

The Influence of Age Structure on Savings and Social Spending

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1. Introduction

Changes in the age structure in the OECD countries and in some Asia-Pacific emerging market economies are likely to affect economic developments in the medium-term. In particular, saving patterns are expected to alter when the elderly become a larger proportion of consumers and savers, with widespread implications for capital and good markets. Social spending is also likely to adapt to the evolving age structure of the population. This will have major implications for public long-term sustainability.

This chapter seeks to quantify the impact of the age structure on private saving and social spending, based on a review of the literature and on new panel data analyses covering OECD countries and Asia-Pacific economies.

The main findings are as follows:

- Age structure is a significant determinant of private saving in both OECD and Asia-Pacific economies. In particular, the old-age dependency ratio is estimated to be negatively correlated with household and private saving and this effect is robust to a range of tests. By contrast, the young-age dependency ratio generally does not have a significant impact on household savings rates in OECD countries. At the same time, the young-age dependency ratio is found to influence private saving, but the sign and the magnitude of the impact depends on geographical coverage and the model specification.

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- Age structure appears to influence social spending in OECD countries, with an increase in the old-age dependency ratio boosting social spending, and a rise in the young-age dependency ratio having the opposite effect. Here again, the old-age dependency channel is estimated to dominate. This finding reflects the marked influence of the old-age dependency ratio on old-age pension expenditure and, to a lesser extent, on active labor market programs, housing, and health-care spending. The results on health-care spending should nonetheless be interpreted with caution, as specific factors explaining this expenditure are only imperfectly captured in analyses through country fixed effects.

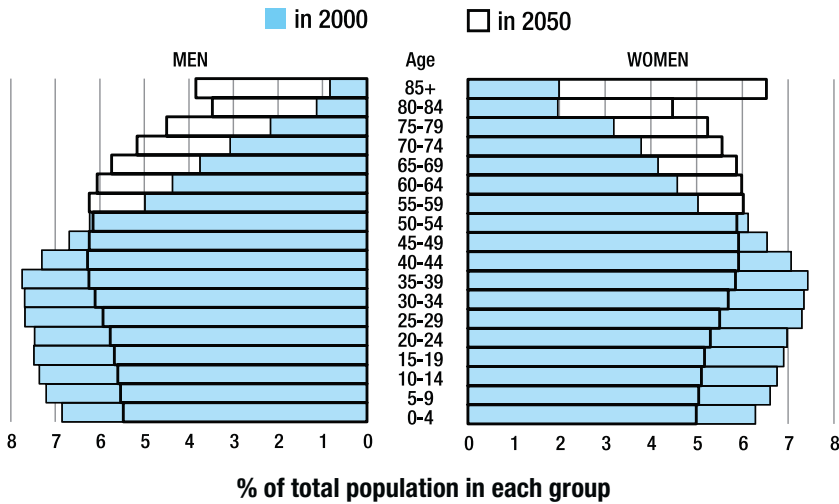
The chapter starts with a discussion of demographic trends both in OECD countries and in Asia-Pacific economies. It then turns to the impact of these trends on private saving. The effect of the age structure on aggregate social spending and its breakdown by components is then analyzed. The final section concludes and identifies policies that would help temper the effects of aging on saving and social spending, and ultimately on economic growth.

2. Demographic Trends in OECD and Asia-Pacific Economies

Population aging at the global level is rapid and will lead to a substantially higher proportion of elderly in the world over the next decades. Whereas the world population had a pyramid shape in 1990, it is expected to have a bell shape by 2050, with a marked increase in the number of persons aged between 40 and 65 years. This is particularly the case for the OECD countries (Figure 5.1), where the progressive aging of populations stems from a combination of the baby-boom in the early post-war period, the subsequent fall in fertility rates, and an increased life expectancy. Although aging is global, there are marked international differences in the speed and the extent of the aging process.

OECD population projections to 2050 suggest that most OECD countries will experience very modest growth or declines in the total population (Dang, Antolin, and Oxley 2001; OECD 2009a, 2009b). This will be accompanied by a fall in the working-age population and an increase in the number of elderly, particularly those over 80, leading to a near doubling, on average, of the ratio of elderly to the working-age population. For most countries, this ratio is projected to increase until about 2035–2045, and then to stabilize or decline slightly. Some countries will experience pressure due to aging populations

Figure 5.1: Population by Age Group and Gender, in 2000 and 2050, as Percentage of Total Population in Each Group



Source: Authors' estimate based on OECD data.

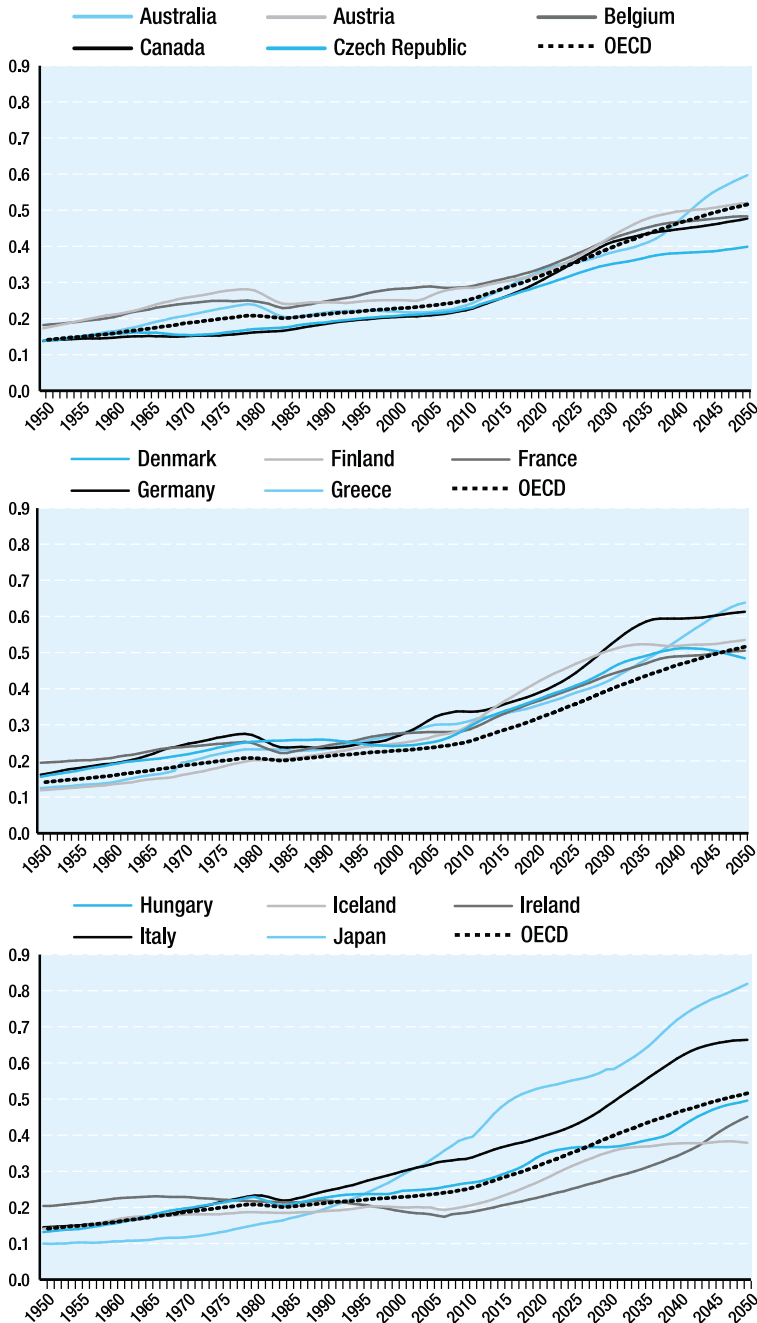
after 2050. OECD countries will also see a small decline in the ratio of youth to the working-age population.

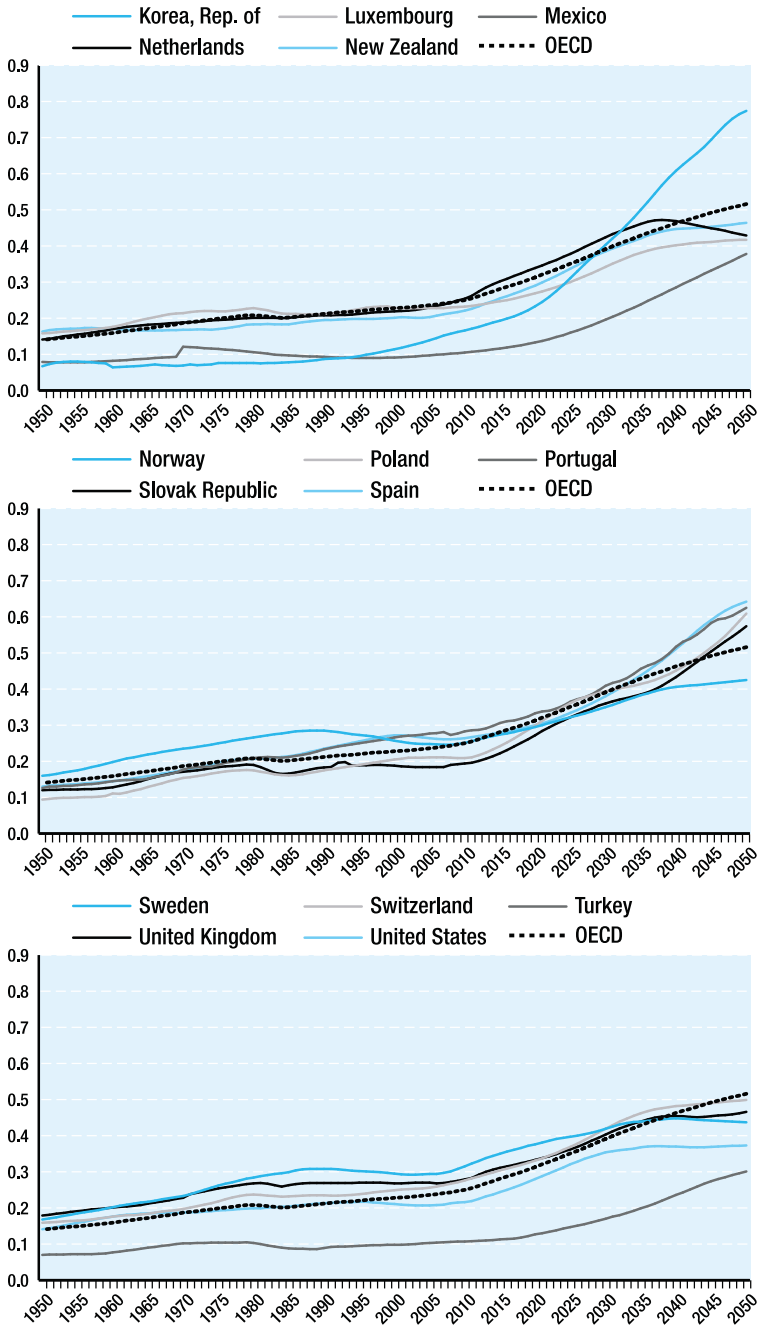
However, not all OECD countries will be affected by aging populations to the same extent (Figure 5.2). Europe has already a much older population than North America. Within Europe, the populations of Italy and Germany are aging faster than France. Countries where the population is currently relatively young, such as Mexico and Turkey, will experience a fast aging process.

Overall, while demographic developments will continue to sustain growth in the US, aging is likely to slow the GDP per capita growth in Japan and Europe. Previous evidence based on simulations suggests that aging could depress GDP per capita by an average of 0.2–0.3 percentage point per year during the next 50 years (Oliveira Martins et al. 2005). International flows of capital, goods and services, and labor will be important mechanisms moderating the effects of population aging in each individual country.

The populations of OECD Asian countries are predicted to age at an extremely rapid pace. The aging process accelerated in the 1990s in Japan and the proportion of elderly in that country is now higher than the average in OECD countries. This trend is expected to continue at a similar pace until 2050. Korea is predicted to be the country where population aging will occur at the

**Figure 5.2: Old-age Dependency Ratios in OECD Countries—
Historical and Projected Values, 1950–2050**





OECD = Organisation for Economic Co-operation and Development.

Source: OECD Demographic and Labour Force Databases.

fastest pace in the OECD, with the old-age dependency ratio¹ reaching 80% by 2050, close to the rate forecast for Japan. The populations of Australia and New Zealand are also projected to increase in age in the coming decades, but the old-age dependency ratio is expected to remain below the OECD average.

Significant aging is foreseen for many emerging market economies of East and Southeast Asia, although on average the share of the elderly in the population is projected to continue to be lower than in the OECD countries. The timing and the extent of aging will differ within the regions (Figure 5.3). The East Asian countries are further advanced in terms of population aging and their old-age dependency ratio is expected to rise sharply from 2010 to 2050. The aging pattern of the Chinese population is similar to that of East Asia. After 2010, the old-age dependency ratio in PRC is expected to increase gradually but would stay below that of East Asia; it is anticipated to be above 40% by 2050. The old-age dependency ratio is projected to start to rise in the Southeast Asian countries from 2020, and to stay below or close to 30% by 2050.

3. Does Demography Affect Private Saving?

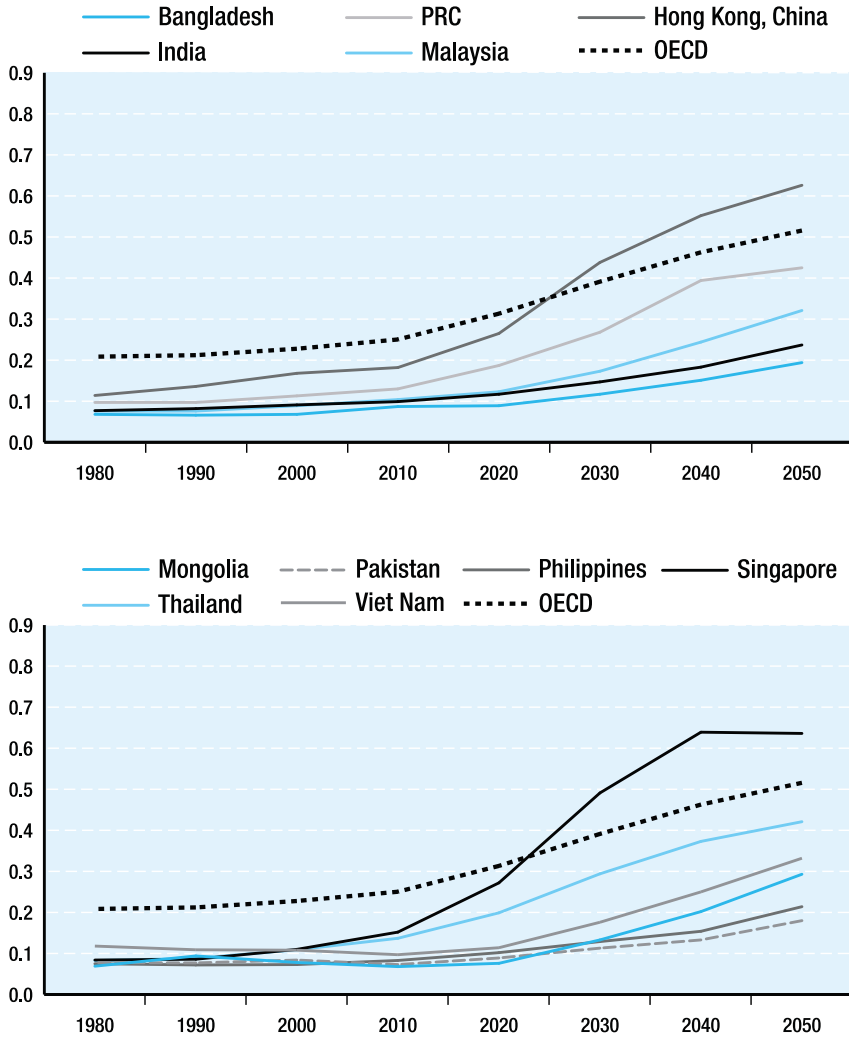
According to the life-cycle hypothesis, older people tend to have a higher propensity to be dissavers, consuming beyond their incomes (Ando and Modigliani 1963). In this framework, a country with a higher old-age dependency ratio will have a lower household savings rate because there will be more elderly dissavers and fewer people belonging in the category of the working-age population, who are generally net savers. Nonetheless, two factors may compensate for this trend. First, the expectation of greater longevity may encourage younger people to increase their savings. Secondly, the expectation of a higher lifetime income may encourage a new generation to increase their saving levels. It is likely, however, that these two effects would not fully offset the elderly dissaving, resulting in a negative relationship between saving and the old-age dependency ratio.

The empirical evidence based on microeconomics studies points to the existence of a partial consumption smoothing.² Household survey data suggest that total consumption displays a humped shape across age groups, but the hump-shaped income profile is even more pronounced for the elderly

¹ The old-age dependency ratio is defined as the ratio of the population over 65 years to the 15–65-year-old population.

² One important exception is Japan. Micro-evidence (Horioka 2009) shows that the life-cycle model is highly applicable in this country.

**Figure 5.3: Old-age Dependency Ratios in Pacific-Asian Countries—
Historical and Projected Values, 1980–2050**



OECD = Organisation for Economic Co-operation and Development.

Source: OECD (2009a).

population (Oliveira Martins et al. 2005).³ In addition, there is evidence that some elderly people may continue to be net savers during retirement, often through housing assets, for the motives of bequests or insurance. In particular, it is found that income-rich elderly run down their net worth at a very slow rate (Dynan, Skinner, and Zeldes 2004; De Nardi, French, and Bailey Jones 2009). Differences in life expectancy related to health, gender, and permanent income appear to be important factors explaining saving patterns, with the effect of each factor being of a similar order of magnitude.

At the macro-economic level, a significant link between the age structure and private saving has usually been found (Table 5.1). For instance, panel regressions conclude that saving is positively correlated with the proportion of working-age population in the total population, and negatively correlated with the old-age dependency ratio, with the latter effect often estimated to be larger than the former.⁴ However, estimates based on cross-sectional aggregate

Table 5.1: Effect of Age Structure on Private Saving

Authors	Scope	Coefficient on Elderly Dependency Rate
Feldstein (1980) Pool cross-section time series	Industrial countries Private savings	-1.21
Masson et al. (1995) Pool cross-section time series	High income and developing countries Private savings	-0.25
Weil (1994) Pool cross section time series	9 OECD countries Household savings	-1.36
Disney (1996) Pool cross-section time series	19 OECD countries Household savings	-2.025
Horioka (1991) Time series	Japan Private savings	-1.03
Schmidt-Hebbel et al. (1992) Cross-section	10 developing countries Household savings	-0.48
Modigliani and Sterling (1983) Cross-section	Industrial countries Private savings	-0.51
Heller and Symansky (1997) Pool cross-section time series	Asian Tigers Private savings	-1.54
Oliveira Martin et al. (2005) Pool cross-section time series	OECD countries Household savings	-4.267

Sources: Heller and Symansky (1997) and authors' compilation.

³ This evidence is not a direct test of the life-cycle hypothesis, as part of the results can be explained by time and cohort effects.

⁴ Savings encompass either private or household savings.

data have yielded larger and more significant coefficients than those derived from pooled time series data.

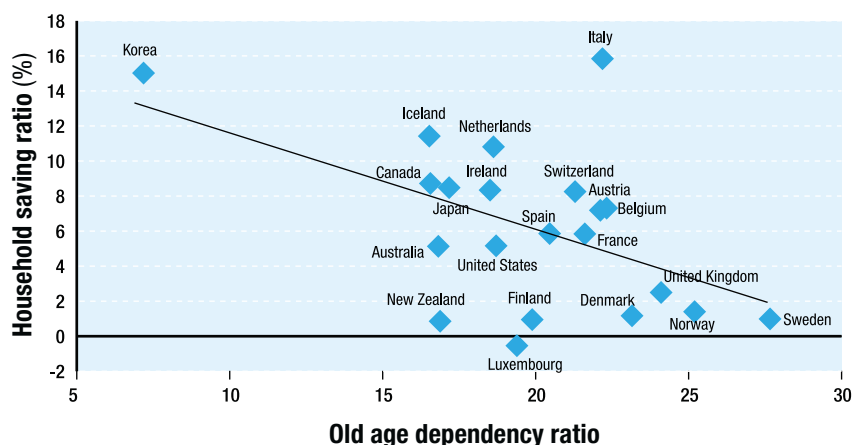
A simple scatter plot of household savings rates against old-age dependency ratios in the OECD countries suggests a negative relationship between the two, although there is a large variation across countries (Figure 5.4). In particular, Italy displays stronger savings rates than suggested by its old-age dependency ratio, whereas New Zealand and Luxembourg show a much lower rate of saving.

To get more insights into the effect of the age structure on saving, a saving equation was estimated for two groups of countries/economies, the OECD countries and Asia-Pacific economies,⁵ for an unbalanced panel of countries in 1980–2008.

$$\text{savings rate}_{it} = a_i + y_1 \text{CONTROL} + y_2 \text{DEMOGRAPHY}_{it} + \varepsilon_{it} \quad (1)$$

where savings rate is respectively the household savings ratio for the OECD countries and private saving (gross national saving–gross public saving) for OECD and Asia-Pacific economies; *CONTROL* is a set of macro-economic controls including fiscal balance (as share of GDP), social spending (as share of GDP), GDP per capita, GDP growth, and the unemployment rate. Fiscal balance

Figure 5.4: Household Savings Rates versus Old-age Dependency Ratio



Sources: OECD (2009a) and World Bank World Development Indicators.

⁵ The Asia-Pacific group incorporates Bangladesh; PRC; Hong Kong, China; India; Indonesia; Malaysia; Mongolia; Pakistan; Philippines; Singapore; Thailand; Viet Nam; Australia; and New Zealand.

seeks to capture any Ricardian household behavior whereby households increase their precautionary saving when they foresee tax increases in the future. Social spending is included, as it may reduce the need for precautionary saving. The unemployment rate corrects for cyclical movements. *DEMOGRAPHY* encompasses the old-age and the young-age dependency ratios.⁶ Country fixed effects have been included to account for country heterogeneity. Data for saving and age-dependency ratios are taken from World Bank's World Development Indicators and the OECD.

There are some econometric difficulties in estimating age-structure models as set up in equation (1), even though the age variable is certainly of better quality than many other variables used in empirical work. The age distribution is slow-moving and thus is difficult to discriminate from other potential secular trends in the data. Different age groups are correlated both within and between countries, leading to potential multicollinearity problems. The lack of harmonization prevents the inclusion of other important drivers of saving in the analysis such as asset prices. Finally, there may be some endogeneity issues, as income and income growth are unlikely to be fully exogenous in a saving equation.

Table 5.2 presents the results regarding household savings rates. The old-age dependency ratio had a significant negative correlation to saving in OECD countries. This finding appears robust to a range of robustness tests, including the introduction of additional demographic factors (such as mortality or birth rate) and social spending, the use of time fixed effects, and different estimation methods such as the 2-step generalized least squares (to control for heteroscedasticity and serial correlation) and the generalized method of moments (to control for endogeneity issues).

Overall, for OECD countries, a 1 percentage point rise in the old-age dependency ratio would lead to a 0.2–0.6 percentage point decrease in household savings rates. In contrast, the young-age dependency ratio mostly does not have a significant impact on household savings rates. Interestingly, social spending is found to influence saving decisions.⁷ More precisely, a 1 percentage point increase in social spending would reduce household savings by about 0.8 percentage point.

⁶ In theory, foreign capital inflow could influence savings. However, it is unclear why this should be incorporated in the analysis, as the saving ratio is an after-measure.

⁷ Barnett and Brooks (2010) report similar results in the case of the PRC, where government spending on health is found to reduce household saving. Spending on education would not generate a similar effect. Evidence is also more mixed for rural households.

Table 5.2: Saving Equation—Household Savings Rates

	Baseline	Baseline + Birth Rate	Baseline + Mortality Rate	Baseline + Social Spending	Baseline + Time Fixed Effects	Baseline - GLS	Baseline - GMM
OECD							
Saving ₍₋₁₎	-	-	-	-	-	-	0.893 (64.57)***
Deficit	-0.243 (-3.31)***	-0.238 (-3.14)***	-0.222 (-3.27)***	-0.254 (-2.92)***	-0.213 (-2.47)***	-0.22 (-10.01)***	-0.111 (-6.26)***
GDP growth	-0.036 (-0.55)	-0.026 (-0.42)	-0.081 (-1.22)	-0.124 (-2.33)**	0.004 -0.05	-0.105 (-4.12)***	-0.063 (-2.92)***
GDP per capita	1.03 -0.32	1.326 (0.43)*	7.561 (1.79)*	0.278 -0.08	3.421 -0.6	1.603 (3.22)***	0.888 (4.23)***
Unemployment rate	0.147 (1.84)*	0.164 (2.17)***	0.237 (3.08)***	0.071 -0.95	0.168 -1.55	-0.01 (-0.23)	-0.053 (-2.44)***
Social spending	-	-	-	-0.807 (-1.86)*	-	-	-
Social spending squared	-	-	-	0.017 (1.82)*	-	-	-
Old-age dependency ratio	-0.552 (-3.42)***	-0.541 (-3.29)***	-0.412 (-2.86)***	-0.386 (-1.65)*	-0.501 (-2.63)***	-0.223 (-3.01)***	0.07 (-2.99)***
Young-age dependency ratio	0.159 -0.87	0.141 -0.73	0.287 -1.6	0.144 -0.71	0.196 -0.88	0.036 (0.63)***	0.041 (2.93)***
Birth rate	-	0.128 -0.74	-	-	-	-	-
Mortality rate	-	-	0.07 (2.20)**	-	-	-	-
Number of observations	632	628	576	473	632	632	623
R²	0.9	0.9	0.89	0.92	0.9	-	-

GDP = gross domestic product, GLS = generalized least squares, GMM = generalized method of moments, OECD = Organization for Economic Co-operation and Development.

t-statistics in parentheses. *, **, *** Significance at 10%, 5%, and 1%, respectively.

Source: Authors' estimates.

The old-age dependency ratio was negatively correlated with private saving both in OECD and in Asia-Pacific countries (Table 5.3). In absolute terms, while an increase of 1 percentage point in the old-age dependency ratio would decrease private saving in OECD countries by 0.8 percentage point (baseline estimation), it would decrease private saving in Asia-Pacific economies by 2.6 percentage points. Several factors could explain the behavioral differences between the two areas, including differences in bequest motives and in social protection coverage. While it is difficult to test econometrically for these assumptions given the paucity of data, there are some indications that the low social protection coverage may be an important factor. Indeed, social spending in the non-OECD Asian countries was about 10 percentage point lower, in terms of GDP share, than in the average of OECD countries (OECD 2009b).

The young-age dependency ratio was also estimated to influence savings, but this effect varied depending on regional coverage and model specification. While there is evidence of a negative relationship for OECD countries, the impact of young-age dependency ratio on private saving was mostly statistically non significant for Asia-Pacific countries.

4. How Does Age Structure Influence Social Spending?

Private savings are only one facet of national savings. It is also crucial to look at the impact of demographic trends on public saving, which represents a sizable share of national saving in OECD countries and Asia-Pacific countries. Most assessments of the impact of aging on public sector saving have focused on calculating the specific implications for expenditure in key social sectors that are likely to be affected by demographic shifts. This includes old-age pension programs but also programs permitting early withdrawal from the labor market and social spending, in particular on health care and long-term care for the frail elderly, child and family benefits, and education.

An increase in the old-age dependency ratio is expected to increase total old-age social spending, as it implies a rising number of pensioners. At the same time, governments may be willing to decrease pensions as the number of elderly rises, to ensure the sustainability of the system. Finally, the magnitude of the effect is an empirical issue. Lindert (1996) found a positive and significant effect of the old-age dependency ratio on old-age spending. In the same vein,

Table 5.3: Saving Equation—Private Savings

	Baseline	Baseline + Birth Rate	Baseline+ Mortality Rate	Baseline + Social Spending	Baseline + Time Fixed Effects	Baseline - GLS
OECD						
Deficit	-0.476 (-3.96)***	-0.441 (-3.80)***	-0.481 (-3.98)***	-0.441 (-3.20)***	-0.452 (-3.18)***	-0.444 (-7.98)***
GDP growth	0.138 -1.61	0.142 (1.65)*	0.159 -1.61	0.171 -1.54	0.097 -0.95	0.034 -0.61
GDP per capita	-3.784 (-0.61)	-3.547 (-0.55)	1.67 -0.19	-1.165 (-0.22)	-2.032 (-0.22)	2.038 (1.88)*
Unemployment rate	0.307 (2.80)***	0.386 (2.73)***	0.42 (2.29)**	0.382 (2.56)***	0.261 (1.73)*	0.258 (3.38)**
Old-age dependency ratio	-0.876 (-3.33)***	-0.806 (-3.66)***	-0.737 (-2.67)***	-1.24 (-3.29)***	-0.684 (-1.96)*	-0.196 (-1.27)
Youth-age dependency ratio	-0.855 (-3.04)***	-0.904 (-3.40)***	-0.936 (-2.69)***	-0.878 (-4.48)***	-0.922 (-2.90)***	-0.423 (-3.85)***
Birth rate	-	0.272 -0.9	-	-	-	-
Mortality rate	-	-	0.098 -1.5	-	-	-
Social spending				-1.48 (-2.28)**		
Social spending squared				0.032 (2.43)**		
Number of observations	317	314	277	573	317	316
R²	0.95	0.95	0.95	0.32	0.95	
ASIA-PACIFIC						
Deficit	-0.76 (-3.02)***	-0.608 (-2.50)**	-0.466 (-0.84)	-	-0.951 (-4.53)	-0.722 (-3.80)***
GDP	-0.068 (-0.59)	-0.059 (-0.72)	1.181 -0.61	-	0.037 -0.2	0.012 -0.14
GDP per capita	22.767 (3.72)***	21.064 (3.14)***	22.863 (2.70)***	-	35.436 (3.88)***	3.901 (2.96)***
Unemployment rate	0.347 -1.21	0.36 -1.02	0.731 -1.23	-	0.614 (1.71)*	0.221 -0.74
Old-age dependency ratio	-2.593 (-3.66)***	-2.344 (-3.77)***	-1.492 (-1.78)***	-	-3.345 (-3.62)***	-2.043 (-9.25)***
Young-age dependency ratio	0.322 (2.37)**	0.203 -1.33	-0.022 (-0.06)	-	0.284 (1.12)*	-0.274 (-1.57)
Birth rate	-	0.121 -0.55	-	-	-	-
Mortality rate	-	-	0.91 (1.94)*	-	-	-
Number of observations	107	82	50	-	107	107
R²	0.95	0.96	0.67	-	0.71	-

GDP = gross domestic product, GLS = generalized least squares, GMM = generalized method of moments, OECD = Organization for Economic Co-operation and Development.

t-statistics in parentheses. *, **, *** Significance at 10%, 5%, and 1%, respectively

Source: Authors' estimates.

most long-term projections point to a rise in old-age spending due to population aging. Dang, Antolin, and Oxley (2001) found that total old-age spending as a percent of GDP rose on average by 3.4 percentage point from 2000 to 2050 for the countries included in their analysis.⁸ In particular, Spain, Norway, Korea, and the Czech Republic were predicted to experience the largest increases, close to or above 7 percentage point.

Past studies provide only limited guidance on the effect of the age structure on health expenditure, as there are numerous factors at play whose impact is quite uncertain. Key factors appear to be the rapid introduction of new technologies and greater demand for health care, itself a reflection of rising incomes and a more educated population.⁹ It is not clear which demographic factors will have the strongest effect on health-care spending. Empirical studies show that expenditure may be more related to nearness to death than to age (Zweifel, Felder, and Meiers 1999; Seshamani and Gray 2004a, 2004b).

Household survey data indicate that the share of health-care spending increases with age (Oliveira Martins et al. 2005). This increase is particularly pronounced in the US. However, despite large demographic trends, age-induced changes in the structure of consumption is expected to be relatively moderate at the aggregate level, as changes in the consumption share of age-sensitive products tend to offset each other across age groups. At the macro-economic level, authors have nonetheless found a significant positive effect of the old-age dependency ratio on health-care expenditure (Khomani and Weale 2007). However, Breyer (1999) showed that health-care expenditure in Germany was mostly influenced by technological progress and not by age. A similar result was found for the US (Okunade and Murthy 2002).

Family spending is another item that is likely to be sensitive to the age structure, in particular the young-age dependency ratio. Dang, Antolin, and Oxley (2001) projected a decline in family/child benefit stemming from the expected fall in the young-age dependency ratio in most OECD countries. From 1.6% of GDP in 1995, the share of these benefits on average in 11 OECD countries would steadily decline to close to 1% by 2035, and would stabilize at this level throughout 2050. However, family spending in Nordic countries would still be above average.

⁸ The study covered 21 OECD countries, including all the Group of Seven countries.

⁹ The role that technological advances play is complex. Some innovations have been cost-saving. Despite this, much of the impact of technology appears to have increased health-care costs (Jones 2003).

Building on this line of research, this paper focuses on the impact of age structure on social spending and its components. We first start with a descriptive analysis detailing the main features of social spending and how they relate to the age structure. Data for social spending are taken from the OECD Social and Welfare Statistics database and are available from 1980 to 2005. Nine social policy areas are identified: old age, survivors, incapacity-related, health, family, active labor market, unemployment, housing, and others.¹⁰

Social spending represents a significant share of government expenditure and GDP, on average about 43% and 19%, respectively (Table 5.4). There is, however, a large variation across countries, with total spending ranging from a bit more than 5% in Korea and Mexico over the sample to more than 25% in the Nordic and some continental European countries (Table 5.5). In contrast, country differences in terms of both level and composition of social spending have not evolved much over time. Social spending as a share of GDP displays an upward trend for most of the countries in the sample, the Netherlands being a clear exception.

Table 5.4: Social Spending Shares and Categories

(average for 1980–2006)

	% of Total Expenditure	% of GDP
Total	43.4	19.2
Old Age	14.3	6.3
Survivors	1.9	0.9
Incapacity-related	5.4	2.4
Health	12.1	5.2
Family	3.9	1.8
Active Labor Market Program	1.4	0.6
Unemployment	2.8	1.3
Housing	0.8	0.4
Other (policy areas)	1	0.5

Source: OECD Social and Welfare Statistics Database.

¹⁰ Public spending on Family includes financial support exclusively for family and children and encompasses child-related cash transfers to family, public spending on services for families, with children and financial support for families provided through the tax system. Spending for such items as health care or housing are not exclusively for families and therefore are not included in this item.

Table 5.5: Social Spending Shares and Categories by Countries (% GDP)

	T	O	S	I	HE	F	A	U	HO	OP
Australia	14.7	3.7	0.3	1.9	4.9	2.1	0.4	1.1	0.2	0.2
Austria	25.5	11.6	0.5	2.6	6.1	2.8	0.4	1	0.1	0.3
Belgium	25.8	7	2.5	3	6.4	2.6	1.1	3	0.1	0.4
Canada	17.7	3.9	0.5	1.1	6.4	0.9	0.5	1.5	0.6	2.5
Czech Rep.	18.7	6.6	0.4	2.4	6	2	0.2	0.5	0.1	0.6
Denmark	25.8	7.3	0	3.6	5.2	3.1	1.4	3.9	0.6	1
Finland	25.4	7.5	1	4.2	5.7	3	1	2.2	0.3	0.5
France	26.4	9.6	1.7	2.3	6.8	2.8	1	1.5	0.8	0.2
Germany	25.1	10.3	0.6	1.9	7.4	1.9	1.1	1.4	0.2	0.5
Greece	17.2	8.7	0.9	1.2	4.5	0.8	0.3	0.4	0.4	0.1
Iceland	15.9	4	0.1	2	6.2	2.6	0.1	0.4	0.1	0.4
Ireland	16.5	3.6	1	1.8	5.3	1.8	1	1.7	0.6	0.3
Italy	21.4	9.5	2.2	1.9	5.8	1	0.5	0.8	0	0
Japan	14.2	5.5	1.2	0.7	5.4	0.6	0.3	0.5	-	0.2
Korea, Rep. of	5.3	1.6	0.3	0.4	2.3	0.2	0.1	0.1	-	0.3
Mexico	5.4	0.8	0.3	0.2	2.4	0.5	0	-	0.7	0.4
Netherlands	23	5.6	0.6	4.9	5.4	1.7	1.2	2.4	0.4	0.8
New Zealand	19.2	6	0.2	2.4	5.6	2.4	0.7	1.1	0.5	0.2
Norway	22.4	6.8	0.4	4.6	4.1	3	0.8	0.7	0.2	0.7
Portugal	15.3	5.4	1.1	2.3	4.5	0.8	0.5	0.6	0	0.1
Spain	19.4	7	1.1	2.4	5.1	0.6	0.5	2.5	0.1	0.1
Sweden	29.8	9.1	0.7	5	7.1	3.7	1.9	1.4	0.8	0.7
Switzerland	17	6.2	0.4	2.6	4.7	1.2	0.5	0.6	0.1	0.7
United Kingdom	19.1	5.2	0.8	2.1	5.5	2.4	0.5	1	1.3	0.5
United States	14.6	5.4	0.9	1.2	5.3	0.7	0.2	0.5	1.4	0.5
AVERAGE	19.2	6.3	0.8	2.4	5.4	1.8	0.7	1.3	0.4	0.5

T = total social spending, O = old-age, S = survivors, I = incapacity-related, HE = health, F = family, A = active labor market program, U = unemployment, HO = housing, OP = other policy areas. (-) means missing.

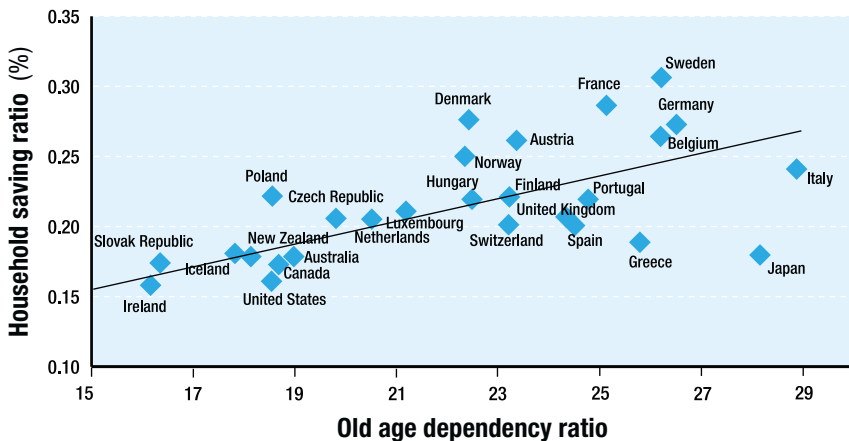
Source: OECD Social and Welfare Statistics Database.

Looking at the social-spending breakdown by category, old age and health are by far the largest components of social expenditure. These components represent on average 14.3% and 12.1%, respectively, of total government spending. Interestingly, the third largest category is Incapacity-related spending, followed by family spending. Spending on unemployment, active labor market programs, and housing represents a small share of the total.

Spending items that are sensitive to the age structure of the population are found to represent more than 30% of total public spending. This spending appears to be well correlated with the old-age dependency ratio (Figure 5.5). Nordic countries, and Sweden in particular, spend more on social expenditure than suggested implicitly by their old-age dependency ratio. By contrast, demographic factors would suggest larger social expenditures in some Southern European countries, but also the US, the UK, and Japan, than is in fact the case. Among the different components of social spending, the correlation with the old-age dependency ratio is the strongest for old age-related spending (Figure 5.6). Health spending appears to show a weak positive correlation with the old-age dependency ratio (Figure 5.7). The graphs in Figures 5.5, 5.6, and 5.7 should, however, be interpreted with caution as they do not control for the effects of additional variables.

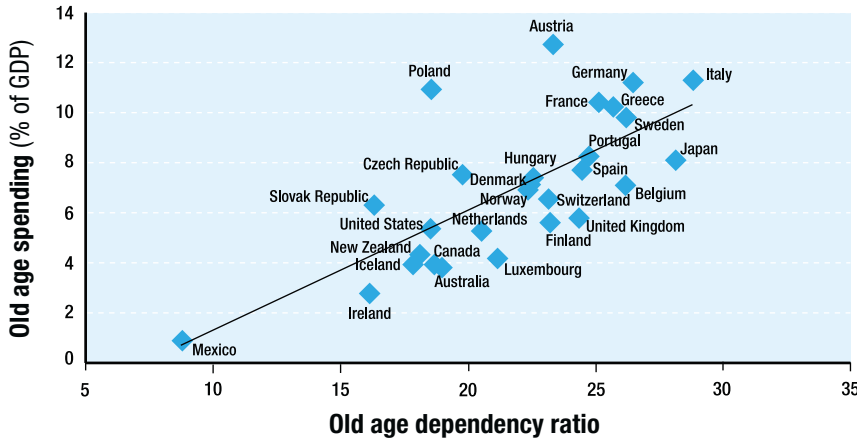
Moving to inferential analysis, an unbalanced panel of OECD countries was estimated over the period 1980–2005 to examine the relationship

Figure 5.5: Social Spending versus Old-age Dependency Ratio



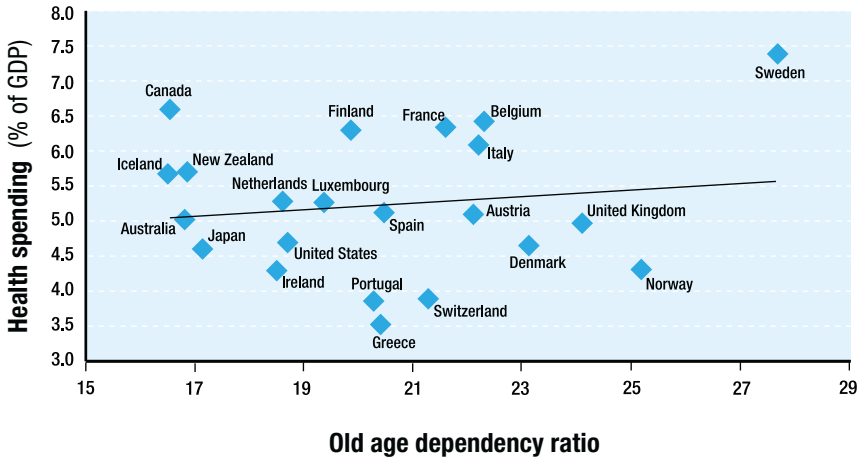
Source: OECD Social and Welfare Statistics Database and World Bank World Development Indicators.

Figure 5.6: Old-age Spending versus Old-age Dependency Ratio



Source: OECD Social and Welfare Statistics Database and World Bank World Development Indicators.

Figure 5.7: Health Spending versus Old-age Dependency Ratio



Source: OECD Social and Welfare Statistics Database and World Bank World Development Indicators.

between social spending and the age structure. The following specification is estimated:

$$\frac{\text{spending}}{\text{GDP}}_{it} = \beta_0 + \beta_1 \text{CONTROL} + \beta_2 \text{DEMOGRAPHY}_{it} + \varepsilon_{it} \quad (2)$$

where *spending* is total social spending and *CONTROL* is a set of macro-economic controls: public tax revenues, GDP per capita, GDP growth, and the unemployment rate. These factors correct for the cyclicity of social spending and the dependence of spending on the state of economic development. *DEMOGRAPHY* encompasses the old-age and the young-age dependency ratios. Country fixed effects have been incorporated. Equation (2) was estimated using ordinary least squares, but several robustness tests were carried out. First, the rate of birth and/or the rate of mortality were added to the set of demographic variables. Secondly, time fixed effects were considered. Finally, the equation was estimated using feasible least squares. Baseline results and robustness tests are reported in Table 5.6.

The old-age dependency ratio is found to be a significant determinant of total spending, with a rise in the ratio implying an increase in spending. This result appears to be extremely robust. A 1 percentage point increase in the old-age dependency ratio would lead to a 0.2 percentage point increase in total spending as a share of GDP. The magnitude of the coefficient ranges from 0.1 to 0.4 depending on the control variables included and on the estimation techniques. The young-age dependency ratio is also estimated to have a negative influence on total social spending in the OECD countries.

In a second step, individual social spending items were analyzed. This made it possible to identify which spending categories are driving the aggregate results. Results are reported in Table 5.6.

The old-age dependency ratio is found to have a positive influence on certain spending categories, in particular old age and, to a lesser extent, health, active labor market measures, and housing spending.¹¹ By contrast, the ratio is estimated to have a negative impact on unemployment benefit and incapacity-related spending. No significant effect of the old-age dependency ratio is found for survivors, family, and others spending, although the coefficient has the expected positive sign (Table 5.7).

¹¹ Results on health expenditure are in line with the expansion of the morbidity hypothesis (Gruenberg 1977). This result should nonetheless be treated with caution, as other demand-and-supply factors which usually drive health-care spending are only imperfectly captured through country fixed effects.

Table 5.6: Total Social Spending Equation

	Baseline	Baseline + Birth Rate	Baseline+ Mortality Rate	Baseline + Birth Rate + Mortality Rate	Time Fixed Effects	Baseline + Time Fixed Effects-GLS
Revenue	0.237	0.243	0.233	0.239	0.565	0.414
	(6.42)***	(6.44)***	(5.78)***	(5.98)***	(41.57)***	(21.06)***
GDP growth	-0.177	-0.177	-0.226	-0.198	-0.16	-0.02
	(-4.34)***	(-4.11)***	(-4.79)***	(-4.32)***	(-3.53)***	(-1.41)
GDP per capita	0.881	1.234	-2.837	-3.206	-0.294	0.134
	-1.06	-1.44	(-2.28)**	(-2.65)***	(-1.48)	-0.62
Unemployment rate	0.283	0.298	0.231	0.241	0.157	0.235
	(7.21)***	(8.66)***	(5.60)***	(6.06)***	(6.56)***	(8.13)***
Old-age dependency ratio	0.193	0.193	0.127	0.127	0.287	0.395
	(3.77)***	(3.68)***	(2.01)**	(2.00)**	(7.91)***	(7.90)***
Young-age dependency ratio	-0.141	-0.17	-0.19	-0.239	-0.039	-0.055
	(-5.08)***	(-4.99)***	(-4.82)***	(-5.51)***	(-2.03)**	(-2.39)**
Birth rate	-	0.173	-	0.313	-	-
		(2.88)***		(3.47)***		
Mortality rate	-	-	-0.049	-0.064	-	-
			(-4.00)***	(-5.02)***		
Number of observations	526	513	484	481	526	526
R²	0.95	0.95	0.94	0.94	0.9	

GDP = gross domestic product, GLS = generalized least squares.

t-statistics in parentheses. **,*** Significance at 10%, 5%, and 1%, respectively.

Source: Authors' estimates

The effect of the young-age dependency ratio varies widely across categories. It is estimated to have a negative but significant effect on old age, health, survivors, and housing spending. These results appear to drive the results found at the aggregate level. By contrast, the young-age dependency ratio would be positively correlated to family spending, which includes child subsidies.

Given the complexity of social policy and behaviors, this paper only presents incomplete evidence and is subject to important caveats. As already mentioned for savings, there may also be some endogenous issues associated with the

Table 5.7: Social Spending Equations by Category

	Old Age	Survivors	Incapacity-related	Health	Family	Active	Unemployment Benefits	Housing	Others
Revenue	0.018	0.03	0.046	0.048	0.028	0.02	0.042	-0.011	0.027
	-1.06	(4.11)***	(3.80)***	(4.97)***	(3.62)***	(3.79)***	(4.72)***	(-3.03)***	(6.45)***
GDP growth	-0.067	0.006	-0.013	-0.064	-0.027	0.001	-0.028	-0.005	-0.003
	(-3.82)***	-0.86	(-1.51)	(-6.35)***	(-3.63)	-0.17	(-3.45)***	(1.86)*	(-0.91)
GDP per capita	0.262	-1.618	-0.007	0.011	1.469	-0.286	-0.334	0.115	-0.063
	-0.48	(-6.35)***	(-2.15)*	(3.89)***	(6.82)**	(-2.14)**	(-2.24)**	(1.89)*	(-0.79)
Unemployment rate	0.097	-0.024	-0.084	-0.022	0.031	0.015	0.14	0.016	0.019
	(5.66)***	(-3.34)***	(-0.33)	(-2.04)**	(3.15)***	(2.39)**	(12.08)***	(5.13)***	(4.10)***
Old-age dependency ratio	0.156	0.003	-0.041	0.037	0.003	0.036	-0.026	0.016	0.008
	(6.98)***	-0.3	(-2.52)**	(2.19)**	-0.22	(4.09)***	(-2.20)**	(2.80)***	-1.28
Young-age dependency ratio	-0.121	-0.025	0.009	-0.016	0.027	0.002	-0.004	-0.006	0.001
	(-5.86)***	(-2.84)***	-1.18	(-1.67)*	(3.70)***	-0.7	(-0.46)	(-2.20)***	-0.32
Number of observations	526	526	526	533	525	491	516	439	498
R²	0.94	0.85	0.92	0.87	0.92	0.87	0.9	0.91	0.91

GDP = gross domestic product.

t-statistics in parentheses. *, **, *** Significance at 10%, 5%, and 1%, respectively.

Source: Authors' estimates

estimation of equation (2), as income level and growth may also be determined by social spending. One alternative would be to estimate a system combining social spending and growth equations (Lindert 1996), but this would also mean disregarding the time dimension of the data. Finally, the relation between social spending and age could be non-monotonic.¹²

¹² Lindert (1996) found that the squared old-age dependency ratio has a negative and significant effect on most spending categories, one main exception being health-care spending.

5. Conclusion

The empirical analysis undertaken in this paper points to a significant effect of the age distribution of the population on savings in both OECD and Asia-Pacific countries. Old-age dependency ratios were usually found to have a negative correlation to private or household saving. The effect of the young-age dependency ratio was less marked and was not always significant. The age structure also appears to influence social spending in OECD countries but, as expected, its effect varies across spending categories. In particular, an increasing aging population is likely to translate into increasing spending on old-age pensions.

There is no straightforward leap from these conclusions to results on national savings. Indeed, one would need to assume that the current share in GDP of other forms of government consumption, revenues, and social contributions remains unchanged. Moreover, one would have to assume that there are no offsetting increases in private savings arising from the decline in public sector savings. This assumption would run counter to empirical studies that suggest significant Ricardian effects (e.g., Schmidt-Hebbel, Webb, and Corsetti 1992).

Nonetheless, the results have important policy implications. First, population aging is likely to depress private saving and thus be detrimental to private investment and consequently long-term output. Policy should be put in place to temper the effect of an aging population. Promising avenues include pension and labor market policies encouraging private saving and employment of older workers. A prerequisite will be to ensure that financial markets are consistent with the optimal allocation of investments. For example, expanding the market for annuities could reduce any tendency to over-save for precautionary motives, and developing a reverse, or lifetime, mortgage scheme would make it easier to use non-liquid assets possibly more efficiently (Oliveira Martins et al. 2005). Secondly, it is important to account for the effect of age structure and its evolution over time when assessing the impact of social measures. This could inform the choice of social-spending categories that should be prioritized and could optimize the cost-efficiency of measures taken.

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Comments

Hyungpyo Moon

This chapter empirically examines the impact of the age structure on private savings and social spending using the new cross-country panel data covering OECD countries and Asia-Pacific economies. In particular, the authors find new empirical evidence such that: (i) population aging decreases private savings in both OECD and Asia-Pacific economies and increases social spending in OECD countries; (ii) the fertility rate, by affecting the young-age dependency rate, is also a significant determinant of private saving and social spending; and (iii) population aging has no significant impact on public health spending in OECD countries. This study will not only add new insight to academic research, but also provide both developed and developing countries with important policy implications for attempts to temper the impact of aging populations.

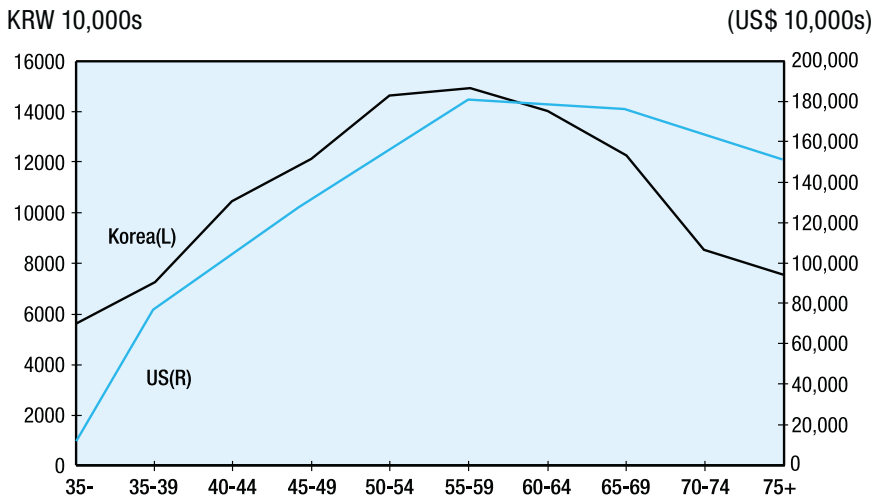
1. Savings and Aging

One interesting empirical finding of the chapter is that savings in Asia-Pacific economies are more sensitive to population aging compared to OECD countries. Estimated results show that a 1 percentage point increase in the old-age dependency ratio would reduce the household savings rate by 0.2–0.6 percentage point in OECD countries while it reduces private savings rate by close to 2 percentage points in Asia-Pacific economies. Making a direct comparison between these two groups of economies is difficult as the dependent variables are different. Nevertheless, it seems that the impacts of demographic change on savings in the private sector are significantly greater in Asia-Pacific economies. Although the chapter did not elaborate this finding, it would be worthwhile to consider what underlying factors could explain such a difference.

According to the life-cycle hypothesis, population aging lowers the household savings rate because there will be more elderly dissavers. The finding in the paper implies that the elderly in Asia-Pacific economies tend to dissave faster than those in OECD countries. How can this difference in the pace of dissaving of the elderly be explained? One reason for it may be a difference in bequest motive, as the stronger the bequest motive, the slower the pace of dissaving of the elderly. Higher labor market participation rate may be another explanation, as the elderly with a higher labor income would be less likely to dissave. In addition, a difference in the institutional backgrounds, including the social protection system, can cause a difference in the saving behavior of the elderly.

One interesting example is shown in Figure 5.8, which compares the pattern of net worth holdings of the average household by age cohorts in Korea and the US. The asset accumulation patterns of average households in two countries show a sharp contrast. Until people are in their mid-50s, US households accumulate their assets relatively faster compared to Korean households. At a later stage, Korean households decumulate their assets much more quickly, producing a humped-shaped asset accumulation profile across

Figure 5.8 Comparison of Net Worth Holdings by Age Cohorts (Korea versus the US)



Source: Korea National Statistics Office, National Survey of Household Income and Expenditure, 2000. Available at: http://kostat.go.kr/nso_main/nsoMainAction.do?method=sub&catgrp=eng2009&catid1=g02&catid2=g02d&catid3=g02da&catid=g02da. US Federal Reserve Board, Survey of Consumer Finances, 2001. Available at: <http://www.federalreserve.gov/pubs/oss/oss2/2001/scf2001home.html>.

age cohorts. In contrast, elderly households in the US deplete their net worth at a very slow rate.

Figure 5.8 also shows that Korean households possess a relatively higher level of net worth in the early stage of working life. This would imply that the bequest motive of the average Korean household is at least as strong as, or even stronger, than that of US households. Also, according to OECD (2009), the average retirement age of Korean workers was 71.2 years in 2007, which is much higher than that of the US workers (64.6 years). Hence, the labor market participation of the elderly cannot explain the faster dissaving of the elderly in Korea. One possible explanation of the faster asset decumulation of this population is the immaturity of the public pension plan. The National Pension Plan in Korea was first introduced in 1988 and is still in its infancy—only 17.6% of those who are aged 65 and over received pension benefits in 2005. This inadequate old-age income security system would make the elderly rely heavily on self-insurance measures and to decumulate their net worth faster than elderly households do in the US.

The above example can also be applied to the findings in this chapter; that is, different levels of social protection, especially for the elderly, are the major cause of different responses in private saving between OECD countries and Asia-Pacific economies. Hence, it would be worthwhile to examine whether this discrepancy of demographic impact on private saving still persists after controlling for the differences in the amount and coverage of public pensions and health insurance programs. The differences in the impact of the young-age dependency ratio can also be explained in the same way, at least partially.

2. Aging and Social Spending

My second comment on Furceri and Mourougane's chapter is directly linked to the first one. In the chapter, the authors estimated the impacts of demographic changes on private saving and social spending separately. However, these impacts may be related. Population aging is indeed a global phenomenon, although its speed differs from country to country depending on the fertility rate and health status, among others. If the degree of aging is similar, I think it is reasonable to assume that demographic shifts will influence each country more or less to the same extent. However, the impacts of demographic changes on the subsectors of an economy, private or public sectors, can vary across countries, depending on their institutional settings.

For instance, people in a country with a well-developed social protection system such as a generous pension and health insurance programs will be less vulnerable to demographic changes. However, demographic shifts would still place significant pressure on age-related public spending. In this case, the impacts of demographic shocks are likely to fall on the public sector more than on the private sector. On the other hand, people in a country where the social protection measures are weak have to respond to demographic change by adjusting their own saving behavior. Thus, the demographic changes will impact more on the public sector in countries with a high level of social spending, and more on the private sector in countries with a low level of social spending. With the gradual expansion of the social safety net in Asia-Pacific economies, we can expect that the pace of decline in private savings will decelerate in the future.

The studies in the chapter do not include the demographic impacts on social spending in Asian-Pacific countries. However, it would be interesting to examine empirically whether the impacts of demographic shifts on private and public sectors are negatively correlated.

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