	23.6	24.5
Spain	16.2	24.2	34.0	30.0
Sweden	17.2	25.5	28.5	29.3
UK	15.9	22.9	26.1	27.3
US	12.4	19.1	21.3	21.6
Average	**14.8**	**22.6**	**25.9**	**25.6**

Source: United Nations (2005)

Table 2

Healthcare Benefit-Age Profiles

	0 – 14	15-19	20 – 49	50 – 64	65 – 69	70 – 74	75 – 79	80 +
Australia	0.60	0.57	0.64	1.00	1.81	2.16	3.90	4.23
Austria	0.28	0.28	0.46	1.00	1.42	1.75	1.98	2.17
Canada	0.43	0.61	0.65	1.00	2.45	2.44	4.97	7.54
Germany	0.48	0.43	0.58	1.00	1.52	1.80	2.11	2.48
Japan	0.44	0.22	0.43	1.00	1.70	2.20	2.76	3.53
Norway	0.57	0.34	0.52	1.00	1.70	2.21	2.69	3.41
Spain	0.57	0.39	0.48	1.00	1.46	1.73	1.97	2.11
Sweden	0.43	0.43	0.63	1.00	1.50	1.50	1.96	1.99
United Kingdom	1.08	0.65	0.76	1.00	2.07	2.07	3.67	4.65
United States	0.88	0.82	0.77	1.00	5.01	5.02	8.52	11.53

Table 3

Per Capita Healthcare Expenditures, Benefit Levels, and Per Capita GDP, 1970 and 2002

(2002 U.S. Dollars)

	1970 Per Capita Expenditure	2002 Per Capita Expenditure	Annualized Growth Rate	1970 Benefit Level	2002 Benefit Level	Annualized Growth Rate	1970 Per Capita GDP	2002 Per Capita GDP	Annualized Growth Rate
Australia	$362	$1,323	4.13%	$428	$1,351	3.66%	$11,916	$20,813	1.76%
Austria	$393	$1,375	3.99%	$587	$1,890	3.72%	$11,830	$25,570	2.44%
Canada	$589	$1,552	3.08%	$647	$1,350	2.32%	$12,073	$23,072	2.04%
Germany	$663	$2,066	3.62%	$842	$2,377	3.30%	$14,804	$24,143	1.54%
Japan	$457	$2,082	4.85%	$741	$2,274	3.57%	$14,419	$31,194	2.44%
Norway	$645	$3,366	5.30%	$772	$3,722	5.04%	$16,032	$42,032	3.06%
Spain	$175	$855	5.08%	$252	$1,074	4.63%	$7,477	$15,688	2.34%
Sweden	$940	$2,128	2.59%	$1,192	$2,511	2.35%	$15,833	$26,994	1.68%
UK	$528	$1,694	3.71%	$466	$1,383	3.46%	$13,474	$26,298	2.11%
US	$481	$2,364	5.10%	$334	$1,415	4.61%	$19,076	$36,006	2.01%
Average	$523	$1,880	4.14%	$626	$1,935	3.67%	$13,693	$27,181	2.14%

Table 4
Per Capita Government Healthcare Expenditures and Per Capita GDP, 1970 and 2002

(2002 U.S. Dollars)

	1970 Per Capita Expenditure	1970 Per Capita GDP	1970 Per Capita Expenditure as Percent of 1970 Per Capita GDP	2002 Per Capita Expenditure	2002 Per Capita GDP	2002 Per Capita Expenditure as a Percent of 1970 Per Capita GDP
Australia	$362	$11,916	3.04%	$1,323	$20,813	6.36%
Austria	$393	$11,830	3.32%	$1,375	$25,570	5.38%
Canada	$589	$12,073	4.88%	$1,552	$23,072	6.73%
Germany	$663	$14,804	4.48%	$2,066	$24,143	8.56%
Japan	$457	$14,419	3.17%	$2,082	$31,194	6.67%
Norway	$645	$16,032	4.02%	$3,366	$42,032	8.01%
Spain	$175	$7,477	2.34%	$855	$15,688	5.45%
Sweden	$940	$15,833	5.94%	$2,128	$26,994	7.88%
UK	$528	$13,474	3.92%	$1,694	$26,298	6.44%
US	$481	$19,076	2.52%	$2,364	$36,006	6.57%

Figure 2

Comparing Benefit Levels and Per Capita Healthcare Expenditures

in Japan and the U.S., 1970-2002

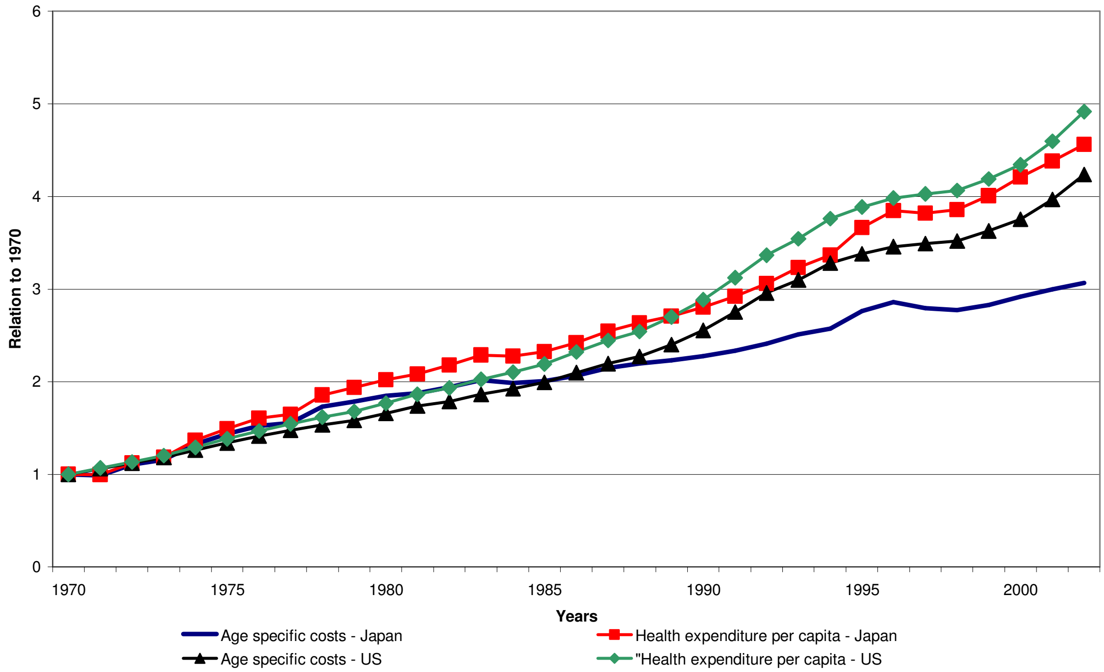


Table 5

Annual Growth Rates of Real Government Healthcare Expenditures and Real GDP, 1970-2002

Country	Real Healthcare Expenditure Growth Rate	Real Healthcare Expenditure Growth Rate Absent Growth in Benefit Levels	Real GDP Growth Rate	Ratio of Healthcare Expenditure Growth Rate to GDP Growth Rate	Ratio of Healthcare Expenditure Growth Rate Absent Growth in Benefit Levels to GDP Growth Rate
Australia	5.61%	1.96%	3.21%	1.75	0.61
Austria	4.23%	0.51%	2.68%	1.58	0.19
Canada	4.28%	1.96%	3.23%	1.32	0.61
Germany	4.62%	1.32%	2.52%	1.83	0.52
Japan	5.50%	1.94%	3.07%	1.79	0.63
Norway	5.82%	0.78%	3.57%	1.63	0.22
Spain	5.79%	1.16%	3.03%	1.91	0.38
Sweden	2.92%	0.57%	2.01%	1.45	0.28
UK	3.91%	0.45%	2.31%	1.69	0.20
US	6.23%	1.61%	3.10%	2.01	0.52
Average	**4.89%**	**1.23%**	**2.87%**	**1.70**	**0.42**

Source: OECD (2004a), own calculations

Table 6

Unit Root Test Statistics (ADF and PP)

Country	Augmented Dickey Fuller Test (ADF) Value	Phillips-Perron-Test (PP) Value
Australia	-3.23 (1)* [Trend & Intercept]	-3.02 [Trend & Intercept]
Austria	-3.05 (0)** [Intercept]	-3.00** [Intercept]
Canada	-2.40 (0) [Intercept]	-2.19 [Intercept]
Germany	-4.00 (0)** [Trend & Intercept]	-4.75*** [Trend & Intercept]
Japan	-3.01 (0)** [Intercept]	-3.35** [Intercept]
Norway	-3.52 (0)* [Trend & Intercept]	-3.73** [Trend & Intercept]
Spain	-3.47 (1)* [Trend & Intercept]	-3.41* [Trend & Intercept]
Sweden	-1.86 (0) [Intercept]	-1.72 [Intercept]
UK	-3.24 (1)* [Trend & Intercept]	-2.4 [Trend & Intercept]
US	-4.34 (0)*** [Trend & Intercept]	-2.14 [Trend & Intercept]

*,** and *** indicate the probability of error of 1%, 5% and respectively 10 %. The number in brackets in case of the ADF test stands for the number of lagged differences. See Dickey and Fuller (1979).

Table 7

Estimated Benefit Growth Rates

	No Measurement Error	OLS	Prais-Winsten	Cochrane-Orcutt	Maximum-Likelihood	ARMA(1,1)-Disturbances
Australia	3.66%	3.61%	3.57%	3.58%	3.58%	X
Austria	3.72%	4.36%	3.77%	3.77%	3.88%	X
Canada	2.32%	2.46%	2.32%	2.32%	2.33%	2.37%
Germany	3.30%	3.76%	3.29%	3.29%	3.38%	X
Japan	3.57%	3.87%	3.53%	3.54%	3.57%	X
Norway	5.04%	5.05%	4.91%	4.91%	4.92%	X
Spain	4.63%	5.26%	4.57%	4.57%	4.52%	4.62%
Sweden	2.35%	2.28%	2.28%	2.29%	2.28%	2.31%
UK	3.46%	3.17%	3.21%	3.21%	3.21%	X
US	4.61%	4.46%	4.44%	4.44%	4.43%	4.46%

Table 8

Estimation Details

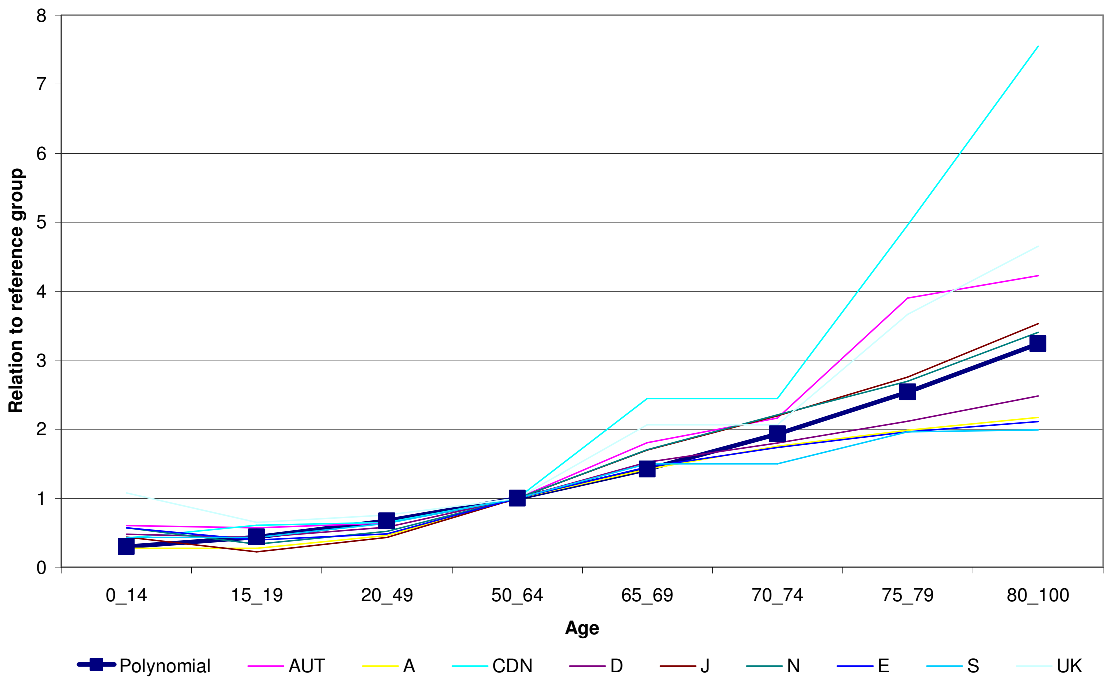
OLS (N=33)										
	AUT	**A**	**CDN**	**D**	**J**	**N**	**E**	**S**	**UK**	**US**
$\ln(\lambda)$	0.0361 (0.001)***	0.0436 (0.002)***	0.0246 (0.001)***	0.0376 (0.001)***	0.0387 (0.001)***	0.0505 (0.001)***	0.0526 (0.002)***	0.0228 (0.001)***	0.0317 (0.001)***	0.0446 (0.003)***
R^2 (adj)	0.9769	0.9595	0.9685	0.9595	0.9798	0.9795	0.9653	0.9309	0.9932	0.9984
DW	0.3973	0.1172	0.1245	0.0865	0.1002	0.1528	0.0779	0.0798	0.3611	0.2193
Prais-Winsten (N=33)										
	AUT	**A**	**CDN**	**D**	**J**	**N**	**E**	**S**	**UK**	**US**
$\ln(\lambda)$	0.0357 (0.003)***	0.0377 (0.006)***	0.0232 (0.003)***	0.0329 (0.005)***	0.0353 (0.004)***	0.0491 (0.004)***	0.0457 (0.007)***	0.0228 (0.004)***	0.0321 (0.001)***	0.0444 (0.001)***
R^2 (adj)	0.8628	0.5253	0.6932	0.5556	0.7356	0.8085	0.5860	0.5441	0.9559	0.9886
DW	1.5996	1.4230	1.2849	1.6962	1.5824	1.7085	0.9675	1.3113	1.4202	0.6900
Cochrane-Orcutt (N=32)										
	AUT	**A**	**CDN**	**D**	**J**	**N**	**E**	**S**	**UK**	**US**
$\ln(\lambda)$	0.0358 (0.003)***	0.0377 (0.006)***	0.0232 (0.003)***	0.0329 (0.005)***	0.0354 (0.004)***	0.0491 (0.004)***	0.0457 (0.007)***	0.0229 (0.004)***	0.0321 (0.001)***	0.0444 (0.001)***
R^2 (adj)	0.8628	0.5266	0.6943	0.5563	0.7373	0.8095	0.5867	0.5438	0.9561	0.9894
DW	1.5994	1.4226	1.2846	1.6958	1.5817	1.7080	0.9673	1.3113	1.4210	0.6893

Maximum-Likelihood (N=33)										
	AUT	**A**	**CDN**	**D**	**J**	**N**	**E**	**S**	**UK**	**US**
ln(λ)	0.0358 (0.002)***	0.0388 (0.005)***	0.0233 (0.002)***	0.0338 (0.004)***	0.0357 (0.003)***	0.0492 (0.004)***	0.0452 (0.008)***	0.0228 (0.003)***	0.0321 (0.001)***	0.0443 (0.001)***
AR(1)	0.7818 (0.107)***	0.9723 (0.065)***	0.9247 (0.063)***	0.9355 (0.056)***	0.9411 (0.057)***	0.9071 (0.068)***	0.9872 (0.038)***	0.9413 (0.484)***	0.8077 (0.101)***	0.8891 (0.075)***
LogL	43.54	45.98	68.27	55.75	63.73	48.73	48.47	64.29	69.38	89.20
ARMA(1,1)-Disturbances (N=32)										
	AUT	**A**	**CDN**	**D**	**J**	**N**	**E**	**S**	**UK**	**US**
ln(λ)	**X**	**X**	0.0237 (0.003)***	**X**	**X**	**X**	0.0462 (0.011)***	0.0231 (0.004)***	**X**	0.0446 (0.001)***
AR(1)	**X**	**X**	0.8858 (0.090)***	**X**	**X**	**X**	0.9568 (0.082)***	0.9160 (0.076)***	**X**	0.7396 (0.118)***
MA(1)	**X**	**X**	0.7068 (0.108)***	**X**	**X**	**X**	0.4551 (0.167)**	0.5752 (0.157)***	**X**	0.9557 (0.031)***
R^2 (adj)	**X**	**X**	0.9815	**X**	**X**	**X**	0.9804	0.9595	**X**	0.9991
DW	**X**	**X**	2.1151	**X**	**X**	**X**	1.7886	2.1895	**X**	1.8890

*,** and *** indicate the probability of error of 1%, 5% and respectively 10 %. In the ARMA(1,1) case the disturbance is estimated as follows: $u_t = \rho \times u_{t-1} + \theta \times \varepsilon_{t-1} + \varepsilon_t$. ε_t are iid N(0,σ2).

Australia	AUT	Canada	CDN	Japan	J	Spain	E	United Kingdom	UK
Austria	A	Germany	D	Norway	N	Sweden	S	United States	US

Figure 3 – Polynomial estimation



The curve is estimated as $0.28 + 0.05 agegroup^2$ while *agegroup* is measured discretionary from 1 to 8.

Table 9

Benefit Level Growth Rates

Country	Original Profiles	Polynominal	Difference (percentage points)
Australia	3.66%	3.60%	0.06
Austria	3.72%	3.65%	0.07
Canada	2.32%	2.46%	-0.14
Germany	3.30%	3.17%	0.13
Japan	3.57%	3.83%	-0.26
Norway	5.04%	4.97%	0.07
Spain	4.63%	4.32%	0.31
Sweden	2.35%	2.20%	0.15
United Kingdom	3.46%	3.35%	0.11
United States	4.61%	4.71%	-0.10

Table 10

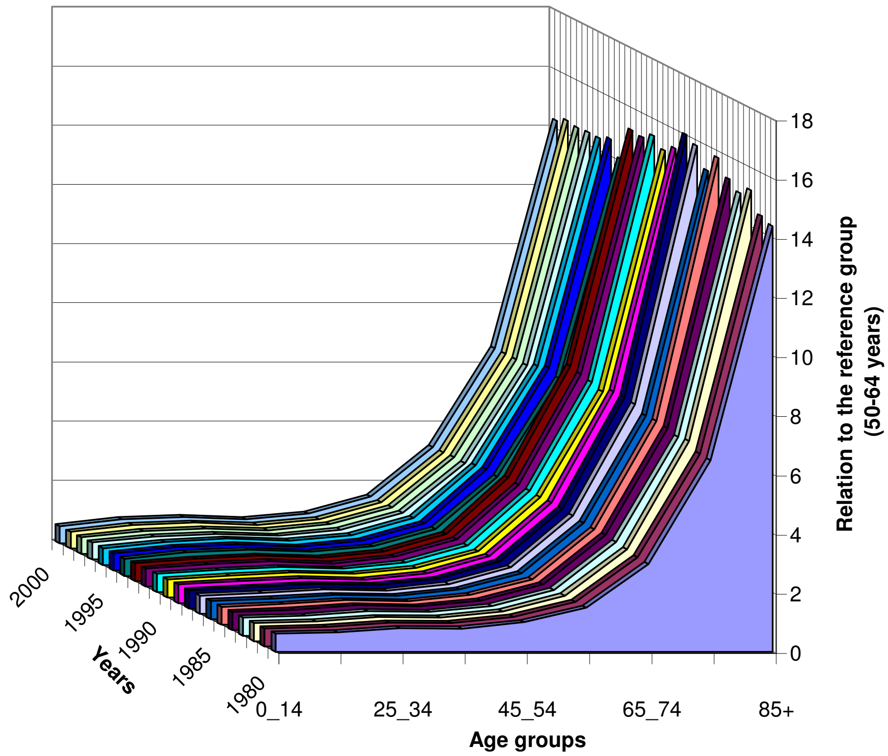
Canadian Age-Benefit Profiles

	0 – 14	15-24	25 – 34	35 – 44	45 – 54	55 – 64	65 – 74	75 – 84	85 +
1980	0.61	0.66	0.80	0.78	1.00	1.49	2.97	6.47	14.39
1985	0.61	0.70	0.83	0.78	1.00	1.53	3.22	6.89	15.76
1990	0.61	0.74	0.84	0.79	1.00	1.56	3.39	6.96	15.09
1995	0.57	0.78	0.88	0.80	1.00	1.59	3.42	6.85	14.57
2000	0.56	0.81	0.89	0.80	1.00	1.56	3.25	6.58	14.27

Source: Minister of Public Works and Government Services Canada (2001), OECD (2004a), own calculations

Figure 4

Canadian Age-Benefit Profiles, 1980 – 2000



Source: Minister of Public Works and Government Services Canada (2001), OECD (2004a), own calculations

Table 11

Present Value of Government Healthcare Expenditures as a Share of the Present Value of GDP

Country	Start 2002	Benefit Levels Grow at Historic Rate for 0 years			Benefit Levels Grow at Historic Rate for 20 years			Benefit Levels Grow at Historic Rate for 40 years			Benefit Levels Grow at Historic Rate for 60 years		
		R=3%	r=5%	r=7%	r=3%	r=5%	r=7%	r=3%	r=5%	r=7%	r=3%	r=5%	r=7%
Australia	6.36%	8.45%	7.75%	7.34%	10.73%	9.63%	8.92%	13.71%	11.59%	10.22%	17.15%	13.35%	11.13%
Austria	5.38%	6.81%	6.38%	6.09%	8.02%	7.39%	6.95%	9.48%	8.34%	7.58%	11.05%	9.12%	7.99%
Canada	6.73%	10.85%	9.54%	8.72%	11.27%	9.88%	9.00%	11.73%	10.18%	9.20%	12.16%	10.40%	9.31%
Germany	8.56%	10.19%	9.74%	9.45%	12.47%	11.67%	11.10%	14.99%	13.32%	12.21%	17.44%	14.54%	12.84%
Japan	6.67%	9.68%	8.86%	8.36%	11.22%	10.12%	9.42%	12.95%	11.24%	10.17%	14.65%	12.07%	10.60%
Norway	8.01%	9.95%	9.25%	8.83%	12.90%	11.69%	10.89%	17.22%	14.50%	12.75%	22.99%	17.33%	14.19%
Spain	5.45%	6.67%	6.40%	6.16%	8.89%	8.28%	7.76%	11.91%	10.26%	9.09%	15.61%	12.08%	10.03%
Sweden	7.88%	8.97%	8.67%	8.48%	9.77%	9.35%	9.07%	10.59%	9.90%	9.44%	11.35%	10.28%	9.64%
UK	6.44%	8.01%	7.48%	7.17%	9.54%	8.74%	8.24%	11.37%	9.93%	9.02%	13.33%	10.90%	9.52%
US	6.57%	9.50%	8.38%	7.73%	13.24%	11.35%	10.16%	18.85%	14.98%	12.51%	26.42%	18.82%	14.45%