

IMF WORKING PAPER

This is a working paper and the author would welcome any comments on the present text. Citations should refer to an unpublished manuscript, mentioning the author and the date of issuance by the International Monetary Fund. The views expressed are those of the author and do not necessarily represent those of the Fund.

MASTER FILES
ROOM C-130

0440

WP/89/13

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

Aging, Savings, and Pensions
in the Group of Seven Countries: 1980-2025

Prepared by Peter S. Heller *

January 31, 1989

Abstract

In the next 30-40 years, past changes in fertility and mortality will lead to a significant increase in the share of the elderly. This study suggests that these demographic trends may lead to a decline in the G-7 private savings rate after 2000, compounding the impact of social expenditure pressures on the government's deficit. Moreover, public pensions may decline as a share of the consumption needs of the elderly, leading to financial pressures to reduce their consumption. The reduced burden of child support on the working population will not offset the increased burden of societal support for the elderly.

JEL Classification Numbers

1221, 1320, 3221, 8410, 9211, 9180

* An earlier version of this paper was presented at a conference on "Current Issues in Pensions and Social Security," Ben-Gurion University, Beer-Sheva, Israel, June 4-5, 1987. The author is indebted to Eric Sidgwick for his excellent work in developing the computer models and the quantitative data base for this study. He is also indebted to T. Catsambas, R. Hemming, R. Holzmann, E. Jacobs, Y. Kop, B. Smith, and M. Wattleworth for their ideas and comments on this paper. The views expressed are those of the author and do not necessarily represent those of the International Monetary Fund.

<u>Contents</u>	<u>Page</u>
I. Introduction	1
II. Demographic Trends and Shifts in the Distribution of Consumption	2
III. Methodology	2
1. Forecasts of the private savings rate	5
2. Forecasts of consumption patterns and levels	6
IV. Results	11
1. What are the effects of demographic trends on aggregate private savings?	11
a. Savings models	11
b. Consumption models	15
2. How sustainable will be the burden of intergenerational support?	20
3. The adequacy of government social security pensions	23
V. Some Concluding Thoughts	25
Text Tables	
1. Major Industrial Countries: Demographic Structure, 1980-2025	3
2. Major Industrial Countries: Age-Dependency Ratios	4
3. Consumption Shares by Aggregated Age Groups	9
4. Change in the Ratio of Aggregate Private Savings to GDP During Each Period	12
5. Changes in Consumption Arising from Changes in the Age Structure	16
6. Major Industrial Countries: Potential Change in the Private and Aggregate Savings Rates, 1980-2000	18
7. Perspectives on the Change in Intergenerational Financing Burden on the Working Population	22
8. Major Industrial Countries: Total Ratio of Pension Outlays to Total Consumption of Pensionable Age Group	24
Appendix Tables	
9. Presentation of Four Econometric Models of Saving	28
10. Change in Aggregate Private Savings Forecast: 1960-80	29
11. Constant Utility Equivalence Scales	30
12. Revised Scale of Equivalent Income for Urban Families of Different Size, Age, and Composition	31
13. Demand Equivalence Scales by Age Group	32
14. Change in the Aggregate Private Savings Rate During Each Period	33
Chart 1. Bureau of Labor Statistics and Constant Utility Equivalence Scales	8a
References	35

Summary

The demographic structure of the major industrial countries is changing significantly. Persistent low fertility rates and lengthening life spans will lead to a major shift in the balance among the young, the working, and the elderly, a shift that will affect the dynamics of these countries and of the world economy. This paper evaluates the implications of this shift for the savings rate, the distribution of consumption across age groups, and levels of intergenerational support for each country of the Group of Seven. Inferences are drawn on the aggregate savings rate of the Group of Seven.

The paper uses two methodologies. The first applies to the analysis the results of earlier econometric studies linking the aggregate private savings rate to demographic variables. The second applies age-specific consumption parameters to examine the aggregate impact on consumption (and potentially on saving) of a change in the population's age structure. The empirical analysis relies on demographic and economic projections of an earlier Fund study by Heller, Hemming, and Kohnert (1986).

The present study suggests the following conclusions. First, the aging of the populations of the seven major industrial countries could lead to a significant reduction in aggregate private savings rates, particularly after 2000. Larger government deficits resulting from increased social expenditures could put further pressure on the overall savings rate.

Second, initial pressure on saving will be felt at different times in the various members of the Group of Seven, earlier in Japan and perhaps the Federal Republic of Germany, and later in the United States and Canada. By 2025, however, the savings rate could decline substantially in all Group of Seven countries. A world economy in which the major industrial countries are all saving limited amounts, or dissaving, would have major implications for global economic growth and international balances.

Third, the window of opportunity for increased saving will remain open through the year 2000, when the group of children under the age of twenty will decline sharply as a proportion of the working population.

Fourth, under present policies, the fiscal burden on the government of supporting the elderly could increase significantly between 1980 and 2025. The reduced burden of child support would not be sufficient to free up the financial capacity to offset this increased burden of societal support for the elderly.

Fifth, in some countries (Canada, France, the Federal Republic of Germany, and the United States), public pensions may decline as a share of the consumption needs of the elderly. Such declines may lead to financial pressure on the elderly to reduce their consumption.

I. Introduction

This paper is an exercise in macroeconomic speculation. Any effort to forecast developments 40 years into the future can be nothing else. Yet the subject is of considerable importance, touching on issues that will vitally influence the world economy. Significant changes in the demographic structure of the major industrial countries are occurring. Persistent low fertility rates and lengthening life spans are leading to a major shift in the balance among the young, the working age population, and the elderly, and this will inevitably affect the dynamics of these countries and the world economy. An earlier paper by Heller, Hemming, and Kohnert (1986) examines the potential effect of these developments on public social expenditure outlays.

This paper seeks to evaluate the implications for the savings rate, the distribution of consumption across age groups, and levels of intergenerational support for each of the G-7 countries. Inferences are drawn on the aggregate savings rate of the major industrial countries as a group (the G-7), with implications for their external balances individually and with the rest of the world.

The paper will focus on three issues:

1. The effect of the aging of the populations on the aggregate savings rate;
2. The financial capacity of the working population to bear the burden of supporting the young and the elderly; and
3. The adequacy of public pensions in meeting the consumption needs of the elderly.

The first issue will have an impact on world economic developments. Pressures to reduce significantly the overall savings rate of the major industrial countries will affect both their external balance and their growth. The second issue addresses whether the private burden of supporting the younger population might decline to such an extent as to offset the increased tax burden arising from the government's responsibilities toward the elderly. As to the third issue, if government pension payments are insufficient to support the consumption of the elderly, one can only assume (a) an increased role for self-support by the elderly (either from private pensions or past savings), (b) that the forecast consumption levels of the elderly may be too high (implying a decline in their consumption standards relative to the working age population), or (c) pressures for additional government pension support in the face of the growing political importance of the elderly.

Section II briefly summarizes prospective demographic trends. Potential developments in savings and consumption are derived from two alternative methodologies described in Section III. Sections IV and V

examine the results of the analysis and provide some brief concluding thoughts, respectively.

A brief caveat. This paper relies on partial analysis and gives insights only into the first round of pressures likely to influence consumption, savings, productivity, and labor market developments. A significant decline in savings rates may lead to a fall in investment, reducing labor productivity growth and the real growth rate from what is assumed in this study.

II. Demographic Trends and Shifts in the Distribution of Consumption

Over the next four decades, the Heller, Hemming, and Kohnert baseline demographic scenario suggests that the share of the 0-19 age group in the population will decline by 5 to 8 percentage points (Table 1). At least two thirds of this decline will occur by the year 2000 (except in France). The assumed increase in the fertility rate will be reflected in some increase in the share of the 0-9 population by 2000 in the Federal Republic of Germany and the United Kingdom; however, in the other countries, even this share will decline by 2000.

This declining share of the young will be offset principally by an increasing share of the working age population through 2000, with increases ranging from 1.4 percent of the population in Japan and France to as high as 3.5 to 4 percent in Canada, Italy, Japan, and the United Kingdom. These two trends explain the sharp decline in the youth dependency rate, the ratio of the young to the working age population (Table 2). The share of the elderly will begin to rise in this period, by 2 percent of the population in Canada, the Federal Republic of Germany, Italy, and the United States, and by as much as 6 percentage points in Japan (only small increases will occur in France and the United Kingdom).

In the first quarter of the next century, these trends are sharply reversed. In all countries but France, the share of the labor force declines by approximately 2 to 3 percentage points, with larger declines in Canada and Japan of 5.4 and 6.5 percentage points, respectively. In contrast, the share of the elderly rises sharply, by as much as 6 percent of the population in Canada, the Federal Republic of Germany, Japan, and the United States, and 3 percent in Italy and the United Kingdom. This will sharply increase the elderly dependency rate.

III. Methodology

Conceptually, this paper uses two different methodologies. The first applies the results of earlier econometric studies linking the aggregate private savings rate to demographic variables. The second applies age-specific consumption parameters to examine the aggregate impact on consumption (and potentially savings) of a change in the

Table 1. Major Industrial Countries: Demographic Structure, 1980-2025

(In percent of the total population)

Age Group	1980	2000	2010	2025	1980	2000	2010	2025
Canada					France			
0-4	7.5	6.6	6.5	6.2	7.0	7.0	6.9	6.0
5-9	7.5	6.9	6.2	6.2	7.6	7.4	6.5	6.0
10-14	7.9	6.9	6.2	6.2	7.6	7.4	6.9	6.0
15-19	10.0	6.9	6.5	6.2	8.0	7.0	7.2	6.2
0-19	32.9	27.2	25.5	24.6	30.3	28.9	27.4	24.3
20-64	57.6	61.4	61.8	56.0	55.7	57.1	59.0	59.9
65+	9.5	11.4	12.7	19.4	14.0	14.0	13.6	15.8
Total population (in millions)	100.0 24.0	100.0 29.0	100.0 30.6	100.0 32.5	100.0 53.6	100.0 58.2	100.0 59.8	100.0 61.3
Germany, Federal Rep. of					Italy			
0-4	4.8	5.3	4.4	4.6	6.4	6.5	5.7	5.8
5-9	5.5	5.9	4.7	4.8	7.7	6.4	6.0	5.8
10-14	7.9	5.7	5.3	4.8	8.0	6.0	6.5	5.6
15-19	8.5	5.2	5.9	4.8	8.0	5.5	6.4	5.8
0-19	26.7	22.1	20.3	19.0	30.1	24.4	24.6	22.9
20-64	57.8	60.5	59.0	57.3	56.4	59.9	58.7	58.0
65+	15.5	17.4	20.7	23.7	13.5	15.7	16.7	19.1
Total population (in millions)	100.0 61.5	100.0 58.2	100.0 57.9	100.0 53.5	100.0 56.2	100.0 58.1	100.0 58.1	100.0 57.2
Japan					United Kingdom			
0-4	7.4	6.4	6.1	5.9	6.1	6.5	6.3	6.3
5-9	8.6	5.9	6.3	5.8	7.0	6.7	6.3	6.2
10-14	7.6	5.4	6.2	5.8	8.1	6.3	6.4	6.2
15-19	7.0	5.7	5.8	6.1	8.2	6.0	6.6	6.2
0-19	30.6	23.4	24.4	23.6	29.3	25.5	25.6	24.8
20-64	60.3	61.7	57.5	55.2	55.8	59.2	59.1	56.9
65+	9.1	14.9	18.1	21.2	14.8	15.3	15.3	18.3
Total population (in millions)	100.0 116.7	100.0 128.2	100.0 131.7	100.0 131.8	100.0 55.9	100.0 56.9	100.0 57.5	100.0 58.5
United States								
0-4	7.4	6.6	6.6	6.1				
5-9	7.4	6.8	6.4	6.3				
10-14	8.0	7.2	6.4	6.4				
15-19	9.2	7.2	6.6	6.4				
0-19	31.9	27.8	25.9	25.2				
20-64	56.9	59.1	60.3	55.4				
65+	11.2	13.0	13.8	19.4				
Total population (in millions)	100.0 236.4	100.0 277.5	100.0 293.9	100.0 314.1				

Sources: Heller, Hemming, and Kohnert (1986); and Fund staff estimates.

Table 2. Major Industrial Countries: Age-Dependency Ratios

(In percent)

	1980	2000	2010	2025	1980	2000	2010	2025
<u>Ratio of Population</u>								
	<u>Aged 0-4 to aged 20-64</u>				<u>Aged 5-9 to aged 20-64</u>			
Canada	13.0	10.7	10.6	11.0	13.0	11.2	10.1	11.0
France	12.5	12.3	11.6	10.1	13.7	12.9	11.1	10.1
Germany, Federal Rep. of	8.2	8.8	7.5	8.1	9.5	9.7	7.9	8.4
Italy	11.4	10.9	9.7	9.9	13.6	10.6	10.3	9.9
Japan	12.2	10.4	10.6	10.7	14.2	9.6	11.0	10.5
United Kingdom	10.9	11.0	10.6	11.1	12.5	11.3	10.6	10.8
United States	12.9	11.1	10.9	11.1	13.0	11.6	10.6	11.3
<u>Ratio of Population</u>								
	<u>Aged 10-14 to aged 20-64</u>				<u>Aged 15-19 to aged 20-64</u>			
Canada	13.7	11.2	10.1	11.0	17.4	11.2	10.6	11.0
France	13.7	12.9	11.6	10.1	14.4	12.3	12.2	10.4
Germany, Federal Rep. of	13.7	9.4	9.1	8.3	14.7	8.5	10.0	8.3
Italy	14.2	10.1	11.1	9.6	14.2	9.2	10.9	9.9
Japan	12.6	8.7	10.8	10.6	11.6	9.2	10.0	11.0
United Kingdom	14.4	10.7	10.9	10.8	14.7	10.1	11.2	10.8
United States	14.0	12.1	10.6	11.5	16.1	12.2	11.0	11.5
<u>Ratio of Population</u>								
	<u>Aged 0-19 to aged 20-64</u>				<u>Aged 65 and over to aged 20-64</u>			
Canada	57.1	44.4	41.3	44.0	16.5	18.5	20.6	34.6
France	54.3	50.5	46.5	40.6	25.1	24.5	23.1	26.4
Germany, Federal Rep. of	46.1	36.4	34.4	33.1	26.9	28.7	35.2	41.3
Italy	53.3	40.8	41.9	39.5	24.0	26.1	28.4	32.8
Japan	50.7	37.9	42.4	42.8	15.1	24.1	31.6	38.5
United Kingdom	52.6	43.0	43.2	43.5	26.6	25.8	25.9	32.1
United States	56.1	47.0	43.0	45.4	19.6	22.1	22.9	34.9
<u>Ratio of Male Population</u>								
	<u>Aged 0-14 to aged 20-64</u>				<u>Aged 65 and over to aged 20-64</u>			
Canada	80.0	67.0	62.0	66.0	14.0	16.0	18.0	32.0
France	81.0	75.1	72.7	63.0	19.4	19.3	22.3	31.0
Germany, Federal Rep. of	63.7	52.8	48.2	48.7	19.6	23.0	31.9	37.9
Italy	78.9	62.7	61.2	58.7	20.0	21.9	23.6	27.7
Japan	79.4	57.1	64.0	63.6	12.9	21.0	28.0	35.5
United Kingdom	76.3	65.6	63.2	64.8	21.0	21.8	22.6	28.8
United States	70.2	74.6	67.9	69.0	14.2	16.7	17.1	25.5

Sources: Heller, Hemming, and Kohnert (1986); and Fund staff estimates.

population's age structure. The empirical analysis relies on the baseline demographic and economic scenario developed for a recent Fund study on aging and social expenditure (Heller, Hemming, and Kohnert (1986)). That study provides demographic projections through 2025, as well as forecasts of the growth of labor productivity, the unemployment rate, and the growth in real output.

1. Forecasts of the private savings rate

The savings literature acknowledges the significance of demographic variables for the aggregate private savings rate. Most studies are derived from Modigliani and Brumberg-type models of consumption, where the savings of individuals change over their life cycle, with the highest savings rates among the middle-age groups, and low savings and even dissaving among the elderly. Intuitively, this suggests a negative relationship between the share of the elderly in the population and the private savings rate. A higher share of the young would also adversely affect the savings rate, in that they are consumers but do not add to income. These relationships are borne out in recent cross-country econometric studies by Modigliani (1970), Modigliani and Sterling (1980), Feldstein (1980), and Horioka (1986), which estimate the impact on the aggregate private savings rate of changes in the youth and elderly dependency rates. ^{1/}

In Section IV.1, the coefficients of these studies are used to project the change in the ratio of "aggregate private savings" (household and corporate) to gross domestic product (GDP) that would arise from the forecast change in each countries' youth and elderly dependency rates, holding all other variables constant. One may also estimate the resulting change in the aggregate G-7 private savings rate. ^{2/} Since the dependent variable in these studies is the ratio of "aggregate private savings" to "private national income," ^{3/} the results in terms of GDP are derived by assuming that this last ratio is fixed at its 1980 level in each country. This assumption probably biases the

1/ The specification of the four models is presented in Table 9.

2/ GDP weights are applied using current dollar exchange rates (as of May 1, 1987).

3/ Private national income is defined by Horioka as the "final consumption expenditure of the household sector plus net private savings" (Horioka (1986)). Aggregate private savings are calculated as "the sum of the net savings of the household sector (including households, private unincorporated enterprises, and private nonprofit institutions serving households) and that of the corporate sector (including nonfinancial and financial corporations and quasi-corporate enterprises)."

results toward an understatement of the likely change in savings rates in any country. 1/

Each of these studies has its limitations, and one should be wary of relying on them for long-term projections. Use of simple linear estimates when there are significant changes in demographic variables may be inaccurate if there are actually nonlinear relationships. Application of the same coefficients to each country is also problematical (e.g., in Japan, the elderly are said to save, which is not consistent with the coefficients of these models). 2/ Such models also fail to consider the impact on savings of the erosion of the nuclear family structure and the increasing number of single parent and single person households in the United States and Europe. Over time, such changes may not only have a significant impact on the savings behavior of working households but also on the bequest motives of the elderly.

Moreover, each equation includes other nondemographic explanatory variables that may change over the period including, inter alia, the rate of productivity growth, the elderly labor force participation rate, the retirement age, the benefit replacement rate of public pensions, and the average growth of real per capita national income. Section IV briefly assesses how forecast changes in these variables may affect the results.

Finally, an analysis was made of the predictive accuracy of these four models, in terms of their predictions for the period 1960-80. The results, presented in Table 10, suggest the caution which is needed in appraising the results. The closest estimates are obtained strictly using the demographic coefficients of the Modigliani and Modigliani-Sterling models, but even these may be off by several percentage points of private national income. With the exception of France (where the Feldstein model yields a more accurate forecast), the sign of the change is correctly forecast by one of the two models. Italy is the one country where the resulting change in saving is the opposite of what any of the equations would have forecast. Surprisingly, the predictions derived using the full set of independent variables appear less accurate.

2. Forecasts of consumption patterns and levels

If the average level of consumption of individuals varies by age, a shift in the age structure of a population will have consequences for the distribution of consumption across age groups. Empirical analysis

1/ The reasoning is as follows. The next 40 years will witness an increase in the magnitude of pension transfers from the government, and this could lead to an increase in the ratio of private national income to GDP. Thus, applying a constant ratio of private national income to GDP would understate any estimated changes in the savings ratio.

2/ This may change as benefit replacement rates increase in the Japanese social security system (see Section IV.3 and Heller, Hemming, and Kohnert (1986), pp. 30-36).

of these effects is rendered difficult by data problems. While consumption expenditure surveys are routinely available, these are typically on a household, not an individual, basis. No studies have attempted to estimate the average consumption level of individuals at different ages, since the consumption of individuals, particularly the young, is integrally related to a household's consumption.

There is, however, a literature available on "household equivalence scales" (Danziger, van der Gaag, Smolensky, and Taussig (1982)). Such scales estimate the relative income required by families of different composition to achieve a comparable standard of living. As such, these scales provide indices of income requirements according to the size of a household, its age structure, the sex of its household head, all relative to that of a reference household. Such scales may be used to derive age-consumption relativities.

Two such scales were used, both relating to the United States. Danziger, van der Gaag, Smolensky, and Taussig (1982) derive a scale based on Lluch's (1973) linear expenditure system; it specifies the minimum amount of money income needed by a household of given characteristics to reach a predetermined utility level U_0 (hereafter the "Constant Utility Equivalence" or CUE scale). ^{1/} In 1968, the Bureau of Labor Statistics (BLS) developed a scale to obtain an objective means of identifying equivalent levels of consumption for families of varying composition. Their scale (hereafter the BLS scale) is "based on the assumption that families spending an equal proportion of income on food have attained an equivalent level of total consumption." ^{2/} The BLS scale was based on detailed consumption surveys of the early 1960s, the CUE scale on the 1972-73 BLS Consumer Expenditure Survey (see Tables 11 and 12).

With these equivalence scales, it is possible to impute, for each household type, by age of household head and broad age group of children (under age 6, ages 6-15, 16-17, 18 and over), the marginal extra income required to add an extra person of a given age to a household. This permits the derivation of a standardized equivalence scale, with an index of relative consumption by age group. ^{3/} For adults, it is necessary to develop an adjusted measure of consumption to reflect the likelihood of being in a single person or multiple adult household (since the consumption required by a two adult household is

^{1/} Danziger, van der Gaag, Smolensky, and Taussig (1982) found that though the equivalence scales are generally a function of the chosen utility level U_0 , and thus of income, the estimated scale proved quite stable over a range of incomes.

^{2/} BLS (1968), p. 1.

^{3/} The differences in the marginal effect of a child or adult across different types of households were averaged to yield a single measure of age relativity.

significantly less than twice that of two single adult households). ^{1/} The results are then normalized by the average equivalence scale for those in the 35-54 age group to yield adjusted for marital status equivalence scales for each four-year period age group (see Chart 1), and scaled up proportionately such that for the year 1980, total private consumption expenditure, C_{1980} , is fully distributed across all age groups, viz.,

$$C_{1980} = \sum I_i * E_i * c_{1980} \text{ where}$$

I_i = number of individuals in age group i ,
 E_i = equivalence scale for age group i , adjusted for marital status, and
 c_{1980} = average per capita consumption expenditure in 1980.

This last procedure was applied for each C-7 country, E_i being held invariant across countries (Table 3).

Finally, there remains the problem of estimating the development of average per capita consumption, c_t , across time. Two approaches are used in this analysis. The first relates the growth of c_t to the growth in labor productivity, based on the assumption that disposable incomes move most closely with real wages, and the latter with labor productivity. The second initially relates the growth of consumption per capita to the growth of GDP per capita, and then adjusts for the change in the demographic structure. ^{2/}

In both cases, an iterative approach is used to derive consumption. Using the first case for illustrative purposes, it is assumed that in 2000, an initial estimate of consumption per capita is made, viz.,

^{1/} Figures were obtained on the number of single (inclusive of those divorced and widowed) and married individuals in the population in each age group. For any given age group i , one could then derive a composite equivalence value, \underline{E}_i ,

$$\underline{E}_i = S_i * E_i + (E_i + E_r) / 2 * M_i, \text{ where}$$

S_i = the number of adults in age group i in single person households,

M_i = the number of adults in age group i in married households,

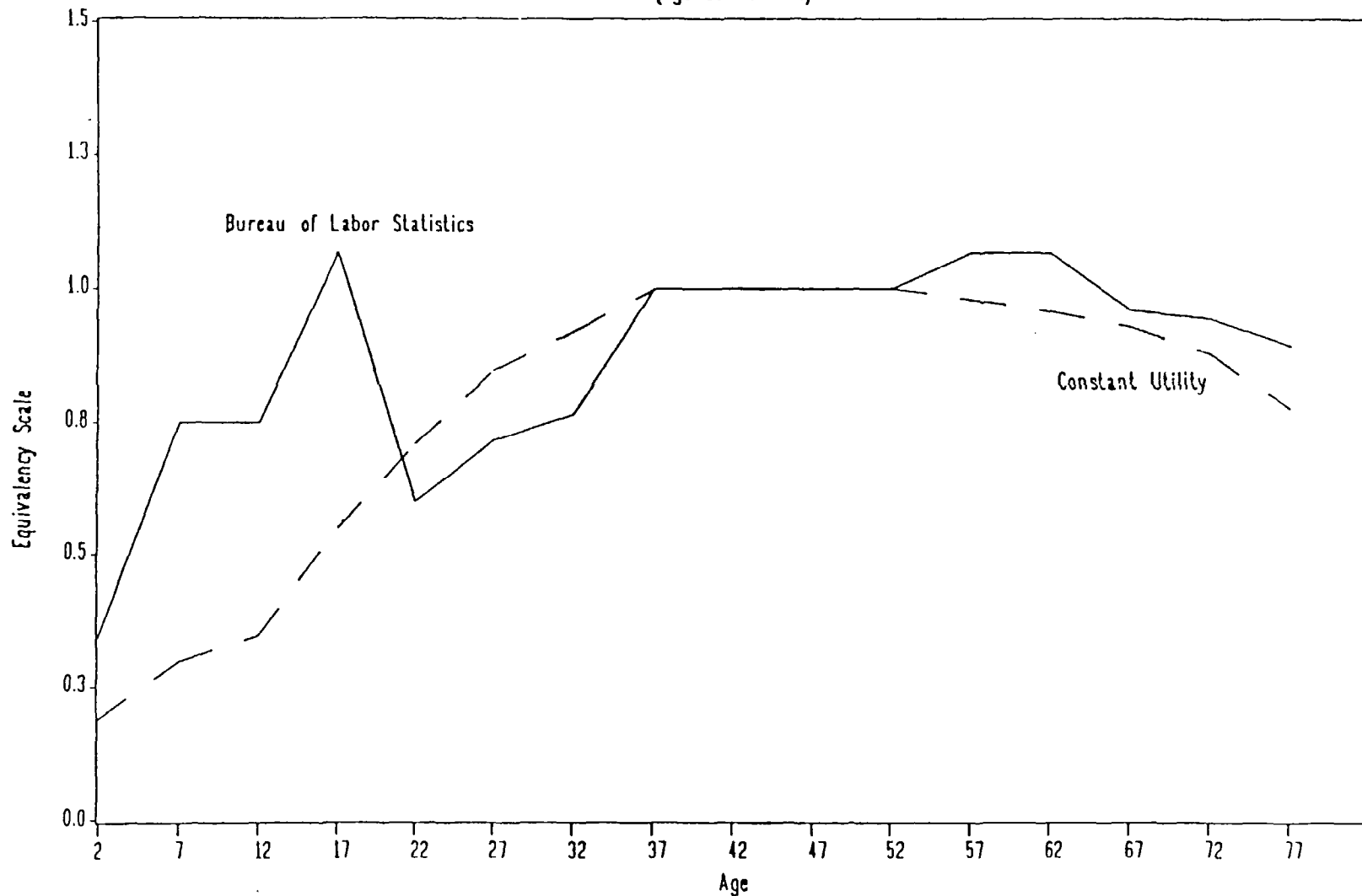
E_i = the equivalent income scale for a single person adult in each age group i , and

E_r = the equivalent income scale for the second adult in a two adult household.

^{2/} All projections are made in constant 1980 prices. In principle one should correct for any relative price effect that may be correlated with consumption patterns by age groups. In particular, the elderly are the largest consumers of medical care, a service with a positive relative price effect in most countries. However, medical care for the elderly is largely provided by the government, and thus the relative price effect largely affects government rather than private consumption (see Heller, Hemming, and Kohnert (1986)).

Chart 1

Bureau of Labor Statistics and Constant Utility Equivalence Scales ^{1/}
(Age 35-54 = 1)



Sources: Bureau of Labor Statistics (1968); Danziger, van der Gaag, Smolensky, and Taussig (1982). See also Table 13.

^{1/} United States data.

Table 3. Consumption Shares by Aggregated Age Groups
(In percent)

	BLS Equivalence Scale				CUE Equivalence Scale			
	1980	2000	2010	2025	1980	2000	2010	2025
Canada								
0-9	9.7	8.6	8.0	7.8	5.0	4.4	4.1	3.9
10-19	19.9	14.8	13.5	12.9	11.4	8.2	7.5	7.2
20-59	54.8	59.3	57.6	49.9	67.2	69.6	67.0	58.5
60-74	11.8	12.6	15.7	22.0	12.6	13.2	16.4	23.1
75+	3.8	4.7	5.2	7.4	3.8	4.6	5.1	7.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
France								
0-9	9.7	9.2	8.5	7.5	4.9	4.7	4.4	3.8
10-19	17.0	15.2	14.7	12.6	9.6	8.5	8.3	7.0
20-59	54.8	54.9	55.0	51.6	65.4	65.9	64.9	60.2
60-74	13.1	14.8	15.2	20.1	14.0	15.7	16.0	21.0
75+	6.0	5.9	6.6	8.3	6.0	5.9	6.5	8.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Germany, Federal Rep. of								
0-9	6.6	6.8	5.6	5.8	3.3	3.4	2.8	2.9
10-19	17.2	10.8	11.5	9.7	9.6	5.9	6.3	5.3
20-59	55.0	55.7	54.1	49.5	65.1	63.8	61.7	56.5
60-74	15.2	19.7	20.6	24.7	16.1	20.2	21.3	25.3
75+	5.9	7.0	8.2	10.3	5.9	6.8	8.0	10.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Italy								
0-9	9.2	8.1	7.3	7.2	4.7	4.0	3.7	3.6
10-19	17.0	11.9	13.3	11.8	9.6	6.5	7.4	6.5
20-59	54.5	56.0	54.4	52.4	65.3	65.1	63.2	60.7
60-74	14.3	17.6	17.9	20.3	15.3	18.2	18.7	21.0
75+	5.0	6.4	7.2	8.4	5.0	6.2	7.1	8.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Japan								
0-9	10.6	7.6	7.7	7.3	5.3	3.8	3.9	3.7
10-19	15.7	11.7	12.3	12.4	8.8	6.4	6.8	6.9
20-59	59.0	57.4	51.6	50.7	70.5	66.2	60.1	59.2
60-74	11.5	18.0	21.0	18.8	12.1	18.5	21.9	19.7
75+	3.3	5.3	7.4	10.7	3.3	5.2	7.3	10.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
United Kingdom								
0-9	8.6	8.3	7.8	7.8	4.4	4.2	3.9	4.0
10-19	17.3	13.0	13.6	12.8	9.8	7.2	7.6	7.1
20-59	51.9	56.2	54.7	51.3	62.4	65.7	63.8	60.1
60-74	16.5	15.6	17.4	20.1	17.7	16.2	18.1	21.0
75+	5.8	6.9	6.7	8.0	5.8	6.8	6.6	7.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
United States								
0-9	9.6	8.6	8.1	7.8	5.0	4.3	4.1	4.0
10-19	18.9	15.2	13.7	13.4	10.8	8.5	7.6	7.5
20-59	53.5	57.4	56.4	50.5	65.4	67.8	66.0	59.4
60-74	13.2	12.2	15.0	19.7	14.1	12.8	15.6	20.7
75+	4.8	6.7	6.8	8.6	4.8	6.6	6.7	8.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Fund staff estimates.

$$c_{2000}^* = c_{1980} * (1 + l)^{20}, \text{ where}$$

l = the growth rate in labor productivity.

Using the above equivalence scales, and the size and structure of the population in 2000 as projected in Heller, Hemming, and Kohnert (1986), one may derive the aggregate consumption associated with each of the age groups. The resulting total private consumption level, divided by the total population in 2000, yields a revised consumption per capita, c_{2000} , which will be the basis for projecting consumption levels in the subsequent benchmark years, 2010 and 2025. The rationale is that the initial extrapolation gives an estimate of trend consumption, but this needs to be adjusted to take account of the bias implied by the changing age structure. The revised consumption per capita represents the base from which subsequent consumption would grow.

Several points should be stressed in using these weights. First, although based on empirical data, these remain simply normative scales. 1/ The equivalence scale may suggest that a child's consumption is 19 percent of a 35 year old's, but this may not be what is actually observed, on average; the implied distribution of consumption across age groups may prove equally inaccurate. Using such scales to examine the result of changes in a population's age structure simply reflects the assumption that adjustments in consumption are necessary to maintain equivalent levels of well being. 2/

Second, there is a marked difference in the age relativities of consumption implied by the two scales. With the exception of the 20-34 age group (Chart 1), the BLS scale is uniformly higher than the CUE scale. Some of the differences are as much as 50 percent (e.g., in the CUE scale, a child aged 0-4 consumes a fifth that of an adult aged 35-54, relative to a third in the BLS scale). As a result, the effects on total consumption from a decline in the share of the young will be greater using the BLS equivalence scale.

These differences are clearly reflected in the corresponding shares of consumption of the younger age groups in 1980, with the CUE scale implying a lower consumption share to the 0-19 age group. In the United States, the shares of the 0-9 age group would be 9.6 and 5 percent of total consumption under the BLS and CUE scales, respectively.

1/ The type of language used in the BLS study is suggestive: "to maintain an equivalent level of 'well being,' as family size increases, more income is necessary regardless of the family composition and age of head."

2/ The measure of equivalent "well being" will depend on which utility scale is used--for the BLS measure, the equivalent "well being" is measured by the percent of income spent on food. For the Danziger, van der Gaag, Smolensky, and Taussig measure, it is based on expenditures upon all commodities, and is derived by the estimation of linear Engel curves combined with the calculation of the parameters of the underlying Stone-Geary utility function (see Appendix B of Danziger, van der Gaag, Smolensky, and Taussig (1982)).

Third, these equivalence scales, developed from data of the 1960s and early 1970s, may not be representative of current (let alone future) consumption patterns. The marginal cost of a child in two-earner households may now be considerably greater than in earlier periods when a single-earner household was more the norm. ^{1/} This suggests that the BLS scale may be the more relevant of the two scales, since it attaches a higher relative consumption weight to the young. Neither scale would appear to take account of the lumpy costs of college education, which would be a significant bulge in the consumption requirements of the age group 18-22 in some countries.

Finally, these equivalence scales have not been developed in any of the other six countries (at least to our knowledge). The derived U.S. scales are thus applied to all of the countries in the analysis. ^{2/}

IV. Results

1. What are the effects of demographic trends on aggregate private savings?

a. Savings models

Table 4 presents the implications of projected demographic trends for the aggregate private savings rate, based on the simple application of the demographic coefficients of the four econometric models of private savings discussed earlier. All other variables used in these models are assumed constant. ^{3/} The results are presented for each country in terms of the impact of changes in the youth (Dep) and elderly (Age) dependency rates, respectively, on the ratio of aggregate private savings to GDP. The combined impact (Net) is also presented.

The results for the period 1980-2000 indicate some striking differences between the models. The two Modigliani models suggest that demographic pressures, ceteris paribus, would lead to at most a modest decline--1 percent of GDP--in the ratio of private savings to GDP for

^{1/} In calculating the age-relativity weights, some data are available to assess whether there are nonlinearities associated with the extra consumption required for a child, depending on whether the child is born into a childless household or one with existing children.

^{2/} An attempt was made to judge whether the marital status adjustment should be made for the different countries. It turned out for the countries for which data were readily available (including Japan and the United Kingdom), that only negligible adjustment in the derived equivalence scales was necessary.

^{3/} In Table 14, the results of our analysis are expressed in terms of the aggregate private savings rate, for example, aggregate private savings as a ratio to private national income (or as originally estimated in the econometric models).

Table 4. Change in the Ratio of Aggregate Private Savings
to GDP During Each Period

(In percent of GDP)

Model Specification	1980-2000				2000-2010			
	M	M-S	F	H	M	M-S	F	H
Canada								
Dep	1.7	1.1	6.6	7.9	0.4	0.4	1.6	1.9
Age	-1.2	-0.7	-1.1	-2.2	-1.2	-0.7	-1.1	-2.3
Net	0.5	0.4	5.5	5.7	-0.8	-0.3	0.5	-0.3
France								
Dep	0.5	0.5	2.1	2.5	0.6	0.3	2.2	2.6
Age	0.4	--	0.5	0.6	0.9	-1.1	1.2	1.7
Net	0.9	0.6	2.6	3.1	1.5	-0.8	3.4	4.3
Germany, Federal Rep. of								
Dep	1.3	0.9	4.9	5.8	0.3	0.4	1.0	1.2
Age	-1.1	-1.1	-1.5	-1.9	-3.7	-2.9	-5.1	-6.8
Net	0.2	-0.2	3.4	3.9	-3.4	-2.6	-4.1	-5.6
Italy								
Dep	1.9	1.6	7.4	8.9	-0.2	0.1	-0.7	-0.8
Age	-1.5	-0.7	-2.0	-2.7	-1.6	-0.7	-2.1	-2.8
Net	0.5	0.8	5.4	6.2	-1.7	-0.5	-2.8	-3.6
Japan								
Dep	1.9	2.1	7.4	8.8	-0.7	-0.7	-2.6	-3.1
Age	-6.0	-3.1	-8.3	-11.0	-4.9	-2.7	-6.8	-9.0
Net	-4.1	-1.0	-0.9	-2.2	-5.6	-3.3	-9.3	-12.1
United Kingdom								
Dep	1.3	0.9	5.0	6.0	--	0.2	-0.1	-0.1
Age	0.5	-0.3	0.7	0.9	--	-0.3	-0.1	-0.1
Net	1.8	0.6	5.7	6.9	-0.1	-0.1	-0.2	-0.2
United States								
Dep	1.3	1.0	5.0	6.0	0.6	0.5	2.2	2.6
Age	-1.5	-0.6	-2.1	-2.8	-0.5	-0.4	-0.7	-1.0
Net	-0.2	0.4	2.9	3.2	--	0.1	1.4	1.6
G-7								
Dep	1.4	1.2	5.6	5.8	0.1	0.1	0.5	4.4
Age	-2.4	-1.2	-3.3	-4.4	-2.0	-1.3	-2.8	-3.7
Net	-1.0	--	2.3	2.2	-1.9	-1.2	-2.3	-3.1

Table 4. Change in the Ratio of Aggregate Private Savings to GDP During Each Period (concluded)

(In percent of GDP)

Model Specification	2010-2025				1980-2025			
	M	M-S	F	H	M	M-S	F	H
Canada								
Dep	-0.4	-0.3	-1.4	-1.7	1.8	1.2	6.8	8.2
Age	-8.3	-4.8	-7.2	-15.1	-10.7	-6.1	-9.4	-19.6
Net	-8.6	-5.1	-8.6	-16.8	-8.9	-4.9	-2.6	-11.5
France								
Dep	0.8	0.8	3.2	3.9	2.0	1.6	7.5	9.0
Age	-2.1	-3.1	-2.9	-3.8	-0.8	-4.2	-1.1	-1.5
Net	-1.2	-2.4	0.4	0.1	1.1	-2.6	6.4	7.5
Germany, Federal Rep. of								
Dep	0.2	--	0.6	0.8	1.7	1.2	6.5	7.8
Age	-3.5	-2.0	-4.8	-6.4	-8.3	-6.0	-11.4	-15.2
Net	-3.4	-2.0	-4.2	-5.7	-6.6	-4.8	-4.9	-7.4
Italy								
Dep	0.4	0.2	1.5	1.8	2.1	2.0	8.2	9.8
Age	-3.0	-1.6	-4.1	-5.4	-6.0	-3.0	-8.3	-11.0
Net	-2.6	-1.4	-2.6	-3.7	-3.9	-1.0	--	-1.2
Japan								
Dep	-0.1	--	-0.2	-0.3	1.2	1.5	4.6	5.5
Age	-4.6	-2.9	-6.3	-8.4	-15.5	-8.6	-21.3	-28.4
Net	-4.6	-2.8	-6.5	-8.7	-14.3	-7.1	-16.7	-22.9
United Kingdom								
Dep	--	-0.1	-0.2	-0.2	1.2	1.0	4.8	5.7
Age	-3.8	-2.1	-5.2	-6.9	-3.3	-2.7	-4.6	-6.1
Net	-3.8	-2.3	-5.3	-7.1	-2.1	-1.7	0.2	-0.4
United States								
Dep	-0.3	-0.4	-1.3	-1.6	1.5	1.1	5.8	7.0
Age	-7.5	-4.0	-10.3	-13.7	-9.6	-4.9	-13.1	-17.5
Net	-7.8	-4.3	-11.6	-15.3	-8.0	-3.8	-7.3	-10.5
G-7								
Dep	-0.1	-0.1	-0.4	-0.4	1.4	-1.3	5.7	6.8
Age	-5.7	-3.3	-7.7	-10.4	-10.2	-5.9	-13.9	-18.7
Net	-5.8	-3.4	-8.1	-10.8	-8.8	-4.6	-8.2	-11.9

Source: Fund staff estimates.

Note: Coefficients derived from following models:

M: Modigliani (1970),
M&S: Modigliani and Sterling (1980),
F: Feldstein (1980), and
H: Horioka (1986).

Also see Table 14.

the G-7 as a group. In contrast, the Feldstein and Horioka models suggest an increase in the G-7 savings rate of 2 percent of GDP. The difference arises principally from the relative size of the coefficient used to measure the impact on the savings rate of the significant decline in the youth dependency ratio during this period. The Modigliani models suggest that changes in this variable, positive or negative, have only a negligible impact on the savings rate. The coefficients of the Horioka and Feldstein models suggest a more substantial impact. 1/

Through 2000, the response of the household savings rate to changes in the youth dependency rate is likely to be a matter of both empirical and policy significance. In almost every country, the youth dependency rate will fall sharply, with the average declining from 53 percent to 43 percent.

In contrast, in the subsequent period, 2000-2025, the youth dependency rate is projected to decline marginally in most countries and to increase only slightly in Japan and the United Kingdom. Only in France will the rate decline gradually, but continuously, over the entire period. The elderly dependency rate will increase over the entire period, in some cases markedly. These four models indicate that demographic trends will give rise to an unambiguous and sharp decline in the aggregate private savings rate, with only the size of the decline a matter of uncertainty. In the period 2000-2010, private saving in the G-7 as a whole could drop by 1 to 3 percent of GDP from its level in 2000; the decline in the youth dependency rate will slightly moderate the large fall in the saving rates arising from the increasing elderly dependency rate. The fall in the savings rate would principally reflect developments in the Federal Republic of Germany and Japan.

During the period 2010-2025, these models imply that the sharp increase in the share of the elderly population could induce a decline in the G-7 private saving rate of 3 to 11 percent of GDP. The impact is likely to be greatest in Canada and the United States, but large declines may also be experienced in the Federal Republic of Germany, Japan, and the United Kingdom.

Over the period 1980-2025, the models imply that demographic pressures could lead to a decline in G-7 private savings by 5 to 12 percent of GDP. The decline could be largest in Japan, where savings may fall by at least 7 percent of GDP. These are large swings. While it would seem doubtful that shifts of this magnitude will actually occur, the pressures will be substantial.

1/ It is interesting to note that these differences are mirrored in the differences observed between the CUE and BLS scales; the former would suggest that additional children have a much smaller effect on consumption than the latter scale (see Chart 1).

The specification of the four econometric models also suggest the important effects of other variables. In Heller, Hemming, and Kohnert (1986), some of these variables are forecast to change over the period, with conflicting effects on the savings rate. Relative to the recessionary period 1978-82, real per capita income growth is forecast to increase during the period 1980-2025 for the Federal Republic of Germany, Japan, and the United States. The Modigliani-Sterling model would suggest that this could buoy the G-7 savings rate by about 1 to 1.5 percent over the full period. Using the Modigliani model, the Heller, Hemming, and Kohnert forecast increase in productivity in Japan and the United States should offset the expected decline in productivity in France and the Federal Republic of Germany, yielding a much smaller additional stimulus to the G-7 savings rate of approximately 0.5 percent of G-7 GDP. In the Feldstein model, the forecast increase in real growth in the United States should buoy G-7 savings by 0.8 percent of G-7 GDP and a further positive effect will arise from the expected reductions in the benefit replacement rate. These effects would be offset, however, by the negative effects on savings of the expected increase in the elderly labor force participation rate.

b. Consumption models

Applying the equivalence scale approach to examine the net change in consumption for the population as a whole implicitly provides an alternative perspective on potential pressures on the private savings rate. The starting point for the analysis is the fact that the increase in the weight of the elderly relative to the 0-19 age group in the population should lead to an increase in consumption, *ceteris paribus*, since the former have significantly higher relative per capita consumption levels.

By applying the age-specific consumption weights to the population shares that are projected to prevail in 2000, 2010, and 2025 (and holding real consumption levels constant), one can see that an index of consumption would rise by 2 to 5 percent under the BLS scale, and 3 to 7 percent under the CUE scale (Table 5). In some sense, these results suggest the pressures on aggregate consumption arising strictly from demographic factors (or at least the change in the age structure). 1/

What is far more conjectural is the broad trend of consumption per capita over the period. In both scenarios (e.g., consumption per capita moves with GDP per capita or labor productivity), total consumption is adjusted to take account of the impact of shifts in the age composition of the population. We have noted that through 2010, GDP per capita tends to rise more rapidly than productivity, reflecting more rapid

1/ It is analogous to the pure demographic effect described in Heller, Hemming, and Kohnert (1986).

Table 5. Changes in Consumption Arising from Changes
in the Age Structure ^{1/}

(1980 = 100)

	BLS Equivalence Scale				CUE Scale		
	1980	2000	2010	2025	2000	2010	2025
Canada	100.0	103.5	104.2	104.6	105.7	106.9	106.9
France	100.0	101.4	102.0	103.3	102.2	103.0	105.4
Germany, Federal Rep. of	100.0	101.5	102.6	102.2	103.9	104.7	104.7
Italy	100.0	100.9	102.7	102.2	104.1	104.7	105.0
Japan	100.0	102.5	103.7	103.0	105.2	104.7	104.1
United Kingdom	100.0	100.5	101.6	101.3	103.0	103.4	103.2
United States	100.0	102.8	103.4	103.8	104.4	105.6	105.7

Source: Fund staff estimates.

^{1/} Calculated by applying the age-specific equivalence weights to the shares of the population in the different age groups.

growth in the labor force than in the population. It is not unreasonable to assume that consumption would broadly follow the trend in GDP per capita.

After 2010, the labor force is projected to stop growing in some countries, while the population continues to rise. As a result, while GDP rises at roughly the rate of productivity, GDP per capita rises at a much slower rate over the period. An important question at that time will be whether the incomes of the elderly, many of which will be dependent on social security benefit formulae, are adjusted to move with the growth in real wage levels, or will be constrained to rise at a slower pace. The effect on aggregate private consumption levels, and thus the implied potential for savings, will hinge on these alternatives.

Table 6 (Part A) indicates the potential change in the ratio of savings to GDP associated with these developments in the ratio of private consumption to GDP for each of the four models. The potential change in savings is calculated assuming that the full change in the consumption ratio is used for savings. As with the earlier results, the major uncertainty relates to the movement of the savings rate in the next decade and a half, but the difference relates less to the demographic scenario and more to the matter of whether per capita consumption moves with labor productivity or GDP per capita. If it moves at the higher growth path associated with GDP per capita during the period 1980-2000, one could witness an increase in the aggregate private consumption rate--or a potential decline in the aggregate savings rate--of approximately 2 to 3 percent of GDP by 2000, with the larger increase associated with the CUE equivalence scale (reflecting the fact that the decline in the share of the young yields less of an offsetting reduction in consumption than that arising from the increase in the elderly). If per capita consumption moves with labor productivity, one could observe a potential increase in the aggregate G-7 savings rate of 1 to 2 percent of GDP, with a particularly significant increase in the potential savings rate of the United States (over 3 percent of GDP). The choice of demographic parameters shifts the potential savings rate by approximately 1 percent of GDP during this period. 1/

In the next decade, the potential G-7 private savings rate could decrease by approximately 3 to 4 percent of GDP from its level in 2000, reflecting a decline in the savings rate in virtually all G-7 countries (with the possible exception of Italy). The sharpest decrease in the potential private savings rate could occur during the period 2010-2025,

1/ The partial nature of this type of model should again be underscored, since changes in the savings rate would themselves influence the rate of economic growth.

Table 6. Major Industrial Countries: Potential Change in the Private and Aggregate Savings Rates, 1980-2000

Part A. Potential Change in Savings Rate (+ = increase)

(As percent of GDP)

Scenario ^{1/}	1980-2000				2000-2010			
	b-1	b-g	c-1	c-g	b-1	b-g	c-1	c-g
Canada	4.5	-1.8	-0.1	-3.1	-2.5	-5.9	-4.3	-7.7
France	1.1	-0.9	0.6	-1.4	0.1	-1.2	-0.5	-1.8
Germany, Federal Rep. of	0.5	-2.2	-0.8	-3.6	-3.0	0.3	-4.4	-1.2
Italy	-2.7	-0.6	-4.8	-2.6	1.5	-1.7	0.3	-3.1
Japan	0.3	-1.5	-1.3	-3.2	-5.4	-1.8	-6.1	-2.4
United Kingdom	0.9	-0.3	-0.6	-1.8	-0.7	-0.9	-1.8	-2.0
United States	3.7	-1.5	3.0	-2.3	-1.7	-5.1	-2.8	-6.5
G-7 average ^{2/}	1.9	-1.6	0.7	-2.7	-2.7	-3.2	-3.7	-4.3
G-7 range ^{3/}	-1.5 to	2.1	-2.7 to	0.9	-4.5 to	-1.3	-5.6 to	-2.3
	2010-2025				1980-2025			
	b-1	b-g	c-1	c-g	b-1	b-g	c-1	c-g
Canada	-8.3	-7.0	-10.8	-8.9	-6.3	-14.7	-15.2	-19.7
France	-10.6	-2.1	-12.2	-3.5	-9.4	-4.2	-12.1	-6.8
Germany, Federal Rep. of	-5.1	3.2	-6.9	2.1	-7.5	1.2	-12.0	-2.6
Italy	-5.4	-1.5	-7.7	-3.5	-6.6	-3.8	-12.2	-9.2
Japan	-2.7	-2.3	2.3	-3.1	-7.7	-5.6	-5.1	-8.7
United Kingdom	-3.2	-0.6	-4.5	-1.8	-3.0	-1.8	-6.9	-5.6
United States	-5.8	-6.4	-7.1	-7.9	-3.8	-13.0	-6.9	-16.7
G-7 average ^{2/}	-5.3	-3.9	-4.6	-5.1	-6.1	-8.6	-7.6	-12.1
G-7 range ^{3/}	-5.3 to	-3.5	-6.5 to	-2.9	-10.2 to	-3.8	-13.2 to	-6.2

Part B. Potential Change in Savings Rates Less Increase in Government Nonpension Social Expenditure ^{4/} (+ = increase)

(As percent of GDP)

Scenario ^{1/}	1980-2000				2000-2010			
	b-1	b-g	c-1	c-g	b-1	b-g	c-1	c-g
Canada	7.0	0.7	2.5	-0.6	-2.6	-5.9	-4.3	-7.8
France	0.6	-1.4	0.2	-1.9	0.4	-0.9	-0.1	-1.5
Germany, Federal Rep. of	2.3	-0.5	1.0	-1.8	-3.7	-0.4	-5.0	-1.8
Italy	-2.8	-0.7	-4.9	-2.7	1.1	-2.1	-0.2	-3.5
Japan	0.1	-1.8	-1.5	-3.4	-6.9	-3.3	-7.7	-4.0
United Kingdom	1.7	0.5	0.2	-1.0	-1.1	-1.3	-2.2	-2.5
United States	4.5	-0.7	3.7	-1.6	-1.9	-5.3	-3.0	-6.7
G-7 average ^{2/}	2.7	-0.8	1.5	-1.9	-3.3	-3.8	-4.3	-4.9
G-7 range ^{3/}	-1.0 to	2.6	-2.1 to	1.4	-5.2 to	-1.9	-6.3 to	-2.9
	2010-2025				1980-2025			
	b-1	b-g	c-1	c-g	b-1	b-g	c-1	c-g
Canada	-10.4	-9.1	-12.9	-11.0	-5.9	-14.3	-14.8	-19.3
France	-11.5	-3.1	-13.2	-4.5	-10.4	-5.3	-13.2	-7.9
Germany, Federal Rep. of	-6.6	1.6	-8.5	0.5	-8.0	0.7	-12.5	-3.1
Italy	-5.8	-2.0	-8.1	-4.0	-7.6	-4.8	-13.2	-10.2
Japan	-3.5	-3.1	1.5	-3.9	-10.3	-8.2	-7.7	-11.3
United Kingdom	-4.6	-2.0	-5.9	-3.2	-4.0	-2.9	-7.9	-6.7
United States	-7.5	-8.1	-8.8	-9.6	-4.9	-14.2	-8.0	-17.8
G-7 average ^{2/}	-6.6	-5.1	-5.9	-6.3	-7.1	-9.6	-8.7	-13.1
G-7 range ^{3/}	-6.6 to	-4.8	-7.8 to	-4.2	-11.6 to	-5.3	-14.6 to	-7.7

Sources: Heller, Hemming, and Kohnert (1986); and Fund staff estimates.

^{1/} Equivalence Scale

- b-1: Bureau of Labor Statistics
- b-g: Bureau of Labor Statistics
- c-1: CUE scale of Danziger, van der Gaag, Smolensky, and Taussig (1982)
- c-g: CUE Scale of Danziger, van der Gaag, Smolensky, and Taussig (1982)

Consumption growing with:

- labor productivity index
- index of GDP per capita
- labor productivity index
- index of GDP per capita

^{2/} Weighted average of each scenario using May 1987 current exchange rate weights.

^{3/} Weighted average of minimum and maximum of each equivalency scale scenario using May 1987 current exchange rate weights.

^{4/} The change in government nonpension social expenditure, as a percent of GDP:

	1980-2000	2000-2010	2010-2025	1980-2025
Canada	-2.5	0.1	2.1	-0.4
France	0.8	-0.6	1.8	2.0
Germany, Federal Rep. of	-3.2	1.2	2.9	0.9
Italy	0.2	0.8	0.8	1.8
Japan	0.4	2.7	1.4	4.5
United Kingdom	-1.4	0.8	2.5	1.9
United States	-1.2	0.4	2.7	1.9

with the onset of retirement of the baby boom population in Canada and the United States. Private consumption in these countries could rise by approximately 6 to 10 percent of GDP under the alternative scenarios.

Over the whole period 1980-2025, there could be a substantial increase in aggregate consumption, whichever scenario is chosen. If one examines the minimum and the maximum G-7 average that is possible across the different scenarios, the potential decline in savings for the G-7 as a whole ranges from 5 to 12 percent of GDP. This will be a pervasive phenomenon in all of the countries surveyed. It is interesting to note that these results are consistent with the earlier savings model results.

The discussion has heretofore focused strictly on private savings. Yet there will be additional pressures on overall savings in the economy, arising from pressures in the government sector. The Heller, Hemming, and Kohnert study indicated that this period will witness a significant increase in the ratio of government social expenditure to GDP. In part, this reflects higher pension transfer payments to the elderly, essentially providing some of the disposable income to finance the increased private consumption already captured in the above analysis.

Some of the increase, however, is likely to be used to fund other social expenditures, particularly medical care, which are not likely to be included in the increased private consumption expenditure suggested from the equivalence scale analysis. One cannot know how this increased government expenditure will be financed, and whether it will be at the expense of private consumption or savings. One can assume that the problem of financing the government's deficit will constitute an additional source of pressure on the overall savings rate in these economies. The pressure may arise from the necessity of increasing taxation, which may be partly borne from a decrease in savings, or it may arise from an increase in the government's deficit.

To give some sense of the additional pressure on savings arising from the fiscal sphere, Table 6 (Part B) indicates the combined impact of the change in consumption (or potential savings) already described in Table 6 (Part A), and the change in the government's social expenditure burden arising from nonpension outlays. 1/ These estimates do not encompass any other factors that may be affecting government expenditures during this period. They are also sensitive to the assumptions made on the ability of policymakers to control the rate of medical care cost inflation, and the absence, in the Heller, Hemming, and Kohnert study, of any projections of the increase in the cost of chronic care for the very elderly (e.g., over age 75).

1/ The effects of increased pension outlays on private consumption is assumed to have already been taken into account in the above analysis.

In the period 1980-2000, the nonpension social expenditure burden is projected to decline in Canada, the Federal Republic of Germany, the United Kingdom, and the United States, with only small increases in France and Japan (less than 0.5 percent of GDP). This will enhance the potential for some increase in the aggregate savings rate of the G-7 group during this period. However, in the subsequent two decades, nonpension social expenditure outlays of the government could rise by 1 to 2 percent of GDP. During the period 2000-2010, the increase would be largest in Japan (1.5 percent of GDP) with the other countries experiencing smaller increases of 0.5 percent of GDP. In the period after 2010, the increases could range from 1 to 2 percent of GDP in Canada, the Federal Republic of Germany, the United Kingdom, and the United States. For the G-7 as a group, these factors may further exacerbate pressures to reduce the aggregate savings rate.

2. How sustainable will be the burden of intergenerational support?

The Heller, Hemming, and Kohnert study suggested that under current policies there would be a striking increase in government social expenditure, in some countries increasing as a share of GDP by as much as 12 percent (Japan) and in others by 4 to 9 percent (e.g., France, the Federal Republic of Germany, Italy, and the United Kingdom). It noted that if the "net increase in expenditure was to be financed exclusively through the payroll tax," tax rates would have to increase by 7 percentage points in France and by as much as 21 percentage points in Japan. The issue raised was whether this higher burden of intergenerational support arising from government transfers to the elderly could be financially absorbed by the working age population.

Yet the study also noted that there remains

"an asymmetry between the young and aged segments of the population in terms of their relative dependence on government intervention for their overall support. The only element of youth care involving substantial government expenditures appears to be education. A comprehensive accounting for the shifts in absorption of economic resources implied by the prospective demographic changes would have to trace also the relative decline in private expenditures for food, shelter, clothing, entertainment, and in some countries medical care. This was beyond the scope of this study." ^{1/}

The question to be addressed in this section is the magnitude of the decline in private consumption associated with the diminished importance of the younger age groups in the population, relative to the potential increase in the tax burden associated with public support of the elderly. Will the reduced burden of child support to the working

^{1/} Heller, Hemming, and Kohnert (1986), p. 4.

age population free up their financial capacity to support, either privately or through public intermediation, the consumption of the elderly?

It is clear from Table 3 that the share of the young in total consumption, by whichever equivalence scale is used, will fall quite significantly, particularly between 1980 and 2000. Table 7 (Part A) indicates the change in the ratio of consumption by the 0-19 age group to total wages, the latter chosen to yield comparability with the payroll tax base. The prospective increases in the payroll tax burden, as indicated in Heller, Hemming, and Kohnert (1986), are also provided for comparison purposes. Four cases are indicated, representing alternative combinations of the two equivalence scales and the two alternative approaches to estimating the dynamics in the growth of consumption with rising productivity and incomes.

The major change in the burden of child support will occur between 1980 and 2000. The greatest reduction--5 to 8 percent of total wages--is associated with the use of the BLS equivalence scale and the assumption that consumption per capita moves broadly on trend with labor productivity. This reflects that the BLS scale imputes a higher relative consumption to the young and because labor productivity rises more slowly than GDP per capita during this period. The smallest reduction in the burden of child support arises with the CUE-GDP per capita scenario, with child consumption falling by 2 to 3 percent of total wages.

The Heller, Hemming, and Kohnert study suggested that payroll tax financing of the growth in government social expenditure in France, the Federal Republic of Germany, Italy, and Japan would yield an increase in payroll tax rates ranging from 3 percent in France to 10 percent in Japan by 2000. In each of these countries, the decline in the burden of child support will indeed free up resources that could, in principle, be taxed by the government to offset some of its increased social expenditure requirements. For Canada and the United States, social expenditures are projected to decline relative to total wages, as will the burden of child support. The combined impact of the reduced burden of child support and the change arising from payroll tax financing of government social expenditures is indicated in Table 7 (Part B).

Between 2000 and 2025, the share of total consumption associated with the 0-19 age group is likely to stabilize, implying that there may be little additional fiscal capacity available from changes in the burden of child support. There is, in fact, the possibility under some scenarios of a slight increase in the burden of child support, primarily reflecting the eventual impact of the increase in fertility rates assumed under the baseline demographic scenario in the Heller, Hemming, and Kohnert study. Yet this will be the period, particularly from 2010 through 2025, when the burden of supporting the elderly will rise most sharply.

Table 7. Perspectives on the Change in Intergenerational Financing Burden on the Working Population

Part A. Comparison of the Change in the Share of Consumption of the 0-19 Age Group in Total Wages, with Potential Payroll Tax Increase (+ = increase)

(In percent of total wages)

	Potential Change in Payroll Tax	Change in Ratio of Consumption of 0-19 Age Group to Total Wages				Potential Change in Payroll Tax	Change in Ratio of Consumption of 0-19 Age Group to Total Wages			
	<u>2/ (A)</u>	<u>Model (B)</u>				<u>2/ (A)</u>	<u>Model (B)</u>			
		b-1	b-g	c-1	c-g <u>1/</u>		b-1	b-g	c-1	c-g <u>1/</u>
<hr/>										
	1980-2000					2000-2010				
Canada	-5.4	-8.2	-5.5	-3.8	-3.1	0.1	-0.7	0.4	-0.1	0.5
France	2.6	-3.2	-2.3	-1.7	-1.3	0.3	-1.3	-0.8	-0.6	-0.3
Germany, Federal Rep. of	3.7	-6.5	-5.6	-3.6	-3.2	3.9	0.4	-0.7	0.5	--
Italy	4.6	-5.9	-6.7	-3.3	-3.7	3.9	0.1	1.3	0.5	1.2
Japan	9.9	-7.4	-6.8	-3.9	-3.6	8.4	2.7	1.5	1.7	1.1
United Kingdom	0.1	-5.1	-4.6	-2.8	-2.6	1.8	0.2	0.3	0.5	0.5
United States	-2.0	-5.5	-3.5	-3.1	-2.0	0.2	-1.0	0.1	-0.4	0.3
<hr/>										
	2010-2025					1980-2025				
Canada	6.0	0.3	1.6	1.7	1.3	0.7	-6.6	-3.5	-2.3	-1.3
France	4.3	0.3	-2.9	0.3	-1.5	7.4	-4.2	-6.0	-2.0	-3.0
Germany, Federal Rep. of	6.3	-0.3	-2.6	--	-1.3	14.0	-6.4	-8.9	-3.1	-4.5
Italy	7.8	--	-1.3	0.3	-0.5	16.8	-5.8	-6.7	-2.5	-3.0
Japan	2.3	0.6	0.5	0.5	0.4	20.6	-4.2	-4.9	-1.7	-2.1
United Kingdom	4.5	0.4	-0.5	0.4	-0.1	6.4	-4.5	-4.9	-1.9	-2.2
United States	4.7	1.5	1.6	1.1	1.2	2.9	-5.0	-1.7	-2.4	-0.6

Part B. Combined Impact of Reduced Burden of Child Support and Increased Government Social Expenditure Burden 3/ (+ = net increase in overall tax burden of taxes and child support)

(As a percent of total wages)

	Model				Model			
	b-1	b-g	c-1	c-g 1/	b-1	b-g	c-1	c-g 1/
1980-2000					2000-2010			
Canada	-13.5	-10.9	-9.2	-8.5	-0.6	0.5	--	0.6
France	-0.6	0.3	0.9	1.4	-1.0	-0.5	-0.3	--
Germany, Federal Rep. of	-2.7	-1.8	0.1	0.6	4.3	3.2	4.4	3.9
Italy	-1.3	-2.1	1.3	0.9	4.6	5.7	5.0	5.6
Japan	2.5	3.1	6.0	6.4	11.1	9.9	10.2	9.5
United Kingdom	-5.0	-4.6	-2.8	-2.5	2.0	2.1	2.3	2.3
United States	-7.5	-5.5	-5.1	-4.0	-0.7	0.3	-0.2	0.5
2010-2025					1980-2025			
Canada	6.3	7.6	7.7	7.3	-5.9	-2.7	-1.5	-0.6
France	4.8	1.5	4.8	3.0	3.2	1.4	4.4	4.4
Germany, Federal Rep. of	6.0	3.7	6.3	5.0	7.6	5.1	10.9	9.5
Italy	7.8	6.5	8.1	7.3	11.1	10.1	14.4	13.8
Japan	2.9	2.7	2.8	2.7	16.4	15.7	19.0	18.6
United Kingdom	4.9	4.0	4.9	4.4	1.9	1.5	4.4	4.2
United States	6.2	6.3	5.8	5.9	-2.1	1.2	0.5	2.4

Sources: Heller, Hemming, and Kohnert (1986); and Fund staff estimates.

1/ Equivalence Scale

- b-1: Bureau of Labor Statistics
- b-g: Bureau of Labor Statistics
- c-1: CUE scale of Danziger, van der Gaag, Smolensky, and Taussig (1982)
- c-g: CUE scale of Danziger, van der Gaag, Smolensky, and Taussig (1982)

Consumption growing with:

- labor productivity index
- index of GDP per capita
- labor productivity index
- index of GDP per capita

2/ Potential increase in payroll tax burden to finance higher social expenditure burden, as a percent of total wages; see Heller, Hemming, and Kohnert (1986), p. 4.

3/ Equals sum of (A) and (B) in Part A.

Over the entire period, 1980-2025, the results in Table 7 (Part B) suggest that the declining share of the young may offer only limited potential for moderating the growth in the fiscal burden of growing government social expenditures for the elderly. Large increases in the tax burden may be necessary, if present policies prevail, particularly after 2000. On the other hand, there is clearly potential in most countries for an increase in the savings rate of the working population in the next decade or so, reflecting the decline in the burden of child support (if such a decline in fact materializes). In effect, this is the window for real capital accumulation available to the current working population to finance their subsequent retirement in the early part of the next century.

3. The adequacy of government social security pensions

Among the many issues that complicate projections of savings rates into the next century is the difficulty of assessing future income levels. In particular, will the disposable income of the elderly be sufficient to accommodate their consumption "requirements" as implied by the above analysis? For the retired population, there will be four principal sources of financing for their consumption needs: public pension transfers, private pension incomes, a drawing down of their private capital assets, and intragenerational family transfers.

Public pension income will constitute an important share of total disposable income for much of the elderly population. The earlier analysis facilitates an examination of adequacy of such transfers relative to the consumption needs of the elderly. If such public transfers were to decline relative to consumption needs, it would cast doubt on the capacity of the elderly to realize the consumption levels assumed in Section III, and thus might imply that the decline in the savings rate may be less than predicted. There would also be important implications for the level of welfare of the elderly as a group. 1/

The Heller, Hemming, and Kohnert study made projections of government pension transfers through 2025. 2/ These can be combined with the projections of the consumption needs of the elderly derived from the equivalence scale analysis, to estimate the share of consumption needs of the elderly financed from public pensions (Table 8). The four different scenarios on consumption needs are presented, though the trends do not differ significantly across the scenarios.

1/ In assessing this issue, one should note current perceptions that the elderly may in fact have been relatively insulated in recent years from adverse shifts in real income.

2/ These projections took into account current program provisions that provide for changes in benefits associated with inflation, average earnings, and changes in the replacement rate and in the retirement age at which benefits commence.

Table 8. Major Industrial Countries: Total Ratio of Pension Outlays to Total Consumption of Pensionable Age Group

	Model: c-g 1/			
	1980	2000	2010	2025
Canada	56	42	33	27
France	79	79	77	64
Germany, Federal Rep. of	123	131	122	119
Italy	79	80	82	85
Japan	46	64	67	65
United Kingdom	47	54	55	54
United States	92	73	61	47

	Model: b-l 1/			
	1980	2000	2010	2025
Canada	59	50	43	34
France	83	86	85	63
Germany, Federal Rep. of	128	143	129	111
Italy	83	81	90	90
Japan	47	69	70	67
United Kingdom	49	58	60	57
United States	98	86	77	60

	Model: b-g 1/			
	1980	2000	2010	2025
Canada	59	44	36	30
France	83	83	81	68
Germany, Federal Rep. of	128	137	131	130
Italy	83	84	89	94
Japan	47	67	72	69
United Kingdom	49	57	59	58
United States	98	77	66	51

	Model: c-g 1/			
	1980	2000	2010	2025
Canada	56	44	37	28
France	79	82	81	60
Germany, Federal Rep. of	123	138	121	103
Italy	79	77	84	82
Japan	46	66	66	69
United Kingdom	47	55	56	53
United States	92	81	72	55

Sources: Heller, Hemming, and Kohnert (1986); and Fund staff estimates.

1/	Equivalence Scale	Consumption growing with:
b-l:	Bureau of Labor Statistics	labor productivity index
b-g:	Bureau of Labor Statistics	index of GDP per capita
c-l:	CUE scale of Danziger, van der Gaag, Smolensky, and Taussig (1982)	labor productivity index
c-g:	CUE scale of Danziger, van der Gaag, Smolensky, and Taussig (1982)	index of GDP per capita

Two patterns emerge. In three countries--Italy, Japan, and the United Kingdom--the level of pensions increases relative to consumption, rising by 10 to 20 percent of consumption in Italy and the United Kingdom, and by as much as 50 percent in the case of Japan. In the United Kingdom, pensions may increase to about 55 to 70 percent of the consumption needs of the elderly. In the case of Italy, pensions are projected to rise to 80 to 90 percent of consumption needs (although this may reflect that its pension system tends to overlap with the provision of welfare payments, such that some of these outlays are, in fact, for nonpensionable age groups).

In the other countries, public pensions may decline as a share of the consumption needs of the elderly. In Canada and the United States, the share could decline by almost 50 percent, with pensions accounting for only 30 percent of consumption needs of the elderly in Canada, and approximately 50 to 55 percent in the United States. In France, the decline in the ratio of pensions to consumption needs may be of the order of 20 to 25 percent, but pension levels may still reach approximately 60 to 65 percent of consumption needs. Pensions in the Federal Republic of Germany are the highest relative to consumption needs among the seven countries. Pensions are projected to decline by 10 to 20 percent of consumption needs but may still be in excess of 100 percent of the projected consumption needs of the elderly.

In assessing the impact of these trends on the likely level of consumption and savings, one would have to argue that in some countries, there are likely to be financial pressures on the elderly to reduce their consumption, though whether this is plausible or socially acceptable is not at all clear. If allowed to happen, this may moderate some of the pressures on the savings rate alluded to above.

V. Some Concluding Thoughts

This section briefly summarizes the principal results and suggests some important unresolved issues.

1. The aging of the populations of the seven major industrial countries could lead to a significant reduction in aggregate private savings rates. Social expenditure pressures on the government's deficit could further exacerbate pressures on the overall savings rate in these economies.

2. This is a phenomenon common to all of the G-7 countries. The timing of the pressures on saving will be different, occurring earlier in Japan and perhaps the Federal Republic of Germany, and later in Canada and the United States. However, by the end of the period, there is a real prospect that the savings rate could decline substantially in all G-7 countries.

3. The window of opportunity for increased saving, if any, will emerge in the next decade and a half, during the period when there will be a sharp decline in the ratio of the 0-19 age group to that of the working population. The results are unclear as to whether the reduced burden of child support in this period will be sufficient to offset the slowly accelerating increase in the society's burden of support for the elderly. Nevertheless, it is quite apparent that this is a window of opportunity which will close fairly decisively in the beginning part of the next century. In the current climate of weak aggregate world demand, one should stress that any policies to increase savings would need to be accompanied by efforts to ensure a commensurate expansion in investment rates.

4. Under present policies, the fiscal burden on the government of supporting the elderly is likely to increase significantly over this period, with the timing different across countries. Over the entire period, 1980-2025, the reduced burden of child support will not be sufficient to free up the financial capacity to offset this increased burden of societal support for the elderly. In some countries, the timing of these two developments is quite different, with the decline in the child support burden principally occurring before 2000, and the increased burden of supporting the elderly emerging after 2010.

5. The change in the ratio of government pension outlays to total consumption of the pensionable age group has important, unexplored implications, both for the issues dealt with above, and for other issues of public policy concern. In terms of savings, there is an oft-expressed view that a reduction in the share of consumption support provided by pensions will encourage higher savings, as the working age population perceives the necessity to cover the expenses of its own retirement. Conversely, an increase in the ratio of government pension support may serve to lower savings rates.

The results of the final part of Section IV suggest a sharp and early increase in the effective level of consumption support by public pensions in some countries, notably in Japan, but, to a lesser extent, in the Federal Republic of Germany and the United Kingdom. In the case of the former two countries, the share of consumption support will then stabilize. If true, will this serve to further exacerbate pressures for a reduction in the savings rate? Will this reduce the extent to which the elderly save in Japan (an issue not addressed in this study)? In the case of Canada, France, and the United States, the decline in the burden of support will be gradual, if at all, declining more rapidly after 2000. Will expectations of this future decline serve to strengthen savings propensities between now and 2000?

In the period 2000-2025, will the reduced burden of support be offset by higher own financing of consumption by the elderly, or are the consumption levels projected in this study (and the implicit reduction

in savings) overestimates? In a period of the "graying" of the electorate, how will this reduction of the potential standard of living of a significant share of the elderly be viewed?

It was noted at the beginning of this paper that it was an exercise in macroeconomic speculation. Most of the key assumptions are sufficiently interrelated such that changes in some will influence all, changing the results. The data used are imperfect. The savings models are all drawn from cross-country studies. Both equivalence scales are based on United States data. It is likely that the consumption data only imperfectly capture some important expenditure demands related to demographic developments, viz., the rising real burden of college education (with its implications for absorbing some of the excess financial capacity arising from a reduced youth dependency rate) and the high cost of supporting the very elderly (e.g., those over age 75), costs which are not presently covered by public transfer programs.

Moreover, the modeling of these phenomena is partial. Numerous developments could occur which might change some of the basic parametric assumptions underlying the projections. Inter alia, these could include deferral of retirement with increased life expectancy, changes in immigration policy, changes in the relative price of consumption goods specific to the elderly, changes in tax policy toward pension benefits, and the effects of a resurgence in inflation. Any developments that result in an erosion of the real value of future pensions might well induce an increase in the savings ratio. Ongoing policy efforts to reform tax systems may also lead to an increase in household savings rates. The emergence of employee-equity plans may enhance the availability of financial resources for the business sector. These caveats suggest that the results are too tentative to support definitive policy proposals at this time.

Yet there appears a broad consistency in the results, particularly for the latter half of the period, and these are such as to give rise to concern. A world economy where the major industrial countries are all saving limited amounts, or dissaving, would have major implications for global economic growth and international balances. If nothing else, this study will hopefully stimulate further efforts to model these phenomena more accurately, and establish whether these developments are indeed likely to occur, or whether compensating adjustments will emerge to limit their impact. This would then provide a firmer basis upon which to develop a policy agenda.

Table 9. Presentation of Four Econometric Models of Saving

1. Modigliani Model (1970)

$$s = 33.7 + 1.31 (y) - 0.88 (AGE) - 0.20 (DEP)$$

(0.03) (0.28) (0.054)

R = 0.77
SEE = 2.16
N = 24

2. Modigliani and Sterling Model (1980)

$$s = 0.02 - 0.51 (AGE) - 0.13 (DEP)$$

(-) (0.12) (0.09)

SEE = 4.67
N = 21

$$+ 2.36 (GDY) + 0.29 (CHPR)$$

(0.39) (0.11)

3. Feldstein Model (1980)

$$s = 0.92 + 5.24 (G) - 1.21 (AGE) - 0.77 (DEP)$$

(1.33) (0.45) (0.20)

R = .90
SEE = .0182
N = 12

$$- 0.37 (B/E) - 0.54 (LPAGED)$$

(0.13) (0.27)

4. Horioka Model (1986)

$$-1.38 - 0.33 (GYPC) - 1.61 (AGE) - 0.92 (DEP)$$

(1.61) (.40) (0.22)

R = .997
SEE = 3.28
N = 21

$$-0.29 LPAGED + 0.47 (INFL) + 0.16 (GDPDEN)$$

(0.10) (0.16) (0.10E-04)

$$- 0.0075 (RETAGE) + 554.34 (INVYPC)$$

(0.003) (328.9)

(standard errors in parentheses)

y = productivity growth.

s = private savings rate (s/y) as a share of private national income.

DEP: the youth dependency rate, viz., ratio of population aged 19 and under to population aged 20-64; in Modigliani and Sterling, the denominator is the male population, aged 20-64.

GYPC: average growth rate of real per capita private national income.

RETAGE: retirement age, proxied by qualifying age for public old-age pensions.

LPAGED: LF participation rate of males aged 65 and over.

INFL: rate of consumer price inflation.

INVYPC: reciprocal of per capita private national income in U.S. dollars (corrected at PPP).

GDPDEN: GDP per square kilometer, in U.S. dollars (corrected at PPP).

AGE: the elderly dependency rate, viz., ratio of retired persons aged 65 and over to number of persons between age 20 and 64; in Modigliani and Sterling, the same ratio is applied but only for the male population 65 and over and 20-64.

G: annual percentage growth rate of real private national income.

B/E: basic benefit-replacement ratio. $\frac{1}{\text{LER}}$

LER: life expectancy at retirement.

CHPR: (labor force participation rate 25-54 - Participation rate 65 and over)/Participation rate 25 through 54.

GDY: rate of growth (per year) of real per capita disposable income.

Sources: Modigliani (1970); Horioka (1986); Feldstein (1980); Modigliani and Sterling (1980).

$\frac{1}{\text{LER}}$ In Feldstein (1980), this is the "new retiree replacement ratio" (based on benefits for a couple plus the average earnings of a worker in the manufacturing industry) as calculated by the Social Security Administration.

Table 10. Change in Aggregate Private Savings Forecast: 1960-80

(In percent of private national income)

	Forecasting Demographic Coefficients Alone				Actual Change 1960-80
	M	M-S	F	H	
Canada	3.8	6.9	16.7	20.5	9.0
France	3.1	-0.5	-2.6	-3.8	-2.8
Germany, Federal Rep. of	-7.7	-0.3	-9.5	-12.9	-6.9
Italy	-7.4	-2.4	-9.7	-13.0	4.0
Japan	0.8	2.6	12.6	14.3	4.8
United Kingdom	-6.3	--	-9.5	-12.4	1.9
United States	1.8	7.7	11.2	13.1	0.8

	Forecast Using all Coefficients				Actual Change 1960-80
Canada	1.2	10.6	8.5	26.6	9.0
France	-6.9	4.7	-7.1	-0.6	-2.8
Germany, Federal Rep. of	-11.3	1.3	-10.9	-21.6	-6.9
Italy	-13.6	-1.9	-19.4	-4.9	4.0
Japan	-6.6	-3.2	-13.4	-24.0	4.8
United Kingdom	-8.0	5.4	-15.8	-5.1	1.9
United States	-1.4	8.9	0.9	-1.9	0.8

Table 11. Constant Utility Equivalence Scales 1/

Consumer Unit Composition	Age of Head of Consumer Unit			
	35	35-54	54-64	65+
<u>One person</u>				
Male	60	63	56	47
Female	50	53	46	37
<u>Two persons</u>				
Husband and wife	77	80	73	64
Female head, child 6-11	56	60	53	--
<u>Three persons</u>				
Couple, child < 6	76	80	73	64
6-11	88	91	84	75
12-17	90	93	86	77
18+	94	98	90	82
<u>Four persons</u>				
Couple, 2 children < 6	83	87	80	71
6-11, < 6	85	89	82	73
6-11	95	98	91	82
12-17, 6-11	97	100	93	84
12-17	97	100	93	84
18+, 6-17	110	113	106	98
18+	101	105	97	89
<u>Five persons</u> <u>2/</u>				
Couple, 3 children 6-11	91	94	87	--
12-17, 6-11	102	105	98	--
18+, 6-17	115	119	112	--

Source: Danziger, van der Gaag, Smolensky, and Taussig (1982).

1/ A consumer unit consisting of a husband and wife with two children, age 12-17 and 6-11, is 100.

2/ Adding more children to the household adds 4 or 5 percentage points to the scale up to family size 8. After that only 2 to 3 percentage points should be added.

Table 12. Revised Scale of Equivalent Income ^{1/} for Urban Families of Different Size, Age, and Composition

(4-person family--husband, age 35-54, wife, 2 children, older 6-15 = 100)

Size and Type of Family	Age of Head			
	Under 35	35-54	55-64	65 or over
One person	37	38	33	28
Two persons				52
Husband and wife	50	61	60	51
One parent and child	40	59	62	58
Three persons				77
Husband, wife, child under 6	62	69	--	--
Husband, wife, child 6-15	62	83	89	81
Husband, wife, child 16-17	--	92	89	--
Husband, wife, child 18 or over	--	83	86	77
One parent, 2 children	68	77	84	75
Four persons				91
Husband, wife, 2 children (older under 6)	71	79	--	--
Husband, wife, 2 children (older 6-15)	76	100	105	95
Husband, wife, 2 children (older 16-17)	--	114	126	--
Husband, wife, 2 children (older 18 or over)	--	96	110	89
One parent, 3 children	88	97	--	--
Five persons				--
Husband, wife, 3 children (oldest under 6)	85	95	--	--
Husband, wife, 3 children (oldest 6-15)	94	115	119	--
Husband, wife, 3 children (oldest 16-17)	--	128	138	--
Husband, wife, 3 children (oldest 18 or over)	--	118	124	--
One parent, 4 children	108	117	--	--
Six persons or more				--
Husband, wife, 4 children or more (oldest under 6)	98	--	--	--
Husband, wife, 4 children or more (oldest 6-15)	107	130	139	--
Husband, wife, 4 children or more (oldest 16-17)	--	145	--	--
Husband, wife, 4 children or more (oldest 18 or over)	--	149	--	--
One parent, 5 children or more	124	137	--	--

Source: Derived from BLS Survey of Consumer Expenditures, 1960-61.

^{1/} The scale values shown here are percentages to be applied to the total cost of a budget (excluding State and local income taxes and disability payments) for the base family (4 persons--husband, age 35-54, wife, 2 children, older child 6-15 years) to estimate the total income required to provide the same level of living for urban families of different size, age, and composition. In addition to the cost of goods and services for family consumption the total budget costs include gifts and contributions, life insurance, occupational expenses, employee contributions for social security, and Federal income taxes. Estimates of personal taxes paid to State and local governments and of payments for disability insurance may be added in those urban areas where applicable.

Table 13. Demand Equivalence Scales by Age Group

(35-54 = 1.0)

	BLS Scale	CUE Scale
0-4	0.34	0.19
5-9	0.75	0.30
10-14	0.75	0.35
15-19	1.07	0.55
20-24	0.60	0.71
25-29	0.72	0.85
30-34	0.77	0.92
35-39	1.0	1.0
40-44	1.0	1.0
45-49	1.0	1.0
50-54	1.0	1.0
55-59	1.07	0.98
60-64	1.07	0.96
65-69	0.96	0.93
70-74	0.94	0.88
75+	0.89	0.78

Source: Fund staff estimates.

Table 14. Change in the Aggregate Private Savings Rate
During Each Period

(In percent of private national income)

Model Specification	1980-2000				2000-2010			
	M	M-S	F	H	M	M-S	F	H
Canada								
Dep	2.6	1.6	9.8	11.7	0.6	0.6	2.4	2.9
Age	-1.8	-1.0	-1.6	-3.3	-1.8	-1.0	-1.6	-3.4
Net	0.8	0.6	8.3	8.4	-1.2	-0.4	0.8	-0.5
France								
Dep	0.8	0.7	2.9	3.5	0.8	0.4	3.1	3.7
Age	0.5	0.1	0.7	0.9	1.3	-1.5	1.8	2.3
Net	1.3	0.8	3.6	4.4	2.1	-1.1	4.9	6.0
Germany, Federal Rep. of								
Dep	1.9	1.4	7.5	8.9	0.4	0.6	1.6	1.9
Age	-1.6	-1.7	-2.2	-3.0	-5.7	-4.5	-7.8	-10.4
Net	0.3	-0.3	5.2	5.9	-5.3	-3.9	-6.3	-8.5
Italy								
Dep	2.5	2.0	9.6	11.5	-0.2	0.2	-0.9	-1.0
Age	-1.9	-1.0	-2.6	-3.5	-2.0	-0.9	-2.8	-3.7
Net	0.6	1.1	7.0	8.0	-2.2	-0.7	-3.6	-4.7
Japan								
Dep	2.6	2.8	9.8	11.8	-0.9	-0.9	-3.4	-4.1
Age	-8.0	-4.1	-11.0	-14.6	-6.5	-3.5	-9.0	-12.0
Net	-5.4	-1.3	-1.2	-2.9	-7.4	-4.4	-12.4	-16.1
United Kingdom								
Dep	1.9	1.3	7.3	8.8	--	0.3	-0.2	-0.2
Age	0.7	-0.4	1.0	1.3	-0.1	-0.4	-0.1	-0.1
Net	2.6	0.9	8.3	10.0	-0.1	-0.1	-0.2	-0.3
United States								
Dep	1.8	1.4	7.0	8.4	0.8	0.7	3.0	3.6
Age	-2.1	-0.8	-2.9	-3.9	-0.8	-0.6	-1.0	-1.4
Net	-0.3	0.6	4.1	4.5	--	0.2	2.0	2.2
G-7								
Dep	2.0	1.7	7.8	9.3	0.2	-0.2	0.7	0.8
Age	-3.4	-1.7	-4.6	-6.2	-2.8	-1.9	-3.9	-5.2
Net	-1.4	--	3.2	3.1	-2.6	-1.7	-3.2	-4.4

Table 14. Change in the Aggregate Private Savings Rate
During Each Period (concluded)

(In percent of private national income)

Model Specification	2010-2025				1980-2025			
	M	M-S	F	H	M	M-S	F	H
Canada								
Dep	-0.5	-0.5	-2.1	-2.5	2.6	1.8	10.2	12.1
Age	-12.3	-7.1	-10.8	-22.5	-15.9	-9.1	-14.0	-29.2
Net	-12.8	-7.6	-12.8	-25.0	-13.3	-7.3	-3.8	-17.0
France								
Dep	1.2	1.1	4.5	5.4	2.7	2.3	10.6	12.6
Age	-2.9	-4.4	-4.0	-5.4	-1.2	-5.9	-1.6	-2.1
Net	-1.7	-3.3	0.5	0.1	1.6	-3.6	9.0	10.5
Germany, Federal Rep. of								
Dep	0.3	-0.1	1.0	1.2	2.6	1.9	10.0	12.0
Age	-5.4	-3.0	-7.4	-9.9	-12.7	-9.3	-17.5	-23.3
Net	-5.1	-3.1	-6.4	-8.7	-10.1	-7.4	-7.5	-11.3
Italy								
Dep	0.5	0.3	1.9	2.3	2.8	2.5	10.7	12.7
Age	-3.9	-2.1	-5.3	-7.1	-7.8	-3.9	-10.7	-14.3
Net	-3.4	-1.8	-3.4	-4.8	-5.0	-1.4	--	-1.5
Japan								
Dep	-0.1	0.1	-0.3	-0.3	1.6	2.0	6.1	7.3
Age	-6.1	-3.8	-8.4	-11.2	-20.6	-11.4	-28.4	-37.8
Net	-6.2	-3.7	-8.7	-11.5	-19.1	-9.4	-22.3	-30.5
United Kingdom								
Dep	-0.1	-0.2	-0.2	-0.3	1.8	1.4	6.9	8.3
Age	-5.5	-3.1	-7.6	-10.1	-4.9	-3.9	-6.7	-8.9
Net	-5.6	-3.3	-7.8	-10.3	-3.1	-2.5	0.3	-0.6
United States								
Dep	-0.5	-0.5	-1.9	-2.2	2.1	1.6	8.2	9.8
Age	-10.6	-5.6	-14.5	-19.3	-13.5	-6.9	-18.5	-24.6
Net	-11.0	-6.1	-16.4	-21.5	-11.3	-5.3	-10.3	-14.8
G-7								
Dep	-0.1	-0.1	-0.5	-0.7	2.1	1.8	7.9	9.5
Age	-7.9	-4.6	-10.7	-14.4	-14.3	-8.2	-19.4	-26.1
Net	-8.0	-4.7	-11.2	-15.1	-12.2	-6.4	-11.5	-16.6

Source: Fund staff estimates.

Note:

M: Modigliani (1970)
M&S: Modigliani and Sterling (1980)
F: Feldstein (1980)
H: Horioka (1986)

Coefficient: Age Dep
-0.88 -0.20
-0.51 -0.13
-1.21 -0.77
-1.61 -0.92

See Table 9 for full specification.

References

- Bureau of Labor Statistics, U.S. Department of Labor, Revised Equivalence Scale for Estimating Equivalent Incomes or Budget Costs by Family Type, Bulletin No. 1570-2 (Washington: U.S. Government Printing Office, 1968).
- Danziger, S., J. van der Gaag, E. Smolensky, and M. Taussig, "Income Transfers and the Economic Status of the Elderly," Institute for Research on Poverty, Discussion Paper No. 695-82 (Madison, 1982).
- Feldstein, M., "International Differences in Social Security and Saving," Journal of Public Economics, 14 (1980), pp. 225-44.
- Heller, P.S., R. Hemming, and P. Kohnert, Aging and Social Expenditure in the Major Industrial Countries, 1980-2025, IMF Occasional Paper No. 47 (Washington: International Monetary Fund, 1986).
- Horioka, C.Y., "Why is Japan's Private Savings Rate So High?" (unpublished, International Monetary Fund, 1986).
- Lluch, C., "The Extended Linear Expenditure System," European Economic Review, 4 (1973), pp. 21-32.
- Modigliani, F., "The Life Cycle Hypothesis of Saving and Intercountry Differences in the Saving Ratio," in Induction, Growth, and Trade, ed. by W.A. Eltis, M.F. Scott, and J.N. Wolfe (Oxford: Clarendon Press, 1970), pp. 197-225.
- _____, and A. Sterling, "Determinants of Private Saving with Special Reference to the Role of Social Security--Cross-Country Tests," in The Determinants of National Saving and Wealth, ed. by F. Modigliani and R. Hemming (New York: St. Martin's Press, 1980), pp. 24-55.
- van der Gaag, J., and E. Smolensky, Technical Supplement on Levels of Living and Household Equivalence Scales (unpublished, Madison: Institute for Research on Poverty, 1980).
- Sturm, P., "Determinants of Saving: Theory and Evidence," OECD Economic Studies, No. 1 (Autumn 1983), pp. 147-97.

