THE ECONOMIC CONSEQUENCES

OF AGEING POPULATIONS

(A COMPARISON OF THE EU, US AND JAPAN)

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INTRODUCTION AND OVERVIEW

Life expectancy, fertility rates and migration flows are the key determining factors underlying all population projections. Any objective assessment of the likely evolution of these factors over the coming decades suggests that *ageing of the EU, US and Japanese populations is an inescapable fact*, due to the progressive lengthening in life expectancy and the fall in fertility rates to below the critical threshold levels required for generational renewal.

The share of elderly people in the overall population is presently of the order of 15 percent in the EC, US and Japan. According to the latest demographic projections, this share is likely to almost double between now and 2050 in the case of the EU and Japan, while growing more modestly in the US to reach 21% at the end of the period. While the share of the elderly also grew over the last number of decades, increases up to the present time did not pose insurmountable problems because the population of working age was also growing rapidly and dependency ratios actually fell. This latter luxury of growing numbers entering the labour force, which governments could turn to in order to fund the additional pension and health care expenditures associated with an ageing population, is fast disappearing. *Over the next half century, sharp increases in dependency ratios are projected to emerge in all areas*. Consequently, as a result of these twin developments, i.e. growing shares of the over 65s in the population allied to declining numbers in the age groups which traditionally supported the non-economically active age groups, "grey" pressure has ceased to be trivial, if it ever was so, in terms of its economic implications.

A lot of research has been carried out in various organisations either on the situation in individual countries or on specific age-related topics such as the impact of ageing on the public finances, on potential output, on private savings behaviour, etc. While this work is vital and adds considerably to the ongoing debate, it suffers from its inherently partial nature in that the importance of international linkages and the role of systemic interactions and feedback mechanisms are inadequately catered for. These *"general equilibrium" elements are crucial to providing a complete understanding of the likely impact of a global phenomenon such as ageing*.

A model such as QUEST II, with its large geographical coverage, is able to provide a single, internally consistent, framework for handling all the macroeconomic aspects of the "greying" issue. QUEST's consistent modelling of the various trade and financial linkages between economies, and especially between the Community's Member States and the US and Japan, ensures that all dimensions of the problem can be looked at including the crucial systemic issues, by definition excluded by partial analyses, such as the *equilibrating role played by interest rates and exchange rates in determining the final, long-term, projections of the economic implications of this phenomenon*.

The paper is structured as follows. Chapter one provides the basic data in terms of the past and expected population trends, with the distinction being made between demographic and economic dependency ratios. Chapter two goes on to discuss, in a partial equilibrium framework, the main channels through which ageing will impact. The rival modelling approaches are also described and the relative merits of the Overlapping Generations Models (OLG) V the Quest II approach is discusssed. The

subsequent two chapters take the broad numbers from chapter one as well as the insights from chapter 2 to provide a general equilibrium perspective on ageing using the Quest II model. Chapter three gives a ***no-policy-change assessment*** of the impact of ageing, with the following chapter looking at a number of policy initiatives which, if adopted, would ***ease the economic burden of ageing*** substantially, according to the simulations carried out. In the last chapter, the results of two equivalent, age-related, modelling exercises are looked at, namely a 1998 analysis carried out by the OECD using its Minilink model and an earlier 1990 analysis carried out by the IMF using its Multimod model

CHAPTER 1: DEMOGRAPHIC TRENDS AND FORECASTS 1960-2050

INTRODUCTION: The present chapter examines past and projected population trends and assesses the implications of these latter trends for dependency ratio developments. The essential feature to highlight regarding past and current developments is the extent of the demographic upheaval which has and is occurring, due to falling birth rates and lengthening life spans. As regards future projections, while uncertainties exist, especially regarding the evolution of fertility rates, one fact appears indisputable namely that large increases in the share of the over 65s in the populations of the EU15, US and Japan will inevitably occur due to the fact that the post-war baby-boom generations in the latter areas will be reaching the normal retirement age in the early decades of the next century. It is envisaged that this ageing process, leading to higher dependency ratios in all of the three regions, will have major economic and social consequences for the countries affected, although accurate predictions will be difficult given that nothing is available in terms of historical demographic precedents.

An exhaustive analysis of past and expected population changes is beyond the scope of the present paper. Consequently, following a short discussion of both the sources for the population projections and on the potential errors attaching to such estimates, the analysis is confined to the dependency ratio implications of these population trends. This latter approach is driven by the need to focus the analysis on the main economic impacts of ageing and on providing an understanding of the essential background material which is used in the simulations which are carried out in the subsequent chapters.

DATA SOURCES AND QUALIFICATIONS: The population projections used for the analysis draw on the UN's long term, medium variant, projections for the US and Japan and on Eurostat's equivalent baseline projections for the Community (see Box 1 for a short commentary on the Eurostat projections). Both sets of projections cover the period 2000-2050. The text below also includes references, where appropriate, to data covering the period from 1960 to the present time, in order to place the expected trends for the next 50 years in their proper historical context.

While the UN and Eurostat population projections appear realistic, with their mid-point estimates being based on a realistic examination of the most recent trends for the key determining variables, it is nevertheless important for policy makers to be conscious of the potential inaccuracies which are involved. The usual warnings therefore apply to these projections, i.e. they are prone to the normal forecasting errors, due in particular to unpredictable and sometimes substantial fluctuations in fertility rates[1] as well as the difficulty in predicting the impact of various social, economic and political factors in the determination of net migration flows.

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[1]An interesting example of potential forecasting errors occurred in France in 1930 when French demographers made a 50 year population projection which forecasted, on the basis of an examination of the consequences of World War I and the subsequent low birth rates of the 1920s, that the French population would only be 35 million in 1980 when in fact the population turned out to be over 50% larger at nearly 54 million. This forecasting error was essentially unavoidable since it resulted from a

Finally, while uncertainties clearly exist regarding long term demographic projections it is nevertheless important for policy makers to bear in mind that the outlook over the short-term, i.e. over the next 20 years, is relatively certain with regard to the age cohorts which have potentially the greatest economic and budgetary implications over that period. For example, excluding migration flows the prediction of which even over relatively short periods of time remains problematic, the growth of the labour force can be predicted fairly accurately over the next two decades since the bulk of any new entrants to the workforce have already been born and likewise with the number of over 65s, given the relative stability of mortality rates, they can also be predicted with reasonable confidence.

1.1 DEMOGRAPHIC AND ECONOMIC DEPENDENCY DEVELOPMENTS: TRENDS AND PROSPECTS

DEMOGRAPHIC DEPENDENCY Ratios: The level and structure of the Community's population is being fundamentally transformed by those factors referred to earlier namely changes in birth rates, life expectancy and migration flows, the results of which will be most felt in the early part of the next century. The Community is not alone in this regard with the US and Japan also equally affected.

A useful summary indicator of these demographic changes is the dependency ratio, which can be defined in a number of different ways depending on its intended purpose. One of the most commonly used ratios is the overall demographic dependency ratio, which is conventionally defined as the ratio of the "dependent" age groups (0-14 and 65+) to the population in the working age groups (15-64). The latter ratio is expected to change dramatically over the next 50 years compared with past behaviour.

Over the period 1960-1995 the overall dependency ratio actually fell in all 3 areas, with decreases in the proportion of young people more than offsetting the rise in the old age dependency ratio. These broad trends are expected to change dramatically over the next fifty years, with the overall dependency ratio expected to rise significantly in all areas, with increases ranging from 15 percentage points in the case of the US to 22 and 40 percentage points in the case of the EU and Japan respectively (Graph 1). These increases in the overall total reflect a broadly stabilising youth ratio and a sharp increase in the old age share of the total. As regard the latter old age ratio, in 1985, for example, the EU ratio of over 65s to those between 15-64 was 20% i.e. there were five potential workers for every one retired person. By 2050 that ratio is expected to deteriorate dramatically to only about two economically active workers for every person over 65.

In terms of the relative timing of these latter changes, the one significant difference is that Japan is forecast to experience the increase in dependency ratios roughly 10-15 years before the EU and the US.

ECONOMIC DEPENDENCY RATIOS: A big problem with the demographic definition of dependency, according to a wide range of commentators, is that it doesn't accurately

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pragmatic decision to extrapolate forward the most recent trends. Demographers could not have been expected to predict the recovery in fertility rates which actually took place.

Graph 1: Demographic Dependency Ratios EU, US and Japan

Total Dependency Ratio[1]
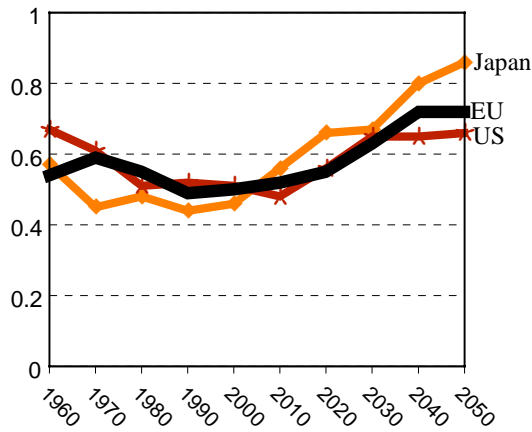
Old Age Dependency Ratio[2]
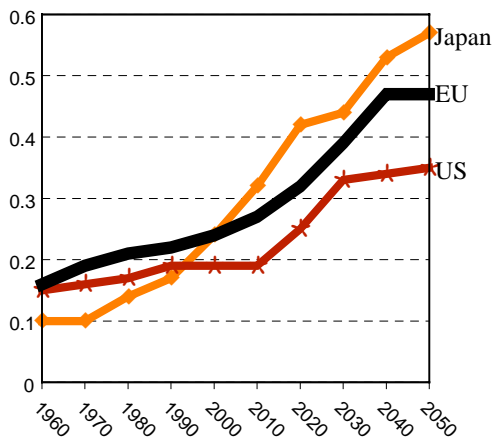
Youth Dependency Ratio[3]
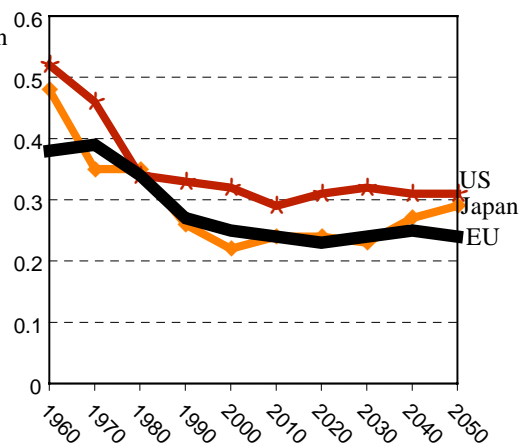
(1): Total Dependency Ratio = (Population under 14 or above 65) / (Pop. aged 14-64)

(2): Old Age Dependency Ratio = (Population above 65) / (Pop. aged 14-64)

(3): Youth Dependency Ratio= (Population under 14) / (Pop. aged 14-64)

Graph 2: Comparison of Economic and Demographic Dependency Ratios: EU, US and Japan

Total Demographic Dependency Ratio
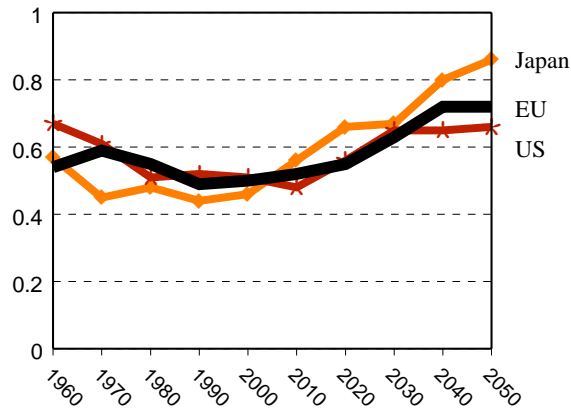
Potential Economic Dependency Ratio (1)
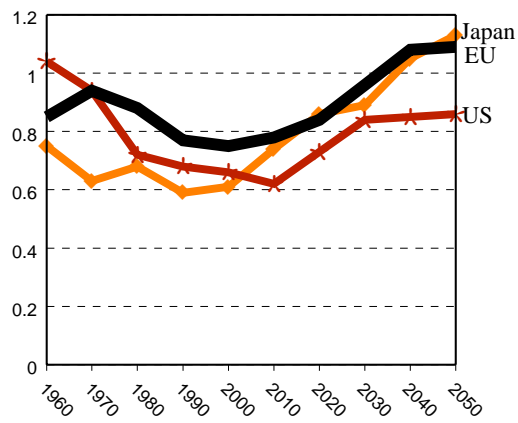
Effective Economic Dependency Ratio (2)
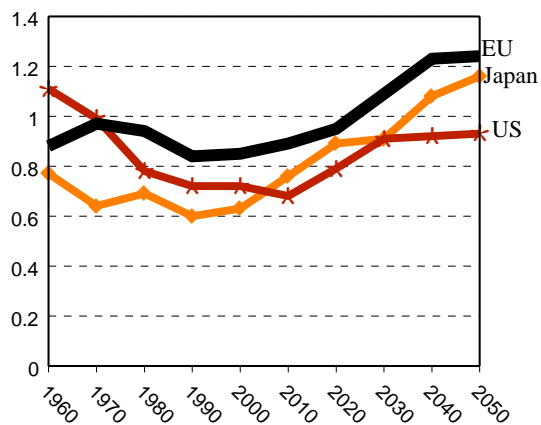
(1): Potential Economic Dependency Ratio =

(Population under 14 or above 65) / (Labour Force)

(2): Effective Eonomic Dependency Ratio =

(Population under 14 or above 65) / (Employment)

reflect the economic burden on the active proportion of the population of working age and in particular on those actually in employment since it is only those who are in employment which are financing government transfers to the non-active population.

It is clear that this latter "economic" dependency burden on current labour income is much heavier for regions or countries with low employment rates. This is particularly the case with the Community where the demographic dependency ratio in 1995 was 49% but the economic dependency ratio (defined as the total of the 0-14 and the 65+ age groups as a proportion of the overall numbers employed) was as high as 85% (Graph 2)[2].

It is also evident that divergences between the Community, the US and Japan in terms of participation rates and employment rates are much larger than the differences in demographic structure and these differentials are reflected in the respective ratios. The Community's demographic and economic dependency ratios of 49% and 85%, for example, compare with a demographic dependency ratio in the US which is not that different (53%) but with an economic dependency ratio which is very different (75%). As regards Japan the 1995 demographic ratio is again not radically different at 44% but the economic dependency ratio is, in fact, a further 16 % points lower than that in the US, being consequently 26 % points lower than here in the Community. These 10 and 26 % points differences in the transfer burden facing US and Japanese versus EU workforces, which must of course at some point reflect itself either in higher taxes / social security contributions in order to finance the additional transfers or in a lowering of benefit payments to recipients, emanates from the fact that the financing of the ageing burden is spread over a greater number of workers in the US and Japan because of the higher labour force participation rates and lower unemployment rates compared with here in Europe.

FUTURE EVOLUTION OF DEPENDENCY RATIOS: Under Eurostat's baseline scenario, the EU's overall population is expected to fall slightly over the next 50 years from 372 million in 1995 to an estimated 367 million in 2050. In addition to the fall in numbers, a significant ageing of the population is also predicted, with the old age dependency ratio (i.e. over 65s as a proportion of the working age population) expected to almost double, rising by 24 percentage points from 23% in 1995 to 47% in 2050. The economic dependency ratio or ageing burden[3], measured in this case as the ratio of the over 65s to the employed population, displays an even greater increase, rising by a massive 39 percentage points from 85% in 1995 to 124% in 2050. In the case of the US and Japan the situation in the latter country appears more alarming with an increase in the economic dependency ratio of 57 percentage points compared with less than 20 points in the case of the US.

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[2] As regards economic dependency, it is important to highlight the relative positions of the individual Member States. As stated in European Economy (1994) « the differences between Member States become considerable since their divergence in terms of activity rates and employment rates are much larger than the differences in age structure and the economic dependency problems will be much heavier in countries with low employment rates. This may be illustrated by the respective positions of Greece, Spain, France and the United Kingdom where demographic dependency is practically the same (54 to 55.5%) but where the economic dependency with respect to employment ranges from 82.7 to 118.1%. »

[3] The economic dependency ratio calculations assume that the employment and unemployment rates remain invariant over the forecast horizon.

When one looks at the actual numbers involved one can see quickly the magnitude of the challenge to be faced by the EU, US and Japan. Over the past 35 years the number of people aged 65 and over in the 3 areas combined increased by roughly 53 million. This, however, did not pose any major economic problems since the working age population rose by substantially more (138 million) and easily supported the additional economic burden. The next 50 years will see a dramatic turnaround in these numbers, with the number of over 65s growing by an additional 92 million but with the working age population actually declining by 41 million. On the basis of these latter absolute numbers one can more readily comprehend the daunting nature of the challenge which this ageing burden places on the economic systems of the respective geographical areas.

TABLE 1: POPULATION TRENDS: 1960-1995

	1960			1995		
	US	**Japan**	**EC15**	**US**	**Japan**	**EC15**
Age	**Totals and Age Structure (Millions + % of Total)**					
0-14	56	28	78	59	20	66
(% of Total)	(31)	(30)	(25)	(22)	(16)	(18)
15-64	108	60	205	174	87	249
(% of Total)	(60)	(64)	(65)	(65)	(70)	(67)
65+	17	6	33	34	18	57
(% of Total)	(9)	(6)	(10)	(13)	(14)	(15)
Total Population	181	94	316	267	125	372

Source: DGII

Dependency Ratio Developments

A: Demographic Dependency Ratios						
	Youth		**Old-Age**		**Total**	
	1960	**1995**	**1960**	**1995**	**1960**	**1995**
EU15	0.38	0.26	0.16	0.23	0.54	0.49
US	0.52	0.34	0.16	0.19	0.68	0.53
Japan	0.47	0.23	0.10	0.20	0.57	0.44

B: Economic Dependency Ratios				
	Potential Economic Dependency (0-14+65s+)/Active Population		**Effective Economic Dependency (0-14+65s+)/Active Employment**	
	1960	**1995**	**1960**	**1995**
EU15	0.85	0.75	0.88	0.85
US	1.04	0.69	1.11	0.75
Japan	0.75	0.57	0.77	0.59

TABLE 2: POPULATION PROJECTIONS: 2000-2050

	2000			2050		
	US	**Japan**	**EC15**	**US**	**Japan**	**EC15**
Age	**Totals and Age Structure (Millions + % of Total)**					
0-14	59	19	64	65	17	52
(% of Total)	(21)	(15)	(17)	(19)	(16)	(14)
15-64	184	86	252	209	59	214
(% of Total)	(66)	(68)	(67)	(60)	(54)	(58)
65+	35	21	61	74	33	101
(% of Total)	(12)	(17)	(16)	(21)	(30)	(28)
Total Population	278	126	377	348	110	367

Source: UN and Eurostat

Dependency Ratio Developments

A: Demographic Dependency Ratios

	Youth		Old-Age		Total	
	2000	**2050**	**2000**	**2050**	**2000**	**2050**
EU15	0.26	0.25	0.24	0.47	0.50	0.72
US	0.32	0.31	0.19	0.35	0.51	0.66
Japan	0.22	0.29	0.24	0.57	0.46	0.86

B: Economic Dependency Ratios

	Potential Economic Dependency (0-14+65s+)/Active Population		Effective Economic Dependency (0-14+65s+)/Active Employment	
	2000	**2050**	**2000**	**2050**
EU15	0.75	1.09	0.85	1.24
US	0.66	0.86	0.72	0.93
Japan	0.61	1.13	0.63	1.16

BOX 1: A COMMENT ON EUROSTAT'S POPULATION PROJECTIONS FOR THE EU

Reflecting the uncertainties of long-term population projections, Eurostat's latest (1996) forecasts for the EU countries provide both « high » and « low » scenarios as well as a baseline (effectively a mid-point projection) scenario. It is the latter baseline scenario which is used for the simulations carried out in the main text.

POPULATION PROJECTIONS FOR THE EU : EUROSTAT'S BASELINE, HIGH AND LOW SCENARIOS

The key underlying assumptions and the associated population projections to 2050 for the three scenarios are given below in Table 3 and Graph 3 respectively. The baseline scenario projects a small decline in the EU's population over the forcast period from 377 million in 2000 to 367 million in 2050. This compares with projections of 303 million and 444 million in 2050 for the low and high scenarios respectively. From the latter overview figures and an analysis of the underlying assumptions one can see quickly the considerable degree of uncertainty attaching to population projections with small differences in key population parameter assumptions cumulating quickly over the long periods considered.

Graph 3: Demographic Projections EU15 2000-2050
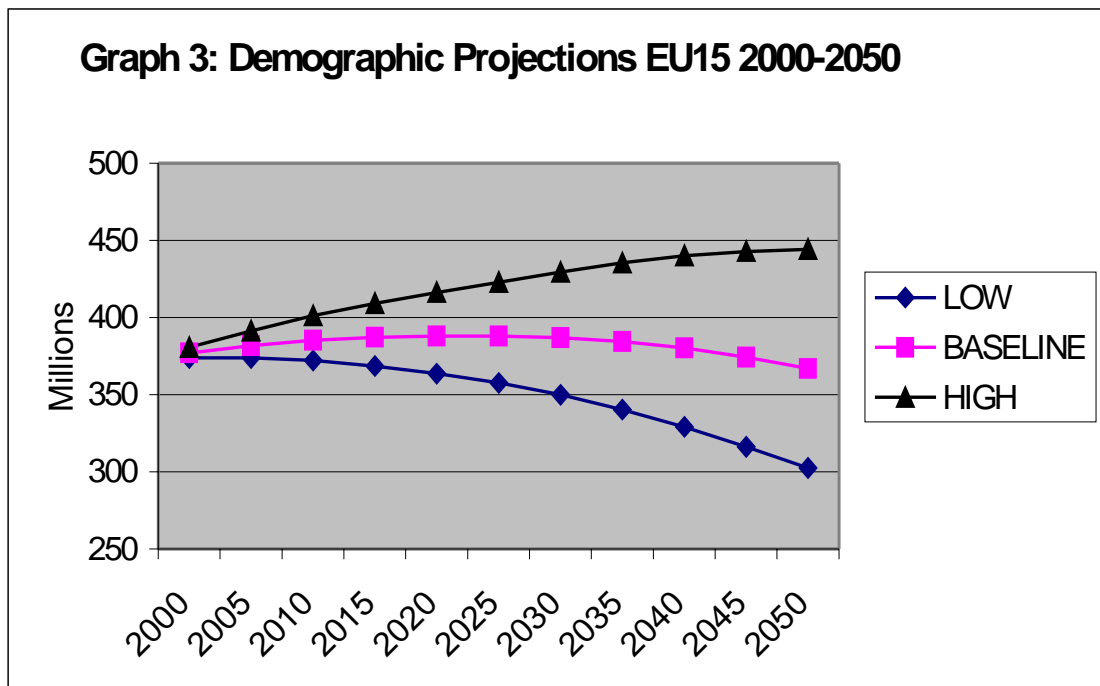
TABLE 3 : KEY UNDERLYING ASSUMPTIONS : FERTILITY RATES, LIFE EXPECTANCY AND MIGRATION FLOWS

	2000	2025	2050
FERTILITY RATE			
Low	*1.40*	*1.44*	*1.45*
Baseline	*1.55*	*1.66*	*1.66*
High	*1.75*	*1.95*	*1.94*
LIFE EXPECTANCY-MALES			
Low	*73.9*	*75.5*	*75.8*
Baseline	*74.7*	*78.4*	*79.7*
High	*75.5*	*81.0*	*82.7*
LIFE EXPECTANCY-FEMALES			
Low	*80.5*	*81.9*	*82.2*
Baseline	*81.1*	*84.1*	*85.1*
HIGH	*81.7*	*85.7*	*86.9*
NET MIGRATION (X 1000)			
Low	*411*	*396*	*396*
Baseline	*679*	*592*	*592*
High	*1010*	*788*	*788*

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TRENDS IN RELATION TO THE KEY INFLUENCING FACTORS 1960-1995: To give some idea of the basis on which the various population assumptions have been calculated, the underlying forecast assumptions given in the table above for the period 2000-2050 can be compared with the actual developments which occurred in fertility rates, life expectancies and migration flows over the period 1960-1995.

- *Fertility Rates: As regards birth rates, the high rates in the immediate post-war period moderated quickly, with fertility rates in the EC as a whole falling to 2.6 in 1960, 1.8 in 1980 and to an average of less than 1.5 in the present decade, which is far below the rate of 2.1 needed simply to maintain a stable population over time. The present EC fertility rates are similar to those pertaining in Japan and compare with rates of 2.0 in the US. These fertility rate changes over the last 50 years have created a spiked population distribution, the effects of which are now starting to manifest themselves.*

Graph 4: Fertility Rates 1960-1995

EC15
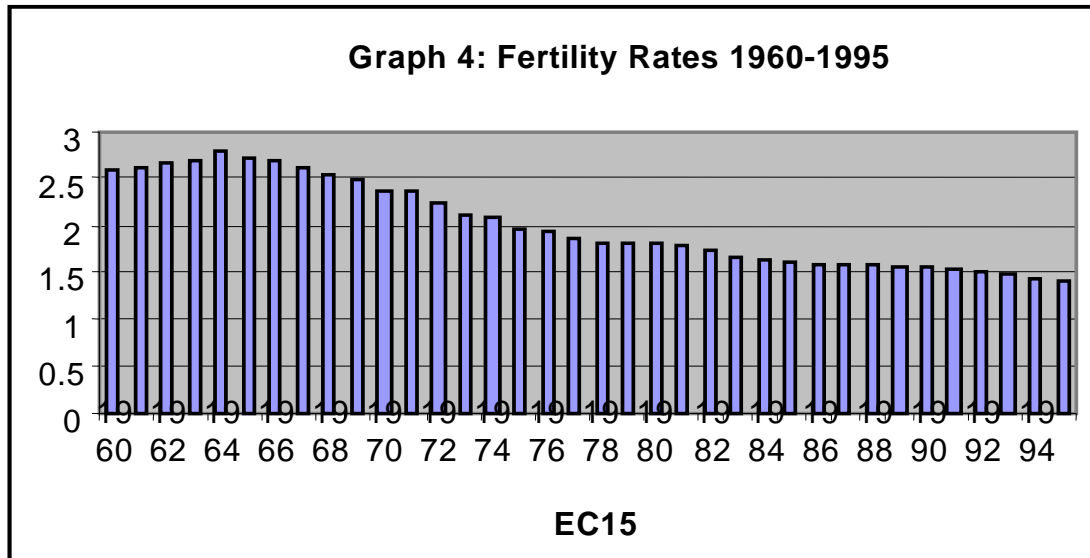
- *Life Expectancy and Net Migration: For the Community as a whole life expectancy at birth increased by 6 ½ years for males and 7 ½ years for females over the period 1960-1995. As regards migration flows, the figures suggest large volatility with numbers in any given period being dictated by an array of factors emanating in the economic, social and political spheres.*

TABLE 4: LIFE EXPECTANCY AND NET MIGRATION DEVELOPMENTS EC 1960-1995

	Life Expectancy			
	1960	*1970*	*1980*	*1995*
Males	*67.4*	*68.4*	*70.5*	*73.9*
Females	*72.9*	*74.7*	*77.2*	*80.3*
	Net Migration (Thousands)			
	1960-64	*1970-74*	*1980-84*	*1991-94*
Total	*257**	*100**	*140**	*528**

* Annual Averages
Source: Eurostat and European Economy No56

CHAPTER 2: HOW IS AGEING LIKELY TO IMPACT ECONOMICALLY

As stressed in Chapter one, the next 50 years will witness a significant increase in ageing in the EU, the US and Japan, with the number of people aged 65 and over likely to grow significantly according to the most plausible scenarios (Table 5). Such an unprecedented phenomenon raises serious questions as to its implications for the public finances, and in particular for the sustainability of the present old age PAYG (Pay-as-you-go) pension system, for private savings behaviour, for the evolution of labour productivity and for the outlook for potential growth and living standards in general[4].

TABLE 5 :   SHARE OF OVER 65S IN TOTAL POPULATION (%)

	1960	2000	2050
US	9.2	12.4	21.2
Japan	6.1	16.5	30.4
EC15	10.6	16.1	27.6

How is ageing likely to impact: Ageing is expected to operate through the following main channels:
- Expenditure Pressures on the Public Finances
- "Life Cycle" Effects on Private Savings Behaviour+Ricardian Equivalence Effects
- Labour Supply Implications
- Potential Impact on Capital Accumulation and Total Factor Productivity
- Equilibrating role for Interest Rates and Exchange Rates and shifts in External Balances

2.1- EXPENDITURE PRESSURES ON THE PUBLIC FINANCES

Despite the normal uncertainties associated with all population projections, the broad thrust or pattern of demographic change is already largely determined for the next 50 years, with ageing being a significant feature of these changes, and with public expenditure pressures being intense in those areas of public budgets, such as health and pensions spending, which are linked to life cycle developments.

Ageing is consequently expected to result in substantial increases in age-related public expenditures[5]. Furthermore, and equally worrying, if past experience is anything to go by, Governments are going to have difficulty even keeping their pension and health care budgets to the, already rather large, percentage points increases which will emanate from purely demographic factors. The reason for this latter difficulty derives from the fact that, despite the relatively favourable demographics operating at present in terms of the public finances, health and pension

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[4] Ageing, of course, will raise a host of more microeconomic issues which are not directly addressed in the paper such as the impact of ageing workforces in terms of labour mobility, both geographical and occupational, as well as internal occupational mobility i.e. the role of seniority rules in companies in reducing the opportunities for rapid promotion of younger workers etc.

[5] These increases are discussed in detail in Chapter 3.

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expenditures as a % of GDP have been rising steadily over the last number of decades. In fact, the Transfers to Households category (i.e. Social Benefits), of which pensions and health are major components, has accounted for nearly two-thirds of the increase in the total Government expenditure to GDP ratio in the Community since 1970. Pensions and health care expenditure combined represents roughly 1/3 of all Government expenditure.

Graph 5: Total Government Expenditure in the EU and its Components 1970-1995

Source: Eurostat
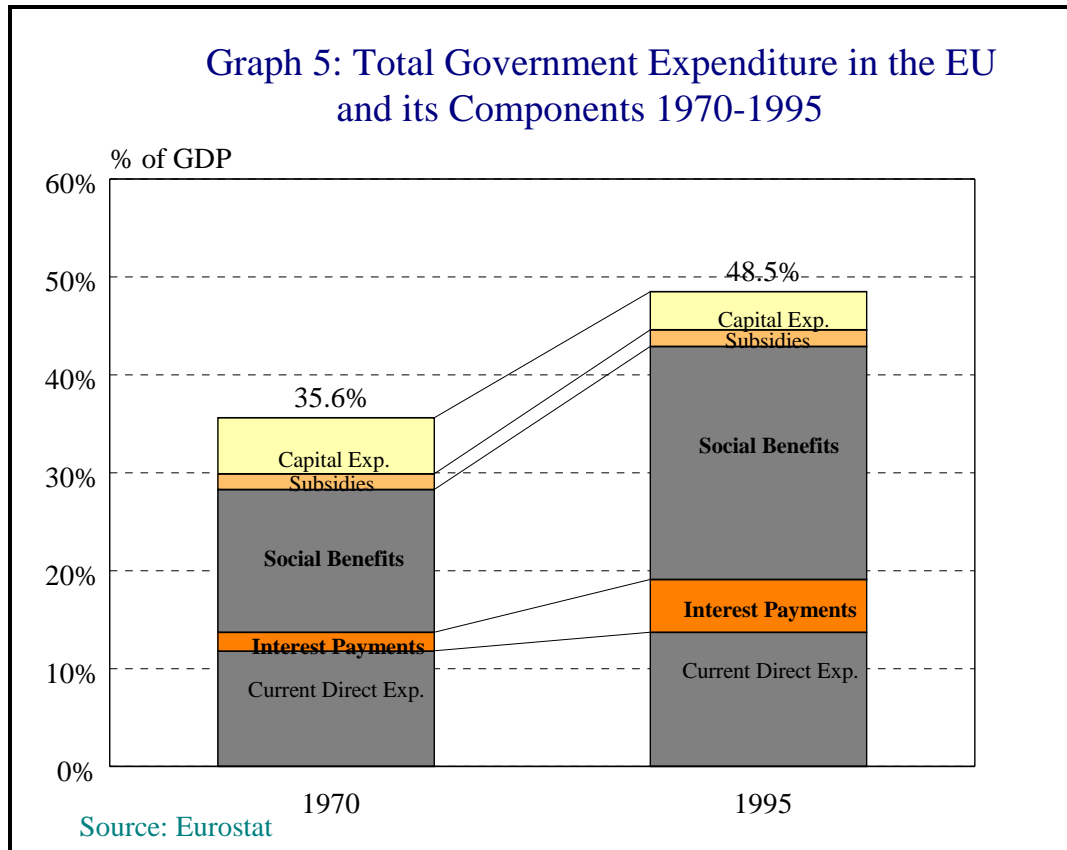
TABLE 6: GOVERNMENT EXPENDITURE TRENDS IN THE EU 1970-1995 (% OF GDP)

	1970	**1980**	**1990**	**1995**	**Change 1970-95**
Current Direct Exp	11.8	14.0	14.0	13.7	1.9
Interest Payments	1.9	3.0	4.7	5.4	3.5
Social Benefits	13.5	17.8	18.5	21.7	8.2
Subsidies	1.6	1.9	1.8	1.7	0.1
Capital Exp.	5.7	4.7	4.4	3.9	-1.8
Total Gov. Exp.	**35.6**	**42.8**	**45.3**	**48.5**	**12.9**

Favourable demographics at present in terms of the public finances : In overall terms, the public finances are at present probably benefiting from demographic developments, with low birth rates over the last number of decades tending to reduce government expenditures, allied to the fact that the large post World War II « Baby-Boom » generation is at the height of its earning power and contributing strongly on the revenue side. This is probably giving governments a sense of complacency which is inhibiting the taking of the necessary reforms which will inevitably be forced on countries once the demographics start to change radically in about 10 years time.

Health and Pension Reform will not be easy: It is important to stress the scale of the task facing governments in relation to controlling health and pension expenditure over the next 50 years. As shown in Table 6, over the last 35 years, increases in these expenditures have been the main culprits in explaining the inexorable rise in the share of government expenditure in GDP but only a small proportion of these pressures came from ageing effects ⇒

- In the case of pensions, according to the OECD (1988), only 25% of the increase in the pension expenditure to GDP ratio be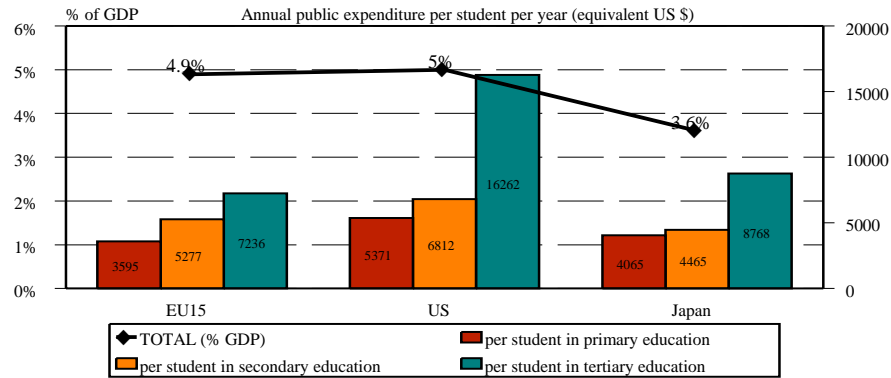tween 1960 and 1985 can be explained by movements in the old-age dependency ratio with the remainder due to non-demographic factors such as increased benefits and a widening in eligibility, associated with the general expansion of the welfare state during the 1960s and 1970s.

- Ageing of the population has an obvious significance for publicly run "Pay-as-you-go" (PAYG) pension systems. Policymakers have realised for some time now that deficits on the PAYG system would quickly reach unsustainable levels if no changes were introduced in terms of both benefits and contribution rates. Such policy changes are being introduced since governments realised that excessive reliance on increased social security contributions would have meant that the financing burden on the future working population may have provoked a negative response in terms of labour supply. Consequently, action on the benefits side has been taken in many cases with the implication that a large proportion of the present working population face the prospect of either less generous pension pay-outs or longer working lifetimes than previously planned for. While reforms have been enacted in a large number of countries, given the scale of the ageing phenomenon, it is accepted that pension expenditure as a % of GDP will still inevitably rise over the next 50 years, placing a heavy burden on national budgets.

- In the case of health care, Oxley and MacFarlan(1994) have estimated that "demand side effects associated with population ageing, increased incomes and increased insurance coverage may explain only a portion - probably under half - of overall expenditure growth. This leaves a large residual which to a significant extent may be attributable to developments affecting the provision of health services".

Overall, therefore, when one realises that the demographic pressures are likely to double in the Community (the old age dependency ratio will rise from 24% to 47%), one sees the looming crisis if the non-demographic factors are also not tackled in any reform process. In this regard, while in the case of pensions the phase of extension of coverage as well as the constant enhancing of benefit pay-outs would appear to be over, health care reforms would not appear to have gone as far.

Education Expenditure: The essential point to be made here is that the hoped-for spending reductions, reflecting the falling share of the younger age groups in the overall population, is not expected to materialise. This lack of proportionality between numbers and expenditures in essence reflects the large fixed cost element endemic to all public education systems. Consequently the hoped for offset to higher pension and health care expenditure will not, it appears, be forthcoming, with in fact the projections for broad stability in the education expenditure to GDP ratio being typical of each of the three geographical areas.

Graph 6: Overview of Public Expenditure on Education, Health and Pensions in the EU, US and Japan

A. 1995 Public Expenditure on Education in the EU, US and Japan

% of GDP   Annual public expenditure per student per year (equivalent US $)

4.9%
5%
3.6%

3595
5277
7236

5371
6812
16262

4065
4465
8768

EU15   US   Japan

- ◆ TOTAL (% GDP)
- ■ per student in primary education
- ■ per student in secondary education
- ■ per student in tertiary education

B. Public Expenditure on Pensions in the EU, US and Japan*

% of GDP

■ 1980   □ 1992

6.7% 7.8%
4.6% 5.2%
3.8% 5.0%

EU   US   Japan
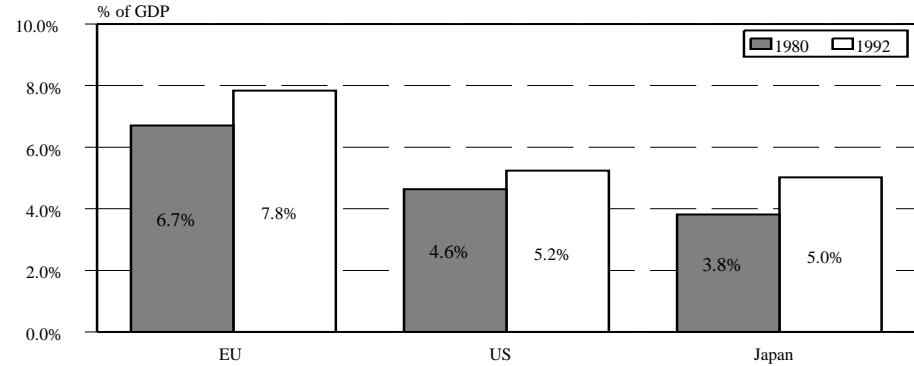
Public Expenditure on Old Age Cash Benefits

C. Public Expenditure on Health in the EU, US and Japan

% of GDP

1960   1965   1970   1975   1980   1985   1990   1995

- ■ United States
- ■ Japan
- ▬ EU
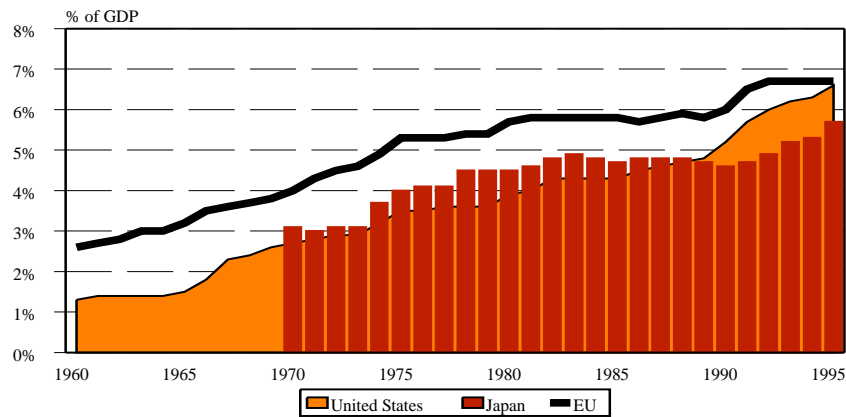
D. Concentration of Total Health Expenditure on the Elderly(1993)*

Population aged over 65

100% Population

16.3% pop.   37.8% H. Exp.
83.7% pop.   62.2% H. Exp.

12.7% pop.   37.2% H. Exp.
87.3% pop.   62.8% H. Exp.

13.5% pop.   42.9% H. Exp.
86.5% pop.   57.1% H. Exp.

100% Health Expenditure

EU   US   Japan

Population aged 0-64
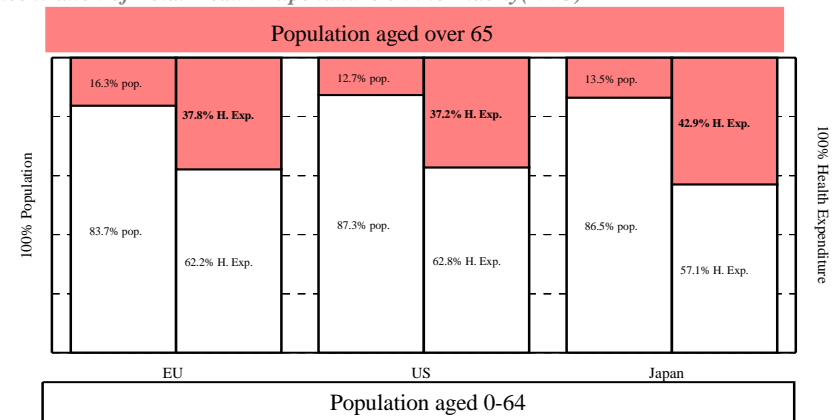
*: EU average based on data for Germany, France, UK, Finland, the Netherlands, Portugal and Sweden

Source: OECD

2.2- "LIFE CYCLE" EFFECTS ON PRIVATE SAVINGS BEHAVIOUR

Demographic change and private savings behaviour: Crucial to any analysis of the likely economic impact of an ageing population is its impact in terms of saving rates. Ageing populations, for example, would be expected to result in a lowering of the private savings ratio if the savings pattern of consumers was to comply with the traditional "life cycle" hypothesis (See Box 2). Life-cycle (LCH) models of savings behaviour suggest that an important component in determining the aggregate saving rate is a population's demographic profile, with savings propensities and the overall dependency ratio expected to be negatively correlated. Inter-temporal considerations provide the intrinsic analytical underpinning of such models with the objective of the average consumer being to even out consumption over a lifetime in which income fluctuates substantially depending on age, i.e. the notion of consumption smoothing. Under this view of the world, the savings rate would be expected to be high when a large proportion of the population is employed, with savings being built up to finance post-retirement consumption. Likewise, the savings rate should be lower when a large percentage of the population is very young or is over the retirement age.

While theoretically the link between aggregate saving rates and dependency ratios in LCH-type models is clear, unfortunately the empirical supporting evidence is more heterogeneous. In a recent review of the empirical evidence, Meredith (1995) concluded that the data source used impacts significantly on the results obtained, with studies based on micro-economic or macroeconomic, time-series or cross-section data, producing widely divergent estimates of the responsiveness of the savings ratio to changes in the dependency ratio.

In overall terms, Meredith suggests that the forecasts of the life cycle model in relation to demographics and savings is generally supported by the evidence derived from aggregate data, with changes in the elderly dependency ratio having a greater effect on savings patterns compared with the youth dependency ratio (see Table 7). An unweighted average of the estimated coefficients shows the savings rate falling by 0.86 and 0.61 of a percentage point for every 1 percentage point increase in the elderly and youth dependency ratios respectively. Effects on the aggregate savings rate of this order of magnitude, in the absence of changes to the other major determinants of household savings, would undoubtedly represent a significant response to the projected shifts in the demographic structure of the EU, Japan and US.

However, it should be noted that while most econometric studies do discover a significant and numerically important association between demographic variables and aggregate saving rates, other studies using household survey evidence challenge that view and suggest that any effects on the saving rate may be negligible. In addition to this survey evidence, the results of studies such as that by Masson, Bayoumi and Samiei (1995)[6], which derives both time series and cross-section estimates, suggests that although demographics are important determinants of private savings rates, the size of the dependency ratio effect is lower than that found in the above series of

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[6] This study on the international evidence regarding the determinants of private saving, concludes that income growth, real interest rates and demographic effects are important determinants of private saving rates. In addition, changes in the fiscal position of governments are found to be substantially offset, by an average of 60%, by changes in private savings behaviour. Population ageing would therefore appear from this study to be an important determinant of, and impact negatively on, private savings rates.

studies quoted by Meredith, with a 1% point increase in the dependency ratio leading, according to Masson et al, to a reduction of only 0.14% in the private savings ratio of industrial countries. In deference therefore to the downward direction of the most recent evidence, it appears prudent to move to the lower end of the various estimates. This is also the approach adopted in the OECD's (1998) paper on ageing which incorporates a coefficient of 0.3 for its model simulations.

TABLE 7   SUMMARY OF STUDIES ON DEMOGRAPHICS AND SAVING
(Figures in parentheses are estimated t-statistics)

	EFFECT ON SAVING RATE OF 1 PERCENTAGE POINT RISE IN THE DEPENDENCY RATIO	
	YOUTH	ELDERLY
AGGREGATE CROSS-SECTION STUDIES		
1. Modigliani (1970)	-0.20 (3.7)	-0.88 (3.1)
2. Modigliani and Sterling(1983)	-0.13 (1.4)	-0.51 (4.3)
3. Feldstein (1980)	-0.77 (3.9)	-1.21 (2.7)
4. Horioka (1986)	-0.92 (4.2)	-1.61 (4.0)
5. Graham (1987)	-0.87 (2.9)	0.12 (0.3)
6. Koskela and Viren (1989)	-0.73 (1.7)	-0.76 (0.8)
7. Horioka (1991)	-0.44 (1.7)	-1.09 (2.4)
8. OECD (1990)	…	-0.93 (2.4)
TIME-SERIES STUDIES		
9. Shibuya (1987)	…	-0.34 (3.8)
10. Horioka (1991)	-0.30 (5.1)	-1.13 (3.7)
11. Masson and Tryon (1990)	-1.10	-1.10
UNWEIGHTED AVERAGE OF THE ABOVE ESTIMATION RESULTS	-0.61	-0.86
HOUSEHOLD DATA STUDIES **Hayashi, Ando and Ferris (1988)** **Bosworth, Burtless and Sabelhaus (1991)**	These studies question the applicability of the life-cycle model on the basis of the observed saving behaviour of the elderly in household data[1]	

Source: Meredith (1995)

[1.] Meredith concludes in relation to these household data studies "By using more recent and detailed information on the income and consumption of retired households, the analysis has shown that the savings rates for the elderly calculated in some household level studies may be misleading. It appears that the elderly do dissave, and that the rate of dissaving is very similar to that predicted by a life-cycle model of household behaviour".

Box 2: Theories of Saving and the Dominance of the Life Cycle Paradigm

THEORIES OF SAVINGS: A wide variety of motives for household saving have been put forward in the theoretical literature. For convenience purposes these motives can be grouped together into essentially three theories of savings with, as one would intuitively expect, assumptions about an individual's time horizon being one of the essential differences between the competing hypotheses.

- *The life cycle model assumes that an individual's time horizon is their own lifetime and that their utility hinges solely on their own consumption. The desire to smooth one's lifetime consumption path by evening out normal cyclical income fluctuations provides the fundamental motive for saving/dissavings during different periods of one's life, with the need to provide sufficient resources for retirement being the clearest example of these life-cycle effects. In the most normal formulation of the life-cycle hypothesis, the lifetime planning horizon of the individual consumer, combined with the expected proportionality between consumption and permanent income, ensures that no net lifetime savings are planned with transfers to heirs only being equivalent to their own initial inheritance.*

- *The bequest model assumes that an individual's time horizon is multi-generational with strong ties linking current generations to their descendants and with individuals driven to maximize not only their own utility but also that of future generations through a bequest motive. Unlike the "finite" life cycle consumers therefore, the "Ricardian" variety are assumed to have "infinite" lives in the sense of having strong links to their descendants via the above mentioned bequest motive.*

- *The precautionary or "buffer stock" theory of saving is built on the view that a major motive for holding and accumulating assets is to shield one's consumption against future uncertainties, such as unpredictable fluctuations or disruptions in income or extraordinary health expenditures. One of the intuitive implications of this "buffer stock" model is that individuals with higher income uncertainty should amass a greater stock of wealth to allow for this.*

DOMINANCE OF THE LCH APPROACH: In terms of the empirical modelling of consumer behaviour, especially in the larger multinational models, the substantial degree of acceptance of the permanent income[7]/life cycle approach(PIH/LCH)• is evident, with virtually all mainstream models emphasising the importance of forward looking consumers and consumption smoothing to reflect the smoothness of permanent income changes. The success of the PIH/LCH approach was not only built on its solid grounding in microeconomic utility maximising theory but also on its empirical explanatory power being consistent, as it was, with both the short-run and long-run evidence. Over the long-run, it suggested that wealth (i.e. permanent income) was the main determining factor in terms of consumption and that the consumption to wealth ratio was a stable one. As regards the short-run it encompasses the Keynesian approach by explaining why over the business cycle consumption fluctuates less than disposable income as a result of consumption

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[7] *The life cycle hypothesis is similar to the Permanent Income Hypothesis in that in both cases consumption is a constant proportion of income.*

smoothing by consumers – which has the effect of evening out consumption in the face of fluctuating income.

While the present dominance of the LCH view is not in doubt, it is not without its detractors. Criticism has been focussed on a number of fronts, including the empirical evidence provided by household survey data which, as mentioned in the text, suggests that the savings behaviour of retired people is very different to that postulated in the LCH view[8]. More fundamentally, the LCH view fails in the minds of a growing number of researchers, including Deaton (1992) and Carroll (1997), to adequately address the issue of income uncertainty and the "buffer-stock" view of savings. While theoretically if all consumers were highly rational and forward looking and operated in a situation of perfectly functioning financial markets they would be able to borrow and lend freely and smooth their lifetime consumption patterns. In reality, a substantial proportion of consumers would not appear to function in this "perfect foresight" way for a variety of reasons including:

- *Firstly, uncertainty concerning future wealth calculations and income flows make people subscribe to more risk averse or precautionary types of behaviour.*
- *Secondly, a large proportion of consumers act in a simpler, less forward-looking, fashion than theory would suggest with many using simple rules of thumb, such as monitoring "buffer" stocks of liquid assets.*

While the above criticisms are entirely valid, most modellers still retain the life cycle assumption since the empirical support for the LCH view remains considerable. As shown in table 7 in the text, which summarises the results of various, cross-country, studies on the link between demographics and saving, the evidence strongly supports the existence of a negative effect on savings of increases in the old-age dependency ratio. In addition, most "working" versions of LCH type models have also taken on board the results of the above empirical research indicating the presence of substantial liquidity constraints on consumption, with its implication that aggregate consumption responds to changes in current income as well as in permanent income. Consequently, most modern models distinguish two types of consumers, the forward looking or wealth constrained variety who smooth their consumption profile in accordance with the life cycle hypothesis and the liquidity constrained or backward looking variety who are restricted to their current incomes in terms of their purchasing patterns.

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[8] *Meredith's skepticism, referred to earlier, on the results of household survey data is supported by Miles (1999) who stresses the role played by PAYG pension systems in the results obtained. Miles states « What the numerical examples and the empirical studies suggest is that failure to measure pension wealth correctly can have a major impact on estimates of saving, especially for the elderly……in principle mis-measurement of pension income could account for the striking discrepancy between what life cycle models imply about the age/saving relation and estimates of saving rates by age that are derived from looking solely at household data in isolation from information on the value of funds that back pensions. The reason is that for those contributing to a funded scheme pension wealth conforms exactly to the simple life cycle pattern; it is steadily built up during the working life and is run down in retirement »*

NATIONAL SAVINGS DEVELOPMENTS AND THE ROLE OF RICARDIAN EQUIVALENCE

A crucial issue to be addressed in terms of the economy-wide growth effects of ageing is the assumptions to be made regarding the national savings implications (i.e. the sum of public and private savings) of increased, age-related, public expenditures. While life-cycle effects look likely to ensure that ageing populations will mean a reduction in private savings in the future and public dissaving is likely to increase on the basis of unchanged policies, ascertaining the national savings implications is not simply a matter of aggregating together the separate effects because that would ignore the existence of potentially important interactions between private and public savings.

- **Firstly,** will public savings deteriorate by an equivalent amount to that of the expenditure increase, i.e. is it reasonable for simulation purposes to assume that non-age related public spending, as well as government revenue sources, remain unchanged in GDP terms;
- **Secondly,** is it reasonable to postulate that private savings behaviour will remain aloof to developments at the public level, which of course would mean that the Ricardian equivalence or debt neutrality hypothesis is deemed irrelevant.

As regards the first point, stability assumptions regarding the non-age related share of overall public expenditure can be deemed legitimate given the objectives of the present exercise, one of which is to single out the demographic factors influencing national budgets, in order to assess the extent of the supplementary, age-related, budgetary adjustments which are likely to be imposed.

Graph 7 : National Saving in the Community

Source: Eurostat
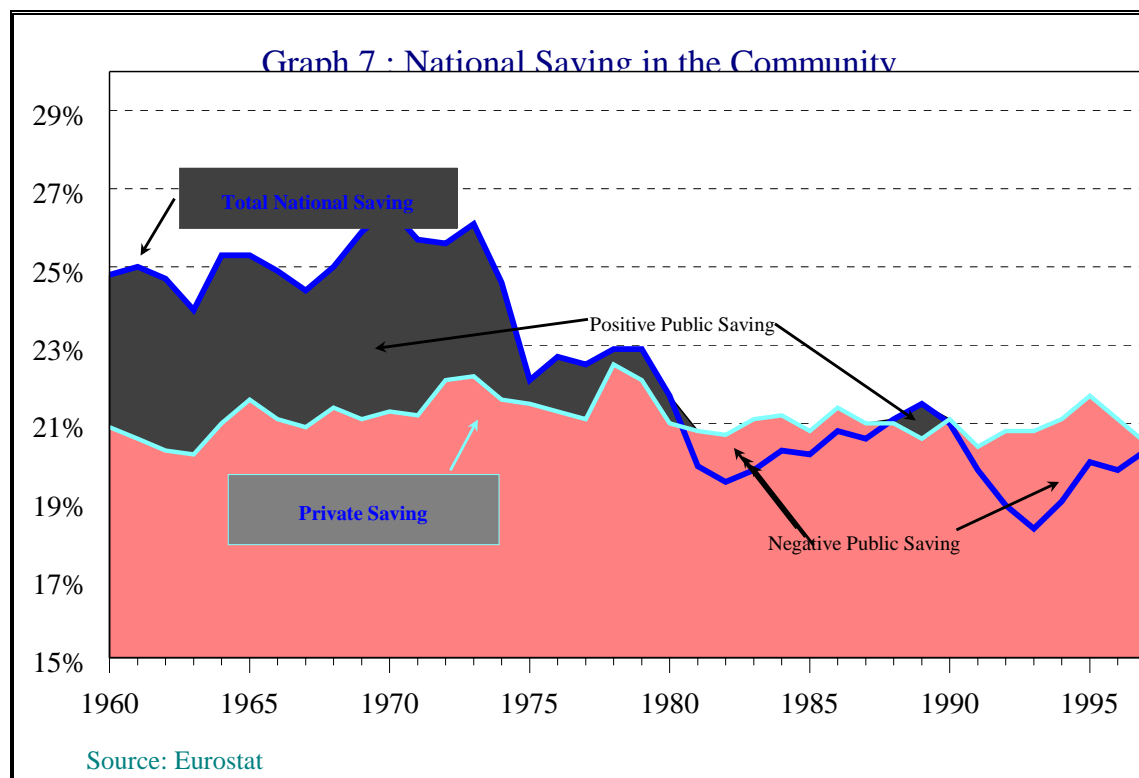
The presumption regarding the private savings / national savings implications, however, flies in the face of the bulk of the empirical evidence. Views differ regarding debt neutrality and the potency of these interactions, with a strict application of the Ricardian equivalence hypothesis implying that overall national savings would be unaffected since any decline in government savings would be fully offset by compensating movements in private savings, since private agents would realise the future tax implications of such a change at the public level. Empirical evidence to support the contention for full Ricardian equivalence (Seater, 1993) is less widespread than those studies which suggest a partial Ricardian offset of about half (Bernheim (1987); Hague & Monteil (1989); Schmidt-Hebbel et al. (1992); Masson et al (1995). Some of these latter studies suggest that the degree of reciprocity between government and private savings developments is likely to be heightened in the event that individual countries are faced with adverse or indeed explosive debt dynamics.

## 2.3 : LABOUR FORCE IMPLICATIONS OF A RISE IN DEPENDENCY RATIOS

Any assessment of the likely burden to be imposed due to ageing must take cognizance of the future shape of Community labour markets. If the latter were to continue to show characteristics similar to those prevailing today, such as high unemployment combined with low activity rates, the additional burden, in the form of increased taxes and social security contributions, imposed on the working population by the increase in dependency ratios, would be likely to generate considerable disincentive effects in terms of labour supply and work effort. Furthermore the budgetary situation would quickly become unsustainable in the absence of fundamental reforms to the present "pay-as-you-go" pension system, with the possibility of initiating the transition phase to a fully funded pension system also appearing more remote in the absence of labour reforms.

As shown in the labour market simulations in Chapter 4, employment reforms along the lines laid down in the recent employment guidelines would be expected to considerably relieve the economic pressure of ageing through unemployment reductions and the achievement of activity rates comparable to those in the US and Japan. These scenarios suggest that the negative impact on Community living standards could be almost totally offset by the implementation of these labour market reforms alone. However, as the discussion in the following paragraphs on labour force participation rates makes clear, such a favourable response from the labour market would, of course, only be forthcoming in the event of a comprehensive reform package, including taxation and social welfare reforms, being agreed to and set in place at the national and Community levels.

The decision to retire early and its effect on labour force participation rates: Two recent studies have examined the impact of tax and benefits system incentives on the early retirement decision making process. In a 1997 NBER Working Paper, Gruber and Wise present evidence of substantial cross country differences in terms of labour force participation rates of the older age groups, with particularly high levels of withdrawals in European labour markets compared with the US and Japan, linked to differences in the treatment of taxes and benefits. Replacement ratios of close to 70 percent, at the official retirement age, were found in the EU, compared with around 40 percent and 55 percent in the US and Japan respectively. In addition, Gruber and Wise

calculated that in the year immediately after eligibility for early retirement, the implicit tax rate on earnings was about 80 percent in several EU Member States (France, Italy, UK and Belgium) compared with rates of zero in the US and less than 50 percent in Japan.

In a separate OECD study, Blondal and Scarpetta (1998) also examined this issue of the role of social security systems in negatively impacting on the participation rates of older workers. The provisions of old age pension systems and the sharp increase since the 1960's in the implicit tax on continuing to work after the age of 55 has made it financially unattractive to work beyond that age. These financial disincentives/penalties to continued labour force participation have been magnified by the introduction of different types of early retirement schemes in many countries, including disability and unemployment-related programmes. All these actions have resulted in a marked decline in the participation rates of older workers since the mid 1970's, with Europe being particularly badly affected. Blondal and Scarpetta estimate that in those Member States with particularly large distortions in their present systems, that the participation rates for 55-64 year olds could be increased by 8-9 percentage points or even more if the disincentives to work for this age group were to be removed. For the remaining Member States, participation rates could increase by between 4-6 percentage points, with the US and Japan gaining by less than 4 percentage points.

Graph 8 : EU-15 Employment as a percentage of the 14-64 Population Age Cohort

Source: Eurostat
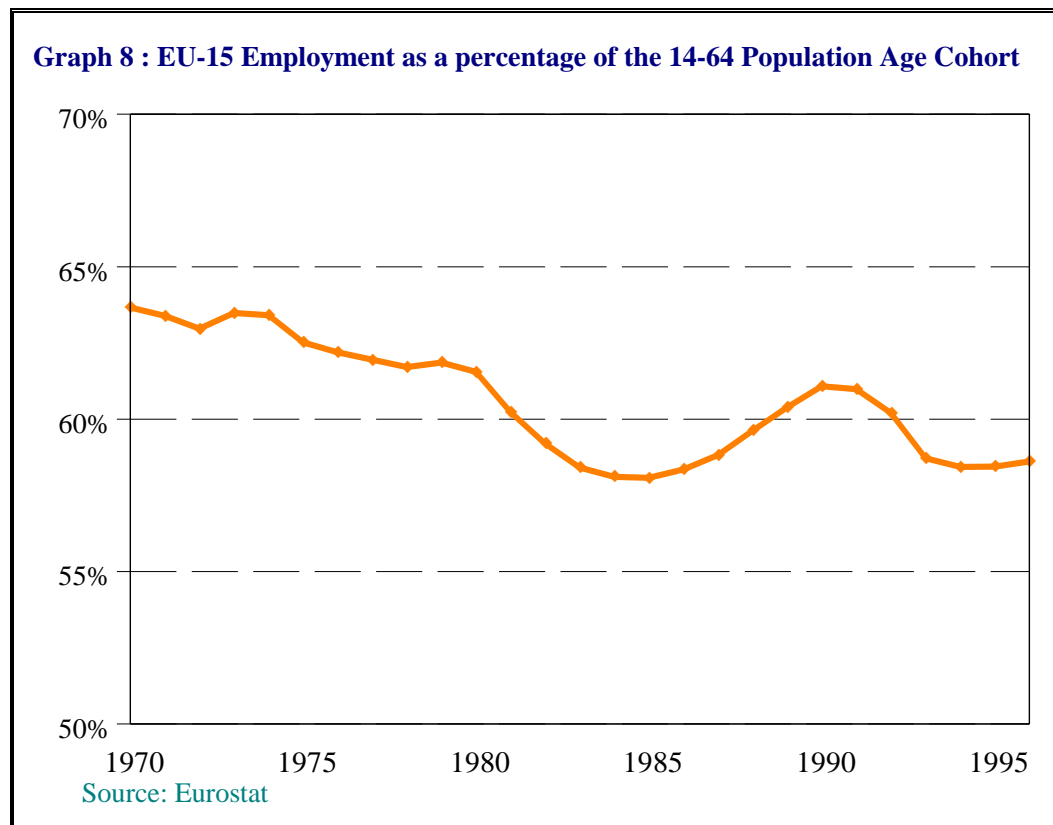
In overall terms therefore while all of the decline in the participation rates of older workers cannot be attributed to financial disincentives and early retirement programmes, with growing prosperity also playing a role, it is clear that these factors have manifestly encouraged the labour force withdrawal of older workers. In terms of the future, while such schemes may often have been reverted to in the past, especially in Europe, as a short-term palliative to lower the unemployment rate, it is clear that

such policy interventions must be unwound in the future as a means of addressing the opposite problem of labour supply shortages. In this regard eliminating the financial disincentives to remaining longer in the labour force as well as measures to increase the statutory as well as the effective retirement age could hold substantial gains especially for Europe. As regards increases in the effective average age of retirement, this could be achieved by changing key features of Member States pensions systems, especially if the latter reforms were to ensure that pension systems became actuarially neutral.

TABLE 8: PARTICIPATION RATES FOR SPECIFIC AGE GROUPS AND EFFECTIVE RETIREMENT AGES IN THE EC, JAPAN AND THE US

Participation Rates: 1990					
	50-54	55-59*	60-64*	65-69	70-74
EC	69.5	53.8	25.5	7.3	2.3
Japan	82.0	71.5	54.7	24.4	23.9
US	80.0	66.1	44.2	11.5	6.3

Participation Rates specifically for the Age Group 55-64		
	1950	1980
EC	51.3	45.1
Japan	63.0	64.5
US	57.2	55.8

Effective Retirement Age*		
	1950	1990
EC	64.3	61.3
Japan	64.7	64.8
US	64.4	62.8

* Statutory Retirement Age is 65 in the EU and the US and 55/60 in Japan.
Source: CPB Netherlands

2.4- POTENTIAL IMPACT ON CAPITAL ACCUMULATION OR ON TECHNICAL PROGRESS

CAPITAL ACCUMULATION: Is the option available of reducing the downturn in living standards through capital accumulation? Savings and investment have a potentially important role to play in helping to offset the effects of rising dependency burdens, with higher savings leading to higher productive investment and higher long-run growth. The negative impact on living standards due to the reduced rate of growth of the labour supply could in this way be potentially offset by higher rates of labour productivity growth emanating from a rising capital stock. However, this investment route to boosting long-run growth would appear to be cut off, since not only is the national savings rate not expected to rise to finance the required higher investment rate, the most likely outcome, especially if one subscribes to the LCH, is a fall in national savings, with the latter fall again largely demographically induced.

Graph 9 : EU15 Gross Fixed Capital Formation and GDP Growth
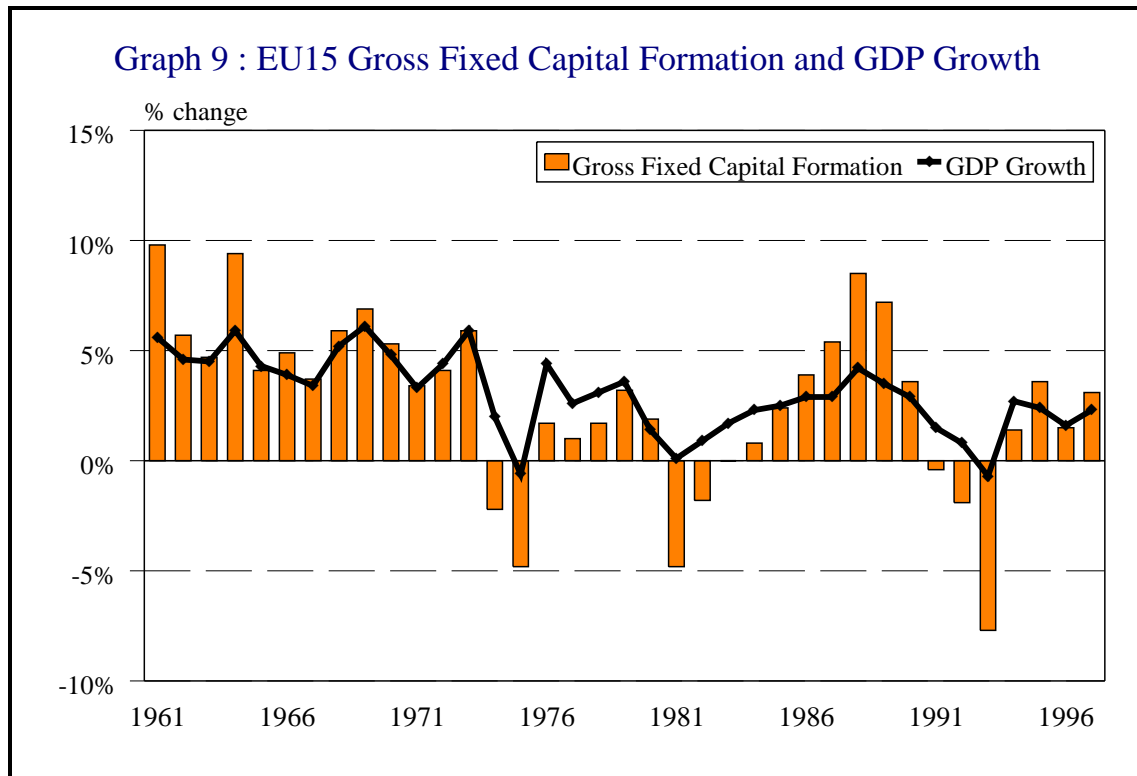
While it is clear that savings and investment are not the only ingredients that influence long-term living standards, with technical progress potentially playing a greater role, nevertheless it must be accepted that greater levels of savings, converted into greater human and physical wealth holdings, increases the options available for coping with the adverse effects of ageing. Consequently, prudence demands action to boost national savings rates over the medium to long run, with action in terms of government savings / dissaving being the most effective avenue to be explored[9].

Technical Progress: One of the critical assumptions to be made in relation to predicting the long-term economic impact of demographic change is the extent to which increased labour efficiency can offset the reduction in the rate of growth of the labour supply. This is a highly complex issue and one which has received a lot of attention in the empirical literature. From a review of the latter it would appear difficult to establish with any certainty whether demographic change will be positive or negative for productivity. According to some research it could be detrimental to productivity growth if an ageing labour force turns out to be less dynamic and innovative whereas other researchers take the alternative view that technological change may be boosted to offset the negative implications of the ensuing relative scarcity of labour.

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[9]The crowding out effects of Government debt, in particular the crowding out of private investment due to the higher real rates of interest, is associated with excessive consumption of available national resources i.e. a lower pool of savings which in turn results over the long-run in a reduction in real income and consumption levels (i.e. reductions in sustainable real standards of living) as a result of the lower average level of capital accumulation.

Simon (1986), Wattenberg (1987) and Romer (1990) take the former view and argue that technical progress is slowed down by the anticipated ageing of the population because of the above mentioned loss of dynamism and since declining markets for capital goods ensures that innovation is less profitable. Cutler et al (1990) present empirical evidence to support the opposite view that labour scarcity induces increased innovation i.e. the "scarcity is the mother of invention" argument. This scarcity view assumes that in a situation of relatively slow population growth, there is an acceleration, on a per capita basis, in human capital accumulation. In their cross-national analysis of 29 non-OPEC countries for the period 1960-1985, Cutler et al estimate that a decline in the annual labour force growth rate of 1 percentage point is associated with about a 0.5 percentage point increase in productivity growth.

Furthermore, this view of Cutler et al. is supported in the context of ongoing research in relation to endogenous growth rate theories. For example, Fougère and Mérette (1997) suggest that investment priorities may change with population ageing, with the latter phenomenon increasing the incentive for human capital investment, resulting in a redistribution of investment away from physical towards human capital, with potentially favourable long-run effects in terms of the rate of economic growth. The empirical interest in this whole area of endogenous growth theory has been enormous in recent years, with the latter stressing that the total factor productivity (TFP) element of economic growth partially emanates from sources which are amenable to policy influence. If it is accepted that the behaviour of economic agents is susceptible to productivity enhancing policy interventions, then this would represent a major departure from the standard neo-classical view which postulates that technical progress is exogenously determined.
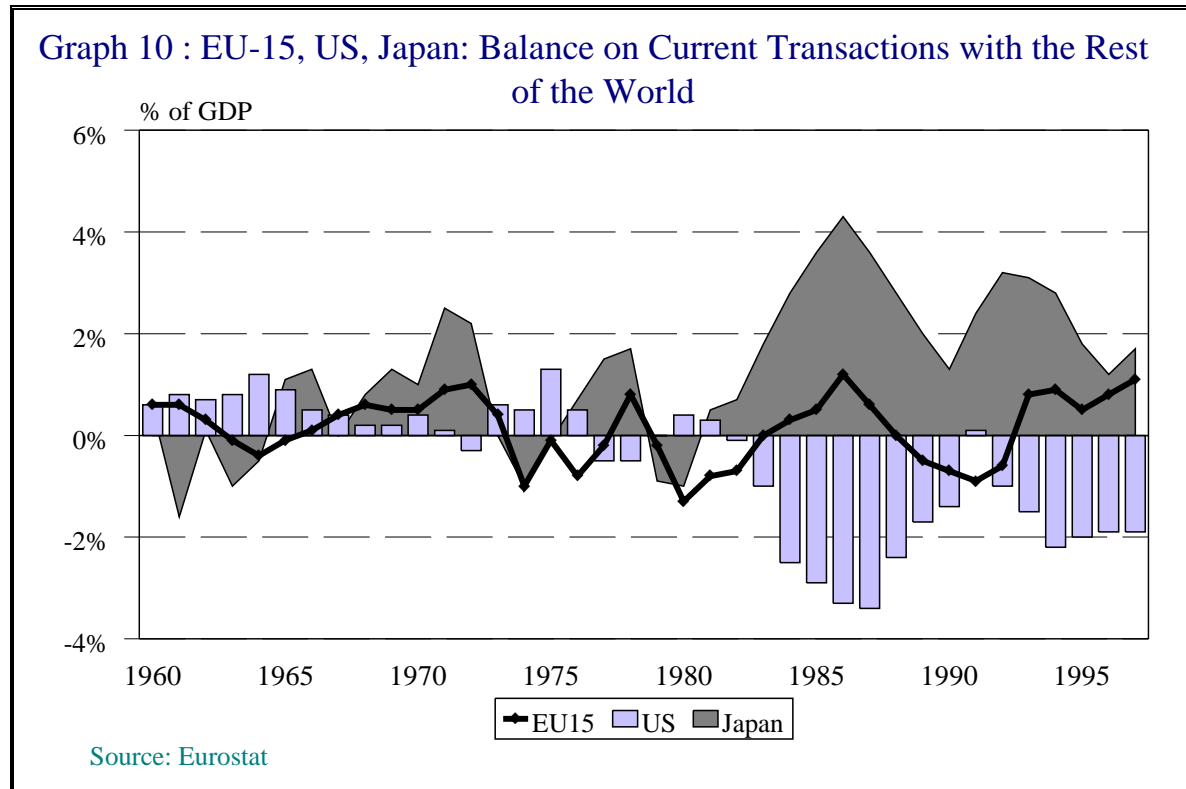
To conclude, therefore, the empirical evidence linking ageing directly to productivity trends is far from convincing with even doubts regarding whether the association or direction of any effect is positive or negative. In these circumstances it seems prudent to take a neutral position with regard to future technical progress or efficiency trends in terms of any simulation work i.e. the average rate of change experienced in the US, Japan and the EU over the past decade is generally extrapolated forward.

2.5 Interest rate, exchange rate and balance of payments developments

Savings and investment developments not only impact on potential growth but also on interest rates, exchange rates and international capital movements. Global and regional movements in the latter variables are precipitated by divergent pressures on the savings / investment front. In broad overall terms, when savings / investment imbalances emerge at the world-wide level, such tensions manifest themselves in real interest rate movements, whereas regionally–based strains result in shifts in exchange rates and net foreign asset positions.

At the worldwide level, given the large differentials in terms of the relative timing and extent of the "greying" phenomenon, current account positions between the developed group of countries and between the latter and the developing world will be prone to protracted swings, with the cumulative changes in net foreign asset positions being potentially important. Trying to withstand these persistent swings in balance of payments positions would not be justifiable, or indeed possible, since the latter will not

be driven by short term considerations such as changes in the relative cyclical positions of countries or in their relative competitiveness, but by fundamental shifts in domestic savings / investment balances. Despite the large element of doubt permeating any predictions in relation to current account positions, with the timing of any swings or indeed the sign being the subject of frequent revisions, nevertheless the majority view is that the developed world should move towards, and remain in, surplus over the next decade or so, with the latter being whittled away in subsequent decades.

Graph 10 : EU-15, US, Japan: Balance on Current Transactions with the Rest of the World

% of GDP

Source: Eurostat

Amongst the many likely demographically induced sources of savings / investment pressures over the coming decades, the following stand out for particular attention:

- **Negative impact on private and public savings**: These pressures will vary across countries, with the developed world likely to be the first affected, and across time, with countries such as Japan starting to age sooner than other developed regions like the EU and the US. These differences will inevitably generate exchange rate and current account tensions.
- **Negative impact on output growth**: If this occurs then less investment will be needed since the slowdown in output growth should translate itself into a slowdown in the requisite rate of growth of the capital stock.
- **Changes in the relative shares in world output of the developed and developing countries**: Given that the relative weights of the latter groups of countries is likely to change over the next 50 years, with the developed world losing out in relative terms, large changes in global patterns of savings and investment should be expected. The developing countries, as a block, for example, are likely to devote a higher proportion of their growing share of world output to investment, and indeed to supplement their thirst for funds by running current account deficits. As mentioned above, the developed world should, on average,

see improvements in their current account positions as savings are raised relative to investment i.e. import demands slow down relative to the developing world.

All of the above 3 sources of pressures and in particular the relative shifts in the respective positions of the various countries will inevitably generate exchange rate and current account tensions and depending on how the global savings / investment balance develops, perhaps also changes in worldwide real interest rates.

BOX 3: MODELLING THE SYSTEMIC ASPECTS OF DEMOGRAPHIC CHANGE : THE QUEST II APPROACH

OLG MODELS: It is often argued in the literature that Overlapping Generations Models (OLG's), which explicitly keep track of the savings decisions and wealth holdings of different age cohorts in the population, are the theoretically most rigorous approach to modelling demographic change. Examples of this multi-cohort approach include Auerbach-Kotlikoff (1987), Fougère-Merette (1998), Hviding-Merette (1998) and Miles (1999). However, it is important to stress that it is also accepted that this approach is not only more complex and demanding but also, due to the fact that it is still in its infancy, that its empirical results are still open to question in terms of their reliability. Consequently, the IMF (1990) and OECD (1998) have adopted an approach which is similar to the one used in this study where existing models have been adapted in order to study the consequences of population ageing.

Furthermore, it is interesting to point out, at this stage, that the results of the simulations in Chapters 3 and 4 are not that different from those produced in studies using the OLG approach. This perhaps is not that surprising since OLG models, as with QUEST II, have the life-cycle hypothesis at their core. Consequently the approach adopted for this study is to modify QUEST II as opposed to going down the OLG route.

PARTIAL V GENERAL EQUILIBRIUM APPROACH: Looking at the ageing problem in the piecemeal way carried out in chapter two, while interesting and elucidating in terms of highlighting the key influences at work, in the final analysis is less than satisfactory since it fails to take account of systemic, dynamic, forces which will undoubtedly kick into action once ageing starts to impact on the economic systems of the respective countries.

Estimating the effects of ageing using a static or partial equilibrium analysis is in fact prone to three major sources of problems :

- *Firstly, policy adjustments are inevitable in order to avoid the development of unsustainable private or public sector imbalances.*
- *Secondly, the emergence of tensions or imbalances in an economy is normally followed by corrective, general equilibrium, feedback effects such as changes in interest rates or exchange rates, in the level and composition of savings, in the behaviour of consumers and investors and even, in certain circumstances, in changes in the rate of technical progress, all of which must be taken into account in assessing the final impact of ageing.*
- *Finally, global interdependencies ensure that changes in the relative current account and net foreign asset positions of countries / geographical zones need to be adequately modelled in order to assess the impact of an ageing process which is not occurring at uniform speeds or intensity across countries or regions of the world.*

ADAPTING MODELS TO HANDLE DEMOGRAPHIC CHANGE: General equilibrium macro models, with a broad geographical coverage, are therefore undoubtedly preferable to the partial equilibrium methods often adopted in analysing the ageing problem. Macro-models, such as QUEST II, however, often have to be adapted in order to be

able to effectively incorporate the effects of demographic changes. Adaptations are usually necessary to the models consumption equations, where demographic influences are rarely explicitly included; to the production / supply-side; and to the way the government sector is modelled. The discussion in Chapter 5 regarding the OECD Minilink and IMF Multimod models gives additional information regarding the kind of « adjustments » which need to be made to the core model structure in order to handle demographic developments.

As regards the consumption equations, the choice between the « life cycle » or « buffer-stock » theories of savings as well as the empirical evidence in support of intertemporal smoothing models (i.e. what is the relative importance of liquidity constrained versus wealth constrained consumers), all remain contentious issues which are unlikely to be resolved in the immediate future. The final decisions made with regard to these issues impact significantly on the models simulation output with, for example, a model where the life-cycle elements are pervasive in determining savings behaviour generating greater economic effects from demographic changes relative to those produced by "buffer stock" inspired theories of savings.

As regards the modelling of the supply-side influences of demographic change, labour supply equations must be capable of taking account of not only changes in total population but also changes in the dependency structure and age structure of the population and of the factors which impact most strongly on labour force participation rate decisions. Being able to model the impact of the latter factors in terms of translating them into variations in the effective labour supply is a basic prerequisite for assessing the consequences of population ageing. Another issue to be addressed is how models should handle the question of technical progress i.e. should it be exogenously or endogenously determined. Most of the larger models retain the assumption that the rate of increase in the latter is exogenous.

As regards the modelling of the government sector, issues inevitably involve the handling of age-sensitive government expenditures and transfer payments to households. The demographic influences on the revenue side revolve around the issue of insulating budgets from the effects of ageing by shifting from direct to expenditure-based taxes.

OVERVIEW OF THE DEMOGRAPHICALLY SENSITIVE PARTS OF THE QUEST II MODEL : MODELLING OF HOUSEHOLD BEHAVIOUR, LABOUR SUPPLY, TECHNICAL PROGRESS AND THE GOVERNMENT SECTOR

HOUSEHOLD BEHAVIOUR: The behaviour of households in the QUEST II model is characterised by the Life Cycle Hypothesis. The latter is a generalization of the Permanent Income Model since it allows for the analysis of consumption and saving behaviour of households with possibly only a finite time horizon. According to this hypothesis, households base their consumption decision on a discounted stream of current and future expected net income and on their current stock of financial wealth. The basic reason for doing this is derived from a concept of inter-temporal utility maximization of households, whereby they find it optimal to smooth consumption over time.

The calculation of permanent income incorporates the current and discounted future expected net income stream the household sector is expected to earn. It consists of all non-capital income, i.e. net labour income and all other transfers to households, including unemployment benefits. The other determinant for private consumption is financial wealth which, at the aggregate level, consists of the market value of firms in the domestic economy, the net foreign asset position and government debt.

It should be noted, however, that although government debt enters the definition for private wealth, this does not mean that it has a positive effect on private consumption because households deduct future tax payments and reductions in transfer payments, which are required to service the debt, from their permanent income. This is also known as Ricardian Equivalence. This proposition does, however, only hold in its extreme form for infinitely lived consumers. Life cycle consumers will discount the future more heavily and thereby underestimate the tax burden associated with government debt. Consequently they will regard government debt at least partially as net wealth of the household sector, with this net wealth effect of government debt being, however, negligible in the life cycle model.

Finally, the empirical specification of the model allows for a deviation to the above formulation reflecting the findings of many empirical studies of consumer behaviour which point to a sizeable fraction of consumption being dependent on real current disposable income because of liquidity constrained private households.

LABOUR SUPPLY: Labour supply or wage setting behaviour in the QUEST model differs strongly from the standard neo-classical model of labour supply. However, the formulation of the wage equations have borrowed some elements of the neo-classical labour supply hypothesis. In standard neo-classical labour supply models, the supply of labour is derived from a household utility function where households value leisure positively. This implies that labour supply, in terms of hours, depends positively on the net real wage rate (substitution effect) and negatively on household wealth, which is composed of life cycle income and financial wealth (income effect).

The wage equation in Quest II encompasses not only the latter neo-classical labour supply hypothesis - based on the consumption leisure choice – but also includes aspects of wage equations known from the bargaining literature where wage rules are postulated, which identify productivity and labour market tightness as major determinants of wage claims by workers. Which feature of the labour supply dominates in this model depends crucially on the bargaining strength of workers.

PRODUCTION/TECHNICAL PROGRESS: Firms are assumed to operate in a monopolistically competitive environment. Private sector GDP is produced via a nested CES and Cobb Douglas production function with capital, energy and private sector employment as inputs. Variables representing an efficiency index for the fixed capital stock and labour augmenting technical progress are also included. Labour augmenting technical progress grows at an exogenously determined rate and the efficiency index for capital captures embodiment effects resulting from current and past investment. Capital stock changes according to the rate of fixed capital formation and the rate of geometric depreciation.

GOVERNMENT: The assumptions about government behaviour are rather conventional. Governments do not maximize an objective function but follow an exogenously given spending pattern. Current expenditure is divided into interest payments on government debt, purchases of goods and services (which includes government investment), government employment, net government transfers to households net of unemployment benefits, and other transfers. Government spending is financed through labour income taxes and social security contributions, corporate income taxes, energy taxes, value added tax and other receipts.

It is well known that public debt dynamics is an intrinsically unstable process provided that the real interest rate exceeds the average growth rate of the economy and both spending and taxation grow in a fixed proportion with GDP. Dynamic consistency therefore requires the introduction of a debt rule which makes one or several spending or receipt categories of the government budget an instrument for debt stabilisation. To enforce the government's intertemporal budget constraint, a fiscal policy reaction function is imposed where the target is the debt to GDP ratio. As a standard setting this rule is imposed for net government transfers to households, which is the least distortionary in the model, but it can also be applied to other receipt or spending categories.

TABLE 9 : KEY PARAMETERS IN QUEST II			
	EC15	*US*	*Japan*
Consumption Function Parameters			
1. Rate of time preference (Annual)	*.036**	*.04*	*.02*
2. Share of liquidity constrained households	*0.3*	*0.3*	*0.3*
3. Planning Horizon (Years)	*50*	*50*	*50*
Production parameters			
4. Output elasticity of labour	*0.65**	*0.61*	*0.63*
*5. Labour augmenting technical progress (Annual)***	*0.014**	*0.006*	*0.032*
Wage equation parameters			
6. Bargaining strength of workers	*0.50*	*0.25*	*0.50*
7. Unemployment effect on wages	*-0.87**	*-0.50*	*-2.50*
8. L.R. elasticity of real wages w.r.t. Productivity	*1.0*	*1.0*	*1.0*
9. L.R. elasticity of real wages w.r.t. Unemployment	*1.37**	*0.55*	*3.47*
* Weighted Average for the Member States. *** Estimated using annual data over the period 1974-1995. Note : for the purposes of the simulations in chapters 3 and 4, technical progress for the EU and Japan converges on US rates.*			

CHAPTER 3: QUEST II CENTRAL AGEING SCENARIO 2000-2050

INTRODUCTION: This central ageing scenario, covering the period 2000-2050, is essentially a no-policy change view of the world over the next 50 years. It shows the public finance, employment, capital accumulation and growth implications of the ageing of populations in the absence of any specific, offsetting, policy adjustments. It should be stressed at the outset that all figures are in GDP per capita terms i.e. living standards, since in QUEST II GDP growth rates are adjusted for changes in trend population.

Given the extent of the demographic changes being envisaged it is accepted that the economic adjustment process will inevitably involve large shifts in an economies' stock variables such as physical capital, net foreign assets, money and government debt, all of which are endogenously determined in QUEST. Stock adjustments of this magnitude invariably take time to feed through with the result that a long baseline is required for the model to settle down in a simulation after a shock. The 70 year baseline used in Quest II allows enough time for these dynamic adjustment mechanisms to work through and for the stock-flow adjustments to take place.

Finally, it is important to underline at the outset that all simulation exercises mechanistically apply past patterns of behaviour to expected future trends and given the unprecedented nature of the demographic changes, caution needs therefore to be exercised with regard to interpreting the results.

QUEST'S BASELINE SCENARIO : Before going on to discuss the Central Scenario it is important to be clear about the public finance and labour market assumptions which underpin Quest's Baseline Scenario[10], since it is against the latter which the Central scenario is compared.

- **Baseline Public Finance Assumptions**: **Stability and Growth Pact is Respected:** In comparing the central ageing scenario with the baseline, it is important to remember that the baseline already assumes broad respect for the Stability and Growth Pact (SGP). The EU's deficit at the general government level is assumed to disappear by 2003 and the Debt to GDP ratio is expected to be around 60% in the same year and to stay at that level thereafter for the duration of the baseline. The model in fact imposes a debt rule of 60% which ensures that, once that level is achieved, it doesn't change very much over the simulation horizon. The imposition of such debt rules are common in most large models since, as mentioned earlier, public debt dynamics is an intrinsically unstable process, with such rules ensuring that the public finances stay on a sustainable path throughout the simulation period. In the case of the ageing simulations, if a debt rule is not imposed the deficit and debt situations quickly reach unsustainable levels (see section 4.1.1). As noted earlier, debt is stabilised via lump sum changes to net government transfers to households, which is the least distortionary budget category in the model.

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[10] The QUEST II baseline incorporates the most recent short and medium term projections of the Commission services up to 2003.

- **Baseline Labour Market Assumptions** : Changes in the population of working age are driven by the assumption that the overall population is growing in all countries over the simulation horizon at a growth rate similar to that witnessed in the most recent decades. Since there is no change in labour taxes and no assumption regarding structural reforms with regard to the respective labour markets, the unemployment rate stays close to its historical level. In addition, participation rates are assumed to stay roughly at their 2000 levels and unemployment benefits are assumed to be indexed to gross wages (see Box 4 for a discussion on benefit rules).

CENTRAL AGEING SCENARIO : The above baseline scenario is given two age related shocks : a **labour force shock**, which encapsulates the main features of the demographic projections over the next 50 years, and a **public expenditure shock** linked to the budgetary implications for pensions, health care and education of an ageing population.

Labour Force Shock : In terms of the population changes, the central scenario assumes that the EU's overall population will decline slightly over the 50 year period as opposed to an assumption in the baseline of the population continuing to grow modestly. In the case of Japan and the US the population is expected to decline substantially in the case of the former (-0.3% a year), and to grow by 0.4% a year in the US.

These overall population changes however mask important developments with regard to the structure of the population, with, as chapter one has shown, declines in the relative share of the 15-64 year old age group leading to large increases in all three regions in overall dependency ratios. These shifts in the population structure are accommodated in the model by changes in the labour force to population ratio which in the baseline is assumed to remain constant but in the central ageing scenario is expected to decline substantially in all areas as indicated in Graph 11.

Graph 11: Labour Force to Population Ratio in the EU, US and Japan
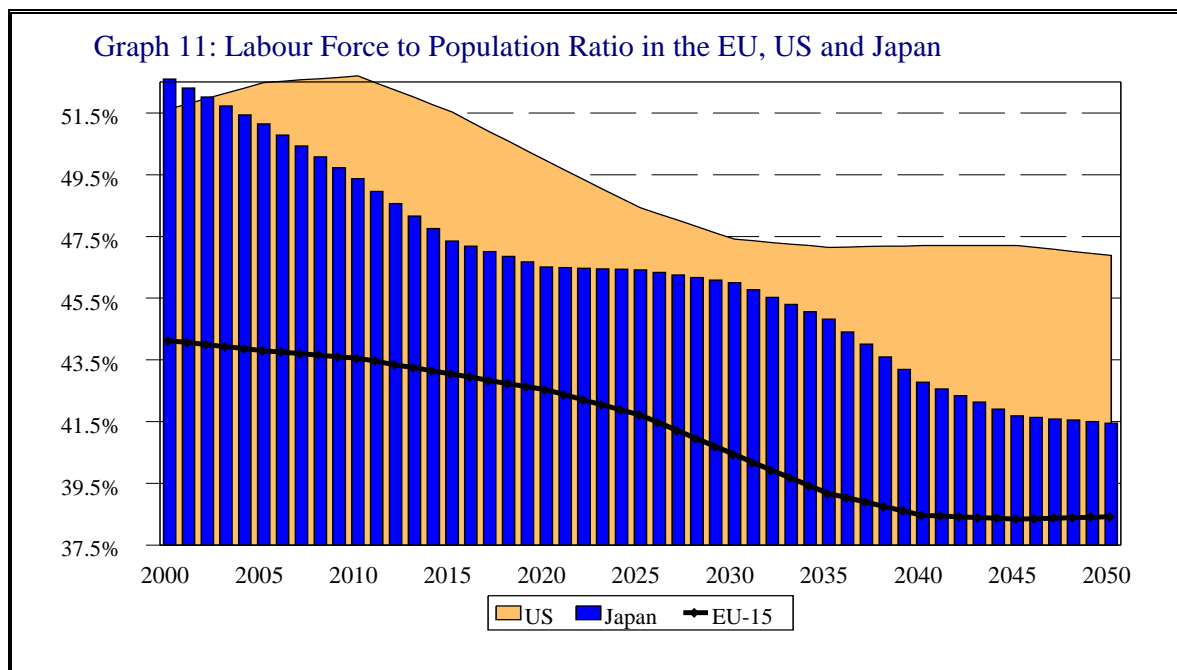
Public expenditure shock : In relation to the budgetary implications it is crucial to stress at the outset that these relate solely to the demographic pressures on the health care and pension budgets, with only about 40% of the increases in these budgets over the last 30 years being driven by age-related spending pressures. Consequently, it is assumed that the non-age spending factors (eg eligibility rules, benefit levels, cost push factors on the supply side of the health system etc), which in the past have been responsible for 60% of the increase in their respective budgets, will not be allowed to push up spending. This is a highly unrealistic prospect but any assessment of these non-ageing influences goes beyond the scope of this present study. All that can be said is that if these latter factors are allowed to grow as they have done in the past then the public finance burden will be more than double that indicated in the present study.

The long range forecasts for the public finance implications in terms of pensions, health and education are largely taken from existing OECD ((Liebfritz et al (1995), Roseveare et al (1996)) and Commission sources (D. Franco et al (1996 and 1997)). As stated previously the latter sources of information, derived from a partial analysis approach, can be effectively used as the basic inputs in a general equilibrium framework. It should be pointed out that most of the latter studies draw on national sources, with many of the national projections in relation to the per capita public expenditure implications of ageing being based on research work in the area of generational accounting.[11]

The main assumptions in relation to the direct public finance implications of ageing are shown graphically in Graphs 12 and 13. The pensions, health and education expenditure projections are extended where necessary by the use of empirically based rules of thumb[12], with the latter drawing on the reasonably strong econometric links between the level of public expenditures on health care systems and pension schemes and changes in the populations' age structure.

The salient features of the public expenditure projections underlying the simulation are as follows:

- **Pensions**: In the absence of any corrective action, age related pressures on pensions expenditure are likely to result in a progressive, ex ante, increase in Government expenditure equivalent to 9, 2 ¾ and 5 ¼ percentage points of GDP in Japan, the US and the EU respectively in 2050.

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[11] Leibfritz et al (1995) « Essentially, the generational accounting method is aimed at assessing whether typical members of each generation would receive back in transfers and services over their lifetime what they have paid in taxes (in net present value terms and adjusted for productivity growth), given the need eventually to satisfy an inter-temporal budget constraint that requires the present value of future tax payments (of existing and future generations) to equal the present value of all future government consumption less the initial stock of debt »

[12] An example of such a rough rule of thumb would be that referred to by Borsch-Supan (1996) who estimates that in the absence of policy adjustments, total age-related social expenditures (i.e. pensions, health and education spending) should grow roughly in proportion to the dependency ratio. He states that "the rise in the dependency ratio translates into an increase in the public demand for funds as long as specific social expenditures and tax rates remain as they are now".

In the case of the EU, due to the pension reforms set in place in a large number of Member States, the above pensions expenditure to GDP ratio is now being forced up only by demographic trends. However, despite the reforms, the demographic trends alone, as reflected in unprecedented increases in dependency ratios, result in large increases in the pensions expenditure to GDP ratio which raises concerns regarding the long-term sustainability of pay-as-you-go (PAYG) pension systems.
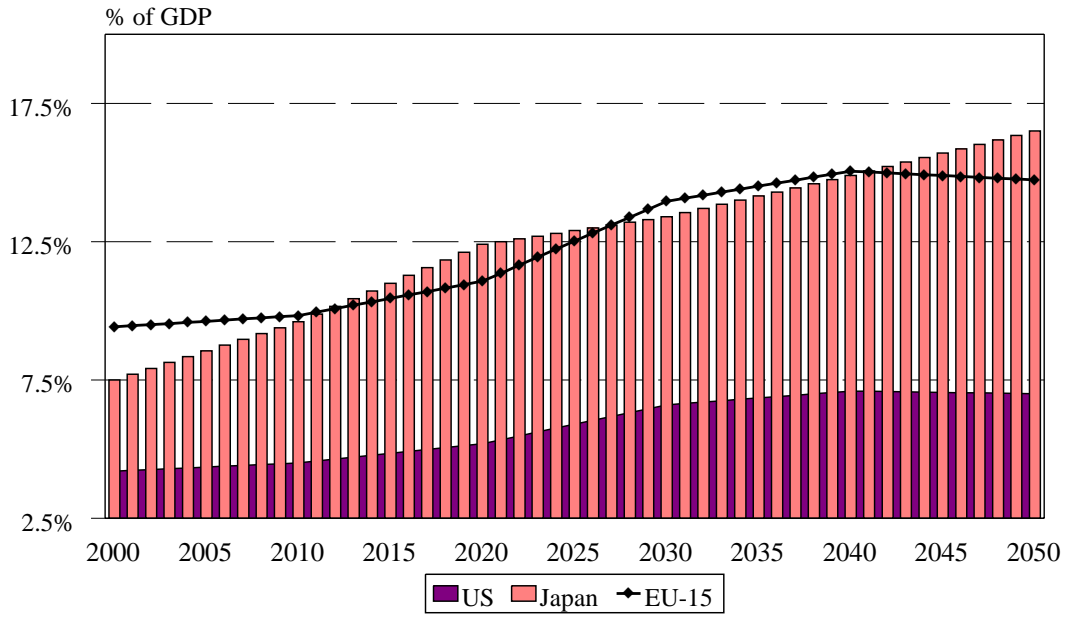
- **Health Care**: In relation to health expenditures, the direct effect of ageing on government deficits is equivalent to an increase of about 1 ¼ to 1 ½ % of GDP in all three cases[13]. Given the latter, relatively small, increases which are expected, it is not surprising that the OECD (1995) estimates that "it would only be necessary to hold growth in per capita real public health spending to around ½ to 1 percent lower than productivity growth in order to offset the impact of ageing on health spending"

  While the health care costs appear manageable it is important again to underline that these projections only refer to the direct effects of ageing on health budgets and do not incorporate any estimates for the non-demographic cost push factors which in the past have been more responsible than any ageing effects for the sharp increase in health care spending. In this regard it is noted that publicly funded health care expenditure for the Community as a whole nearly tripled over the period 1960-95, a period of relatively benign demographic developments, growing from 2 ½ % of GDP in 1960 to 6 ¾ % in 1995.

- **Education**: The demographic impact on education expenditure, despite falling primary and secondary school populations is not expected to provide any significant budgetary savings which could be used to alleviate the additional cost pressures on the pensions and health budgets. Using OECD and Eurostat sources for public expenditure on education as a percentage of GDP in 1995 allied to a per capita breakdown for the primary, secondary and tertiary sectors, it is projected that the direct budgetary effects of ageing will be small, on the assumption that expenditures per child grow in line with real productivity developments.

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[13]Health care provision for the elderly is on average more expensive than for the non-elderly, with the 1993 ratio estimated by the OECD at 4 ¾, 4 ¼ and 3 for Japan, the US and the EU, respectively.

Graph 12: Public Expenditures on Pensions 2000-2050

% of GDP

US · Japan ◆ EU-15

Graph 13: Public Expenditure on Health and Education 2000-2050

% of GDP devoted to Public Health Exp.

US ■ Japan EC-15

% of GDP devoted to Public Education Exp.
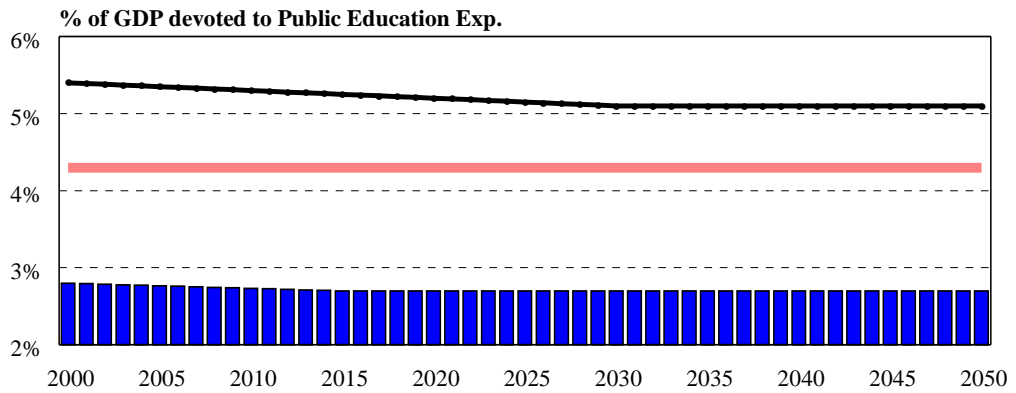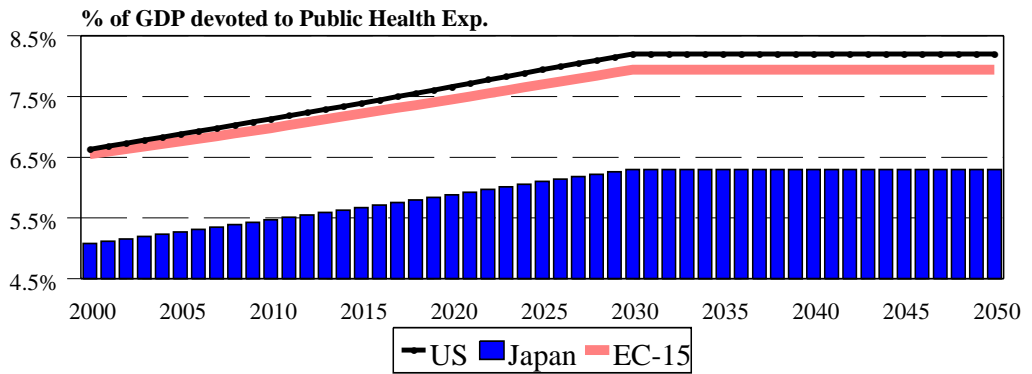
The overall impact of these budgetary changes, in the pensions, health care and education sectors, would be to increase public expenditure as a % of GDP by 6 3/4, 10 and 4 percentage points in the EU, Japan and US respectively. Left unbridled, in terms of policy corrections, the budget deficit and debt implications of these developments would quickly reach unsustainable proportions[14].

How are the Additional Age-Related Spending Pressures Financed : The Central Scenario, as with the baseline, assumes that the SGP is respected. Consequently, with the debt rule imposed it is clear that the imposition of the above changes in government expenditures would have the effect of breaching the 60% rule and would have to be financed either on the revenue or the expenditure side of the budget. Since the bulk of the increase in government expenditure occurs on the pensions budget and since it is also assumed, for reasons spelt out in the next chapter, that Governments will make little progress over the simulation horizon in moving to a fully funded pension system (i.e. the PAYG pension system is left broadly unchanged), it is assumed that the additional budgetary costs are financed by increases in social security contributions, which in Quest II has exactly the same impact economically as a direct increase in labour taxation.

MAIN RESULTS OF THE CENTRAL AGEING SCENARIO The overall impact of the above labour market and public finance shocks is to reduce the level of GDP over the period 2000-2050 in the EU, US and Japan by 19, 10 and 22 percent respectively compared with the baseline. The evolution of these changes is indicated in Graph 14, with the greatest effects occuring after 2020.

In terms of growth rates, Table 10 shows that ageing is expected to reduce the annual average rate of growth, relative to the baseline, by close to ½ a percentage point in the case of the EU and Japan and around a ¼ of a percentage point in the US. In absolute terms the EU's and Japan's annual average growth rate over the period 2000-2050 would fall from the baseline rate of 2 ¼ percent to roughly 1 ¾ percent in the present scenario. As regards the US, the fall would be from the baseline figure of 2 percent to 1 ¾ percent.

(Note : See box 4 for a discussion on the sensitivity of the results to different assumptions regarding the reservation wage)

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[14] The overall impact of ageing on primary balances over the period 2000-2050 can be estimated by taking the primary balance level for 2000 as the base and adding in the above expected changes to public pensions, health and education expenditure over the next 50 years. In the latter case, the assumption is made that all government revenues as well as government expenditures that are not sensitive to the ageing phenomenon remain constant, as a percentage of GDP, at their 2000 levels.

TABLE 10 : CENTRAL AGEING SCENARIO *: AVERAGE PER CAPITA GROWTH RATES OVER THE PERIOD 2000-2050**

	EU15		US		Japan	
	Ageing Scenario	**Change Relative to Baseline**	**Ageing Scenario**	**Change Relative to Baseline**	**Ageing Scenario**	**Change Relative to Baseline**
GDP	1.84	-0.43	1.71	-0.21	1.67	-0.49

*In the Central Scenario unemployment benefits are assumed to be indexed to gross, as opposed to net, wages (see Box 4). In addition, no change in expected in relation to participation rates, with the result that the decline in the population of working age feeds through fully to the respective labour forces.
**Note : A direct comparison with the results of the OECD simulations reported in Chapter 5 is not possible since the baseline scenarios differ because of different assumptions regarding TFP growth rates. However, it should be stressed that the change in growth rates relative to the respective baselines is broadly similar for the EU and Japan although this is not the case for the US.

GRAPH 14: IMPACT OF AGEING ON GDP IN THE EU, US AND JAPAN
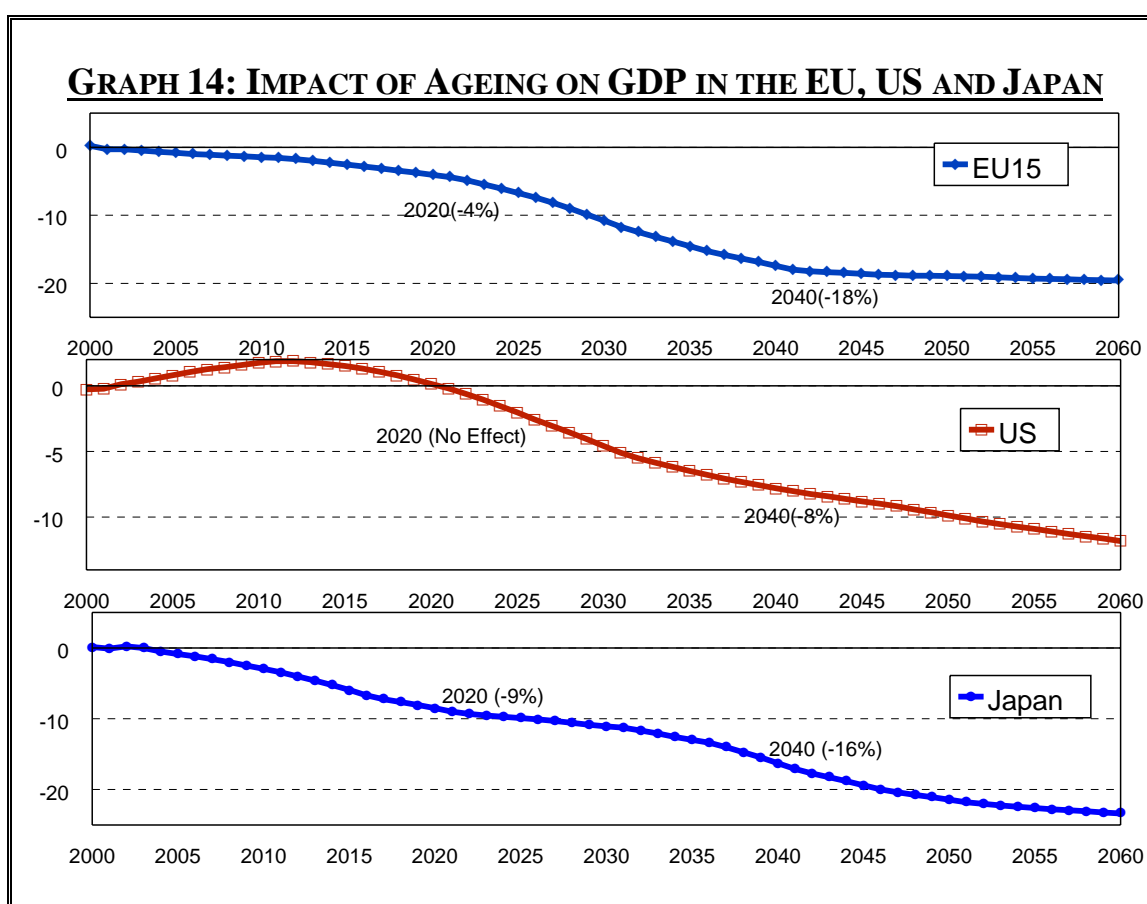
In terms of the decomposition of growth into its employment, capital stock and total factor productivity components (see Table 11), it should be stressed at the outset that this growth breakdown is purely indicative, with its purpose being to show where the changes in growth are emanating from. While the breakdown can therefore be used in broad terms to indicate what is driving average growth rates down in the respective regions, it should not be compared with expected changes in actual employment or capital stock levels over the simulation period.

Given the comments in the previous chapter concerning the need to take a neutral position with regard to technical progress over the time horizon of the simulation, it is not surprising that the results regarding the contributions to growth show no change with regard to total factor productivity. As the Table indicates the effects of ageing manifest themselves in terms of changes to employment and the capital stock, with the former being the most affected. In overall terms, 70% of the decline in average growth rates in the Community is expected to result from employment changes with the remaining 30% emanating from capital stock changes. A roughly similar breakdown is envisaged for Japan with the ¼ point reduction in average US growth rates emanating almost entirely from employment changes.

TABLE 11 : CENTRAL AGEING SCENARIO : CONTRIBUTIONS TO PER CAPITA GROWTH OVER THE PERIOD 2000-2050

	EU15		US		Japan	
	Annual Average % Change	**Change Relative To Baseline**	**Annual Average % Change**	**Change Relative To Baseline**	**Annual Average % Change**	**Change Relative To Baseline**
Employment	-0.13	-0.30	0.03	-0.18	-0.16	-0.36
Capital Stock	0.75	-0.12	0.75	-0.05	0.72	-0.12
Total Factor Productivity	1.22	0.00	0.94	0.02	1.12	-0.01
Totals	1.84	-0.43	1.71	-0.20	1.67	-0.49

CONCLUSIONS: In the case of the EU this central ageing simulation shows that per capita living standards are likely to fall significantly over the next 50 years. The effect of ageing populations in terms of slowing the rate of growth of potential output will also make the budgetary implications of ageing, in terms of higher pensions and health care costs, more difficult for the individual economies to bear. While the above no policy change simulation may be unrealistic in that Governments are unlikely to stand idly by, it nevertheless gives an idea of the scale of the task faced by policymakers in devising policy measures aimed at avoiding, or at least cushioning, the potential shock to peoples' living standards.

If the scenarios prove accurate, economic agents in Europe could be looking at an annual half point reduction in potential growth rates from the present 2 ¼ percent to an average rate of 1 ¾ percent over the next fifty years, representing a cumulative GDP loss of nearly 20 percent. Cumulative reductions of 10% and 21½% are predicted for the US and Japan respectively. While these large corrections are not inevitable, countries need to accept that they must act quickly to set in place a range of policies

and reforms, along the lines set out for the Community in the subsequent chapter, in order to avoid such a slowdown. In relation specifically to the Community, at this stage it is possible to say that while the broad framework for ensuring budgetary sustainability, in the face of substantial age-related spending pressures, would appear to be in place in the form of the Stability and Growth Pact (SGP), less comfort can be taken from the degree of readiness of the Community's labour markets to withstand the inevitable shock which is looming, with labour force declines of the order of 15 percent being presently predicted.

BOX 4 : WAGES, LABOUR TAXATION AND UNEMPLOYMENT BENEFITS : ECONOMIC IMPACT OF DIFFERENT ASSUMPTIONS REGARDING THE RESERVATION WAGE

In the central ageing scenario described in the text a key assumption regarding unemployment benefits has been imposed, namely that the latter transfer payments are linked to gross, not net, wages. In other words the burden of ageing is imposed on workers, in the form of higher labour taxation levels, but not on benefit recipients since their income is linked to the pre-tax wage level. This assumption is equivalent to assuming that the minimum wage remains constant. This box looks at the implications of this decision to change replacement ratios, in terms of the overall assessment of the impact of ageing. Before going on to look at the simulation results, a quick overview of wage determination in Quest II is provided as well as an examination of the key role played by taxation developments.

WAGE DETERMINATION IN QUEST II : Given the fact that market clearing is an unrealistic description of European labour markets, which are characterised by substantial involuntary unemployment, standard macroeconomic analysis, which is incorporated in QUEST, does not therefore rely on such a framework. In the model it is assumed instead that wages are set in an imperfectly competitive fashion. Real wage developments are determined as a function of the reservation wage (i.e. a replacement ratio effect which impacts on the consumption / leisure choice), labour productivity and the unemployment rate.

- *Reservation Wage Effect on Wages : The reservation wage is composed of unemployment benefits and the value of leisure. Leisure can be expressed as a function of household wealth and the average hours of work supplied per period[15].*

- *Gross wages are also positively indexed to labour productivity, with indexation depending on the bargaining power of workers[16]. More precisely, in the case of perfect competition in the labour market, net wages would be linked to the reservation wage but not directly to productivity. Such a link would only emerge indirectly insofar as the reservation wage may rise with labour productivity.*

- *Real wages also depend negatively on the unemployment rate, since a high unemployment rate increases both the risk of becoming unemployed and adversely affects the probability of finding a job.*

INTERACTION BETWEEN TAXATION AND WAGE TRENDS : Net, after tax, wages is what workers bargain for. In this regard, there exists various models of trade union objective functions. They share, however, the common feature that gross wages are set as a mark-up over a reservation wage (after tax unemployment benefits), which is adjusted for a labour tax factor because in wage setting workers look at the difference between unemployment benefits and their net wage. Wages are effectively determined therefore by maximising the income differential between working and unemployment. Consequently, in this scenario, as regards the interaction between taxation and wage developments, labour taxes and social

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[15] *In the standard parameter setting which is used in the simulations the leisure effect is zero.*
[16] *The short run elasticity of wages with respect to productivity is 0.5 for the EU countries and Japan and 0.25 for the US.*

security contributions have an important bearing on the real wage demands of workers. An increase in either component would make leisure (unemployment benefits) more attractive relative to work and wage costs would have to rise. Except for the case of zero bargaining power of workers, a decline in taxes or social security contributions will not lead to a fully proportional decline in wages since workers will increase their share in total surplus.

It is also the case in Quest II that no different effects on wage costs should be expected from a policy of reducing wage taxes as opposed to cutting social security contributions. It should be expected from a model with informed bargaining behaviour that tax incidence is independent of who pays the tax. Yet, changes in either the tax rate or social security contributions can still lead to different results depending on how unemployment benefits will respond to these changes.

IMPACT OF UNEMPLOYMENT BENEFITS BEING LINKED TO GROSS V NET WAGES : The increased levels of labour taxation imposed in the central ageing scenario[17] is associated, as shown in Table 12, with an attempt by workers to offset the loss in living standards with higher real wage demands. However, as also shown in the table the rise in real wages is tempered if benefits are linked to net as opposed to gross wages. This reservation wage impact is important economically, with the downturn in GDP being less severe in the event that the financing burden of ageing is spread across both workers and benefit recipients. While Graph 15 shows that this effect is evident in the Community, the US and Japan, it is clear that the impact on the Community is particularly important, with the latter reflecting replacement ratio and bargaining strength differences between the respective regions.

TABLE 12 : IMPACT OF THE BENEFIT RULE FOR THE EU

|	Unemployment Benefits Linked to Gross Wages		Unemployment Benefits Linked to Net Wages	
	2025	2050	2025	2050
% Change relative to Baseline				
GDP	-6.7	-18.9	-4.4	-14.0
Real Wages	5.6	2.3	3.6	1.8
Real Net Consumption Wages	-11.3	-19.2	-15.6	-24.2*
Real Unemployment Benefits	5.7	2.6	-15.1	-25.0
% Points Change relative to Baseline				
Labour Taxation as a % of GDP	8.4	12.4	10.1	14.8*

* More employment leads to higher tax revenues

Why are unemployment benefits indexed to gross wages in the central scenario ?. The justification for this decision is an attempt to keep the living standards of benefit

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[17] *Labour taxation as a percentage of GDP grows by over 12 percentage points in the central scenario.*

recipients constant i.e. effectively an unchanged minimum wage is imposed. In addition, an assumption of burden sharing, which would impact strongly on the poorest sections of society, was not regarded as politically implementable, at least in the initial stages when the effects of ageing are only starting to manifest themselves.

- *What happens when labour taxes go up but benefits don't change – real net consumption wages decrease, the mark-up of net wages over unemployment benefits falls and workers try to, at least partly, restore the historical mark-up level by shifting the additional burden of taxation onto employers in the form of higher wage demands. These latter developments are negative for investment and growth.*

- *If, on the other hand, governments increase labour taxation and simultaneously lower benefits, by indexing the latter to net wages, the incentive for workers to shift the burden of the additional taxes onto employers is lessened since the net wage to benefit replacement ratio doesn't change.*

Finally, since equity considerations will increasingly play a role as the impact of ageing becomes more severe, it is assumed that the net wage benefit rule is a more realistic scenario and consequently the latter rule is imposed for the simulations in Chapter 4.

Graph 15: GDP Gains of Linking Benefits to Net Wages
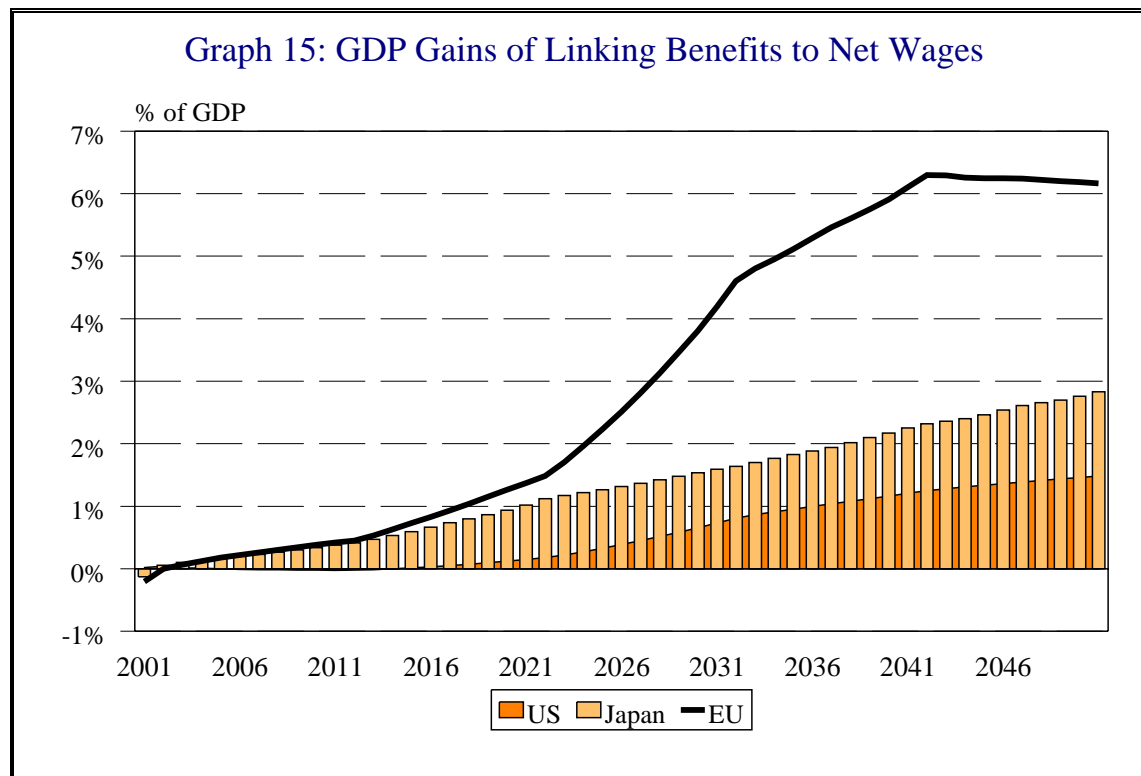
CHAPTER 4: QUEST II POLICY SCENARIOS : EASING THE ECONOMIC BURDEN OF AGEING IN THE COMMUNITY

INTRODUCTION: Given the likelihood of a substantial reduction in GDP growth rates, the Member States will have to look at a range of macro and structural policy actions to cushion the impact on living standards. The possible policy responses to offset the negative effects of ageing can be grouped under the following three broad headings:

- **BUDGETARY**: Offsetting the negative impact of ageing on national savings through adherence to the provisions of the stability and growth pact. If this is actively pursued over the coming years, not only will national savings benefit but a sounder fiscal position will ensure more favourable debt dynamics when the public sector spending pressures from ageing start to emerge. In the specific case of the EU, respect of the SGP provisions will inevitably involve the introduction of wide-ranging reforms to those most age sensitive areas of government expenditure such as pensions and health care, without which deficits will be difficult, if not impossible, to control with consequent problems in terms of debt sustainability. Given the existence of high tax to GDP ratios in most of the Member States and the potentially distortionary impact of the large additional tax hikes which would be required, the simulations in this chapter assume that any budgetary adjustments which take place do so on the expenditure side and not on the revenue side as in the central ageing scenario.

- **LABOUR MARKET**: Neutralizing the demographic developments through labour market reforms e.g. policies to raise labour force participation rates and to extend the average working lifetime (Note: Increasing immigration is assumed not to be a credible policy option). Labour market reforms in the EU, using the vehicle provided by the National Action Plans for Employment, must deliver a steady reduction in the non-cyclical component of unemployment whilst promoting higher rates of labour force participation. In this regard, measures to ensure an increase in the effective retirement age would be particularly beneficial since, in addition to raising participation rates, it would boost productive capacities and ease budgetary pressures via reduced transfer payments and additional tax revenues.

- **PRODUCTIVITY**: Promoting higher factor productivity growth through structural reforms aimed at enhancing the efficiency and flexibility of goods, services and capital markets in the Community, whilst acting to ensure open and competitive trading conditions at the global level.

As the results of the simulations carried out in this chapter show, all the above measures would individually, and collectively, act to counteract the projected slowdown in the growth of Member States living standards.

4.1: BUDGETARY POLICIES

This section looks at two issues: firstly, a simple illustration of the importance of adhering to the provisions of the Stability and Growth Pact, by looking at the debt and debt servicing implications of the "non-financing" alternative; and secondly, an examination of the case where any age-related increases in government expenditures are financed on the expenditure side of the budget. This latter simulation, given that the bulk of the additional ageing costs are attributable to the pensions budget, amounts to a pension reform scenario since some movement away from the present PAYG system of financing is implicitly assumed.

4.1.1. BUDGETARY PRUDENCE : THE IMPORTANCE OF RESPECTING THE SGP : It is clear that respecting the SGP's "close-to-balance" rule demands additional consolidation efforts on behalf of many of the Member States, and that maintaining that position will be difficult once the demographic situation starts to worsen after 2010. Such efforts are nevertheless vital for both avoiding the development of unsustainable debt positions and for helping to fund age-related spending increases. With regard to the latter, if the provisions of the SGP are adhered to, the declining interest payments burden associated with shrinking public debts could be used to fund part of the additional expenditure burden on the pensions and health sides linked to the retirement of the "baby boom" generation. In this way the primary balance adjustment to the demands of an ageing population could be eased. Member State governments must therefore use the "breathing space" available over the next decade to place the public finances on a durably sound footing.

Primary Balance, Interest Payments and Debt to GDP ratio implications of Ageing in the event that the SGP is not adhered to : (i.e. the debt rule is turned off in the model and Governments resort to debt financing). The evolution of the debt ratio depends on interest rate and growth rate developments as well as trends in relation to the primary balance. While the primary balance is a crucial determinant of overall fiscal positions it is not the only one, with the initial stock of debt and debt servicing costs also playing a key role in the evolution of fiscal positions. When real interest rates are greater than real growth rates, unless the surplus on the primary balance is adequate to compensate for the increased debt interest payments, debt dynamics are unstable and a vicious circle of rising debt as a percentage of GDP will inevitably ensue. It is clear in these circumstances that the initial fiscal starting position impacts strongly on a country's debt evolution, with lower debt/GDP ratios and higher primary surpluses in the base year ensuring more virtuous debt dynamics. With high debt levels in many EC Member States, and with interest payments already eating up 8% points of GDP or more in some cases, it is clear that a number of countries are still especially vulnerable to adverse interest rate developments[18].

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[18] The benefits of consolidation for these high debt countries are clearcut: lower debt servicing costs, emanating from lower debt levels and lower interest rates, with the latter lower rates in turn boosting growth. As regards the interest rate benefits, studies such as Faruquee et al (1996) for the OECD countries and Ball and Mankiw (1995) for the US point to reductions of about 0.8-0.9 percentage points in real interest rates following public debt reductions of 20-25% points.

Using the primary balance estimates which underpin the central ageing scenario[19], and the latter's predicted growth rates, the present simulation assesses the associated debt dynamics in the event of non-compliance with the SGP over the 50 year period. This scenario is for illustrative purposes only since such a full scale resorting to debt financing would quickly run into problems. Consequently, its only purpose is to highlight the extent and nature of the budgetary difficulties which are likely to manifest themselves. In addition to the primary balance and growth rate data, the effective interest rate on the public debt has been calculated for the year 2000 and is extrapolated forward to 2050. The real interest rate / real growth rate differential is of the order of 2 ¼ percentage points. In overall terms, in the event of a debt financing policy being adopted, the EU would experience a deterioration in its primary balance of 7 percentage points, and increases of 9 and 148 percentage points respectively in the interest payments to GDP and the debt to GDP ratios over the fifty year period.

Graph 16: Non Respect of Stability and Growth Pact (% of GDP)
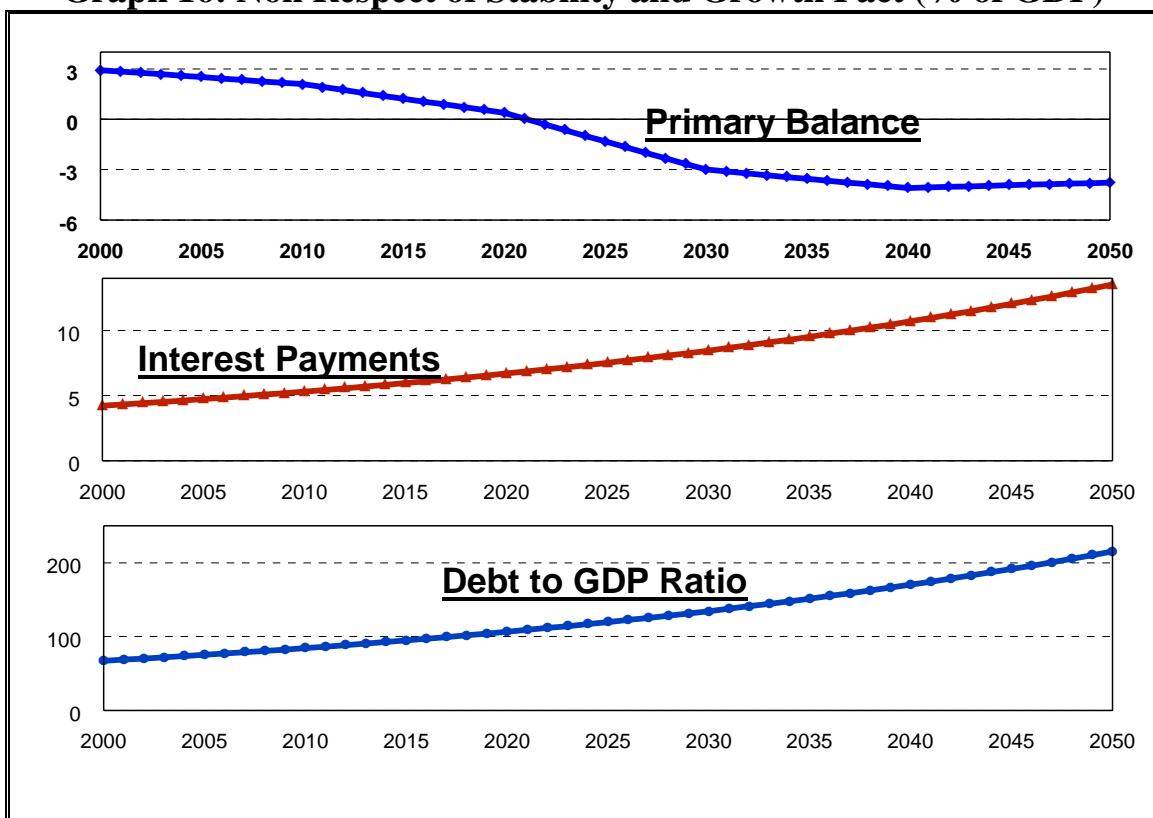
It should be borne in mind that while the above graphs take account of the age related deterioration in both primary balances and real growth rates, they do not reflect any potential deterioration in debt dynamics driven by real interest rates being higher because of the higher deficits and debt levels. No attempt is consequently made to assess the likely evolution of the gap or differential between real interest rates and real growth rates over the period because of the large uncertainties involved. While it is conceivable that if the pressures on primary balances are not adequately tackled the fiscal situation will be further stretched by higher rates of interest on Government debt, such a prediction is not clearcut in circumstances where GDP growth rates are also expected to fall.

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[19] These primary balances can of course also be used as an indication of the SGP induced adjustments needed to respect the close to balance rule.
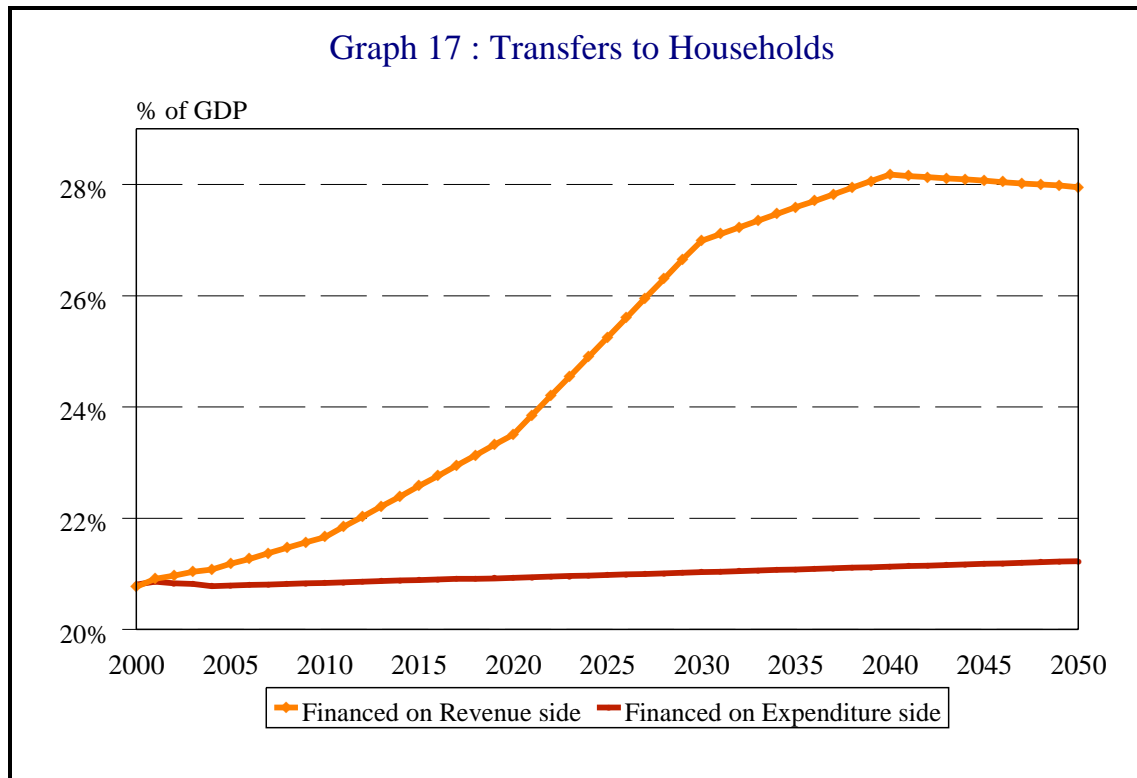
4.1.2 PENSION REFORM SIMULATION i.e. economic impact of moving from the present PAYG system to a fully funded system. It is important to remember that it is the public sector's exposure to the unfunded liabilities of the PAYG-pension system which is the single greatest source of expenditure pressure over the coming decades. If retirement income was derived from a fully funded pension system, ageing would only significantly impact on health expenditures and old age poverty relief.

The "pension" reform simulation examines the economic implications emanating from the choice between the two competing financing options for pension systems i.e. the choice between PAYG, which is financed by current taxes and social security contributions, which was the assumption underlying the Central Ageing Scenario in the previous chapter, and the "Fully Funded" option, which is financed out of a stock of capital accumulated during one's working lifetime[20]. The "fully funded" option appears attractive at the moment as a way of reducing the public sectors exposure, under the PAYG system, to the pensions implications of a rapidly ageing population i.e. exposure either in the form of the need to finance the additional pensions expenditure through higher taxes/social security contributions or via the need to seek specific or generalised expenditure reductions[21]. However, while the benefits of the "fully funded" option are attractive, the inter-generational equity considerations (i.e. the switch to a fully-funded system would impose a double burden on the present generation, with the latter having to fund their own pensions whilst continuing to finance, through taxes and social security contributions, the pensions of those who retired under the previous PAYG scheme) allied to the political fallout[22] from the latter should not be ignored.

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[20] Chand and Jaeger looked at the _**fiscal**_ consequences of moving to a fully-funded system. They conclude « that the fiscal costs of undertaking such a shift may be very high, and that meeting these costs may require, in many cases, an amount of fiscal adjustment that is substantially higher than would be needed to fix the PAYG system. While there are several advantages to the PAYG system, …..the system is particularly vulnerable to the ageing phenomenon, unlike the more individually-based, defined-contribution, fully funded schemes. However, as we have noted, it is possible to place the defined-benefit system on a satisfactory long-term footing. This course of action would require anticipating the demands associated with ageing through implementing a constant sustainable contribution rate. »
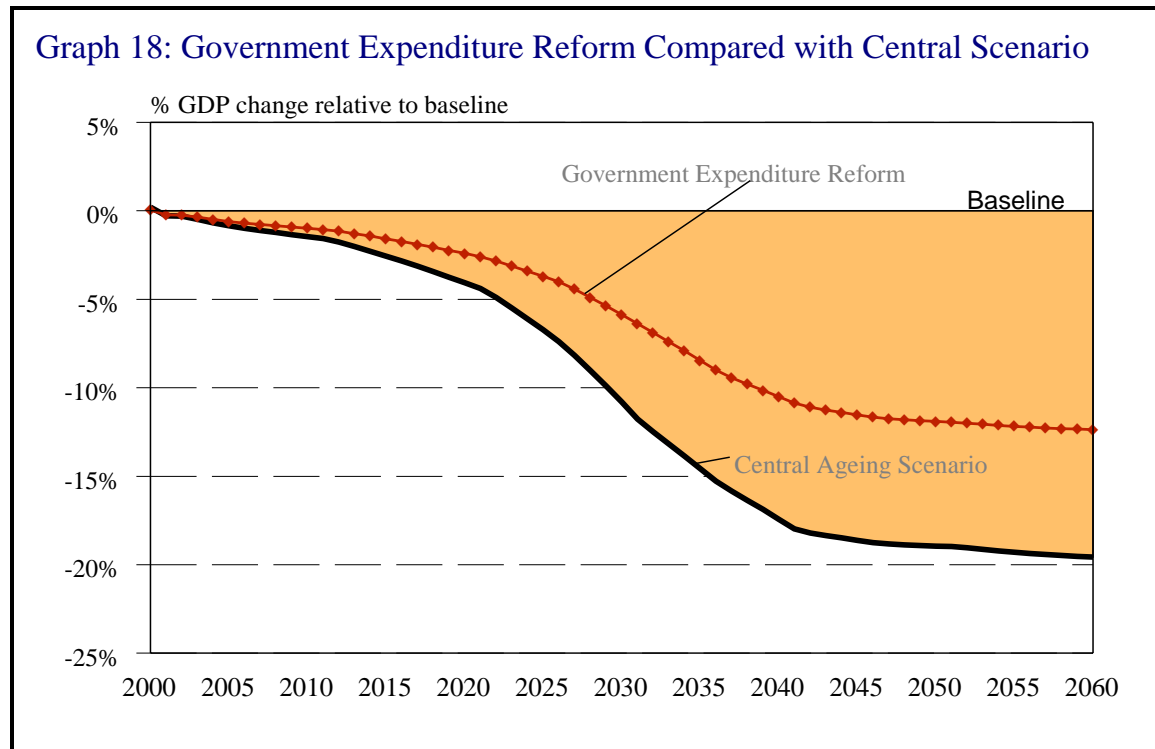
[21] As stated in European Economy (1994) the fully funded system carries many attractions «The considerable increase in taxes and social security contributions that may result from some demographic and employment scenarios has increased the attractiveness of a fully funded system. In the case of the latter systems, each cohort would accumulate sufficient capital to finance its own pension, with no need for transfers between cohorts ; capital accumulation would likely be higher than under the pay-as-you–go system and the disincentive effects of high fiscal and para-fiscal pressures could be avoided or, at least, alleviated. All in all, thus, the fully funded system would tend to increase saving and hence capital formation during the build-up phase. »

[22] The results of simulations carried out by Miles (1999) suggests that the shift to a fully funded system will pose enormous political problems « The result that the great majority alive now would be worse off if the unfunded state system is phased out – even though every future generation is better off – illustrates the nature of the transition problem rather clearly. Democratically elected governments facing voters who focus on the direct implications to them (and not to all future generations) of changes to state pension systems would find it hard to get support for this kind of transition plan. (The simulation results suggest) that once a transition from an unfunded to a funded scheme is complete welfare for all subsequent generations will be higher, but without relying on deficit financing the transition will cause certain generations to be worse off, and those generations could form a majority of voters thus permanently blocking any change. But since the value of the future benefits are permanent while the costs are transitory it might seem that a temporary increase in fiscal deficits to compensate what would have been the losers will solve the problem…….In general this is false……….Whether a Pareto optimal switch from unfunded to funded pensions can be engineered is an unresolved issue of great practical importance »

Graph 17 : Transfers to Households

While an in-depth examination of the benefits of pension reform are not undertaken in the present study a rough indication of the likely economic gains from pursuing such reforms is given in the simulation below. In this scenario, the negative consequentials for government expenditures of an ageing population are not, as in the central aging scenario, financed through increased social security contributions (i.e. the PAYG system) but are financed by expenditure reductions in the transfers to households category of government spending (Graph 17). Implicit in this scenario is some form of constraints being placed on the pension or health care budgets in order to contain the rise in total spending. In overall terms, as indicated in Graph 18, such expenditure reform (i.e. a switch from revenue to expenditure financing) would have the effect of reducing the negative economic impact of ageing and would boost the average growth rate from the annual rate of 1 ¾ % in the central scenario to 2 % in the present "pension reform" simulation[23].

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[23] It is important to stress that the objective of this simulation exercise is not to imply that there will be a large disposable income shock for public transfer recipients such as pensioners. What the simulation tries to show is the economic implications of not allowing the overall tax burden on the employed population to increase, by offsetting any increases in public expenditure linked to ageing through expenditure restraint in those areas of the public budget most affected by the latter phenomenon namely health or pensions. Given that the bulk of the increase in age-related public expenditure is expected to be on pensions then the simulation is implicitly assuming that there will be a move by governments to shift, at least partially, the burden of the present system of pension provision which is financed by current taxes and social security contributions to a system based on private provision i.e. the "Fully Funded" option. Such a move would imply a large decline, as a percentage of GDP, in government transfers to households compared with the central ageing scenario, as shown in graph 17, but would not necessarily imply a similar decline for pensioners incomes. In fact, as the section on the income distribution consequences of ageing makes clear, income growth for pensioners is expected to grow by close to 2 percent, on an annual average basis, under the present « pension reform » scenario (which is in effect a public expenditure reform scenario). While this growth in income is lower than for wage earners the difference is explained by the drop in the labour taxation burden on workers compared with the central ageing scenario.

Graph 18: Government Expenditure Reform Compared with Central Scenario

% GDP change relative to baseline

Government Expenditure Reform

Baseline

Central Ageing Scenario

4.2 LABOUR MARKET REFORM: RAISING LABOUR FORCE PARTICIPATION RATES, EXTENDING WORKING LIFETIMES AND LOWERING STRUCTURAL UNEMPLOYMENT

Policies to increase labour supply and reduce unemployment: Policies to increase the workforce, or to reduce non-cyclical unemployment, would be an appropriate response to the adverse demographic developments and would bring a triple gain, an increase in potential output; a reduction in public expenditure on the elderly, due to the slower rate of increase in the effective dependency ratio, and higher tax revenues. Actions in this area fall under three broad policy headings[24]:

- Extending the working lifetime beyond the present statutorily imposed limits
- Labour market reform aimed at raising participation rates
- Labour market reforms to tackle structural unemployment

Longer working lifetimes: With life expectancy having increased and continuing to do so, with jobs becoming less physically strenuous and with entry into the labour force occurring at a progressively later age, there is a strong prima facie case for government action to lengthen the average working lifetime.

Raising Participation Rates: The present rates of labour force participation have two distinguishing features: the higher rate of participation for males compared with females (currently around 20 percentage points higher for men in the OECD as a whole), and that participation rates decline significantly, well in advance of the statutory retirement age. Widespread adoption of early retirement programmes,

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[24] While increased immigration is another possibility for expanding the labour force, it is not regarded as a potent policy target because of the practical limits to such a policy due to the political sensitivities involved, not only in the host countries but also in the migrants home country because of the likely "brain drain" impact of immigration programmes geared to attracting highly skilled potential migrants.

financial disincentives to continuing to work right up to retirement and policies that discourage part-time working arrangements will all have to be looked at, or redressed, if participation rates are going to be significantly increased. In addition, participation rate changes over the simulation period will also hinge on real wage and reservation wage developments, with the reservation wage being influenced by taxation and social welfare reforms over the period in question. It should be stressed that GDP growth rates would only be modified in the period when the overall participation rates are increased, although the static gains, as reflected in higher GDP levels, would of course be retained in future years.

TABLE 13 : LABOUR FORCE PARTICIPATION RATES* 1970-1995

	1970	1980	1990	1995
US	65.2	70.9	76.5	76.9
Japan	72.0	71.6	74.1	76.4
EU15**	65.3	65.4	66.3	65.6

* Defined as the civilian labour force divided by the population of working age.
** Including West Germany
Source :DGII

Policies to Reduce Structural Unemployment: Every percentage point reduction in the unemployment rate represents a budgetary saving of about a third of a point due to decreased transfer spending and increased tax receipts. Consequently, the greater the success of the labour reforms to be introduced, the greater the budgetary savings to be reaped from the unemployment reductions, with any savings been able to be used to offset the likely additional expenditures on pensions and health care. It is clear therefore that the fight against unemployment is justified not only in its own right but also as an essential element in a successful response to the demographic challenges of the next 50 years.

Labour Market Simulations : For the purposes of this simulation it is assumed that some combination of all the above factors (i.e. longer working lifetimes, higher participation rates and lower NAIRU's) will be forthcoming from the reform initiatives introduced by the respective governments. If such a comprehensive labour market reform programme can be introduced the results of the present simulation suggest that the GDP impact of ageing can be effectively eliminated with growth rates being restored to the Quest baseline rates. This is indicated in graph 20 below.

This labour market reform package is introduced in the model in the form of an increase in EU labour market participation rates of the order of 10 percentage points, which would bring the latter rates close to the present US and Japanese participation rates. This increase would occur progressively over the period at the rate of a 1 percentage point increase every five years. The actual labour force implications of such an increase are indicated in Graph 19, with the latter showing that this is equivalent to an increase of more than 20 million workers in the EU's labour force at the end of the simulation period in 2050. Finally, it should be noted that an increase of 10 percentage points may appear a lot but when one remarks (see Table 13) the growing divergence over the last number of decades between EU participation rates

compared with those in the US and Japan and the fact that the US, while starting at the same rate as the EU in 1970, has been able to increase its participation rates by 11 ½ percentage points over a 25 year period (1970-95)[25] one realises that the objective is an attainable one.

Graph 19 : Labour Force Impact of Increasing Participation Rates
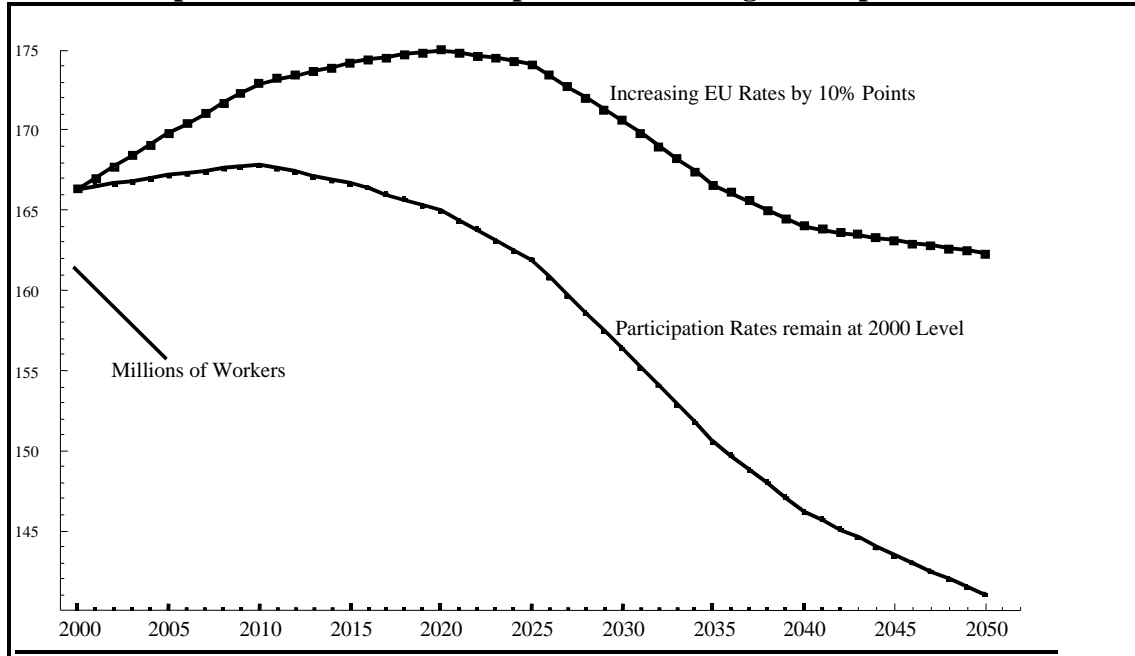
Graph 20: Large Gains from Labour Market Reform
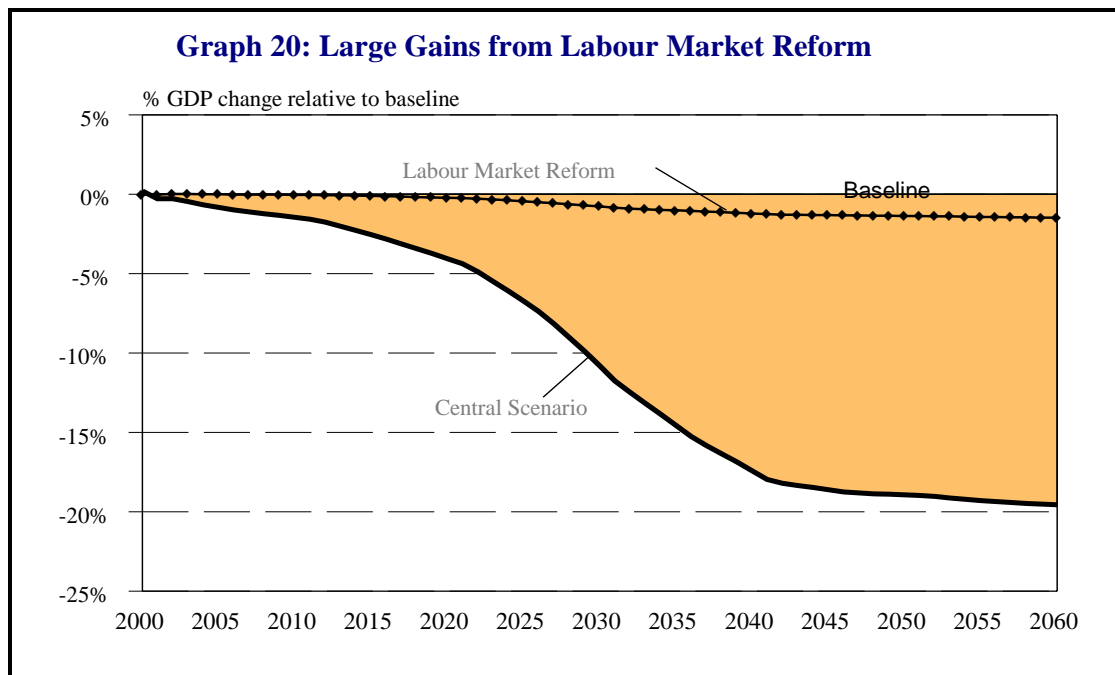
4.3 DEMOGRAPHIC CHANGE AND PRODUCTIVITY: THE ROLE OF TECHNICAL PROGRESS IN EASING THE DOWNTURN IN LIVING STANDARDS:

One of the key areas to look at in terms of easing the threat to future living standards are policies conducive to improvements in total factor productivity. As stressed by

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[25] Over the same 25 year period the EU's participation rate remained static at around 65 ½ percent of the population of working age.

Richardson (1997) "there may be links between human capital and technological innovation, between trade policies and technology, between human capital and income distribution and so on. Trade openness may also be a condition for deriving the benefits of a better-educated labour force……This suggests that in order to foster improvements in total factor productivity there is a need for a consistent set of policies founded on open trade, macroeconomic stability and encouragement for the accumulation of human capital". Policy reforms in this area can lead to both GDP level effects (i.e. static, once-off, efficiency gains) and long run, permanent, GDP growth rate effects (i.e. dynamic gains).[26]

In the case of the Community, the policy options available to permanently raise the rate of growth of TFP are getting fewer and fewer. The Community has made enormous progress over the last number of decades in putting in place the policy strategies which are most often linked in the literature with the reaping of substantial dynamic gains such as a stable macroeconomic environment (i.e. EMU) and an open trading environment both internally (i.e. the single market programme) and externally through the World Trade Organisation (WTO). These openness and low inflation effects on growth rates have already also been largely reaped in the US and Japan but all 3 areas can still continue to derive static gains from regulatory reform to improve the functioning of product, labour and capital markets.

4.4: COMPREHENSIVE REFORMS SCENARIO

For the final simulation, "pension" plus labour market reforms allied to a small technical progress shock to reflect the gains to be achieved from introducing such a comprehensive package of reforms, are introduced in the model to get an idea of their combined impact. The overall conclusion to be drawn from this last simulation is that if governments are successful in introducing a reform package on this scale then the economic implications of ageing are capable of being more than offset in the Community as a whole.

As shown in Graph 21, which gives an overview of the simulation results, the biggest contribution to the easing of the economic pressures of ageing emanates from the package of labour market reforms. This is also reflected in table 14 which gives a rough breakdown of the composition of growth in the comprehensive reform scenario.

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[26] An example of this split between static and dynamic gains would be the Community's single market programme with the static gains coming through in the form of economies of scale and greater competition and with the permanent growth rate effects resulting from the increased competition in an enlarged market having a favourable effect on technological innovation and investment.

Graph 21: Overview of Simulation Results

% GDP change relative to baseline
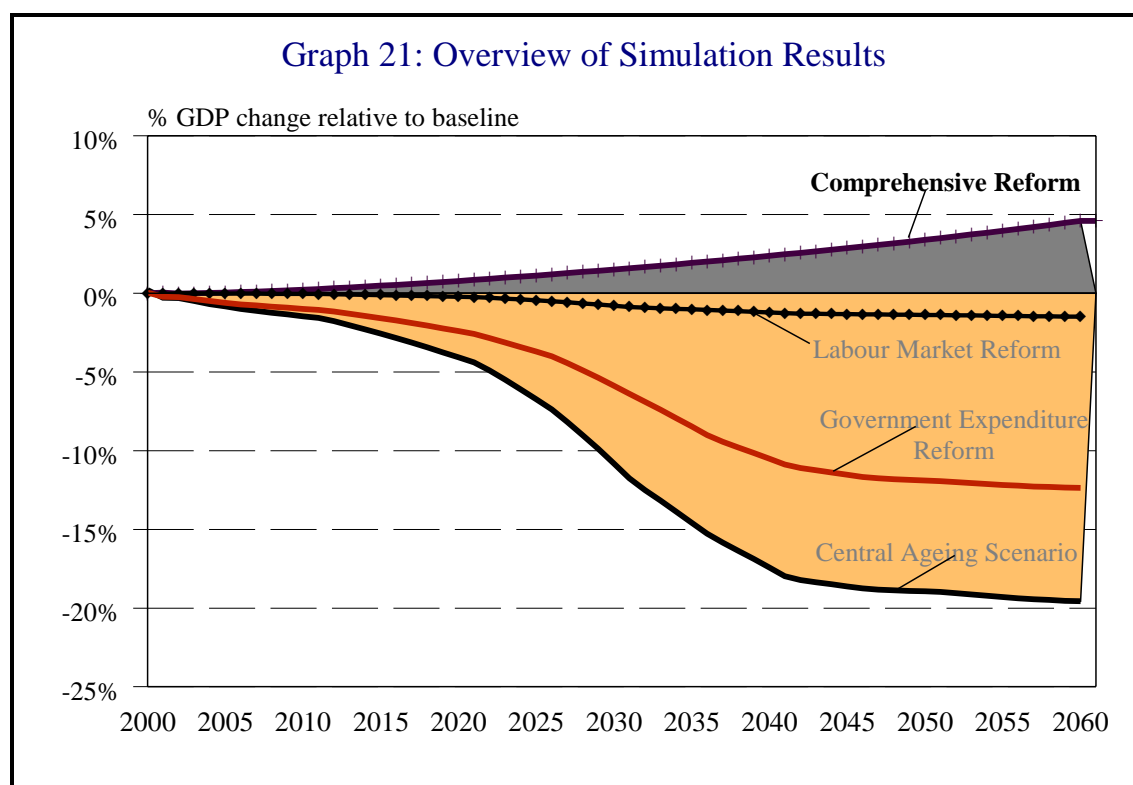
*NOTE: In Graph 21, the results of the central ageing scenario are not directly comparable with the other reform scenarios since one of the underlying assumptions of this central ageing simulation is that unemployment benefits are linked to gross wages, whereas for the other simulations the assumption is that benefits are linked to net, after tax, wages.

TABLE 14 : COMBINED REFORMS SCENARIO : CONTRIBUTIONS TO PER CAPITA GROWTH OVER THE PERIOD 2000-2050

	EU15	
	Annual Average % Change	Change Relative To Central Scenario
Employment	0.18	0.30
Capital Stock	0.89	0.14
Total Factor Productivity	1.27	0.05
Total	2.34	0.50

4.5: INCOME DISTRIBUTION CONSEQUENCES OF AGEING:

Given the extent of the shocks which are likely to be experienced over the next 50 years and the implications which the latter will have in terms of the growth in overall living standards, an obvious issue to be touched upon is the extent to which the living standards of individual income groups within society will be impacted upon. In terms of the latter, on the basis of rudimentary calculations of the average per capita real

income growth for those income groups most implicated in the various ageing scenarios, namely pensioners, wage earners and unemployment benefit recipients[27], it is possible to assess in broad overall terms the income distribution consequences attaching to the simulations summarised in this and the previous chapter.
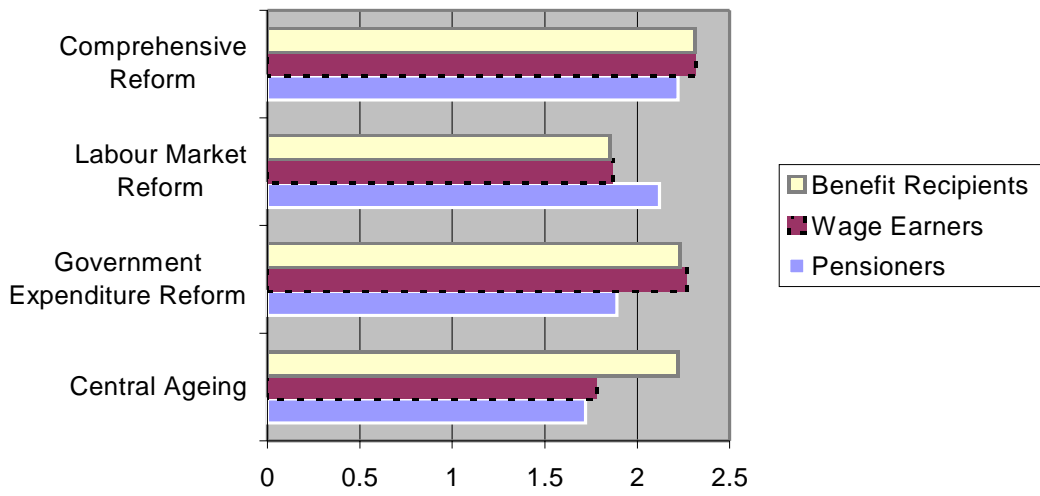
As regards the specific income categories, the results of the calculations suggest that pensioners incomes grow roughly in line with GDP growth rates in all of the scenarios. With regard to wage earners and unemployment benefit recipients, trends in relation to their respective incomes depend on assumptions regarding the benefit rule underlying the individual simulations. If benefits are linked to gross wages then benefit recipients gain relative to workers whereas if benefits are linked to net, after tax, wages then the income growth of both groups grows roughly in proportion.

For example, in the central ageing scenario, since benefits are linked to gross as opposed to net wages, it is estimated that the income growth of benefit recipients will be roughly half a point higher, on an annual average basis, than that of pensioners or wage earners in each year of the 50 year period. With regard to the public expenditure reform scenario, wage earners and benefit recipients gain at the expense of pensioners due to the drop in labour taxation associated with the implicit assumption of at least some movement away from the present PAYG system of financing pension income. On the other hand, pensioners do relatively well out of labour market reform since, with the increase in the effective labour supply having the effect of reducing the real wage growth of workers, pensioners gain from the higher GDP growth rates emanating from the reform process itself. These relative gains and losses cancel each other out in the comprehensive reform scenario with, as assumed in the baseline, the income growth of all three groups growing roughly in proportion to GDP growth.

Finally, the more equal distribution of income achieved under the latter comprehensive reform scenario (Graph 22) is an important argument in favour of this approach. A more balanced package of reforms, compared with the more piecemeal approach assumed in the pension and labour market reform scenarios, could perhaps avoid some of the distributional conflicts which may arise when age-induced policy measures are introduced in such a fragmented manner.

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[27] Calculating real incomes per worker and per unemployed person is relatively straightforward, with per capita labour income being defined as real, after tax, wage income per person employed, and with per capita benefit income being simply unemployment benefits divided by the number of unemployed. Data problems ensure, however, that per capita pension income calculations are not as easy. For the purposes of the present exercise it was decided to use a rough proxy and define pension income as being equal to publicly provided pension income divided by the number of over 65s in the population.

Graph 22 : Distributional Consequences of Ageing
(Annual Average Income Growth per Head 2000-2050)

Comprehensive Reform

Labour Market Reform

Government Expenditure Reform

Central Ageing

□ Benefit Recipients
■ Wage Earners
■ Pensioners

0   0.5   1   1.5   2   2.5

CHAPTER 5:   RESULTS OF COMPARABLE AGEING STUDIES

While the many partial analyses carried out on the effects of demographic change are not comparable with the more comprehensive Quest II approach, broadly similar general equilibrium, multi-country, approaches to that of Quest have been carried out by other international organisations. For example the OECD (1998) using its Minilink model, which was specifically set up to handle the consequences of ageing, and an earlier 1990 IMF study carried out on that institution's Multimod model.

5.1 : OECD MINILINK MODEL STUDY OF GLOBAL CONSEQUENCES OF AGEING

In a recent OECD Working Paper "The Macro-Economic Implications of Ageing in a Global Context", Turner et al, using the OECD's new international, dynamic, and general equilibrium macro model (Minilink) formulate a number of long-term scenarios which sketch out the likely national and international macro-economic consequences of ageing in OECD countries. An attempt is also made to assess the likely impact of policies which might be used to ameliorate or reverse the negative effects of ageing on the growth of productive potential and living standards.

On the basis of the available demographic projections, a baseline scenario to 2050, incorporating the main influences of ageing on the global economy, is set up which shows that without comprehensive policy reforms on a broad range of policy fronts, leading to prolonged, trend, improvements in factor productivity growth or in labour force participation rates, economic growth is likely to slow substantially over the next 50 years in virtually all of the OECD's member states.

Minilink estimates that the projected dependency ratio increases will, using a no-policy change assumption, lead to cumulative relative reductions in the levels of GDP per capita by 2050 of about 10,18 and 23 percent for the US, the EU and Japan respectively because of the slower annual rate of growth in living standards compared with the recent historical experience.

Additional simulations were run to illustrate the beneficial effects of a variety of budgetary and structural reform initiatives. These reforms are shown to have their greatest potency when implemented as a package and carried out in a timely and co-ordinated manner at the international level. Such a comprehensive approach would, according to the authors go a long way towards re-establishing earlier growth trends, with the EU likely to gain the most with an average boost of 0.7 per cent per annum in living standards compared with gains of only 0.3 per cent per annum for the US and 0.6 per cent in Japan, cumulatively raising output levels by over 40 per cent in the EU by 2050, compared with 15 and 30 per cent for the US and Japan respectively.

The relatively strong performance of the EU reflects the additional scope available in the Community in terms of structural unemployment reductions, participation rate and labour efficiency increases as well as in relation to budgetary consolidation. This scenario is particularly motivating for the Community's policy makers in that if a comprehensive policy strategy can be successfully implemented, the OECD scenarios point to an annual average growth in living standards in the EU of two percent over the

period 2000-2050 compared with 1.7 per cent estimated for the period 1990-2000. Clearly on the basis of these estimates the EU has the means available to successfully tackle its upcoming dependency ratio problems.

Finally, the long-term scenarios also address the issue of whether the OECD economies can offset the effects of ageing on living standards by increased foreign investment in the non-OECD area. The conclusion on this point is that any contribution from shifting investment away from domestic sources towards offsetting the effects of ageing is likely to be modest given the potentially adverse effects on domestic productivity and given the large element of uncertainty surrounding the future growth potential of the non-OECD region as a whole.

TABLE 15: OECD SIMULATIONS 2000 – 2050 LIVING STANDARDS IN THE REFERENCE CASE AND COMBINED REFORMS SCENARIOS						

	EU		US		Japan	
	Average growth 2000-50	**Level by 2050 1995=100**	**Average growth 2000-50**	**Level by 2050 1995=100**	**Average growth 2000-50**	**Level by 2050 1995=100**
Reference Case Scenario	1.3 (1.7)*	195	1.1 (1.7)*	176	1.1 (1.5)*	176
Combined Reforms Scenario	2.0	264	1.4	202	1.7	227

* Average Growth in Living Standards 1990-2000

5.2 : IMF STUDY OF G7 COUNTRIES USING THE MULTIMOD MODEL

In an article entitled "Macro-economic effects of Projected Population ageing in Industrial Countries", Masson and Tryon (IMF 1990) present the results of simulations of the effects of population ageing, over the period to 2025, using the Multimod model. Multimod uses the overall dependency ratio, which combines the old age and youth ratios, to capture the demographic effects, with the latter overall ratio being used with the exogenous total population variable to determine the working age population. This dependency ratio variable appears in both the consumption function and on the supply side of the model, with the labour force part of the production function being set equal to the working age population times the participation rate which is set exogenously.

The dependency ratio, acting as a proxy for population ageing effects, operates through three main channels in the model. Firstly, on the assumption that "life cycle" motives for savings operate, aggregate consumption relative to income is increased (ie savings are reduced) by the growth in the dependency ratio. Secondly, higher dependency ratios are associated, all other things being equal, with declines in potential output because of the lowering of the labour force. The outcome in terms of per capita output is dependent upon the resulting capital stock per worker as well as on the labour force participation rates. Finally, government health and pensions expenditures will be

increased due to the greater share of old people in the population, with the authors speculating that there may be some offset on education expenditure because of more favourable youth dependency ratios.

Using estimates compiled by Heller et al. in "Ageing and Social Expenditure in the Major Industrial Countries, 1980-2025" as inputs for the simulations, Masson and Tryon simulate the net effect of ageing through the three channels alluded to earlier - reduced savings rates, a lower labour force and higher government expenditure.

In aggregate terms, the results of the simulations suggest that the macroeconomic effects of ageing may be substantial by 2025, with all of the G7 industrial countries experiencing higher real interest rates and lower output over the simulation period. In addition, substantial long run changes in the current account and net foreign asset positions of G7 countries are predicted due to differences in the extent and speed of ageing across countries. Finally, due in large part to endogenous tax increases, the evolution of fiscal deficits is not as dramatic as the changes which are likely to ensue in terms of external positions. Masson and Tryon conclude that the real cost to the world economy shows up in the effect on production through a smaller labour force and a lower capital stock.

TABLE 16	MULTIMOD RESULTS: DEMOGRAPHIC CHANGE: COMBINED EFFECTS (Deviations from Baseline)					
		US		JAPAN		GERMANY	
	2000	2025	2000	2025	2000	2025
Real GNP (%)	-0.1	-0.1	0.4	-13.2	-0.2	-5.8
Real Interest Rate (%)	0.1	2.9	-3.3	4.8	-1.1	3.6
Current Account Balance (% of GDP)	1.1	2.7	-2.5	-4.0	-0.5	-0.9
Net Foreign Assets (% of GDP)	2.7	36.2	-13.4	-59.0	-3.3	-23.5
General Government Financial Balance (% of GDP)	0.8	-1.3	-2.5	-1.6	-1.9	-1.5
Government Debt (% of GDP)	-1.5	3.5	7.5	27.3	6.1	19.0

	FRANCE		ITALY		UK	
	2000	**2025**	**2000**	**2025**	**2000**	**2025**
Real GNP (%)	-0.4	-1.6	0.8	-3.3	0.0	-2.3
Real Interest Rate (%)	-0.3	3.0	-1.4	2.0	-0.7	2.9
Current Account Balance (% of GDP)	0.5	1.3	-0.4	0.2	0.4	-0.1
Net Foreign Assets (% of GDP)	2.1	11.8	-0.6	7.4	0.9	6.3
General Government Financial Balance (% of GDP)	-0.3	-1.2	-0.7	-2.5	0.0	-1.1
Government Debt (% of GDP)	2.2	9.0	0.3	29.0	0.2	9.5

SUMMARY AND CONCLUDING COMMENTS

SUMMARY OF STUDY: The essential points to be retained from the foregoing analysis are as follows:

- Barring unexpected changes in fertility rates, or politically unthinkable migration scenarios, Europe, and indeed the rest of the developed world, will have to live with smaller labour forces (assuming unchanged participation rates and the maintenance of the present retirement ages) and a greater burden on those in employment (assuming no productivity changes) due to the sharp increase in old age dependency ratios. Furthermore, it should be underlined that in the event of unexpected changes in the fertility rate, while in the long run the latter would be beneficial in terms of the dependency ratio, in the short run a higher birth rate increases the burden on the working age population.

- The report stresses the distinction between economic and demographic dependency ratios. A big problem with the demographic definition of dependency is that it doesn't accurately reflect the economic burden on the active proportion of the population of working age and in particular on those actually in employment since it is only those who are in employment which are financing government transfers to the non-active population. It is clear that this latter "economic" dependency burden on current labour income is much heavier for regions or countries with low employment rates. This is particularly the case with the Community relative to the US and Japan, where the EU demographic dependency ratio in 1995 (defined as the dependent population as a proportion of the 14-64 age group) was 49% but its economic dependency ratio (defined as the dependent population as a proportion of the overall numbers employed) was as high as 85%.

- It is also clear that these divergences between the Community, the US and Japan in terms of participation rates and employment rates could have big implications in terms of the economic and political sustainability of the present system of burden sharing in the Member States. For example, while the 1995 differences in terms of demographic dependency ratios are not that different between the three regions, the same degree of uniformity does not apply to the economic dependency ratios. The Community's 1995 economic dependency ratio of 85% compares with ratios of 75% and 59% in the US and Japan. These 10 and 26 % points differences in the transfer burden facing EU workforces, relative to those in the US and Japan respectively, must of course at some point reflect themselves either in higher taxes / social security contributions in order to finance the additional transfers or in a lowering of benefit payments to recipients. The latter choice between increased taxes or reduced benefits is a difficult one and from the scenarios presented in the paper is one which will increasingly have to be made over the next number of decades. Such choices are, however, more easily made, and the solidarity between the working and dependent populations is potentially less strained, when the financing of the ageing burden can be spread over a greater number of workers as in the US and Japan because of their higher labour force participation rates and lower unemployment rates compared with here in Europe.

- In assessing the extent of the budgetary challenge to be faced, an important point to remember is that, despite the relatively favourable demographics operating at present, the single greatest contributory factor in explaining the growth in government expenditure over the last number of decades has been increases in the budget category "Transfers to Households". While the bulk of the spending pressures under this latter heading have emanated from increased pensions and health care expenditures, less than half of the latter increases can be explicitly attributed to demographic factors. It is clear therefore that governments will be faced not only with substantially increased age-related spending pressures in these areas but also pressures in terms of curbing the non-demographic elements of these budgets. In this regard, while in the area of pensions, in general it would appear that the period of widened eligibility and enhanced benefits, which were typical of the changes introduced in previous decades, is well and truly over, Governments have been less successful in curbing their health budgets.

- The main channels through which ageing are expected to operate are : the above mentioned expenditure pressures on the public finances; "life cycle" effects on private savings behaviour as well as Ricardian equivalence effects operating through the deterioration in public savings; labour supply implications; potential impact on capital accumulation and total factor productivity; and finally the equilibrating role to be played by interest rates and exchange rates and shifts in external balances. All of the latter factors are discussed in some detail using a partial equilibrium framework.

- Looking at the ageing problem using the latter partial equilibrium approach, while interesting and elucidating in terms of highlighting the key influences at work, in the final analysis is less than satisfactory since it fails to take account of systemic, dynamic, forces which will undoubtedly kick into action once ageing starts to impact on the economic systems of the respective countries. Estimating the effects of ageing using a static or partial equilibrium analysis is in fact prone to three major sources of problems : <u>Firstly</u>, policy adjustments are inevitable in order to avoid the development of unsustainable private or public sector imbalances. <u>Secondly</u>, the emergence of tensions or imbalances in an economy is normally followed by corrective, general equilibrium, feedback effects such as changes in interest rates or exchange rates, in the level and composition of savings, in the behaviour of consumers and investors and even, in certain circumstances, in changes in the rate of technical progress, all of which must be taken into account in assessing the final impact of ageing. <u>Finally</u>, global interdependencies ensure that changes in the relative current account and net foreign asset positions of countries / geographical zones need to be adequately modelled in order to assess the impact of an ageing process which is not occurring at uniform speeds or intensity across countries or regions of the world.

- The general equilibrium approach used in this paper, using the QUEST II model, overcomes, the above mentioned, key limitations of the partial approach, with QUEST's consistent modelling of the various trade and financial linkages between economies, and especially between the Community's Member States and the US and Japan, ensuring that all dimensions of the ageing problem can be looked at, including the crucial systemic issues, by definition excluded by partial analyses.

- Simulations with the QUEST II model, which take explicit account of the labour force and public finance implications of ageing, suggest per capita living standards in the EU, US and Japan are likely to fall significantly over the next 50 years due to the direct influence of the ageing process. The effect of ageing populations in terms of slowing the rate of growth of potential output will also make the budgetary implications of ageing more difficult for the individual economies to bear. If the scenarios prove accurate, economic agents in Europe could be looking at an annual half point reduction in potential growth rates from the present 2 ¼ percent to an average rate of 1 ¾ percent over the period 2000-2050, representing a cumulative GDP loss of nearly 20 percent. Cumulative reductions of 10% and 21½% are predicted for the US and Japan respectively. While it can be argued that the latter no policy change simulation may be unrealistic in that Governments are unlikely to stand idly by, it nevertheless gives an idea of the scale of the task faced by policymakers in devising policy measures aimed at avoiding, or at least cushioning, the potential shock to peoples' living standards.

- The degree of uniformity of the results from the Minilink, Multimod and Quest II simulations suggests that the only arguments emanate from the degree as opposed to the direction of the expected effects. Even allowing for private savings effects at the lower end of the expected range, the investment and growth effects remain considerable. In other words, changing key savings parameters in the model (eg private savings effect, degree of Ricardian Equivalence etc) would not radically alter the essential conclusions. The only area where significant doubt remains is in relation to technical progress where both the extent and even the direction of any ageing impact is still unclear.

- Given the likelihood of a substantial reduction in GDP growth rates, the Member States will have to look at a range of macro and structural policy actions to cushion the impact on living standards. The possible policy responses in the Community to offset the negative effects of ageing are grouped under three broad headings in the paper: budgetary, labour market and productivity, the impact of which is assessed using QUEST II simulations:

    1. BUDGETARY: If the provisions of the Stability and Growth Pact (SGP) are adhered to over the coming years, not only will national savings benefit but a sounder fiscal position will ensure more favourable debt dynamics when the public sector spending pressures from ageing start to emerge. Assessing the role to be played by budgetary policy is carried out by looking at the results of two simulations: firstly, a simple illustration of the importance of adhering to the provisions of the SGP, by looking at the debt and debt servicing implications of the "non-financing" alternative; and secondly, an examination of the case where any age-related increases in government expenditures are financed on the expenditure side of the budget. This latter simulation, given that the bulk of the additional ageing costs are attributable to the pensions budget, amounts to a pension reform scenario since some movement away from the present PAYG system of financing is implicitly assumed.

    2. LABOUR MARKET: The possibility, through labour market reforms, of neutralizing the labour force implications arising out of the demographic developments is examined in some detail. For the purposes of this labour

market simulation it is assumed that some combination of longer working lifetimes, higher participation rates and/or lower NAIRU's will be forthcoming from the reform initiatives introduced by the respective governments. If such a comprehensive labour market reform programme can be introduced the results of the simulation suggest that the GDP impact of ageing can be effectively eliminated with growth rates being restored to the Quest baseline rates. This labour market reform package is introduced in the model in the form of an increase in EU labour market participation rates of the order of 10 percentage points, which would bring the latter rates close to the present US and Japanese participation rates. It should be noted that an increase of 10 percentage points may appear ambitious but when one compares the present relatively low level of EU participation rates with those pertaining internationally and the fact that a country such as the US has been able to increase its participation rates by 11 ½ percentage points over a 25 year period (1970-95), one realises that the objective of a 10 % points increase over 50 years in the EU is an attainable one.

3. PRODUCTIVITY: The final avenue explored in the paper is the promotion of higher factor productivity growth through structural reforms aimed at enhancing the efficiency and flexibility of goods, services and capital markets in the Community, whilst acting to ensure open and competitive trading conditions at the global level. For this final simulation, "pension" plus labour market reforms allied to a small technical progress shock to reflect the gains to be achieved from introducing such a comprehensive package of reforms, are introduced in the model to get an idea of their combined impact. The overall conclusion to be drawn from this last simulation is that if governments are successful in introducing a reform package on this scale then the economic implications of ageing are capable of being more than offset in the Community as a whole.

CONCLUDING COMMENTS : The unprecedented speed and extent of the ageing phenomenon presents governments with a number of important economic policy challenges[28].

- First and foremost, policy-makers will need to increasingly address the consequences of ageing for future standards of living and face up to the painful intertemporal transfer choices to be made in this regard i.e. how much should the present generation transfer in terms of physical and human capital in order to ensure that the retirement of the "baby boom" generation doesn't pose insurmountable problems.

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[28] OECD (1996) « An ageing perspective provides policy makers with valuable insights on future challenges and potential directions. It is particularly powerful in understanding medium and longer-run challenges; demography is one of the few areas where it is possible to make meaningful projections that extend well into the next century. However, it is only a partial perspective. Ageing rarely operates in isolation from other forces of change- such as technology or trade……A longer-term perspective does not mean that policy action can be postponed. In many countries, a window of opportunity exists in which to address both short- and long-term policy goals in ways which are mutually reinforcing. Further, unless action is taken soon, problems are likely to be much worse after 2010 in most Member countries as the heaviest effects of ageing populations begin to be felt »

- Secondly, as stressed consistently throughout the paper, fiscal policy will need to be closely scrutinised in order to be able to cater for the inevitable age related spending pressures which will emerge, without provoking the development of unsustainable deficit and debt positions and significant disincentive effects in relation to work effort and labour supply decisions. The latter spending pressures have in fact already started to manifest themselves in Japan and will become increasingly evident here in the Community in about 10-15 years time. In addition, this process of fiscal policy scrutiny invariably touches on the question of intra- and intergenerational burden sharing and the extent to which the political underpinnings for such budgetary transfers, both within and across generations, will be able to withstand the extent of the age-related transfers involved. This in fact is one of the big unknowns in terms of predicting the future impact of ageing. With an increasing proportion of national resources being transferred to the retired population, it is difficult at this point in time to speculate as to the extent which these changes in the distribution of societies resources, between the employed and dependent populations, will be capable of being resolved without major crises and inter-generational conflicts.

- Thirdly, it is clear from the results of the QUEST II simulations presented earlier that despite the normal uncertainty zones surrounding the estimates of the magnitude of the effects, that there is no "quick fix" available to reduce the inevitable economic burden of ageing. With the number of older people projected to grow relative to those of working age, the share of the population contributing to economically measurable productive activities is reduced. Increases in productive capacity or the foregoing of current consumption i.e. increased saving, represent the only means available for economies to attenuate the pressures of ageing on future working-age populations.

- Fourthly, in terms of policy prescriptions, governments will need to adopt a multi-faceted approach in order to moderate the economic burden of ageing, combining fiscal consolidation; pension & health care reforms; labour market reforms, including action to boost labour force participation rates and to increase the effective retirement age to reflect increased longevity; and finally structural reform initiatives to enhance the efficiency of resource allocation and to stimulate higher, sustainable, rates of economic growth. The economic impact of the "greying" of the population over the next 50 years will only become unbearable for the Community in the event that its labour markets, and by implication its tax and social security systems, remain in their present state and if the SGP is not adhered to[29].

- Finally, in operational terms, one of the key conclusions to be drawn from this analysis is the importance of initiating research into the practical and political difficulties of introducing a fully funded pension system. While health care costs are clearly an issue, the pure ageing effects on health care budgets is dwarfed by the expected pensions increases. While the fully funded approach raises difficult

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[29] As stated in Bovenberg and van der Linden « Just as with other trends that affect our society, ageing requires countries to adapt their economies……countries have many alternative ways to do just that. Since ageing is a rather predictable trend, countries have ample time to adjust. Indeed, we advocate that countries spread their eggs not only over various policy measures but also over time. Gradually phasing in policy measures and announcing these measures early, avoids abrupt, painful policy corrections. »

political and financial market issues, as well as concerns in terms of the ownership and prudential rules to be applied to the accumulated funds, the economic case put forward in the present paper allied to looming demographic pressures on the PAYG system must surely mean that, over the next 50 years, all countries will move at least partially away from the latter PAYG system.

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