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**EU pension reform-
An overview of the debate and an empirical
assessment of the main policy reform options**

by

Kieran Mc Morrow and Werner Roeger*

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ASSESSMENT OF THE MAIN POLICY REFORM OPTIONS

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Over the last decade there has been a noticeable surge in interest in all of the developed economies in both the politics and economics of pension reform. While concerns have always been present regarding the basic rationale underpinning pension systems, this recent deepening in interest has been driven essentially by demographics and the economic and budgetary implications of ageing populations. Ageing raises serious questions regarding the long term sustainability of the present PAYG public pension system as well as heightening the degree of interest in the efficacy of the alternative, non-PAYG, pension financing mechanisms which are available, most notably funding. In this regard, there has been a discernible trend in recent years in the pensions debate towards advocating greater recourse to capital market solutions as a way of resolving the pensions crisis although a lot of work has also been carried out in assessing the possibilities for reform within the PAYG system itself. This paper will examine the basic case for pension reform, will present empirical evidence regarding the potency of the various pension reform options and will address the issue of whether PAYG or funding is the most appropriate way of providing retirement income.

As mentioned above, at the heart of this whole pension reform debate are demographics, with a growing awareness amongst policy makers of the many effects which "grey" pressure will have, at a global level, progressively over the coming decades. Any objective assessment of the likely evolution of the key underlying determinants of population changes over the next 50 years suggests that ageing of the EU's population, as with most of the developed world, 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. While the share of the elderly in the total population also grew over the last number of decades, the overall economic burden on those in work was attenuated by the fact that the population of working age was also growing rapidly. This latter luxury of growing numbers entering the labour force, which governments in the past could turn to in order to fund the additional pension and other age-related expenditures is fast disappearing, with the present EU ratio of four workers per pensioner likely to be cut in half by 2050. This change in the old age dependency ratio is particularly problematic for the PAYG pension system since the pensions of the present generation of over 65s[1] is paid for through the social security contributions of the present workforce.

Consequently, 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 cohorts, are at the heart of the growing interest in pension systems and pension reform. This paper will examine the key themes which permeate this debate, whilst at the same time attempting to both quantify the size and nature of the problems to be faced and analysing the respective merits of the main policy solutions which have been put forward in the literature. While the focus is on

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[1] 65 is used simply for illustrative purposes since the effective retirement age in the EU is closer to 60.

the EU, a comparison of the EU's pension system with that of the US is also provided and the analysis of the various policy choices is of course applicable to more than just the Community situation.

In terms of content, this paper should in fact be seen as a logical follow-up to a paper on "The Economic Consequences of Ageing Populations"[2] which was published at the end of 1999 and which includes a lot of the basic background research used for the present analysis. It is not the intention of the present paper to repeat the ground covered in the earlier work but references to the latter will be made where appropriate. In addition, since the primary focus of this paper is on the empirics of pension reform, very little attempt is made to discuss the more normative aspects of the debate. These latter aspects are discussed in detail in chapter 5 of the European Commission publication, "The EU Economy : 2001 Review", which was released by the Directorate General for Economic and Financial Affairs in November 2001.

The present paper is structured as follows:
- Section 1 gives an overview of the pension reform debate, including an analysis of its key underlying driving forces. Much of the latter analysis is based on a comparative assessment of the past and future evolution of the EU and US pension systems.
- Section 2 goes on to describe the model which is used to quantify the effects of the various pension reform options, with an assessment also being made of its explanatory power by comparing its projections for future pension expenditure with the equivalent projections recently produced by the EU's Economic Policy Committee (EPC).
- Sections 3 to 5 provide the results of a series of simulation exercises which systematically assess the various parametric and systemic policy options available to governments, with all the options being evaluated relative to their growth, budgetary and income distribution effects.
- In addition to assessing the effects of a broad combination of parametric reforms of the PAYG system, section 3 also looks at the effects of individual policy initiatives including changes in the generosity of the PAYG system and increases in the effective retirement age.
- Given the strains which are emerging in the PAYG system, section 4 starts the analysis of the main alternative to this latter system i.e. capital market funding, and examines the essential factors to be considered in any systemic change, such as the internal rate of return differences between the PAYG and funded systems and the transition costs of moving from the former to the latter.
- Section 5 goes on to provide a series of systemic simulations ranging from a 100% shift to funding, including compulsory and voluntary savings variants, to a partially funded pension system with shares of 75% for the PAYG system and 25% for funding.
- In the final section of the paper, an attempt is made to distil the key policy messages to be retained from the analysis, with particular attention being devoted to the need for an "optimal" EU pension reform strategy based in particular on a progressive 100% shift to funding. Given that this transition process will have to occur over more than one generation, policy makers must handle the transition path in as effective a way as possible. In this regard, during the transition phase

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[2] See Mc Morrow and Roeger (1999)

governments must give priority to those policy measures aimed at offsetting the growth loss associated with ageing rather than on the budgetary pressures of the latter phenomenon, although both policy goals are, of course, closely interrelated.

- The paper finishes with a detailed overview of the main points and key policy conclusions to be retained from the study.

OUTLINE OF STUDY

EU PENSION REFORM

| GENERAL OVERVIEW OF PENSION REFORM DEBATE (SECTION 1) | EMPIRICAL EVALUATION OF PENSION REFORM OPTIONS (SECTIONS 2-5) | PREFERRED EU PENSION REFORM STRATEGY (SECTION 6) |

| 1. KEY ISSUES+CONCEPTS 2. COMPARISON OF EU + US PENSION SYSTEMS 3. POLICY SOLUTIONS | 1. MODEL DESCRIPTION 2. PAYG REFORMS 3. SYSTEMIC REFORMS | 1. 100% SHIFT TO FUNDING 2. TWO STAGE OPTIMAL TRANSITION PATH 3. PUBLIC + PRIVATE PILLARS |
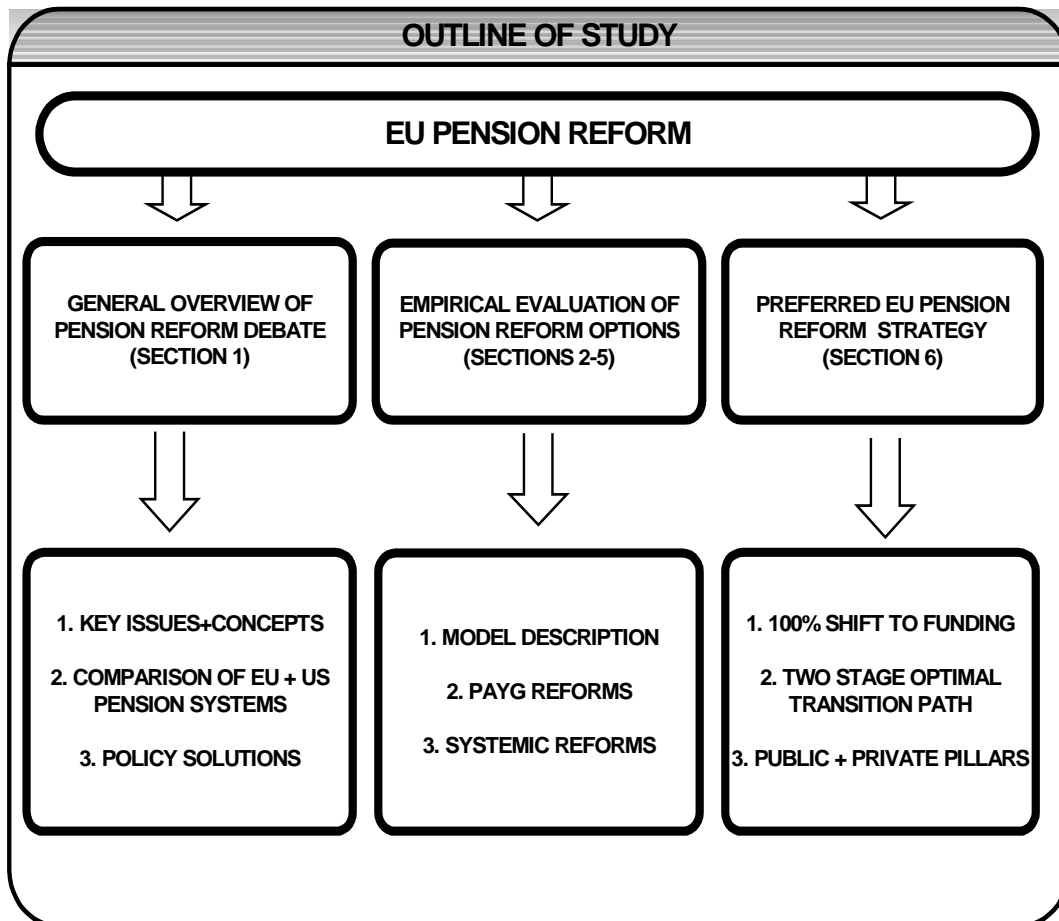
1.1 KEY ISSUES AND CONCEPTS

For those coming to the pension reform debate for the first time the terminology used can often appear a little confused, with Table 1 below attempting to isolate the key issues and concepts which need to be kept in mind by the reader.

TABLE 1 : KEY ISSUES AND CONCEPTS

MAIN QUESTIONS TO BE ADDRESSED	ESSENTIAL POINTS TO BE RETAINED
1. WHAT ARE THE MAIN SYSTEMS FOR FINANCING CONTRIBUTORY PENSION INCOME ? (NON-CONTRIBUTORY PENSIONS ARE NOT CONSIDERED AS THEY ARE PURELY REDISTRIBUTIVE AND ARE FINANCED FROM GENERAL TAXATION)	PAYG V FUNDING : The key issue in terms of contributory pension systems is the choice between the relative merits of an unfunded system such as Pay-As-You-Go (PAYG) and a funded system and not as some commentators would like to suggest between public and private provision. Funding can be carried out in both the public and private sectors or using a combination of both sectors.
2. HOW ARE THESE SYSTEMS FINANCED?	CONTRIBUTION RATES : The PAYG and Funded pension systems are financed simply by financial contributions from workers : which are channelled via the tax system (Social Security Contributions - SSC's) in the case of the PAYG system and in the case of funding via regular pension contributions to various types of pension funds.
3. WHAT DETERMINES THE LEVEL OF PENSION ONE FINALLY RECEIVES ON RETIRING AND IS THIS DEGREE OF GENEROSITY GUARANTEED OR NOT ?	REPLACEMENT RATES + DEFINED BENEFIT (DB) V DEFINED CONTRIBUTION (DC) SCHEMES : The level of ones pension is referred to as the replacement rate (the % share of ones final salary that one receives in retirement). The replacement rate in the PAYG system is of the defined benefit (DB) or "guaranteed" variety and is determined by a large number of globally established factors including the contribution rate, the number of contribution years, the indexation and eligibility rules applied etc. Note that whilst the PAYG's replacement rate is in theory guaranteed this has not stopped governments periodically changing key parameters of the PAYG system so that generosity levels have changed over time - in a positive direction over the last 40 years but potentially in the opposite direction over the coming decades as the effects of ageing start to "bite". In the case of funding the replacement rate is increasingly of the defined contribution (DC) variety (although DB schemes are also possible) where the final benefit is not guaranteed and depends on the level of contributions made and the rate of return achieved by the particular pension fund chosen.
4. IS FUNDING INHERENTLY A CHEAPER FORM OF FINANCING THAN PAYG AND, IF IT IS, WHY IS IT NOT EXCLUSIVELY USED FOR PENSION FINANCING ?	INTERNAL RATES OF RETURN FOR BOTH SYSTEMS : The ultimate cost of any system is determined by the rate of return achieved on the contributions made throughout ones working life. It is accepted in this paper that for the average worker that the internal rate of return of the PAYG system is lower (and consequently the equilibrium contribution rate is higher) than that of funding and this is what one should expect

	in a dynamically efficient economy that the rate of return on capital (i.e. the real interest rate) is higher than that of labour (i.e. real wage growth)[3]. However, there are a number of other very important factors to be considered in the ultimate choice of system such as the fact that firstly, while the average return from funding is higher, the volatility of those returns is also greater (higher return is, in theory at least, always matched by higher risk); secondly the issue of the transition costs of moving from PAYG to funding, and finally a series of more "nebulous" arguments such as the need for balance in the economy as a whole between human and physical capital investment and balance for the individual in terms of a prudent risk diversification strategy (nebulous in the sense that both the PAYG and funded systems can be designed to ensure that adequate account is taken of these latter factors).
5. HOW IS AGEING LIKELY TO AFFECT BOTH TYPES OF PENSION SYSTEMS AND WHAT SHOULD BE DONE ABOUT IT ?	**BOTH SYSTEMS ARE EXPOSED TO RISK** : Ageing will affect both systems of pension provision in a number of different ways including: • the effects of "greying" populations on economic growth and consequently on the rates of return of both systems; • the need to offset the effects of shrinking labour forces and growing dependency ratios on SSC's and on pension fund contribution rates through a combination of mutually reinforcing labour market and pension system reforms; • the growing pressure to strengthen the financial basis of the PAYG system by linking contributions and benefits more closely and thereby allaying fears that the initial insurance rationale for the PAYG system has not given way to an excessively redistributive agenda, with the risk from the latter being that SSC's would increasingly be seen by workers not as pension contributions but as simply another form of taxation; • the need to assess the financial market risks associated with funding and the requirement for prudent risk diversification strategies and financial market reforms; • policy makers will also need to address the budgetary implications of ageing and the need for a fair system of intergenerational burden sharing; • finally, ageing will demand a re-assessment of fundamental life choices at the individual level regarding the time to be spent working and the standard of living one aspires to in retirement. Pension systems will have to be adapted to allow for a sufficient degree of flexibility for individuals to make those choices and to see the financial effects of their decisions.
6. WHAT ARE THE BASIC ECONOMICS OF PENSION REFORM ?	**CASE FOR PENSION REFORM RESTS ON SPILLOVER EFFECTS** : A primary economic case for pension reform, on the basis of standard neoclassical theory, is a difficult one to make since while a funded system is in principle superior, there is however no pareto-optimal move

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[3] Feldstein and Liebman (2001) " .....the existence of a capital stock implies that individuals could instead (of PAYG) finance their retirement by saving and investing in actual capital goods where they would earn a real return of p. In a dynamically efficient economy, the real rate of return p must exceed the rate of growth of the economy, y (Cass, 1965). Thus each working generation incurs a loss because it receives a return y on its Social Security taxes that is less than the return p that it would earn by investing those funds in the capital stock"

	from a PAYG to a funded system because of the transition costs, with one generation at least having to suffer a loss in the transition process (i.e. lower consumption / higher savings by either individuals or governments). Consequently, the case for welfare enhancing pension reform is normally made on the basis of positive secondary or spillover effects from reforming particular aspects of a country's pension system, on the efficiency of the economies labour and financial markets; on the budgetary gains or finally on the savings and overall growth performance of the economy. The scope for welfare enhancing reform is large since the PAYG and funded pension systems are each quite distinct, with significant differences linked to the basic design of, and incentives built into, the respective systems. The key economic question therefore is which pension system or combination of systems is likely to have the greatest effect on promoting savings, providing work incentives and generally enhancing overall growth prospects in a country which is faced with a dramatic ageing of its population. The actual pension system a country ends up with reflects not only the above economic considerations but also a host of country-specific distributional and political priorities.
7. WHAT IS THE PRIMARY FOCUS OF THE PRESENT PAPER ?	**ECONOMIC, BUDGETARY AND POLITICAL SUSTAINABILITY OF PENSION REFORM** : This paper's primary focus is on the economics of pension reform and especially the growth and budgetary consequences of the various pension reform options, in the face of unprecedented demographic change. Political sustainability, in the form of the income distribution effects of the reforms set in place, is also considered. In terms of pension systems, the paper assesses the key issues to be considered in any shift from PAYG to funding, namely the internal rates of return of both systems and the transition burden. The insights from this analysis are then used to put forward an "optimal" EU pension reform strategy.

1.2 MAIN DRIVING FORCES UNDERLYING THE GROWING CALLS FOR PENSION REFORM

The pension reform debate is clearly being driven by a large number of interrelated economic factors but one of the most significant and visible is the growth in the cost of retirement income provision over the last 40 years and the prospect of a massive increase over future decades as the effects of ageing really start to emerge. In this regard public pension expenditure as a percent of GDP has risen in the EU from about 6% in 1960 to over 12%[4] in 2000 and on the assumption that no action will be taken to address this situation, pension spending could reach unsustainable levels close to 20% of GDP[5] in the coming decades. Linked to this alarming expenditure outlook are

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[4] Pension expenditure figures are taken from OECD sources due to the fact that a longer time series is available. The figure of 12% for 2000 for the EU is however in keeping with the roughly equivalent figures from Eurostat's ESSPROS database for the late 1990's. It is important to stress that due to different definitions and concepts used there are sometimes large discrepancies between different published sources, with for example the EPC's Ageing Working Group estimating that pension expenditure in the EU in 2000 was of the order of 10 ½% of GDP.

[5] This figure of 20% assumes that the starting point for pension expenditure as a % of GDP is the OECD figure of 12% in 2000 and not the 10 ½% of GDP assumed by the EPC.

of course economic growth considerations with obvious concerns being expressed regarding the negative effects of these developments for future changes in the living standards of citizens.

This section will look at the main factors which have been driving changes in pension spending over the past number of decades and which will undoubtedly determine changes in the future. These factors are as follows:

- **PURE DEMOGRAPHICS** : by this is meant changes in fertility rates and life expectancy which impact on the size of the working age and pensioner populations in an economy.
- **LABOUR MARKET INFLUENCES** : This broad heading looks at all the factors which influence the share of the working age population which end up as effective contributors to the PAYG pension system - namely the numbers in employment who pay the social security contributions needed to pay the pensions of the present retired population.
- **GENEROSITY OF PENSION SYSTEM** : This is the final factor which determines the overall level of pension expenditure in an economy and is often proxied by the gross replacement ratio.

There are without doubt a lot of other factors in the pension system which should be taken into account in any detailed assessment of expenditure trends, such as eligibility and indexation rules, but these are not directly allowed for in the calculations which are given in this section. For the present exercise, it is sufficient to have a rough breakdown of pension expenditure over the last 40 years and this can be carried out using simple relationships which isolate the main driving forces in terms of expenditure changes. Pensions expenditure over time is essentially driven by changes in the economic dependency ratio (numbers in employment / numbers of pensioners) and adjustments to the generosity of the system. In effect the economic dependency ratio is determined by changes in the old age dependency ratio and changes in employment, with generosity developments being measured by modifications to the gross replacement rates of the respective EU and US pension systems.

1.2.1 : HISTORICAL ANALYSIS 1960-2000
WHAT WAS THE ROLE OF DEMOGRAPHIC, LABOUR MARKET AND GENEROSITY FACTORS IN DETERMINING THE PAST GROWTH OF EU AND US PUBLIC PENSION EXPENDITURE ?

It is important to stress again at the outset that this analysis of the factors which have been responsible for the increase in pension spending over the period 1960-2000 is purely illustrative, with definitive breakdowns into the three components of pure demographics, labour market influences and generosity not being feasible given the large array of influences which are involved and because of obvious data constraints. Despite this reservation the breakdown provided is, in the opinion of the authors, a reasonable picture of the main influences at work, with an identical methodology being applied to both the EU and US.

1. DEMOGRAPHIC INFLUENCES : The main points to be retained from graph 1 are as follows :

- With regard to fertility rates it is clear that a significant break occurred in both the EU and the US around 1970[6], with the numbers in the 0-14 year old age group declining significantly in both areas following strong growth in the 1960's. However, while this negative pattern has persisted in the EU in the period up to 2000 there has been quite a significant recovery in the youth population in the US in the 1980's and early nineties.
- In terms of life expectancy at birth, both areas have experienced a steady upward movement in longevity since the 1960's with life expectancy of around 70 in 1960, growing by 7 to 8 years in both the US and EU respectively up until the year 2000.
- Regarding the population of working age the US has always had a higher growth rate, with increases in excess of 1 ½ % on an annual average basis in the 1960's and 1970's and close to 1% annually in the 1980's and 1990's. The EU on the other hand has experienced a much slower pace of increase in the working age population with the average over the last 4 decades being of the order of ½ a % annually.
- In terms of the number of pensioners there has been a steady upward shift in the share of pensioners in the overall population, with the share of the over 65s in the total populat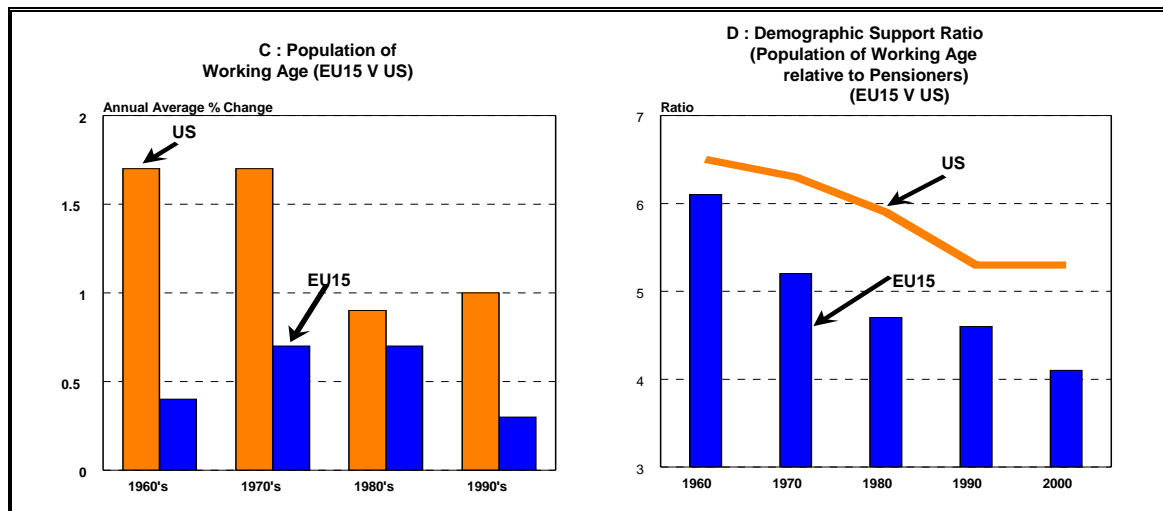ion growing from 9% to 13% of the total in the US over the period 1960-2000 and from 11% to 16% in the EU over the same period.
- Finally, with regard to the old age demographic support ratio, which is simply the inverse of the dependency ratio, there has been a significant change over the last number of decades in the number of people in the population of working age relative to the number of people over 65. In 1960 the demographic support ratio was 6.5 and 6.1 in the US and EU respectively, by 2000 this ratio of people aged 15-64 relative to people aged 65 and over had fallen to 5.3 and 4.1 in the US and the EU respectively. Clearly therefore in terms of pure demographics the EU has been more severely affected over the last 40 years by falling birth rates and working age population changes than has the US.

GRAPH 1 : PURE DEMOGRAPHICS

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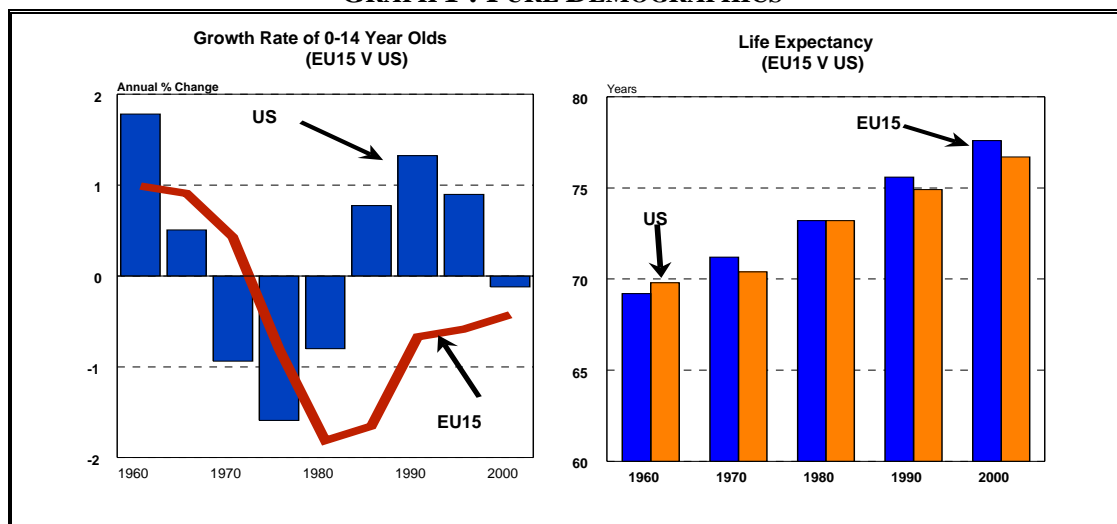
[6] While a large array of factors have been put forward as possible explanations for this break in trend, the growing use of the contraceptive pill was undoubtedly one of the contributory elements.

C : Population of Working Age (EU15 V US)

Annual Average % Change

US

EU15

2
1.5
1
0.5
0

1960's   1970's   1980's   1990's

D : Demographic Support Ratio (Population of Working Age relative to Pensioners) (EU15 V US)

Ratio

US

EU15

7
6
5
4
3

1960   1970   1980   1990   2000

2. LABOUR MARKET INFLUENCES: The demographic support ratio only provides part of the story in terms of pension expenditure pressures in the EU and the US. The demographic ratio doesn't accurately reflect the economic burden on the active proportion of the population of working age (i.e. the labour force) and in particular on those actually in employment since it is only those with jobs which are financing, through their social security contributions, the government's pension transfers to the non-active pensioner 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 and graph 2 shows clearly that this is particularly the case with the Community relative to the US. The main points to be retained from the graph are as follows :

- In terms of participation rates, the last 40 years has seen very little change in the EU in the proportion of the working age population which is actively participating in the labour force. By contrast, the US has experienced a 13 percentage points increase in participation rates rising from 71% in the 1960's to 84% in the 1990's. This has resulted in annual average growth rates of the US labour force of 1 ½ - 2% in each of the last 4 decades compared with rates of ½ a % a year in the EU over the same period.

- Coupled with large increases in labour force growth, the US also experienced roughly equivalent rates of growth in employment since the rate of structural unemployment in the US over the last 40 years has been reasonably stable at 5-6% of the labour force. As against this the EU performance on all counts looks rather dismal, with poor growth in the population of working age being compounded by virtually no change in labour force participation rates and an increase in structural unemployment from around 2% of the labour force in the 1960's to close to 10% at the end of the 1990's. In addition, European workers appeared to make greater recourse to retiring early over the period with the effective retirement age falling in the EU by 5 ¼ years to less than 60 over the period 1960-2000 compared with a fall of 3 ½ years in the US to 63 over the same period. Given the preceding comments it is hardly surprising to find that the employment performance in the EU compared with the US over the last 40 years has ranged from less than a ¼ of a % growth in the 1960s, on an annual average basis, to ½ a % in the 1980's and 1990's compared with annual rates of growth which ranged from 1½-2% a year in the US over the same period.

- With such a weak labour market performance in the EU compared with the US, changes in the economic support ratio in both areas have evolved in very different ways. As graph 2 shows, the economic support ratio did not change very much in the US over the last 40 years, staying at roughly 4 workers per pensioner - in fact it improved marginally in the 1990's. Over the same period the EU ratio deteriorated from having a broadly similar ratio to the US in 1960 of 4 workers to 1 pensioner to a ratio of 2 ½ workers supporting 1 pensioner in 2000. Since pension expenditure as a proportion of GDP is essentially made up of the economic support ratio plus changes in generosity one can quickly see that the weak EU labour market performance over the last number of decades has not acted to offset the pure demographic changes coming from reduced birth rates and increased life expectancy and has consequently led to sharp increases in the pension burden. In contrast to this the US labour market has fully offset the pure demographic effects so that no upward pressure has occurred in terms of US pension spending from the economic dependency ratio.

GRAPH 2 : LABOUR MARKET INFLUENCES
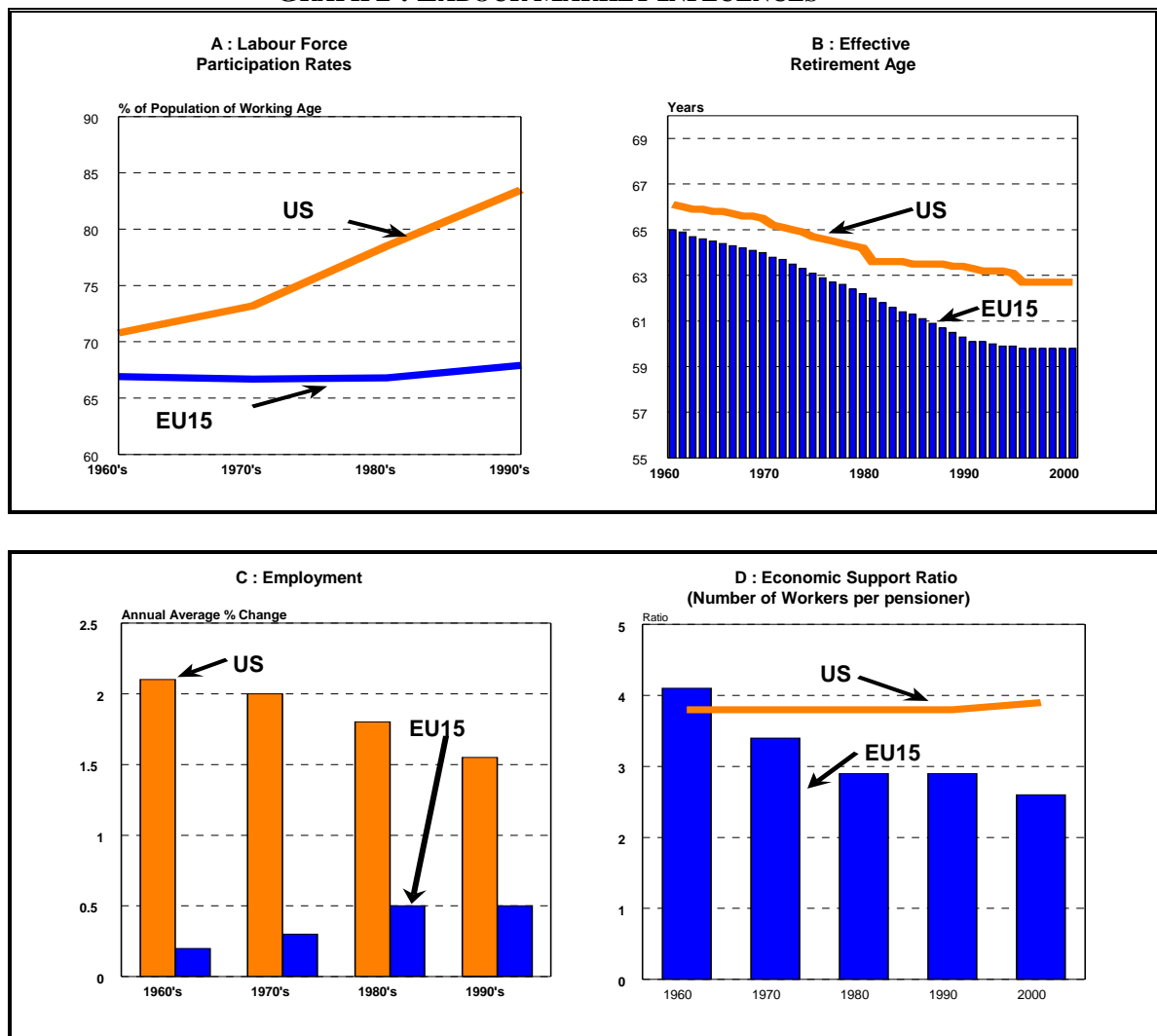
3. GENEROSITY OF THE SYSTEM : The last piece of the pension expenditure story comes from changes in the generosity of the respective pension systems in the EU and the US. This is undoubtedly the most difficult calculation to be made and the one

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around which most controversy revolves. Graph 3 below shows the OECD's synthetic indicator for the gross replacement rate applying in the EU and the US over the period 1960-1995. It is an admittedly crude attempt to track the changes in the generosity of the respective systems but nevertheless can be broadly corroborated using evidence from other data sources at the national level. What the graph is simply saying is that the generosity of the EU and US public pension systems have both improved over the last number of decades, with US pensioners gaining relatively more as shown by a narrowing of the generosity gap with the EU public pension system from nearly 14% points in 1960 to 6% points in the mid 1990's.

GRAPH 3 : GENEROSITY OF PENSION SYSTEM
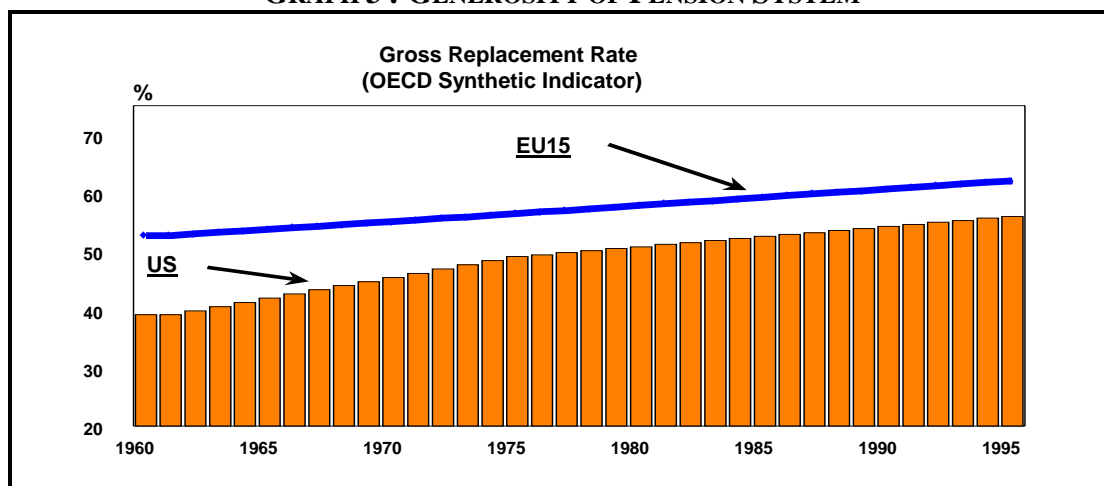
4. COMBINED IMPACT OF DEMOGRAPHIC + LABOUR MARKET + GENEROSITY CHANGES ON OVERALL PENSION EXPENDITURE : The final graph in this section brings together the information gathered regarding all the demographic, labour market and generosity changes which have occurred since 1960 and presents the total change in pension expenditure over the last 40 years[7] and the proportion of the change which can be roughly attributable to the factors mentioned.

- In terms of overall pension expenditure changes, using the broadest definition of pension spending which includes old age, survivors and disability pensions, Graph 4 shows that the increase in the total public expenditure on pensions was 3 ¼% points of GDP in the case of the US and 6 ¼% points in the EU over the period 1960-2000.

- In terms of the driving factors behind these overall changes it is clear that if the EU had experienced the same labour market performance as the US it would have restricted the change in total pension expenditure to that which occurred in the US. In the US since the pension spending pressures emanating from pure demographic factors were neutralised by favourable labour market changes the only factor forcing up US pension expenditure over the period was changes in the generosity of the system. In the case of the EU, demographic, labour market and generosity changes all contributed to the large increase in pensions spending.

- The Community's old age economic dependency ratio in the year 2000 of 38% (i.e. equal to a support ratio of 2 ½ workers per pensioner) compares with a ratio of less than 26% in the US (4 workers per pensioner). This 12 % points difference

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[7] The 1995 generosity levels are simply extrapolated forward to 2000 to allow a comparison for all three sets of variables (demographic, labour and generosity) over the full 40 year period 1960-2000.

in the transfer burden facing EU workforces, relative to those in the US, must of course at some point reflect themselves either in higher taxes / social security contributions in order to finance the additional age related 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 later on in this 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. This is the case in the US because of their higher labour force participation rates and lower structural unemployment rates compared with here in Europe.

- These differences in the respective performances of the US and the EU on the pension spending side were of course reflected in terms of changes on the revenue side of public pension systems. The social security contributions imposed on US workers rose from 7% of wages in the 1960's to 12 ½% in the 1990's (with a 50/50 split between employers and employees). In the case of the EU, social security contributions rose from 11 ¼% of wages in the 1960's to around 19%[8] in the 1990's.

- Finally, it is important to reiterate that these pension expenditure figures only refer to the public PAYG system in the EU and the equivalent social security system in the US. In the case of the EU nearly 90% of retirement income provision comes via the PAYG system[9] with the remainder coming from various funding pillars. In the case of the US, the breakdown between social security and funding is roughly 2/3 to 1/3 respectively. In terms of the total income of pensioners, the PAYG system provides roughly 55-60% of the total income of pensioners in the EU, with the US social security system contributing roughly 40%.

GRAPH 4 : PENSION EXPENDITURE IN EU AND US : 1960-2000

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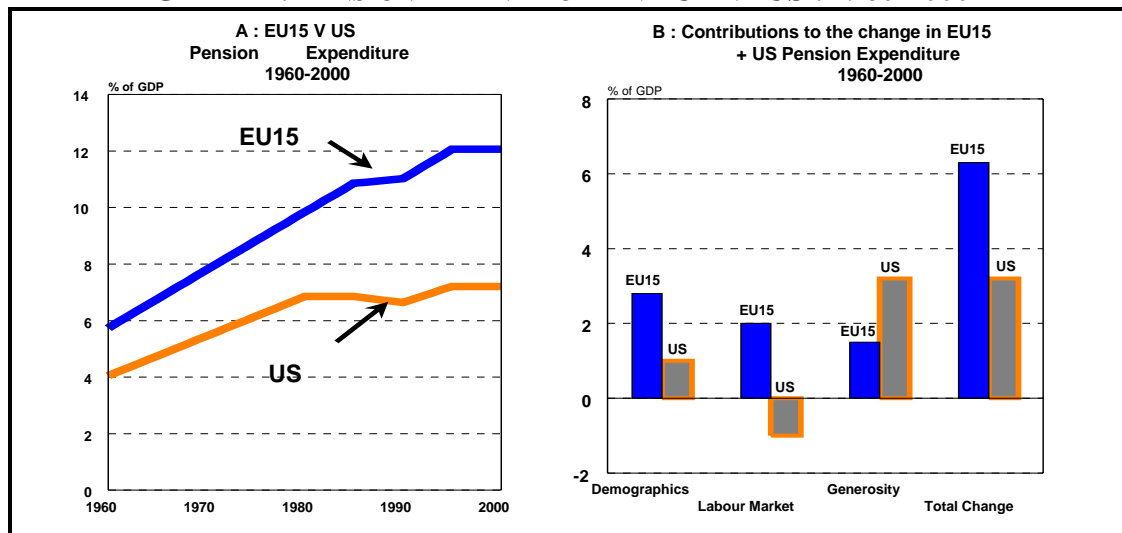
[8] Note: This figure for 2000 of 19% is taken from OECD sources and is higher than the figure of 16% used in the simulations in Section 2. The reason for the difference is explained by the fact that the model used for the simulations is calibrated on the EPC pension expenditure figure of 10 ½% of GDP in 2000 whereas this figure of 19% is based on the higher OECD estimate for pension expenditure of 12%.

[9] This breakdown between PAYG and funding only refers to the EU average with big variations in the respective shares of the individual EU countries.

In addition to the insights provided by an historical evaluation of the main driving factors behind the growth in pension expenditure over the last number of decades, an understanding of future pressures in this area is also important in terms of the pension debate. A recent joint EPC / OECD exercise was carried out to assess the budgetary consequences of ageing populations over the period to 2050 and the results of this exercise are given in Graph 5. This graph shows clearly that ageing populations will exert strong upward pressure on public expenditure over the next number of decades in both the US and the EU but the effects will be substantially greater in the EU. If one looks at the purely demographic factors one sees that this factor alone will boost EU pension expenditure by 6½% points compared with 2½% points in the US. While this large demographic pressure in the EU is forecast to be offset by declines in generosity and some labour market improvements, it is clear that the EU is still facing much greater pension expenditure pressures over the next 50 years compared with the US.

GRAPH 5 : CHANGE IN PENSION EXPENDITURE IN THE EU + US (2000-2050)*
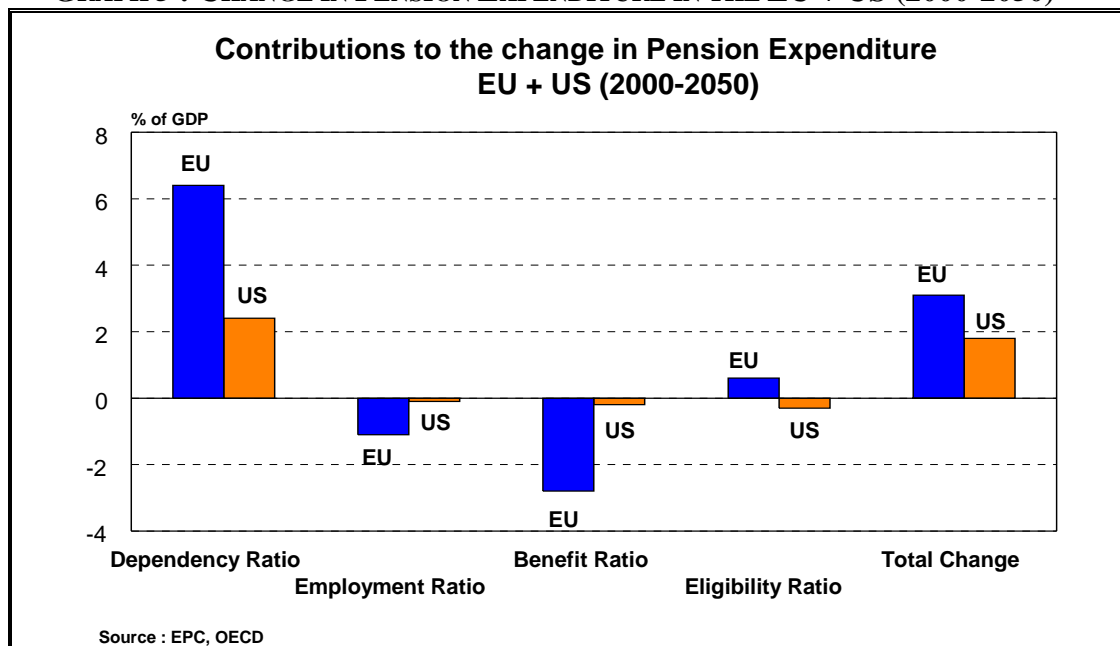
* Relative to Graph 4B the breakdown of pension expenditure in the present graph can be roughly compared as follows : dependency ratio = demographics; benefit ratio = generosity; employment + eligibility ratios = labour market.

Finally, it may be useful to recall the conclusions of Mc Morrow and Roeger (1999) with regard to the overall economic impact of ageing populations on the economic growth performance of the EU and US over the coming decades. The simulations underpinning the latter analysis were carried out using the Commission services QUEST II model and suggested that per capita living standards in the EU and the US were 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 would 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 roughly an annual half point reduction

in potential growth rates from the present 2 ¼ percent rate of growth 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% are predicted for the US, which would be equivalent in growth rate terms to an annual average loss of around a ¼ of a % point over the next 50 years. 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 people's living standards over the coming decades.

GRAPH 6 : GROWTH EFFECTS OF AGEING POPULATIONS (2000-2050)

IMPACT OF AGEING ON THE LEVEL OF GDP IN THE EU AND THE US
(% Change Relative to Baseline)

Source : Mc Morrow and Roeger (1999)
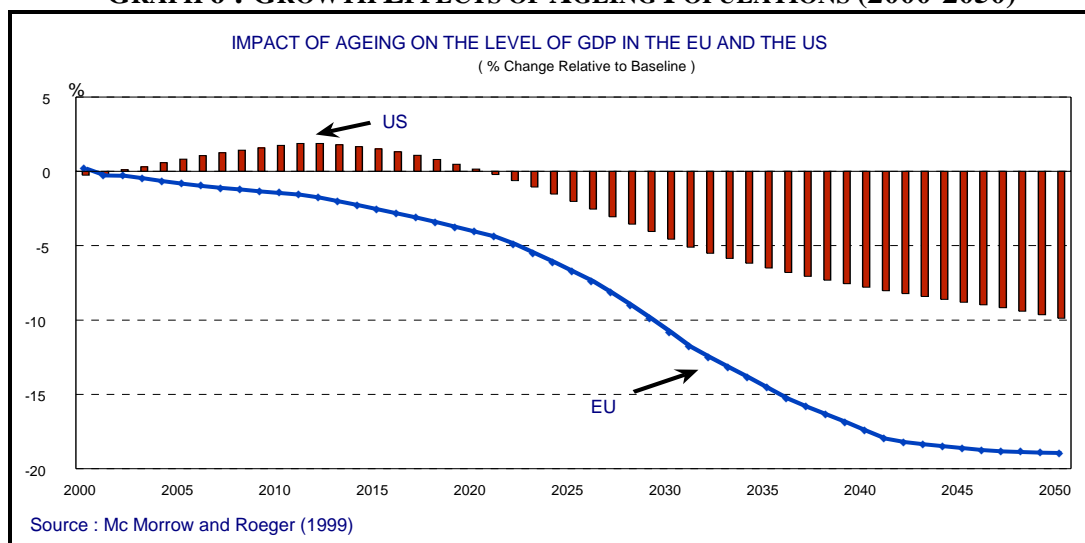
In conclusion, therefore, the EU will face a more difficult time over the coming decades compared with the US in coming to terms with the implications of a significant ageing of its population with regard to both the public pension expenditure implications and in terms of its impact on overall standards of living. When one looks at the actual numbers involved one can more easily grasp the magnitude of the challenge to be faced by the EU. Over the past 40 years the number of people aged 65 and over in the EU increased by roughly 27 ½ million. This, however, did not pose any major economic problems since the working age population rose by substantially more (47 million) and easily supported the additional economic burden. The next 50 years will see a dramatic turnaround in these trends, with the number of over 65s growing by an additional 42 million but with the working age population actually declining by 41 million. By comparison, while the US will witness similar absolute increases in its over 65s population to that of the EU (i.e. 41 million), unlike the EU it will not experience a decline in the numbers in the working age population - in fact it is projected to witness a growth of 30 million in this age category. 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 EU's economic system relative to that of the US. Given that the economic and budgetary scale of the ageing problem looks likely to be so much greater in the EU than in the US, the rest of this paper will focus exclusively on the possible policy solutions available to EU governments to tackle the pension expenditure and growth implications of this ageing phenomenon, although a large number of the possible solutions will be equally applicable to the US situation.

1.3 WHAT ARE THE POSSIBLE POLICY SOLUTIONS ?

ESSENTIAL POLICY PROBLEM : Without reform, ageing will dramatically increase the costs of EU public PAYG pension schemes, with the financing of the additional spending pushing the burden of social security contributions on workers to levels approaching 30% of their wages. Furthermore, ageing poses not only specific sustainability concerns for the public pension system but also, and more importantly, serious worries regarding the overall economic growth impact on economies.

BROAD OVERVIEW OF MACRO POLICY SOLUTIONS : Policy action to address the growth and budgetary implications of ageing populations needs to be directed at two key objectives, in order of priority :

- **1. ADDRESSING THE NEGATIVE ECONOMIC GROWTH IMPLICATIONS OF AGEING THROUGH THE FOLLOWING MEASURES :**
    - **A: BOOSTING SAVINGS AND 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.
    - **B: ACTION TO EXPAND THE EFFECTIVE LABOUR SUPPLY** : Policies to increase the workforce and 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. Possible actions in this area[10] are: firstly, extending the working lifetime beyond the present effective retirement age of less than 60, at least to the statutorily imposed limit of 65 or even to go further by linking the statutory age to changes in life expectancy; and secondly, labour market reforms aimed at raising participation rates and tackling structural unemployment.
    - **C: STRUCTURAL REFORM INITIATIVES AIMED AT OFFSETTING THE EFFECTS OF AGEING VIA PRODUCTIVITY IMPROVEMENTS** : In the case of the EU, the policy options available to permanently raise the rate of growth of TFP are getting fewer and fewer. The EU 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). While these openness and low inflation effects on growth rates have already been largely reaped, the EU can still continue to derive static gains from regulatory reform to improve the functioning of product, labour and capital markets. In the case of pension reform, financial market restructuring is a particularly important area for action.

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[10] 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. Furthermore, given the magnitude of the ageing crisis, normal immigration patterns could at best only provide a small proportion of any overall solution.

- **2. EFFECTIVELY DEALING WITH THE PUBLIC EXPENDITURE PRESSURES OF AGEING : IN THIS REGARD POLICIES MUST BE EVALUATED AGAINST 3 OBJECTIVES**
  - **A:** Are policy reform actions positive from an economic growth perspective ? The higher the growth rate the greater the degree of budgetary relief achieved.
  - **B:** How effective are the individual policy measures in putting the public finances on a sustainable footing ?
  - **C:** How sustainable are the policies which have been set in place in a long run context ? Are there big changes implied in the relative income position of pensioners and of the working age population ? Is such a reform path politically sustainable given the inevitable growth in the political power of the retired population over the coming decades ?

SPECIFIC PENSION POLICY SOLUTIONS : As can be easily garnered from the above discussion regarding macro policy solutions to the ageing problem, pension policy must contribute to the overall economy-wide measures being adopted to tackle this problem. The most effective way in which it can do this is through assessing the various pension policy suggestions against the above mentioned 3-pronged policy strategy. Table 2 presents the main policy suggestions in the pension area, with the rest of this paper concerned with evaluating these various policy strategies against the three objectives of boosting growth, containing budgetary pressures and avoiding negative income distribution consequences. Whilst discussing these strategies in the coming sections, readers will hopefully find answers to the following key questions which must be asked about the operation of any pension system :

- What are the advantages and disadvantages of both the PAYG and funded approaches to retirement income provision ?

- Which is the cheapest pension financing option for individuals (i.e. what is the equilibrium contribution rate -ECR- for both the PAYG and funded systems) ?

- What type of reforms are needed to keep the ECR of the PAYG system constant at its 2000 level (i.e. what will it take to offset the effect of ageing on the PAYG system over the next 50 years) ?

- Given the risks which both the PAYG and funded systems are exposed to, what is the best long run risk diversification strategy ?

- What are the costs associated with a move from PAYG to funding ?

- What measures need to be taken to protect the natural benefits of funding ?

- What is a sensible pension policy for the EU for the coming decades ?

TABLE 2 : POLICY REFORM OPTIONS : MAIN ISSUES TO BE CONSIDERED

BASIC CHOICE FOR PENSION REFORM : PARAMETRIC / LABOUR MARKET REFORMS OF THE PAYG SYSTEM V SYSTEMIC REFORMS IN THE FORM OF A SHIFT TO FUNDING OR SOME COMBINATION OF BOTH SYSTEMS*

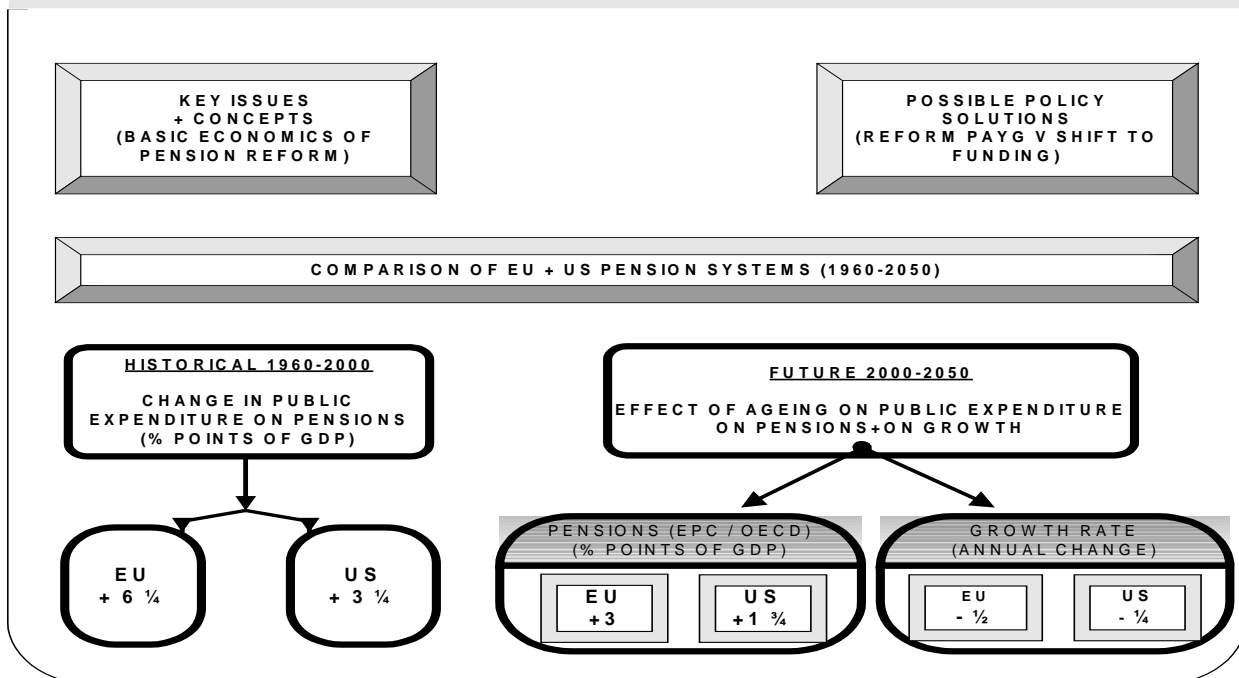| PARAMETRIC / LABOUR MARKET REFORMS OF THE PAYG SYSTEM	SYSTEMIC REFORMS : FULL OR PARTIAL SHIFT TO FUNDING
REFORM OPTIONS : While "PAYG" reforms should essentially only refer to the mechanics or parameters of the PAYG system, namely the replacement rate, the contribution rate, the eligibility criteria etc, in sections 2 and 3 of this paper these reforms refer to any actions of governments to place the PAYG system on a more sustainable long term footing and consequently the following reforms are discussed: • Labour market reforms such as increases in participation rates and falls in structural unemployment. • Reductions in the generosity of the PAYG system via direct replacement ratio changes or indirectly via changes in indexation rules (price V wages) or modifications in terms of accrual rates / reference earnings etc. • Increase in the effective retirement age.	**REFORM OPTIONS :** The essential issue to be assessed in sections 4 and 5 of the paper is the extent to which governments should abandon the "unfunded" PAYG system in favour of a system of funding which is based on the accumulation of a stock of capital assets amassed throughout one's working lifetime. Any policy action aimed at increasing the share of funding needs to take the following factors into consideration : • what are the transition costs involved; • what is the justification in terms of the financial cost of the system; • what is the economic justification in terms of the benefits for savings and growth, for labour supply and for financial market development.
MAIN ISSUES TO BE CONSIDERED • Gains from reform in terms of financing costs and incentive effects. • Intergenerational equity considerations. • Assessing the extent to which the PAYG system will be affected by the change in demography - is it really more exposed to demographic risk than a funded system or is it simply a question of adjusting the passivity ratio which will bring the system back into equilibrium by adjusting the ratio of years worked to years in retirement ? • Importance to be attached to retaining the natural advantages of PAYG including universal coverage, defined benefits, absence of financial market risk and intergenerational solidarity. • Balance to be struck between the insurance and redistributive goals of the system. • The growing demands for greater transparency in PAYG systems and for a closer actuarial link between individual contributions and individual benefits for labour supply and economic growth reasons. At the moment this link between contributions and benefits does not exist since the contribution rate from current workers to the PAYG system is simply dictated by the payments to be made to current pensioners, with the system, in theory at least but not in practice, always in balance.	**MAIN ISSUES TO BE CONSIDERED** • Should funding be controlled by the public or private sectors or some combination of both ? • Should funded schemes involve compulsory or voluntary savings ? • Financial market risk and the volatility of returns to defined contribution schemes - role and cost of insurance mechanisms to limit the losses. • Cost of tax incentives for encouraging the take-up of private pension plans. • Design features of the funded system which need to be addressed, particularly the relatively high administration costs associated with funding. • Does funding really lead to higher savings, lower labour market distortions and more efficient financial markets or is the only real difference its higher rate of return ? • Actuarial and intergenerational fairness coupled with higher rates of return are important advantages for funding but are these more than offset by the transition costs to such a system coupled with any additional administration, tax incentive and volatility costs when the funded system is operational ? • How significant are the financial market gains likely to be, given the rather mixed evidence from the literature and the fact that the EU already has a sophisticated financial sector. Arguably, regulatory issues and effective levels of competition are more important concerns for policy makers in terms of efficiency gains in this sector rather than a shift to funding.

ISSUES COMMON TO THE PAYG AND FUNDED SYSTEMS
• Are both systems equally affected by the lower economic growth outlook associated with ageing ?
• How well do both systems handle demographic, macroeconomic and financial market risks ? Are both systems affected by political risk in terms of time inconsistency ?

* This breakdown into "PAYG" and systemic reforms is purely for illustrative purposes since reform efforts in practice do not fall neatly into the latter two categories. However, this simplistic breakdown is conceptually useful in isolating the important lines of argument in the pension reform debate. This simplicity is particularly evident for the "PAYG" reforms, with measures included, such as increases in the retirement age and labour market reforms, which are equally applicable to the funded as well as the PAYG system, with these reforms included in the "PAYG" section simply to show the extent of the action which will be needed to stabilise the PAYG system. Furthermore, this breakdown into PAYG and systemic does not accurately reflect the inherently more "hybrid" nature of national pension systems. For example, many national PAYG systems have elements of funding either of the prefunding type (which is discussed in Annex 2) or of the notional defined contribution type which is now operating in both Italy and Sweden. Many of these "hybrid" systems are an attempt to tap into the "natural" advantages of both the PAYG and funding options, with the objective of keeping the financing costs of the overall system as low as possible. The notional defined contribution approach has additional objectives such as insulating the PAYG system from the effects of ageing whilst simultaneously addressing design faults with the original system, in particular the lack of a clear actuarial link between contributions and benefits which could lead to labour supply distortions. While the design of pension systems may differ, the basic economic rationale is more homogeneous, with the crucial economic considerations being the following : to avoid distortions wherever possible, in particular by creating close links between contributions and benefits and by having a high degree of transparency in the system; to boost savings and to keep economic growth considerations at the centre of pension policy deliberations.

The above list of reform options and the issues which need to be considered shows the difficulty of coming to any firm conclusions in relation to pension reform simply by examining the literature. The case for pension reform is essentially an empirical question which must be assessed using a set of parameters which are specific to a particular country or group of countries such as the EU. The objective of sections 2-5 is to present the essential details of the EU's pension system and to empirically evaluate the above pension reform strategies against the specific background circumstances pertaining in the EU in terms of demographics and labour market performance. Section 6 then tries to bring all the main strands of the pension reform debate together to create an "optimal" EU pension reform strategy, with the final choice for policy makers being clearly dictated by more than the economic considerations enunciated in the present paper.

OVERVIEW OF PENSION REFORM DEBATE

| KEY ISSUES + CONCEPTS (BASIC ECONOMICS OF PENSION REFORM) | | POSSIBLE POLICY SOLUTIONS (REFORM PAYG V SHIFT TO FUNDING) |

COMPARISON OF EU + US PENSION SYSTEMS (1960-2050)

HISTORICAL 1960-2000
CHANGE IN PUBLIC EXPENDITURE ON PENSIONS (% POINTS OF GDP)

FUTURE 2000-2050
EFFECT OF AGEING ON PUBLIC EXPENDITURE ON PENSIONS+ON GROWTH

| EU + 6 ¼ | US + 3 ¼ |

PENSIONS (EPC / OECD) (% POINTS OF GDP)
| EU + 3 | US + 1 ¾ |

GROWTH RATE (ANNUAL CHANGE)
| EU - ½ | US - ¼ |

SECTION 2 : DESCRIPTION OF MODEL USED TO ASSESS THE PENSION REFORM OPTIONS

In section 1 the essential background details have been provided in terms of the pension reform debate and of the advantages and disadvantages of the different pension reform strategies. Given the difficulty of reaching operational conclusions regarding the choice of pension system to adopt and given the conflicting signals coming from any broad based literature review, it is clear that the final choice in terms of the actual pension reforms to be implemented rests to a large extent on the empirical supporting evidence. Using a new ageing model which has been constructed for this analysis, sections 3 to 5 of this paper will summarise the results of a number of simulations which systematically address the key questions underlying the pension reform debate. This present section has an introductory role in that it will present the main properties of the model to be used in the subsequent sections for evaluating the various parametric and systemic reform options, with a detailed technical description of the model being provided in Annex 1.

This section is sub-divided as follows: (2.1) describes the models baseline growth and pension expenditure projections for the EU-15 as a whole to 2050, with this baseline scenario underlining the size of the demographic challenge to be faced over the period. This is followed in sub-section 2.2 by an analysis of the explanatory power of the model. In order to show that the model is calibrated on realistic parameter values and to ensure that the simulations themselves are as realistic and policy relevant as possible, the ageing model is used to assess the economic and budgetary implications of the key assumptions underlying the pension scenarios recently prepared by the EPC's ageing working group. (2.3) provides a short discussion of the main criteria to be adopted in assessing the effectiveness of the various reform options. Finally, it is important to stress at the outset that all the simulations in this, and subsequent, sections refer to the EU-15 as a whole and consequently, as with all averages, some of the assumptions / results may appear substantially at odds with the specific circumstances of individual EU Member States. In fact, given the marked differences between the pension systems of the 15 EU countries, these simulations can only be associated with a "stylised" EU Member State.

2.1 MODEL'S BASELINE SCENARIO OF THE GROWTH AND PENSION EXPENDITURE IMPLICATIONS IN THE EU OF AGEING POPULATIONS (2000-2050)

In order to be able to show the basic mechanisms at work in the ageing model and to provide an appropriate reference framework for the pension reform simulations, it is important to describe the key assumptions on which the models baseline scenario is based and the impact of these assumptions in terms of the overall growth, pension expenditure and income distribution effects of ageing populations.

In terms of the assumptions used, the demographic context for the baseline scenario is provided by Eurostat's population projections to 2050, which were specially prepared in 2000 for the EPC for their ageing analysis. In terms of future labour force developments, the baseline assumes that participation rates will stay at their 2000 levels over the next 50 years and that there are no further reductions in the effective

retirement age, which is consequently predicted to remain at close to 60 over the period.

The model also makes important assumptions regarding the generosity of the pension system. In this regard, in calculating pension expenditure as a per cent of GDP, it is well known that the key determinants are the old age dependency ratio and the generosity of the pension system, as measured by the pension income replacement ratio relative to wages in employment. Because of the many difficulties in calculating this replacement ratio, it was decided to work back from the pension expenditure figures for 2000 provided by the Member States in the EPC's Working Group. Using the EPC's expenditure to GDP ratio for the EU as a whole of around 10 ½ per cent in 2000[11] and using the models old age dependency ratio would imply a net replacement ratio (NRR) for the EU of about 74 per cent in 2000 which is equivalent to a gross replacement ratio of 54 per cent. This 20 percentage points difference between the gross and net concepts reflects the much higher taxation levels on workers compared with pensioners, with the NRR of the EU as a whole assumed in the baseline to stay at its 2000 level of 74 per cent for the next 50 years.

What are the economic and budgetary implications of these demographic and pension generosity assumptions over the simulation period. As shown in Graph 7, the models baseline scenario assumes a fall in the level of GDP in the EU over this period of 19 per cent,[12] with pension expenditure as a percentage of GDP rising by 7 percentage points to 17 ½ per cent of GDP. This rise in pension expenditure is due uniquely to the rise in the old age dependency ratio since the generosity of the system is kept constant at its 2000 level. In terms of the burden of ageing on workers, the doubling in the old age dependency ratio is forecast to increase the taxation burden significantly, with social security contributions (as a percentage of wages) needing to rise from 16 per cent in 2000 to nearly 27 per cent in 2050 in order to meet the pension expenditure obligations operating under the PAYG system. Given the dramatic deterioration in the financing costs of the public pension system, as represented by the nearly 70 per cent increase in the rate of SSC's paid by workers and the equivalent hike in pension expenditure commitments of governments to 17 ½ per cent of GDP, it is not surprising to find that the overall implicit debt of the PAYG system rises dramatically over the period from a figure of about 180 per cent in 2000 to 280 per cent in 2050.

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[11] It should be noted that the EPC expenditure to GDP ratio projections not only cover old-age pensions but also other replacement income to people aged 55 and over, i.e. early retirement pensions, disability and survivors pensions and other transfers to the elderly. Entitlement to this additional replacement income is not determined on the same basis as for old-age pensions. Moreover, it should be mentioned that most, though not all, of these government expenditures are financed on a PAYG basis. A proportion of these expenditures in some Member States may be financed on a funded basis and/or through transfers from the general government (i.e. not directly from social security contributions).

[12] This result is almost identical to that reported in Mc Morrow and Roeger (1999) based on Eurostat's 1996 population projections for the period 2000-50. This similarity in terms of the GDP loss associated with ageing is not that surprising however given that, while individual EU country population projections have in some cases changed quite significantly between the 1996 and 2000 Eurostat exercises, the population projections for the EU-15 as a whole have remained very similar, in terms of both the overall population total and its decomposition into the various age cohorts.

TABLE 3 : BASELINE SCENARIO*

	GROWTH	BUDGETARY IMPACT		INCOME DISTRIBUTION	
	GDP PER CAPITA	SOCIAL SECURITY CONTRIBUTIONS (% OF WAGES)	PUBLIC PENSION EXPENDITURE (% OF GDP)	WORKING AGE POPULATION CONSUMPTION	PENSIONERS CONSUMPTION
2000	0	16.1	10.5	0	0
2030	-12.0	22.9	15.0	-11.9	-15.5
2050	-19.0	26.9	17.6	-19.6	-19.5

*Compared with a technical scenario where no "ageing" is assumed i.e. the population trends evident in the most recent decades are simply extrapolated forward.

As well as the growth and budgetary implications of ageing, the baseline also contains important information in terms of the evolution of the internal rates of returns of both the PAYG and funded systems over the coming decades (this is discussed in more detail in section 4) :

- With regard to the PAYG system, while real wages are expected to rise slightly, reflecting changes in relative factor endowments, the growth in the wage bill is expected to decline due to the demographically induced fall in the number of people employed.
- As regards the return on funded schemes, the real interest rate is expected to decline over the period but not significantly, with rates of return only falling from 5 ½ per cent to 5 ¼ per cent. With regard to the real interest rate, it is important to underline that movements in the latter reflect developments in terms of both the supply and demand for funds, with overall national savings as a percentage of GDP forecast to decline in the baseline due to falls in private savings,[13] but with the demand for savings also falling due to the expected decline in GDP growth rates.

Finally in terms of income distribution, the baseline scenario to 2050 assumes that the working age population and pensioners will both be affected to the same extent by the ageing phenomenon.

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[13] The consumption to GDP ratio rises in the baseline due to the higher marginal propensity to consume (MPC) of retirees, with the share of retirees in the overall population rising steadily throughout the period.

GRAPH 7 : BASELINE SCENARIO 2000-2050

**A :Baseline Scenario
GDP Impact of Ageing in the EU**

**B: Baseline Scenario
Public Pension Expenditure Impact
of Ageing in the EU**
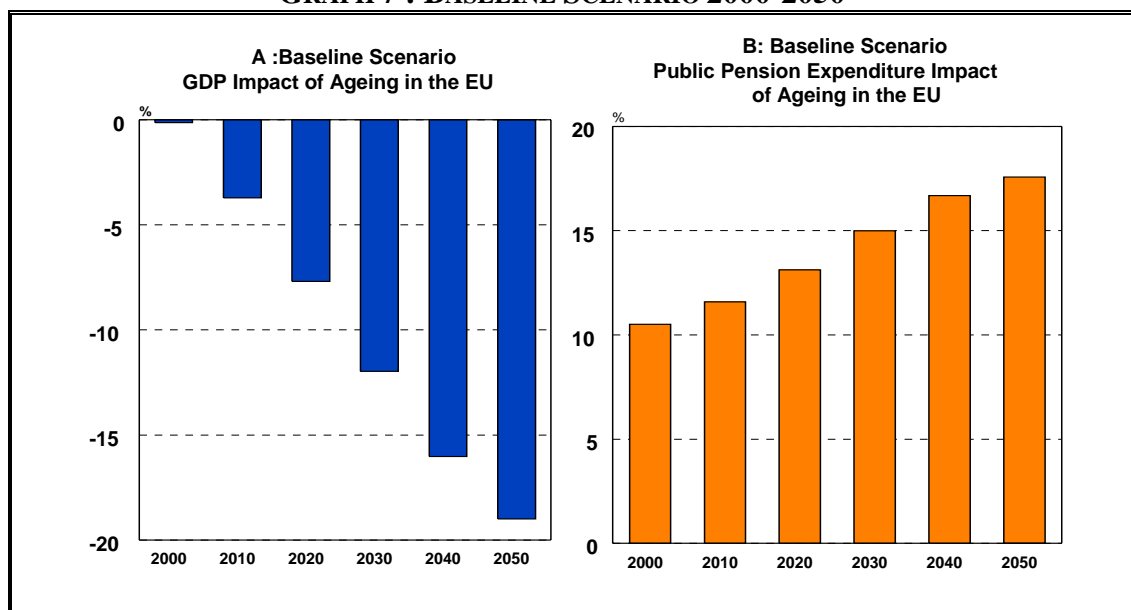
2.2 ASSESSING THE EXPLANATORY POWER OF THE AGEING MODEL : A COMPARISON WITH THE PENSION PROJECTIONS FROM THE EU'S ECONOMIC POLICY COMMITTEE[14]

Economic Policy Committee (EPC) : Pension Projections 2000-2050 – As explained earlier, new projections for the EU's Member States have been recently published by the EPC's ageing working group regarding the pension expenditure implications of ageing populations over the period 2000 to 2050. As shown in Graph 8, these projections suggest that expenditure on pensions in the EU will rise by about 3 percentage points of GDP over the period 2000-50 to reach 13 ½ per cent of GDP in 2050. This increase is much lower than the 7 percentage points of GDP increase in pensions expenditure estimated under the baseline scenario in sub-section 2.1. The much lower EPC pension projections largely result from the fact that although the EPC forecasts are based on the assumption that pension policies remain unchanged over the next 50 years (i.e. the forecasts are based on legislation in force in 2000), key underlying parameters will nevertheless change over the forecast period since :

- Firstly, the EPC projections are based on the assumption of a large increase in labour force participation rates over the forecast period (due to higher participation rates amongst younger, female, age-cohorts compared with earlier generations) and on reductions in structural unemployment.

- Secondly, the parameters of the pension system itself are not static but incorporate to some extent the lagged effects of recently introduced reforms. In particular, many reforms incorporate a transition period of several years to a new less "generous" pension regime. Over time, increasing numbers of pension entitlements will be calculated on this less generous basis. As an example of the

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[14] Assessment of the economic and budgetary impact of the labour market and pension generosity assumptions underpinning the recent pension expenditure projections to 2050 of the EU's Economic Policy Committee (EPC).

latter changes, many countries have already altered the rules relating to the indexation of pension benefits from wages towards prices, and consequently, on the assumption that wages will continue to grow faster than prices, this will inevitably lead to a decline in the real value of the average pension received by pensioners relative to the average real wage received by workers.

The above factors go a long way towards explaining the differences between the EPC pension projections and those contained in the baseline scenario of the ageing model described in sub-section 2.1. However, in addition to these clarifications, given the need to be able to assess the effectiveness of individual pension reforms, a quantification of where the pension expenditure changes in the EPC's scenario are emanating from would be particularly useful. In this regard, in the report of the EPC's ageing working group, a further breakdown of the EPC's pension projections were provided for the EU Member States.

GRAPH 8 : EPC PENSION PROJECTIONS 2000-2050 (EU-15)
(CONTRIBUTIONS TO CHANGE IN PENSION EXPENDITURE)
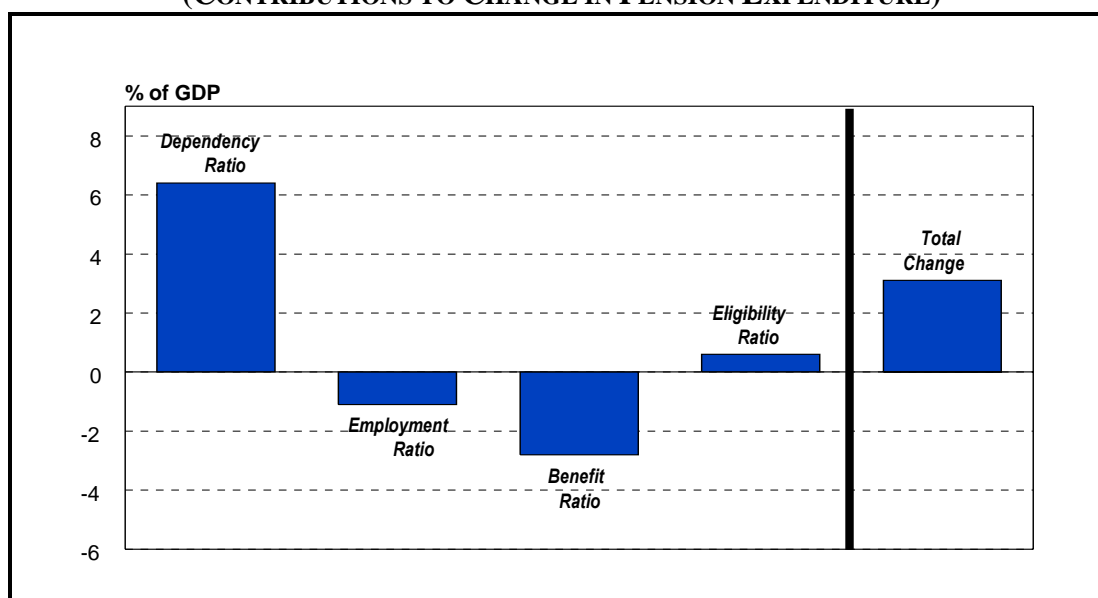
Source : EPC Ageing Working Group

Graph 8 shows a weighted average of the EPC's figures for the EU as a whole (although there were large differences between individual Member States), broken down into their various contributing components, namely changes in the old age dependency, employment, benefit and eligibility ratios. This breakdown allows one to quantify the relative importance of the labour market and generosity changes that are expected to take place in EU countries and provide a useful backdrop for an empirical assessment of the individual reform options in sections 3 to 5. Graph 8 shows that governments intend to implement a significant package of labour market reforms, with changes in the employment and eligibility ratios highlighting the labour force participation rate and structural unemployment improvements referred to earlier. Unfortunately, from the point of view of pension expenditure, one can see that the employment and eligibility ratios tend to offset each other to a certain extent. It is also clear from Graph 8 that the two big driving factors in determining the overall change in pension expenditure over the next 50 years will be the old age dependency

ratio and the benefit ratio (i.e. defined by the EPC as the average pension relative to GDP per worker)[15].

EPC Scenario: Budgetary and economic implications of the EPC's labour market and pension generosity forecasts for 2000-2050 – In order to show the simulation properties of the model before using it to assess the various pension reform options in the coming sections, it was decided to analyse the impact of introducing into the model the assumptions used by the EPC for their own pension expenditure exercise. While the same population projections from Eurostat are used in this simulated "EPC" scenario, as in the actual EPC work, using the EPC assumptions for participation rates, structural unemployment and pension generosity ensures that there are a number of key differences between the "EPC" scenario and the baseline simulation :

- With regard to the labour market, as against an assumption of no change in participation rates in the baseline, the "EPC" scenario assumes an increase in EU participation rates of 4 percentage points and that structural unemployment in the EU will fall by 2 percentage points compared with 2000.

- On the question of replacement rates, as referred to earlier, the EPC projects a significant fall in the generosity of the pension system over the next 50 years, with the benefit ratio expected to reduce the increase in EU pension expenditure by 2 ¾ percentage points. It should also be reiterated that this decline in generosity in the EPC scenario does not appear to be due to new policy reform decisions but reflects more the current policy situation that most countries apply pension indexation mechanisms which amount to less than full real wage indexation. In terms of the ageing model, this EPC assumption regarding generosity would be equivalent to a drop in the net replacement ratio for the EU from 74 per cent in 2000 to about 58 per cent in 2050.

GRAPH 9 : PENSION EXPENDITURE IMPACT OF AGEING IN EU-15 (2000-2050)

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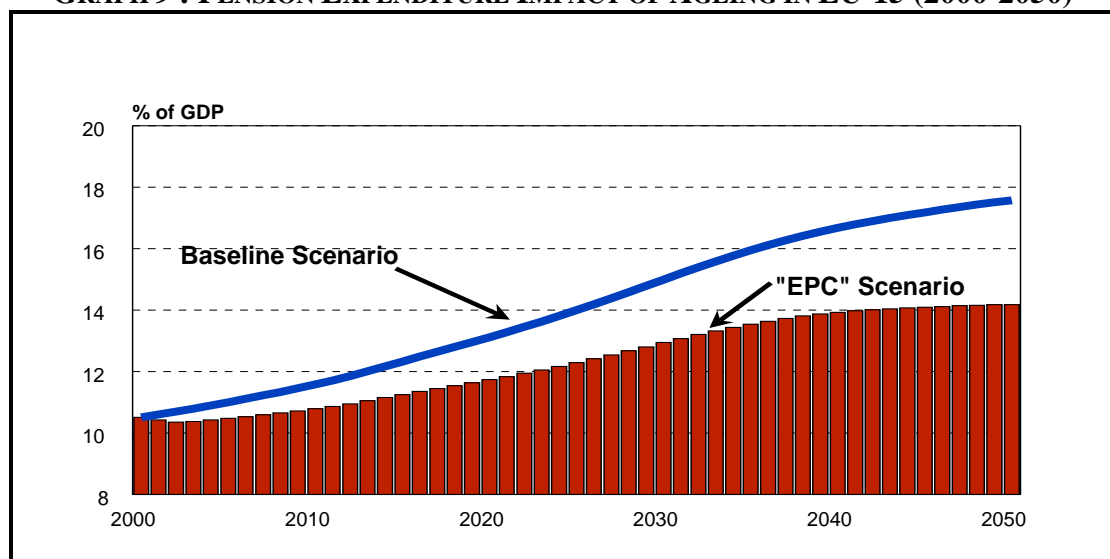
[15] It should be noted that while the EPC definition of the benefit ratio (average pension/GDP per worker) can over particular periods of time deviate markedly from the more commonly-used replacement rate definition (average pension/average wage), nevertheless the evolution should be broadly similar over a period of 50 years if one assumes, as is the case with the ageing model, that real wages and productivity grow in line with each other over the long run.

When the above labour market and benefit changes were introduced in the model the change in pension expenditure over the period to 2050 was reduced from an increase of 7 percentage points in the baseline to 3 ¾ percentage points and the overall loss in terms of living standards (GDP per capita) due to ageing populations was cut to 9 per cent compared with a decline of 19 per cent in the baseline (see Graphs 9 and 10). While it is not possible to compare the GDP loss produced by the model with anything equivalent from the EPC's work, it is feasible to get a rough indication of the budgetary impact of the respective labour market and pension generosity assumptions. In this regard, the budgetary gain from running the EPC changes through the ageing model works out at approximately a halving of the pension expenditure costs of ageing, with this estimate of the fiscal gain being very similar to the estimates produced by the EPC using the national models of the individual Member States.[16] Consequently, in terms of pension expenditure projections, the model's parameter settings would appear to be realistic, with the model thereby constituting a credible framework for pension reform analysis, at least at the aggregate EU level.

TABLE 4 : "EPC" SCENARIO*

	GROWTH	BUDGETARY IMPACT		INCOME DISTRIBUTION	
	GDP PER CAPITA	SOCIAL SECURITY CONTRIBUTIONS (% OF WAGES)	PUBLIC PENSION EXPENDITURE (% OF GDP)	WORKING AGE POPULATION CONSUMPTION	PENSIONERS CONSUMPTION
2000	0	16.1	10.5	0	0
2030	-4.6	19.8	12.9	-2.0	-16.6
2050	-9.2	21.7	14.2	-5.1	-21.2

*Compared with a technical scenario where no "ageing" is assumed i.e. the population trends evident in the most recent decades are simply extrapolated forward.

Finally, while it is clear that the "EPC" scenario, which in effect summarises the labour market and pension generosity assumptions already introduced or in the pipeline in the Member States, will have large budgetary and growth consequences over the coming decades, it is important to understand the specific nature of the effects. In this regard, the impact of the individual reforms are very different, with the reduction in the generosity of the pension system providing roughly 80 per cent of the gain in terms of the public finances but only about 20 per cent of the improvement in growth whereas the opposite is discernible for the labour market reforms. The budgetary impact of the latter reforms is small, with any gains in terms of a larger

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[16] Using Eurostat's latest demographic forecasts, there is a sharp upward movement in the old age dependency ratio over the period 2000-2050. On the basis of the national models used for the EPC's analysis, this rise in the dependency ratio is forecast to increase pension expenditure by nearly 6 ½ percentage points over the next 50 years. Using a slightly different definition of the old age dependency ratio (i.e. the working age population is defined more realistically as 20-60 rather than the 15-64 age cohort used for the EPC's analysis) but one which nevertheless produces a similar absolute change in the ratio over the period 2000-2050 to that used by the EPC, the ageing model forecasts an increase in pension expenditure of 7 percentage points over the same period. These increases are expected to be reduced significantly on the assumption that the EPC's labour market changes and pension generosity reductions are introduced, with the national models used by the EPC predicting that the pension expenditure increase will be roughly halved to an increase of about 3 percentage points and with ECFIN's ageing model suggesting an increase of 3 ¾ percentage points compared with the dependency ratio-induced increase of 7 percentage points if none of the EPC changes are introduced.

taxable base being offset by increases in the pension eligibility ratio. On the basis of the EPC's own decomposition of the source of the budgetary gain it is clear that the net effect of the labour market reforms will be equivalent to only about half a percentage point off the increase in pension expenditure, with the ageing model suggesting a slightly higher reduction of ¾ of a percentage point. However, with regard to the growth impact, the participation and structural unemployment improvements will deliver 80 per cent of the gain in living standards relative to the baseline scenario.

GRAPH 10 : GDP IMPACT OF AGEING IN EU-15 (2000-2050)
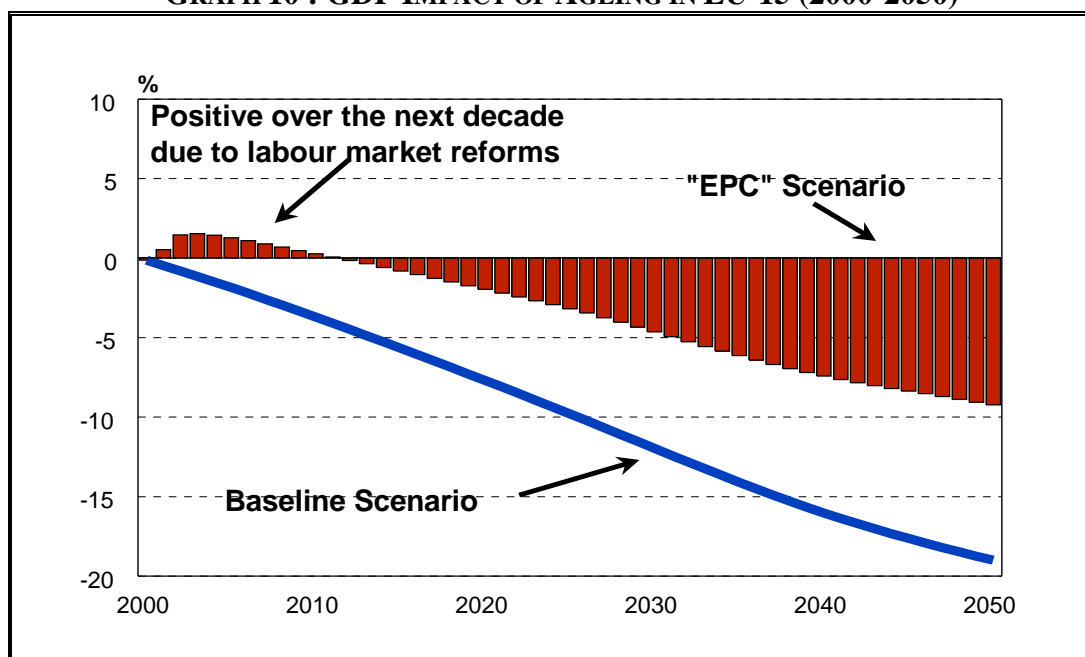
2.3 CRITERIA FOR EVALUATING THE EFFECTIVENESS OF THE VARIOUS PAYG AND SYSTEMIC PENSION REFORM OPTIONS ANALYSED IN SECTIONS 3 TO 5

The simulation results in sub-section 2.2 suggest the possibility of a substantial degree of success for policy makers in terms of easing future fiscal and growth concerns if all the "EPC" labour market reforms and generosity changes are successfully introduced. In addition, sub-section 2.2 succinctly underlined the difficulty of introducing pension related reforms which simultaneously ease the budgetary and economic consequences of ageing populations. Sections 3 to 5 will examine in more detail the various pension reform options available to governments as they struggle to cope with shrinking labour forces and the growing number of elderly in the total population.

Amongst the questions to be addressed are the following :

- Should Member States consider further "parametric" reforms, in addition to those referred to in the "EPC" scenario, such as increases in the effective retirement age, or go for more ambitious systemic reforms?

- What criteria should be adopted by policy makers in deciding which of the reform options should be ultimately introduced?

Sections 3 to 5 will try to answer these questions by assessing the individual reforms referred to earlier in the paper in the context of a range of policy objectives, thereby establishing the relative potency of the various options. In this way it is hoped to have a more complete evaluation of the implications of the various pension reform choices available to governments, avoiding a narrow focus on just one single objective such as, for example, the budgetary gain. In fact, all of the various pension reforms presented will be assessed from the perspective of the following policy objectives:

- economic growth;

- budgetary sustainability; and finally,

- distributional fairness (as measured by changes in income distribution between the working age population and pensioners - in effect a measure of the political sustainability of any reform measures)[17].

By using this multi-faceted assessment approach and, in particular, by extending the analysis to beyond the normal measuring rod of budgetary issues, it is hoped to provide policy makers with a more complete picture of the implications of the different parametric and systemic pension reforms, with the various scenarios being grouped under the following broad headings:

- **Parametric / Labour Market reforms of the PAYG pension system**: (1) reduction in generosity, (2) increase in the effective retirement age, (3) a broad package of "PAYG" reforms - labour market, generosity and retirement age changes. (Section 3)

- **Systemic reforms**: (1) a complete shift from PAYG to a funded (i.e. accumulated assets) pension system - compulsory V voluntary savings options (2) a partial shift to funding combined with a stabilised PAYG system (i.e. 25 per cent Funded / 75 per cent PAYG). (Sections 4 and 5).

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[17] This measure of distributional fairness tries to take both perspectives into account - namely in terms of avoiding further increases in the burden of taxation on workers and in terms of avoiding large losses in living standards for pensioners.

SUMMARY OF BASELINE + "EPC" SCENARIOS

BASELINE SCENARIO

"EPC" SCENARIO

KEY ASSUMPTIONS (2000-50)

PARTICIPATION RATES (NO CHANGE)
STRUCTURAL UNEMPL (NO CHANGE)
GENEROSITY (NO CHANGE)

KEY ASSUMPTIONS (2000-50)

PARTICIPATION RATES (+ 4% POINTS)
STRUCTURAL UNEMPL (- 2% POINTS)
GENEROSITY (74% IN 2000 TO 58% IN 2050)

KEY RESULTS

PUBLIC PENSION EXPENDITURE (+ 7% POINTS)

LEVEL OF GDP (-19%)

KEY RESULTS

PUBLIC PENSION EXPENDITURE (+ 3 ¾% POINTS)

[DIFFERENCE WITH BASELINE DUE TO ASSUMED LABOUR MARKET + GENEROSITY CHANGES)

KEY CRITERIA FOR EVALUATING PENSION REFORMS
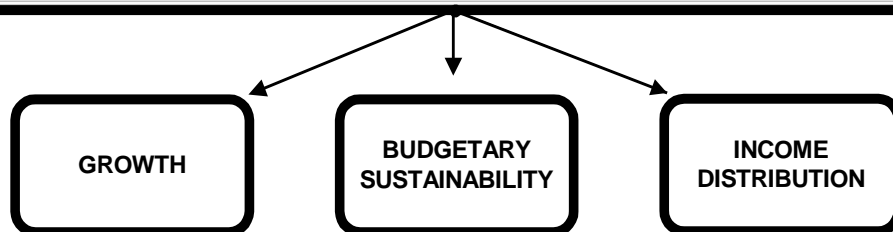
GROWTH

BUDGETARY SUSTAINABILITY

INCOME DISTRIBUTION

In addition to the EPC announced labour market reforms described in sub-section 2.2 which impact on the underlying fundamentals of a country's pension system, a large number of additional reforms are possible, with the following paragraphs confining themselves to an examination of firstly the implications of a parametric reform such as a reduction in the generosity of the PAYG pension system and secondly the effects of an increase in the effective retirement age up to the statutory age of 65. At the end of this section an attempt is also made to summarise the overall budgetary and growth effects of introducing a broad package of reforms, all of which will impact on the operation of the PAYG system. This final scenario combines the EPC's labour market and generosity assumptions with an increase in the effective retirement age to 65 in order to see whether such a comprehensive overhaul of some of the key influences on the PAYG system would firstly be successful in stabilising the financial side of the public pension system, and secondly whether it would result in large gains in growth whilst simultaneously avoiding problems in terms of income distribution.

3.1 CHANGES TO THE GENEROSITY OF THE PAYG SYSTEM (PARTIAL V FULL SHIFT FROM WAGE TO PRICE INDEXATION)

This simulation simply takes the EPC's own figures for the change in pension expenditure over the period 2000-2050 which is due to changes in the benefit ratio, and uses these figures to work out what is the implied change in the systems net replacement ratio (NRR), which as explained earlier is equal to the gross replacement rate adjusted for differences in the effective rate of taxation imposed on workers and pensioners. In order to reduce the increase in pension expenditure by 2 ¾ percentage points, as suggested in the EPC's simulations for the next 50 years, EU governments, according to the model, would have to cut the net replacement rate (NRR) of the system from its present level of 74 per cent down to 58 per cent in 2050.

GRAPH 11 : CUT IN PENSION GENEROSITY
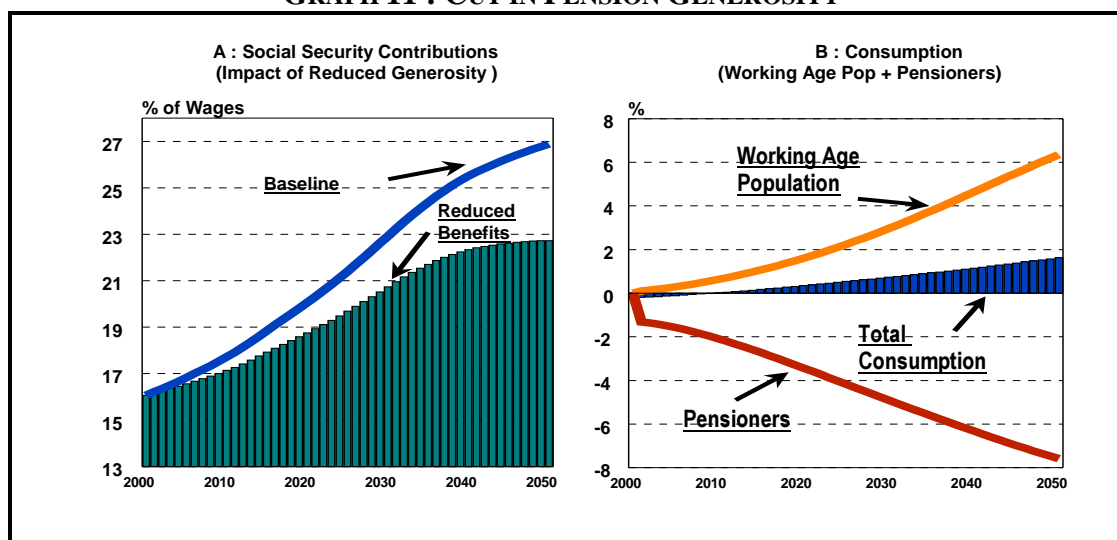
This NRR figure of 58 per cent would still be considered by many commentators to be generous and of course only reflects the proportion of retirement income coming from the public PAYG system since it does not include private pension provision.[18] In the present simulation, the reduction in generosity assumed by the EPC could be achieved in a large number of ways including cutting benefits directly, changes in the eligibility criteria, such as the number of years needed for full pension entitlement, or by changes to the rules applied with regard to indexation. For simplicity, it is assumed that all of the decrease in generosity, to a NRR of 58 per cent, is achieved through a movement on behalf of public pension schemes towards some form of price indexation. As an additional simulation showed, however, this drop of 16 percentage points in the NRR is not equivalent to a shift to full price indexation. Full price indexation would in fact result in the net replacement rate falling to 45 per cent which therefore implies that relative to our baseline assumption of no change in the NRR over the next 50 years, that the present "reform" efforts in terms of the generosity of the PAYG system are equivalent to the introduction of a "hybrid" form of indexation, hybrid in the sense that governments may not wish to go for full price indexation but instead may decide to partially retain the link between pensions and wage developments.

What are the budgetary, economic and income distribution consequences of such a significant decline in the net replacement ratio?. In terms of the budgetary consequences, would a move from a system assuming 100 per cent real wage indexation to a hybrid wage/price system or more dramatically a move to full price indexation lead to a stabilisation of the pension system in terms of social security contributions (SSC's)?. In terms of SSC's, a move to a hybrid index would have the effect that the increase in SSC's as a percentage of wages will be about 4 percentage points less in 2050 than in the baseline scenario, whereas even with full price indexation, while SSC's will fall by more than 8 percentage points relative to the baseline, there would still be an increase in contributions from 16 per cent to 18 ½ per cent of wages. Consequently, while the budgetary gains are significant, stabilisation of the EU's PAYG pension system would not appear to be achievable solely by shifting from a system which is 100 per cent indexed to wages to one based exclusively on prices.

In addition, as one can see from Table 5, a decline in the generosity of the PAYG pension system, equivalent to a move to a hybrid indexation regime, will have an insignificant impact in terms of growth, with the fall in the replacement ratio only marginally offsetting the GDP loss associated with ageing. Furthermore, such a decline in pension generosity will have implications in terms of income distribution since while the fall in SSC's will ensure that the consumption of the working age population actually increases relative to the baseline over the next 50 years, these reforms will have big negative implications for pensioners consumption which is expected to fall by over 7 ½ per cent over the same period.

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[18] Figures published by the European Commission (2000a) suggest that PAYG pensions represent roughly 89 per cent of all pensions in the EU, although the country variation is quite large, especially for countries such as the UK and the Netherlands which have a much higher proportion of private pension provision compared with the EU average and in fact have levels closer to those of the US.

TABLE 5 : CUT IN PENSION GENEROSITY

	GROWTH	**BUDGETARY IMPACT**		**INCOME DISTRIBUTION**	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	**SOCIAL SECURITY CONTRIBUTIONS (% OF WAGES)**	**PUBLIC PENSION EXPENDITURE (% OF GDP)**	**WORKING AGE POPULATION CONSUMPTION (% DIFF. FROM BASELINE)**	**PENSIONERS CONSUMPTION (% DIFF. FROM BASELINE)**
2000	0	16.1	10.5	0	0
2030	+1.1	20.7	13.6	+3.0	-4.9
2050	+2.1	22.7	14.9	+6.4	-7.6

3.2 AN INCREASE IN THE EFFECTIVE RETIREMENT AGE

In this retirement simulation, the effective retirement age, which is presently close to 60 in the EU, is brought back up to the average statutory retirement age of 65 gradually over the next 10 years. Part of the rationale for this simulation is the fact that since the 1960's there has been an enormous deterioration in the so-called "passivity" ratio which measures the number of years worked relative to the number of years spent in retirement. In the 1960's the passivity ratio was about 3[19] but by 2000 this ratio had fallen to less than 2 due to increases in life expectancy and falls in the effective retirement age to less than 60.

As Graph 12a shows, under the retirement scenario, the passivity ratio is expected to improve over the next 10 years but to deteriorate again over subsequent decades. This pattern of change is driven by two essential factors : firstly, by the increase in the effective retirement age, which will impact strongly only in the period up to 2010 and secondly, the ongoing increase in life expectancy over the period as a whole. Under the retirement simulation the number of years spent in work rises to the 1960s level of 45, which unfortunately is still insufficient to stabilise the passivity ratio. The latter objective can only be achieved if governments were to link the retirement age to changes in life expectancy.

TABLE 6 : INCREASE IN EFFECTIVE RETIREMENT AGE TO 65

	GROWTH	**BUDGETARY IMPACT**		**INCOME DISTRIBUTION**	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	**SOCIAL SECURITY CONTRIBUTIONS (% OF WAGES)**	**PUBLIC PENSION EXPENDITURE (% OF GDP)**	**WORKING AGE POPULATION CONSUMPTION (% DIFF. FROM BASELINE)**	**PENSIONERS CONSUMPTION (% DIFF. FROM BASELINE)**
2000	0	16.1	10.5	0	0
2030	+8.7	18.3	12.0	+5.2	+13.8
2050	+13.1	20.5	13.4	+10.8	+16.3*

* Given that pensioners do not receive any additional pension entitlements from working the five extra years, assumed in the simulation, this higher level of consumption relative to that of the working age population simply reflects the fact that life cycle consumers will have a shorter period over which to consume their accumulated lifetime wealth.

From the graphs shown for the retirement simulation, it is clear that an increase in the effective retirement age (ERA) to the statutory age has major benefits in terms of

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[19] In other words workers spent 3 years in employment for every year spent in retirement.

growth and budgetary sustainability, as well as being relatively favourable with regard to income distribution.

In terms of budgetary developments, the impact is quite dramatic with the increased burden on workers over the period, in terms of SSC's, being reduced to 4 ½ percentage points versus 11 percentage points in the baseline and with an equivalent strong improvement in terms of public expenditure on pensions which would fall by over 4 percentage points in 2050 compared with the baseline. As a rough rule of thumb the public expenditure impact of an increase in the ERA is of the order of 1 to 1 (i.e. if workers were to work, on average, one additional year before retiring, the increase in public expenditure on pensions over the period to 2050 would be reduced by 0.84 of a percentage point of GDP). This strong budgetary gain is however predicated on the assumption that any additional years in employment do not yield any additional pension benefits.[20]

In addition to the very favourable public finance impact, the increase in the average working life also appears to simultaneously meet the other key policy objectives of boosting growth and avoiding big changes in income distribution, which in the longer term could call into question the political sustainability of any pension reforms that have been set in place. In terms of GDP, the increase in the retirement age has a significant effect on the level of GDP, with the latter growing by over 13 per cent compared with the baseline, thereby on its own going a long way towards offsetting the GDP loss associated with ageing.

Finally, as shown in Graph 12d, this retirement age reform is also relatively good from an income distribution perspective, with the consumption of both the working age population and pensioners rising relative to the baseline.

GRAPH 12 : INCREASE IN THE EFFECTIVE RETIREMENT AGE TO 65

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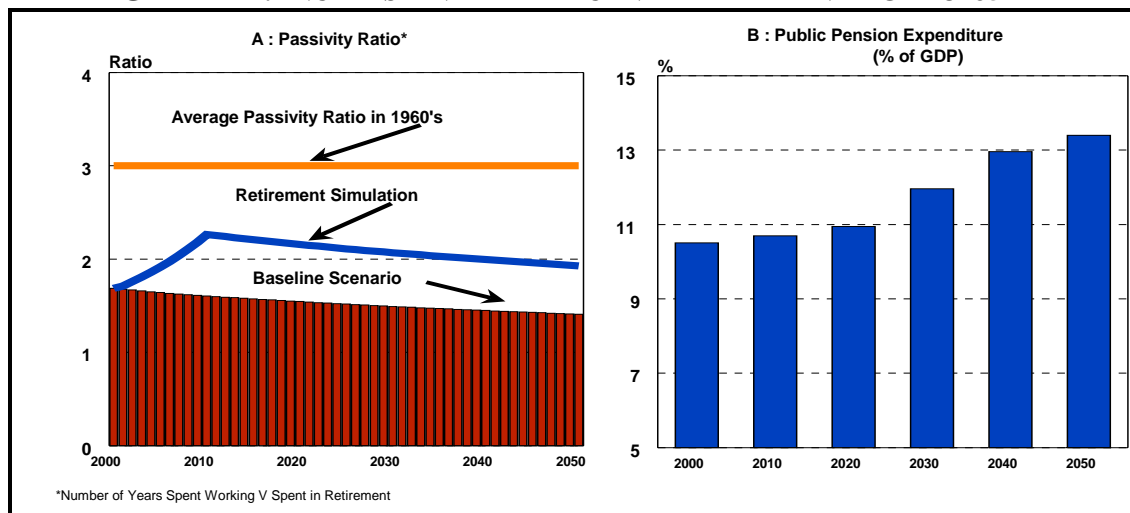
[20] This assumption is crucial since in a separate simulation based on an "actuarially fair" adjustment of pensions to reflect the increased number of contribution years, the budgetary gain from an additional year of work falls from 0.84 of a percentage point of GDP to 0.6, while the GDP gain stays roughly the same as in the main simulation. The definition of "actuarially fair" used in this simulation is based on the assumption that in return for the extra five years of contributions that the generosity of one's annual pension would increase by slightly less than 12 per cent relative to what it would otherwise have been but pensioners will receive this higher pension for, on average, five years less than in the baseline scenario. Consequently, while the fiscal gain is reduced it still remains relatively substantial.

C : GDP Effect of Increasing the Effective Retirement Age (Relative to the Baseline Scenario)

D : Retirement Scenario - Consumption (Relative to Baseline Scenario)
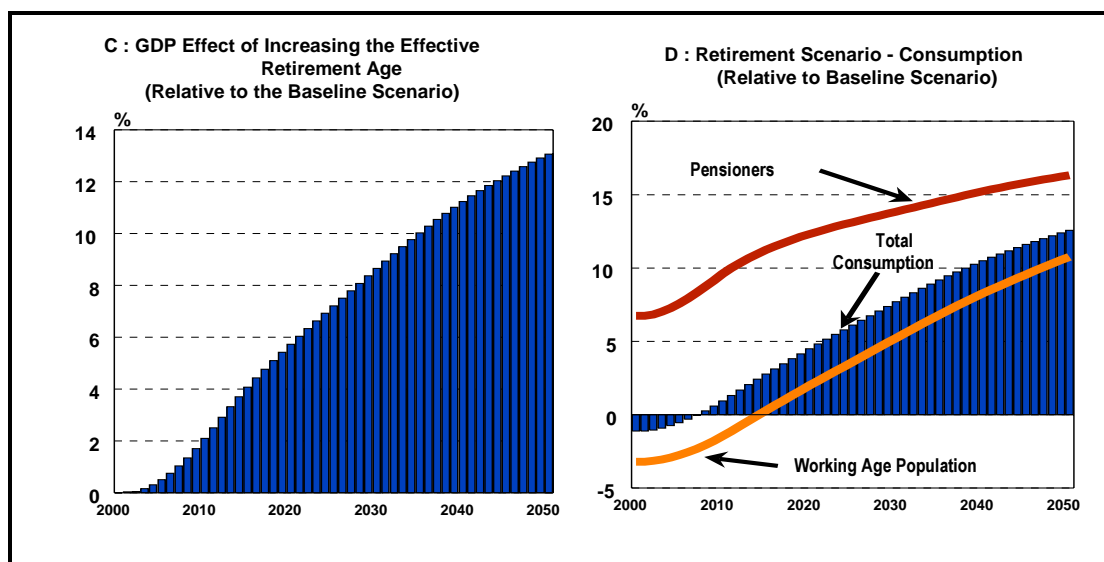
3.3 : BROAD PACKAGE OF "PAYG" REFORMS : LABOUR MARKET + GENEROSITY + RETIREMENT AGE CHANGES

What is required to restore equilibrium to the PAYG system? There are many possible ways to measure equilibrium in the PAYG system but one of the most commonly adopted in the literature and also one of the most intuitive is a stable contribution rate (i.e. SSC's as a percentage of wages do not change over time). As discussed earlier, the equilibrium PAYG contribution rate under the "EPC" scenario of labour market reforms and reductions in pension generosity will not be stabilised, with SSC's expected to grow by about 5 ½ percentage points, from around 16 per cent to 21 ½ per cent of wages over the next 50 years. As mentioned previously, in terms of the individual "EPC" reforms, while the labour market reforms will undoubtedly ease the decline in living standards, such reforms unfortunately do relatively little in terms of reducing the budgetary impact of ageing. On the other hand, while it is clear that the reduction of more than 20 per cent in the net replacement rate of the PAYG system, which underpins the EPC's pension expenditure projections, will do little to ease the GDP loss associated with ageing, it will significantly help the financial position of the PAYG system. Nevertheless, this reduction in the generosity of the system is still not sufficient to bring the system back into financial equilibrium. Consequently, it is clear that additional reforms are necessary to achieve this latter objective with the increase in the effective retirement age being the option chosen in the present simulation to achieve this.

A : GDP Gain From Parametric / Labour Market Reforms

B: PAYG System Brought Back into Equilibrium (Social Security Contributions - % of Wages)
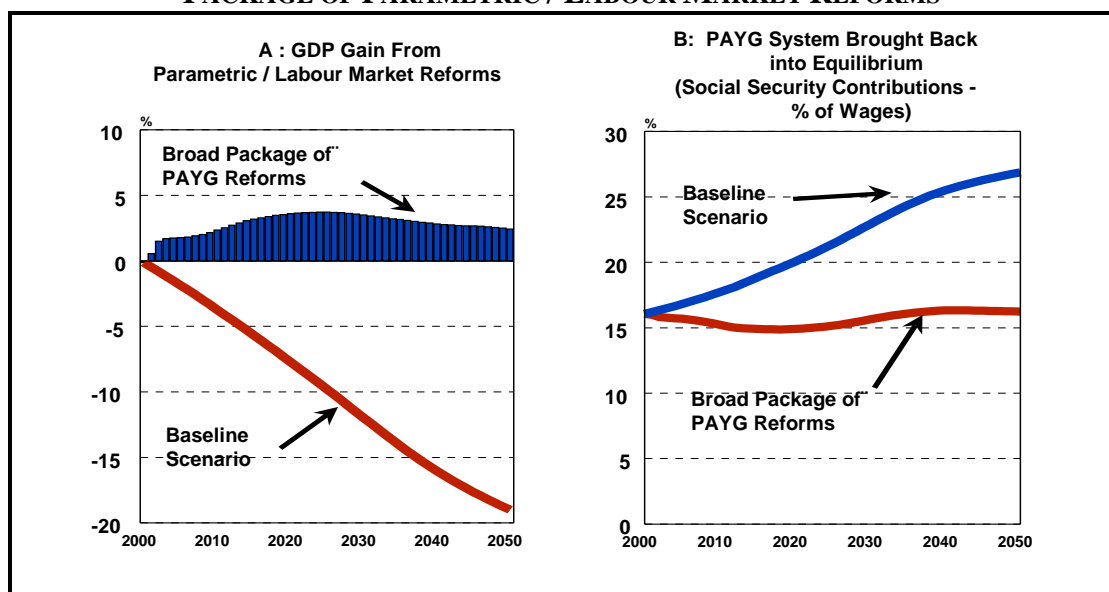
The results of this final PAYG related simulation, where the "EPC" scenario is combined with an increase in the effective retirement age to 65, are shown in Graph 13. The essential points are as follows: if such a broad package of parametric / labour market reforms can be introduced, then, firstly, the negative effects of ageing on living standards in the EU, which was assumed in the baseline to be a loss of about 19 per cent, will be more than offset, and secondly, the equilibrium contribution rate paid by workers to fund the PAYG system can be stabilised at its 2000 level of 16 per cent. In terms of income distribution developments, the working age population will still do better than pensioners due to the impact of the fall in the net replacement rate on pensioners' income. Despite this reduction in pension generosity, pensioners will nevertheless witness a 13 ½ per cent increase in their consumption relative to the baseline, compared with a gain of over 28 per cent for the working age population. In terms of stabilising the equilibrium contribution rate, it is interesting to note in the graph that the rate actually falls over the period to 2020, reflecting the front-loaded nature of both the EPC and retirement age reforms, but then goes back up to 16 per cent as a result of, amongst other things, the influence of ongoing increases in life expectancy.

TABLE 7 : BROAD PACKAGE OF PARAMETRIC / LABOUR MARKET REFORMS ("EPC" SCENARIO + INCREASE IN RETIREMENT AGE)

	GROWTH	BUDGETARY IMPACT		INCOME DISTRIBUTION	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	SOCIAL SECURITY CONTRIBUTIONS (% OF WAGES)	PUBLIC PENSION EXPENDITURE (% OF GDP)	WORKING AGE POPULATION CONSUMPTION (% DIFF. FROM BASELINE)	PENSIONERS CONSUMPTION (% DIFF. FROM BASELINE)
2000	0	16.1	10.5	0	0
2030	+17.6	15.6	10.2	+16.2	+12.3
2050	+26.5	16.2	10.6	+28.3	+13.6

WHAT IS NEEDED TO STABILISE THE TRANSITION BURDEN IN THE EU ?

STABILISE TRANSITION BURDEN = NO INCREASE IN FINANCIAL COST OF THE PAYG PUBLIC PENSION SYSTEM		
IMPLICIT DEBT OF PAYG SYSTEM DOES NOT CHANGE FROM 180% OF GDP IN 2000	PUBLIC EXPENDITURE ON PENSIONS STAYS AT EPC ASSUMED LEVEL OF 10 ½% OF GDP IN 2000	SOCIAL SECURITY CONTRIBUTIONS STAY AT 2000 LEVEL OF 16% OF WAGES

REFORMS NEEDED TO STABILISE THE BURDEN

1 : REDUCE THE GENEROSITY OF THE PENSION SYSTEM

(EPC ASSUMES FALL FROM A REPLACEMENT RATE OF 74% IN 2000 TO 58% IN 2050)

2 : LABOUR MARKET REFORMS

(EPC ASSUMES INCREASES IN PARTICIPATION RATES + DECLINES IN STRUCTURAL UNEMPLOYMENT)

3 : RETIREMENT AGE CHANGES

(INCREASE IN THE EFFECTIVE RETIREMENT AGE FROM 60 TO 65)
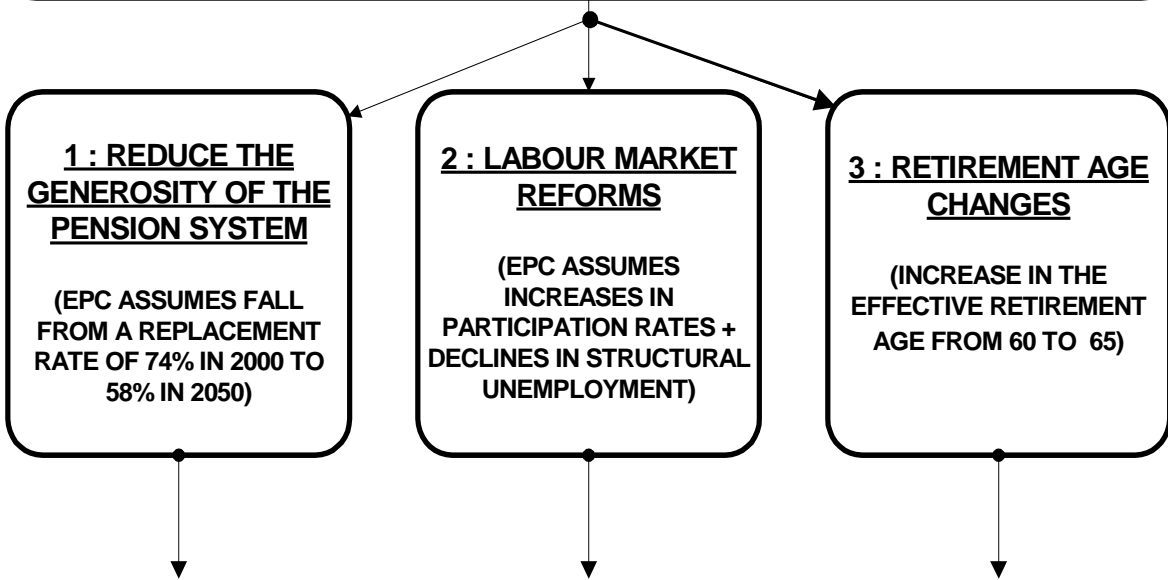
EFFECT OF INTRODUCING SUCH A BROAD PACKAGE OF REFORMS ON GROWTH + PUBLIC EXPENDITURE + INCOME DISTRIBUTION		
AVERAGE ANNUAL GROWTH RATES BOOSTED BY ½ A % POINT OVER 2000-2050	PUBLIC PENSION EXPENDITURE STAYS AT 2000 LEVEL OF 10½% OF GDP OVER THE NEXT 50 YEARS	INCOME DISTRIBUTION CONSEQUENCES ARE POSITIVE (WORKERS + PENSIONERS BOTH GAIN FROM REFORM)

Before going on to present the specific systemic reform simulations in Section 5, it is important to discuss two crucial factors in determining the desirability and extent of any systemic reforms to be implemented, namely what will happen to the internal rates of return (IRR) of both the PAYG and funded systems over the next 50 years and secondly what is the likely size of the transition burden associated with a scrapping or significant shift away from the PAYG system in favour of a funded alternative. Any review of the pension reform literature will quickly show the importance of these two fundamental issues in terms of assessing the systemic reform options. In the case of the simulations in this section, the rate of return of the funded system is set equal to the real interest rate which in turn has been calibrated on the average real rate of return over the 1965-1995 period of a balanced portfolio of pension fund assets (i.e. 50% equities / 50% bonds) which has been calculated by Miles and Timmermann (1999) as being equal to 5¼% for this latter period, for a representative group of the EU's Member States.

4.1 FORECASTS FOR THE INTERNAL RATE OF RETURN OF THE PAYG + FUNDED PENSION SYSTEMS : 2000-2050 (BASELINE SCENARIO + SENSITIVITY ANALYSIS)

BASELINE SCENARIO : EVOLUTION OF THE INTERNAL RATE OF RETURN (IRR) OF A FUNDED SYSTEM 2000-2050 – The effect of ageing on the real interest rate is difficult to predict a priori, since while the direction of change for some of the key determining factors can be forecast, this is clearly not the case with all of the concerned variables, thereby introducing a large element of uncertainty regarding the future evolution of real returns. For example, the effect of ageing on capital intensity is ambiguous, with standard growth models predicting that the latter will rise when population growth declines. What is stressed in these models is the lower demand for replacement investment given the fact that the population is declining. But these models tend to neglect other demographic effects such as changes in the participation rate. Standard life cycle models provide a richer menu of possible reactions. The fall in the birth rate has a negative effect on savings because the share of, high saving, young households in the total population declines. An increase in life expectancy has, everything else being equal, a positive effect on savings, although this effect may be quantitatively negligible. Finally, a fall in the labour force as a share of the total population has a negative effect on the savings rate since life cycle consumers tend to underpredict the decline in future income and therefore do not revise their savings plans sufficiently in order to preserve the historic capital / labour ratio.

However, while the last paragraph highlights some of the factors explaining the high degree of uncertainty surrounding the direction of change for real interest rates due to ageing, the baseline scenario for the EU produced by the model predicts that the real return on pension fund assets over the next fifty years will fall but not dramatically so. Real interest rates decline by only a ¼ of a percentage point between 2000 and 2050, with this estimate being consistent with similar estimates produced by Brooks (2000) and Borsch-Supan (2001).

In the baseline simulation, while the overall supply of savings does decline due to ageing, this does not lead to an increase in the real interest rate since the demand for savings, in the form of investment, falls by even more, reflecting the fact that less capital is required for a declining population. The low interest rate effect emanating from the OLG (i.e. overlapping generations) model used for this paper's simulations essentially reflects the fact that ageing is increasingly been driven by steady increases in life expectancy rather than ongoing falls in the birth rate. These demographic changes ensure that the interest rate effect is muted since the group of pensioners is growing relative to the working age population and consequently the savings pool is falling since the fraction of dissavers (pensioners) to savers (working age population) is rising. At a wider level this real interest rate result is also credible if one believes in the benefits of investment portfolio diversification at the global level in terms of its effects in maintaining relatively high real returns over the coming decades[21].

While this result of a small fall in the IRR of the funded system is shared by a majority of commentators, it is important to highlight some notable outliers to this view such as, for example, the paper by Kotlikoff, Smetters and Walliser (2001) which suggests that the real interest rate will not, in fact, decline at all but will increase by 2% points over the next 50 years and by 3% points over the next 100 years. Kotlikoff et al., at the start of their analysis accept the possibility that ageing may lead to capital deepening, with the extra capital accumulation leading to a decline in the marginal product of capital and consequently to lower real returns to capital, as the ratio of pensioners, with accumulated wealth, rises relative to the number of young workers supplying labour in the economy. However, on the basis of their simulations, ageing results in capital "shallowing" (i.e. less capital per worker), since the ageing-induced higher taxation levels on labour derails what the authors refer to as "a natural process of capital deepening". Higher taxation levels reduce the amount of after-tax income available to workers to save throughout their working lives and consequently their accumulated stock of assets for funding their retirement income could turn out to be much less than most commentators are predicting. While the results presented in this paper are very interesting, it should be underlined that they are not representative of the mainstream position. Furthermore, the authors themselves accept that their simulations start from an extreme position, due to the fact that the model is calibrated on US data using 2000 as the base year, a year in which the capital/labour ratio was abnormally high relative to trend, due to the investment boom, and the real interest rate was correspondingly low. Consequently, the paper is not comparing steady states, with a stable ratio of capital per effective unit of labour, with the possibility that the papers controversial results could be dominated by this disequilibrium starting position.

BASELINE SCENARIO : EVOLUTION OF THE INTERNAL RATE OF RETURN (IRR) OF THE PAYG SYSTEM 2000-2050 – The IRR of the PAYG system is often proxied by real wage growth or real GDP growth, although the most correct measure is the growth of the real wage bill (i.e. the taxable base). With regard to real wages, the model expects the latter to grow at an annual average rate of a little over 2 per cent over the period, which is somewhat higher than in the past, in order to reflect a premium for the growing scarcity of labour over the simulation horizon. This result is

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[21] While ageing is a global phenomenon and consequently will impact on global growth rates, differences in the timing and the scale of the effects across countries should allow at least some opportunities for maintaining relatively high returns from such a diversification strategy.

also of course consistent with the assumption that ageing will lead to capital deepening (i.e. more capital per worker), which in turn leads to higher labour productivity and consequently to higher real wages. As can be seen from Graph 14, in terms of the real wage bill, while real wages will grow at a slightly faster rate compared with the last 10-20 years, this rate of increase will not be sufficient to stop the growth of the real wage bill declining in relative terms since overall employment is forecast to fall over the next 50 years.

GRAPH 14 : INTERNAL RATE OF RETURN (IRR) OF PAYG AND FUNDED SYSTEMS
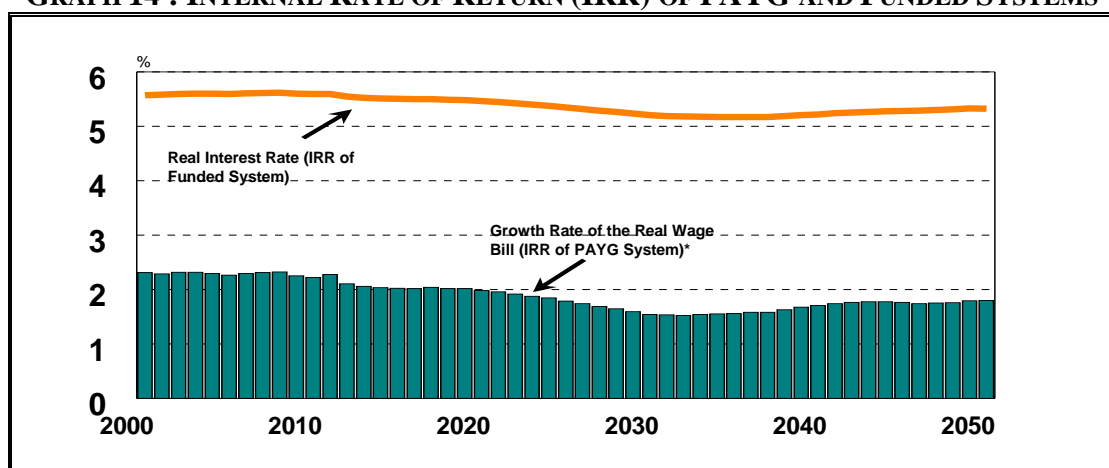
*Real wages plus employment, with real wages defined as growing in line with real GDP per person employed.

SENSITIVITY ANALYSIS FOR AN INDIVIDUAL WORKER: RATE OF RETURN DIFFERENTIAL IN FAVOUR OF FUNDING : At the level of the system as a whole, it is projected in the baseline scenario that the rate of return differential presently enjoyed by funded schemes, compared with the PAYG system, is likely to persist over the simulation horizon to 2050, with a differential in favour of funding of the order of roughly 3 ¼ to 3 ½ percentage points predicted by the model. It should be quickly stressed that this higher rate of return is what one should expect a priori, as the return on capital (i.e. the real interest rate) should always be higher than that on labour (i.e. real wage growth), otherwise there would be no real incentive to undertake the higher risk associated with investing.

Given the implications of these rate of return calculations for the underlying cost of both systems, it is important to assess the degree of uncertainty surrounding the baseline forecasts.   This risk assessment exercise however can only be properly carried out by running the model on the basis of Eurostat's optimistic and pessimistic population projections, as opposed to the central projection used for this papers baseline scenario, and on the basis of a different set of model parameter settings, all of which would impact on the rate of return calculations for the PAYG (i.e. growth rate of the real wage bill) and funded systems (i.e. the real interest rate). While this is not attempted here (but is clearly on the agenda for future research), an attempt however is made to assess the sensitivity of the baseline rates of return in the context of an individual contributor to both systems. In the case of a contributor to the PAYG system, while on average over the next 50 years the system will generate returns, in the form of real wage bill growth, of 1 ¾ to 2 ¼%, the question asked in this section is what will be the return to individual workers at particular points in time and on the basis of different sets of assumptions concerning the evolution of some of the basic parameters of the PAYG system. In the case of a contributor to a funded system, the

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focus is a little different to that of a PAYG contributor, with the uncertainties in relation to capital market funding well understood but with less awareness as to the sensitivity of the contribution rate to the actual rate of return achieved.

This analysis is carried out below firstly on the PAYG and funded systems individually and finally an attempt is made to assess the relative merits of both systems together from the perspective of an individual trying to make a decision in the year 2000 as to which system would be best in terms of his own personal pension strategy, a purely hypothetical exercise of course given that such a choice is not available in practice.

PAYG SYSTEM : HOW SENSITIVE ARE RATES OF RETURN FOR AN INDIVIDUAL CONTRIBUTOR TO THE PAYG SYSTEM TO CHANGES IN KEY ASSUMPTIONS : One of the key arguments put forward by the pension fund industry in favour of funding is that the internal rate of return for an individual contributing to the PAYG system will not only deteriorate over the next 50 years but that workers who are now joining the system will make negative rates of return on their contributions into the system. While Table 8 clearly confirms the first assertion, the second contention is less clearcut, with the results dependent on the assumptions one makes but it must be stressed that it is quite easy to foresee a set of circumstances whereby an individual contributor would receive a negative return, with the risk of this eventuality rising over time. Before going on to provide the important conclusions to be drawn from the Table, a number of points should be stressed regarding how the table has been constructed.

The top half of the Table essentially summarises the key parameters which must be taken into account in terms of assessing the rate of return an individual PAYG contributor gets from the SSC's he has paid into the system. The 6 key parameters are as follows:

- the number of years he has been working and the number of years he has been paying SSC's - normally these figures should be the same but it has often been pointed out in the literature that the first generation of contributors to the PAYG system got an exceptionally favourable deal in that, in actuarial terms, they contributed for an insufficient number of years to justify the pension benefit they received. This can explain two well known phenomena : firstly, why the PAYG system was so popular amongst the first generation of workers; and secondly, a large part, though not all, of the so-called transition burden of the present system can be traced back to this initial "largesse".
- average duration in retirement - there are two main ways of measuring average duration, with various arguments being possible as to which is the correct one to use. Depending on which one assumes in the calculations can make an enormous difference in terms of the rates of return achieved for the PAYG contributor. For example, should one assume life expectancy at the time of retirement, in which case you must allow for a duration of 23 ½ years for a person retiring in the year 2000, or life expectancy at birth with this measure giving an average retirement duration of 17 ½ years. While the latter life expectancy measure may be a reasonable assumption to make when one is talking about the system as a whole (although life expectancy at the time of entry to the labour force would be an even

better measure), life expectancy at 65^{22} is clearly the one to assume when one is talking about an individual who has already reached his retirement age.

- Average annual real wage growth whilst working : this calculation is based on actual GDP per person employed calculations over the period 1960-2000 and on the results of the baseline scenario for the forecast period. It could be argued that measuring real wage growth using GDP per person employed could be unduly optimistic given that alternative measures of wage growth, such as real compensation of employees, have been growing at an annual average rate which has been roughly one percentage point lower over recent decades than that of GDP per person employed (i.e. productivity)[23].

- Annual average real wage growth in retirement : calculations taken from results of the baseline simulation.

- Average rate of social security contributions paid into the PAYG system (% of wages) : this calculation is based on the average annual rate of PAYG pension contributions over the period 1960-2000 and on the equivalent results of the baseline scenario for the forecast period.

- Generosity of the PAYG system - (Pension replacement rate as a % of final salary) : the 74% and 58% replacement rate options are taken from the simulations.

The bottom half of the table is where the internal rate of return calculations of the PAYG system are made but only 3 of the 6 key parameters are allowed to vary, namely the life expectancy assumption, real wage growth and the generosity of the system. The rate of return of the system is simply the amount of payments each PAYG contributor receives relative to the amount of SSC's paid into the system throughout the person's working life. There are just two scenarios presented, the first is the baseline scenario where a replacement rate of 74%, life expectancy at 65 and real wage growth of 2 ¼ is assumed and the second scenario assumes slower real wage growth, a less generous replacement rate and life expectancy at birth. The choice of the slower real wage growth assumption for the forecast period between the 2¼% - 1¼% options refer to GDP per person employed V real compensation of employees respectively. The rate of return calculations are carried out for 3 different time periods to establish if there is any credence to the belief that returns for the PAYG system have been falling over time. The three different time periods are as follows:

- a worker starting in the year 1960 (two variants are presented - one assuming that the worker only contributes to the PAYG system for half the normal number of years and the second variant where the worker makes all the necessary contributions).

- a worker starting work in the year 2000; and finally

- a worker starting work in the year 2040.

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[22] Life expectancy at 65 is used as a proxy for life expectancy at retirement, with retirement in the EU presently occurring on average at slightly less than 60.

[23] Over the long run, however, it is not unreasonable to assume that real wages and productivity grow in line with each other.

TABLE 8 : INTERNAL RATE OF RETURN OF AN INDIVIDUAL WORKER CONTRIBUTING TO THE PAYG PENSION SYSTEM*

	WORKER STARTING WORK IN 1960		WORKER STARTING WORK IN 2000	WORKER STARTING WORK IN 2040
	CONTRIBUTING TO PAYG FOR 50% OF WORKING YEARS	CONTRIBUTING TO PAYG FOR 100% OF WORKING YEARS	CONTRIBUTING TO PAYG FOR 100% OF WORKING YEARS	CONTRIBUTING TO PAYG FOR 100% OF WORKING YEARS
AVERAGE DURATION IN WORK	40 YEARS	40 YEARS	40 YEARS	40 YEARS
AVERAGE DURATION IN RETIREMENT (LIFE EXPECTANCY AT BIRTH V LIFE EXPECTANCY AT 65)	17 ½ YEARS OR 23 ½ YEARS	17 ½ YEARS OR 23 ½ YEARS	21 ½ YEARS OR 27 ½ YEARS	21 ½ YEARS OR 27 ½ YEARS
AVERAGE ANNUAL WAGE GROWTH WHILST WORKING - %	2 ¾	2 ¾	1 ¼ / 2 ¼	1 ¼ / 2 ¼
AVERAGE ANNUAL WAGE GROWTH WHILST IN RETIREMENT - %	2 ¼	2 ¼	1 ¼ / 2 ¼	1 ¼ / 2 ¼
AVERAGE RATE OF SOCIAL SECURITY CONTRIBUTIONS paid INTO PAYG system (% of WAGES)	13	13	21.6	29.3
GENEROSITY OF PAYG system (PENSION REPLACEMENT rate as SHARE OF FINAL SALARY)	74% V 58%	74% V 58%	74% V 58%	74% V 58%
INTERNAL RATE OF RETURN OF PAYG system **				
BASELINE SCENARIO • PENSION GENEROSITY : 74% OF FINAL SALARY • DURATION IN RETIREMENT (LIFE EXP. AT 65) • REAL WAGE GROWTH : 2 ¾% V 2 ¼%	9.5 (2 ¾ WAGE GROWTH)	5.0 (2 ¾ WAGE GROWTH)	3.2 (2 ¼ WAGE GROWTH)	1.9 (2 ¼ WAGE GROWTH)
SENSITIVITY ANALYSIS • PENSION GENEROSITY : 58% OF FINAL SALARY • DURATION IN RETIREMENT (LIFE EXP. AT BIRTH) • REAL WAGE GROWTH : 2 ¾% V 1 ¼%	7.5 (2 ¾ WAGE GROWTH)	3.6 (2 ¾ WAGE GROWTH)	0.8 (1 ¼ WAGE GROWTH)	-0.6 (1 ¼ WAGE GROWTH)

*   The simulation results for the worker starting work in 2000 and in 2040 are based on the central demographic projections of Eurostat. If a more pessimistic or optimistic demographic scenario had been chosen the results presented in the table would be correspondingly affected in a similar direction since the ultimate determinant of the rate of return of the PAYG system is the rate of growth of the working age and pensioner populations since the PAYG system is a pure transfer system between these two population groups.

** Rate of return is the rate of interest needed to equalise the present discounted value of payments into the PAYG system (i.e. the SSC's) with the present discounted value of retirement income received from the PAYG system

The important points to be retained from the table are as follows:

- the baseline rate of return for a worker making contributions to the PAYG system in every year he worked would vary from a return of 5% for a worker which started in 1960 to 2% for a person starting in 2040. Consequently while the rate of return for the PAYG system is declining over time, on the basis of these baseline calculations and assumptions, future workers should continue to achieve low, but nevertheless positive, rates of return by contributing to the PAYG system.

- however, using credible alternative assumptions (such as the EPC assumed drop in the generosity of the system, a reduction in the number of years over which an individual would receive pension payments and a lower assumption for real wage growth) the model would predict a significant decline in the rates of return relative to the baseline results and indeed for a worker starting in 2000 there is a significant risk that the rate of return could be close to zero, with the model predicting negative returns for a worker starting to work in 2040.

- from the first column of Table 8 it is easy to explain the initial enthusiasm for the PAYG system, with the first generation of contributors often receiving rates of return not only which were well in excess of those which they could receive from a funded approach, but equally as important these returns were substantially less volatile.

- in overall terms it should be evident from the table that rates of return from the PAYG system depend on a large array of factors and that it is impossible to predict with any accuracy what future rates of return will turn out to be. All that can be said is that firstly, rates of return for the PAYG system have been on a relatively steep downward trend over time; secondly, at present, for a worker starting in 2000 that he is still likely to make positive, although low, returns from the PAYG system, at least in the baseline scenario, but that policy makers must take serious note of the possibility of negative returns for contributors in future decades. The prospect of negative returns means that the whole political acceptability of the PAYG system will be irreparably damaged unless appropriate reforms are set in place.

FUNDED SYSTEM : HOW SENSITIVE ARE EQUILIBRIUM CONTRIBUTION RATES (ECR'S) TO CHANGES IN RATES OF RETURN : The purpose of this sensitivity analysis is different to that for the PAYG system where we were primarily interested to see what rate of return a PAYG contributor could hope to receive over the coming decades compared with the 1960-2000 period. Since we already know that the average rate of return on funded pension schemes over the last 40 years has been around 5 ¼% a year and since our baseline scenario assumes that the same rate of return should be broadly achievable over the next 50 years what is more interesting to assess regarding funding is how sensitive the equilibrium contribution rate (ECR) of the funded system is to changes in rates of return. Again, as with the previous table for the PAYG system, the top half of table 9 lays out the key assumptions needed to make the calculations for the equilibrium contribution rates. As these variables are broadly comparable with the earlier table there is no need to repeat the explanations here. The second half of the table is also set up in a similar manner to Table 8 as it too has a baseline and alternative scenario which is based on a similar set of replacement rate and life expectancy assumptions. The table then provides the ECR calculations for the funded system for a series of rates of return assumptions ranging from 4 ¼% - 6 ¼%. The key conclusions are as follows:

TABLE 9 : EQUILIBRIUM CONTRIBUTION RATES (ECR'S) FOR A FUNDED SYSTEM BASED ON VARIOUS RATE OF RETURN ASSUMPTIONS

KEY UNDERLYING ASSUMPTIONS REGARDING THE CONTRIBUTOR TO A FUNDED PENSION SCHEME	
AVERAGE DURATION IN WORK	**40**
AVERAGE DURATION IN RETIREMENT (LIFE EXPECTANCY AT BIRTH V LIFE EXPECTANCY AT 65)	**21 ½ YEARS OR 27 ½ YEARS**
AVERAGE ANNUAL WAGE GROWTH WHILST WORKING (%)	**2 ¼**
AVERAGE ANNUAL WAGE GROWTH WHILST IN RETIREMENT (%)	**2 ¼**
TARGET REPLACEMENT RATE FROM FUNDED PENSION (GENEROSITY OF PENSION - PROPORTION OF FINAL SALARY)	**74% V 58%**

EQUILIBRIUM CONTRIBUTION RATE OF FUNDED SYSTEM (% OF WAGES)			
	RATE OF RETURN OF 4 ¼ %	RATE OF RETURN OF 5 ¼ %	RATE OF RETURN OF 6¼ %
BASELINE SCENARIO (ECR AS % OF WAGES) • PENSION GENEROSITY : 74% OF FINAL SALARY • DURATION IN RETIREMENT (DETERMINED BY LIFE EXPECTANCY AT 65)	25.8%	18.1%	12.6%
SENSITIVITY ANALYSIS (ECR AS % OF WAGES) • PENSION GENEROSITY : 58% OF FINAL SALARY • DURATION IN RETIREMENT (DETERMINED BY LIFE EXPECTANCY AT BIRTH)	16.9%	12.1%	8.7%

- depending on whether one assumes a 6 ¼% a year return or a 4 ¼% return, an individual worker wishing to provide for a retirement duration of roughly 27 ½ years, at a generosity level of 74% of his final net wage, would have to make annual contributions ranging from a low of 12½% to more than double that at nearly 26%. Consequently, the cost of the funded system is very sensitive to the rates of return one assumes.
- if one assumes a lower rate of pension generosity and if one has only to provide for 21 ½ instead of 27 ½ years, the equilibrium contribution rate for the funded system falls to between 8¾% and 17% of wages depending on whether one assumes a 6 ¼% or a 4 ¼% rate of return.

WORKER IN THE YEAR 2000 : HYPOTHETICAL CHOICE BETWEEN THE PAYG AND FUNDED SYSTEMS :This final set of calculations are simply an attempt to underline the basic rationale which a worker should employ in trying to evaluate the various options which are available for financing his or her retirement income. The calculations in the table for both the PAYG system and the funded system for a worker starting to work in the year 2000 are mostly taken from Tables 8 and 9 and are based on the following common assumptions:
- the average duration in work is 40 years;
- life expectancy at birth is assumed;
- a 58% replacement rate is assumed.

The only assumptions which are allowed to vary are real wage growth in the case of the PAYG system and real interest rates (i.e. rates of return) for the pension fund system. While the table provides a small amount of additional information relative to Table 8 for the PAYG system, there is no new information regarding funding. What the table is simply trying to do is to focus the attention of the reader on the sensitivity of the PAYG and funded systems to changes in real wages and real interest rates and of the effect, if any, on the cost of the respective systems (i.e. the equilibrium contribution rates). The two key measuring rods for both systems are presented (i.e. the internal rate of return and the equilibrium contribution rates) when one introduces different real wage and real interest rate assumptions into the model. The key results from this exercise can be summarised as follows:
- for the PAYG system, since contributors are assumed to be guaranteed the replacement rate of 58% for the 21 ½ years average duration in retirement, the ECR of the system does not change with changes in real wage developments and consequently all that changes is the implicit rate of return for the individual worker.
- for the funded system one is faced with a very different set of circumstances in that unless one adjusts the contribution rate to changes in rates of return over time then the achievement of a given replacement rate cannot be guaranteed and this is where the trade offs start to be become visible. In effect what a worker is doing with his PAYG contributions is putting his trust in government that the latter will provide him with a "guaranteed" retirement income which will also insure him against the possibility of a higher than expected life expectancy. This implicit contract is predicated on an assumption that while the rate of return in the PAYG system may be low it is nevertheless positive, at least, for example, being equivalent to what a person would get if he invested in government bonds (note : respecting these implicit PAYG guarantees in future will of course become increasingly problematic). On the other hand by opting for the funded system one

is implicitly accepting the possibility of a higher rate of return but also, as with any higher rate of return, one is also accepting a higher degree of risk.

- what the table also makes clear is that the higher the rate of return differential in favour of funding, not surprisingly the higher the degree of attractiveness of opting out of the PAYG system. For example, in the Table if the real interest rate is 6 ¼% for the funded option versus 1¼% for real wage growth in the PAYG system, the cost of providing a pension equal to 58% of your net final salary and providing that income level for 21 ½ years would only cost 8.7% of ones salary in a funded system whereas a similar package of benefits for a similar period of time in the PAYG system would cost you 21.6 % of your salary. At the other extreme, if there is only a 1% point differential in the rate of return of both systems then the differences in the cost of financing both systems is smaller but still significant, 16.9% for funding V 21.6% for the PAYG system.

What section 4.1 has tried to illustrate is that the baseline rates of return for the PAYG and funded systems which will be used for the simulations in section 5 have a large degree of uncertainty surrounding them but nevertheless it is fair to conclude that a greater degree of risk would appear to surround the future path of PAYG returns at the EU level rather than funding. In the case of the PAYG system, not only has the trend rate of return been clearly downward over the last number of decades, future returns are particularly vulnerable to demographic risk and in particular to the growth rate of the working age population which could turn out significantly different to that indicated in the central Eurostat projections used for the present analysis. For funding, on the other hand, there is a possibility of diversifying the risk to the system both internally in terms of the bond/equity allocation in the fund itself and externally in the sense of diverting funds to higher growth regions to that of the domestic market.

However, it must be stressed that for the individual Member States that any final decision in terms of which system to opt for must be determined following a close analysis of the various assumptions and trade-offs involved. The main conclusions to be retained from this sub-section are as follows :

- while the rate of return in previous decades for individual PAYG contributors has been strongly positive, comparing favourably with the higher, yet more volatile returns from funding, it must be accepted that PAYG returns have been falling over time, with forecasts of negative returns for contributors over the coming decades not an unrealistic prospect. Politicians are acutely aware that the PAYG system will become untenable if negative returns were ever to become a reality;
- contribution rates to funded schemes are very sensitive to the rates of return assumed;
- for an individual worker, a funded system which incorporates some of the guarantees of the PAYG system would appear to provide the "best of both worlds".

TABLE 10 : WORKER IN THE YEAR 2000 : HYPOTHETICAL CHOICE BETWEEN THE PAYG AND FUNDED SYSTEMS

	PAYG PENSION SYSTEM (SENSITIVITY OF SYSTEM TO REAL WAGE DEVELOPMENTS)*			FUNDED PENSION SYSTEM (SENSITIVITY OF SYSTEM TO REAL INTEREST RATE DEVELOPMENTS)**		
	REAL WAGES = 1 ¼ %*	**BASELINE SCENARIO** REAL WAGES = 2 ¼ %*	REAL WAGES = 3 ¼ %*	REAL INTEREST RATE = 4 ¼ %**	**BASELINE SCENARIO** REAL INTEREST RATE = 5 ¼ %**	REAL INTEREST RATE = 6 ¼ %**
RATES OF RETURN	¾	1 ¾	2 ¾	4 ¼	5 ¼	6 ¼
COST OF SYSTEM (EQUILIBRIUM CONTRIBUTION RATES)	21.6***	21.6***	21.6***	16.9	12.1	8.7

*   REAL INTEREST RATE IS KEPT AT BASELINE RATE OF 5 ¼%

**   REAL WAGE GROWTH IS KEPT AT BASELINE RATE OF 2 ¼%

*** AS THESE SCENARIOS ARE SIMULATED ON THE ASSUMPTION THAT THE REPLACEMENT RATE IS CONSTANT OVER THE PERIOD OF THE INDIVIDUAL'S RETIREMENT, WITH 100% REAL WAGE INDEXATION BEING ASSUMED, THE EQUILIBRIUM CONTRIBUTION RATE OF THE PAYG SYSTEM DOES NOT THEREFORE CHANGE AS REAL WAGES CHANGE.

****THE SCENARIOS ARE IDENTICAL FOR THE PAYG AND FUNDED SYSTEMS EXCEPT FOR THE ASSUMPTIONS ON REAL WAGES AND THE REAL INTEREST RATE, WITH THE RATES OF RETURN DIFFERENTIAL IN FAVOUR OF FUNDING ALWAYS POSITIVE. ALL OTHER ASSUMPTIONS INCLUDING AVERAGE DURATION IN EMPLOYMENT (40 YEARS), AVERAGE DURATION IN RETIREMENT (21 ½ YEARS) AND PENSION GENEROSITY (58%) ARE IDENTICAL.

BASELINE SCENARIO : *Transition burden (making the implicit debt of the PAYG system explicit)* – The second crucial variable to be assessed in any analysis of a shift to funding is the transition burden. This "burden" is equivalent to the liabilities / accrued rights of the PAYG system at a particular point in time, with the level of the burden determined by the net present value of pensions to be paid to contributors who are still in the workforce and those which have retired[24]. This transition burden, like the equilibrium contribution rate, can be used as a measure of the extent of equilibrium / disequilibrium in the whole PAYG system between contributions going in from workers and payments going out to pensioners. There are a number of different methods for calculating the transition burden, with the present paper using the "accrued-to-date" liabilities method since this is the preferred approach in the literature when analysing the implications of a systemic shift from an unfunded to a funded system.[25]

GRAPH 15 : CHANGE IN TRANSITION BURDEN : 2000-2050 (BASELINE SCENARIO)*
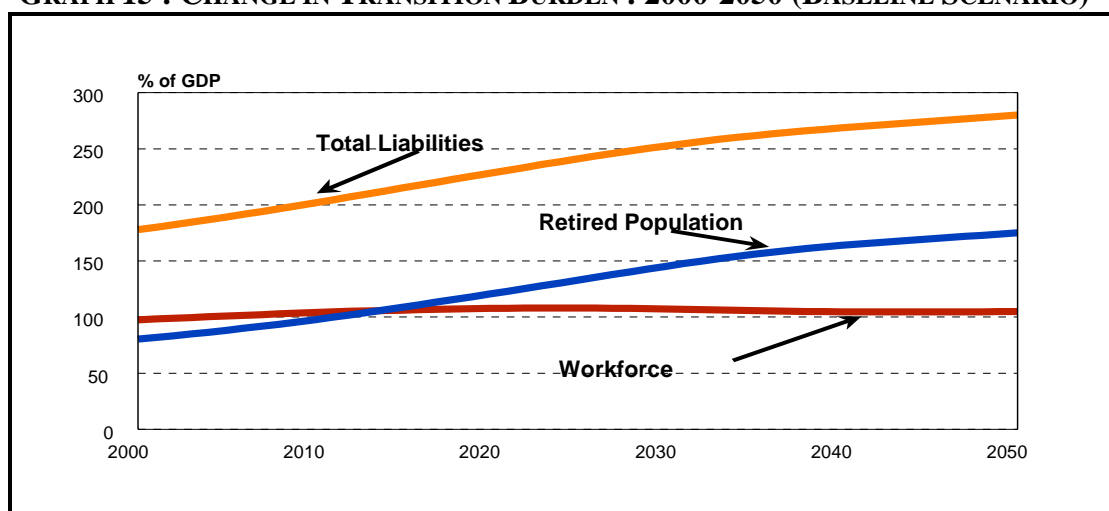
* Net present value of pensions to be paid if the PAYG system continues to function on the basis of the pension rules operating under the baseline scenario.

Transition burden (indicator of equilibrium in the PAYG system) – To show how this concept of the transition burden can be used as an equilibrium indicator for the PAYG system as a whole, Graphs 15 and 16 show the change in the transition burden under both the baseline and under the alternative scenario of a broad package of parametric / labour market reforms (i.e. labour market, generosity and retirement age changes), where the EPC reforms have been introduced and the effective retirement age has been increased to the statutory age of 65. A number of points are evident from the graphs :

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[24] As already explained in 4.1, part of the transition burden is made up of the initial gain (or "free lunch" depending on your perspective) made by the first generation of contributors when the link between contributions and benefits was inappropriately generous.

[25] See Franco (1995) and Holzmann (1997) for further details regarding the accrued-to-date liabilities method in particular and for a general discussion of the alternative estimation approaches. See also Disney (2001) on the measurement of pension liabilities in EU countries.

- The EU as a whole has a large implicit debt burden in its PAYG system with the baseline assuming a figure of the order of 180 per cent of GDP in 2000. While comparable estimates of the EU's PAYG debt burden do not exist, van den Noord and Herd (1993) produced estimates for the pension liabilities of the four largest EU Member States, with estimates for the year 1990 ranging from 156 per cent for the UK to 242 per cent for Italy. A simple average for these four EU countries (used as a proxy for the average of the EU-15 as a whole) suggests an overall burden of around 190 per cent in 1990, with equivalent figures for the same year using the methodology adopted in the present paper pointing to a figure of 160 per cent. Such differences are not surprising however since a direct comparison between the two sets of results is not possible given differences in terms of a number of crucial assumptions between the present study and the van den Noord and Herd analysis, including differences regarding the level of the replacement ratio, the pension indexation method and finally the discount rate. The effects of a number of these differences is analysed later on in this section. While a range of other studies have addressed this issue of the implicit pension debt of the PAYG system, such as Kane and Palacios (1996) and Holzmann (1997), unfortunately in terms of providing alternative estimates for the level of the EU's implicit debt, both of the latter papers mainly use the 1993 figures from van den Noord and Herd as the basis for their analysis.

- As Graph 15 clearly indicates, the transition burden in the baseline scenario continues to rise from 180 per cent of GDP in 2000 to 280 per cent in 2050. As against this, however, if one examines the "EPC" scenario (described in Section 2), while the present set of EPC reforms do not result in a stabilisation of the transition burden, the reforms have at least the effect of slowing down the degree of financial deterioration in the PAYG system, when one compares the model results from 2000 up to 2050 compared with the deterioration experienced over the 1970-2000 period. Part of the reason for the failure of these reforms to stabilise the situation reflects the fact that while the economic gains from increasing the employment ratio through increases in participation rates and falls in structural unemployment are significant, the budgetary benefits of increasing the employment ratio are not as striking since, as discussed earlier, these are partially offset by increases in the eligibility ratio.

- Finally, from Graph 16 it can be discerned that the "EPC" reforms, allied to an increase in the effective retirement age up to the statutory age, does result in an effective stabilisation of the transition burden and consequently a prolongation of the average working life appears to be a necessary complement to the EPC reforms in order to bring the PAYG system back into equilibrium. In addition, even with such a large package of PAYG related reforms one can see clearly from the graph that the transition burden is displaying a small, yet distinct, upward momentum in the period up to 2050 reflecting the effects of ongoing increases in life expectancy. Consequently, if policy makers wish to keep the PAYG system in equilibrium over time then the retirement age will have to be adjusted periodically for changes in life expectancy[26].

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[26] A number of other simulations were carried out to see whether there would be gains from using debt, as opposed to tax, financing of the transition burden but the results were not encouraging given the debt magnitudes involved.
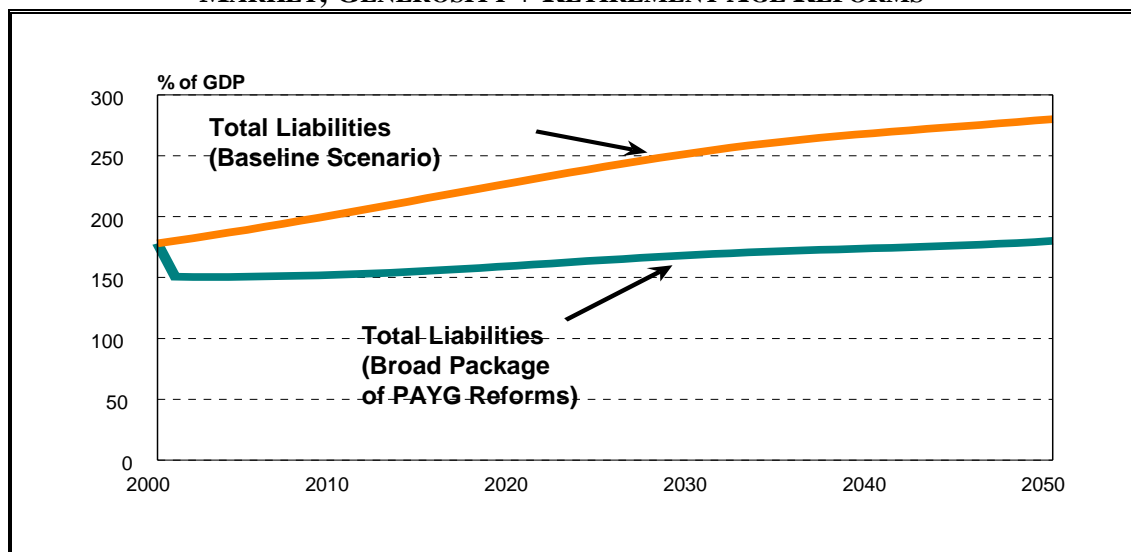
SENSITIVITY ANALYSIS : *Sensitivity of Transition burden to Various Shocks to the PAYG system* : Given the importance of the transition burden calculation to the systemic reform debate, a number of sensitivity simulations were run with a satellite, partial equilibrium, model to the main ageing model with the key results presented in Table 11. The objective was to compare the baseline transition burden results with what would happen to the "burden" if one of the three key determining factors underlying movements in the burden over time were to change. The three factors are changes in the dependency ratio, in the generosity of the system and in the real interest rate.

The table is set up as follows : the top half of Table 11 provides all the relevant details regarding the baseline scenario which has been calculated using the main general equilibrium ageing model. It shows the values in the year 2000 and in 2050 for the transition burden itself and for the most important variables which influence the baseline outcome. It also provides the same information for the breakdown of the transition burden into the liabilities accrued by workers and by pensioners. For example, in the case of the total liabilities of the PAYG system, it shows that the total baseline transition burden will rise by slightly more than 100 percentage points over the 50 year period 2000-2050, if no reforms are enacted, and it gives the values for the old age dependency ratio, the net replacement ratio and the real interest rate which underlie this baseline calculation. The bottom half of the Table provides all the results for four simulations which are undertaken with the partial equilibrium model and gives the results relative to the baseline figures presented in the top half of the table. The key points to be retained from the simulations are as follows:

- The percentage change in total PAYG liabilities for both changes in the dependency ratio and in the generosity of the system is roughly proportional to the size of the shock, with the size of the systems replacement ratio dictating the size of the actual change in liabilities. For example, a 30% improvement in the dependency ratio and a 40% reduction in the generosity of the public pension system translates into reductions of 23 and 31 percentage points respectively in

the transition burden when the replacement rate is of the order of 70%-75% which is the rate which is assumed in the baseline.

- In terms of the split of liabilities between workers and pensioners, while changes in the generosity of the system affects both groups equally, the dependency ratio change is not equally split between the liabilities due to workers and those due to pensioners, with the liabilities of the latter group changing more since the change in the dependency ratio is achieved via an increase in the effective retirement age.

- There is a clear inverse relationship between real interest rate movements and the implicit debt of the PAYG system. This is what one should expect a priori since, for example, if the real interest rate goes up then governments need to put aside lower amounts of capital to fund their future PAYG liabilities. This latter rationale also forms part of the logic underlying the larger effect evident for the liabilities accrued by workers since, by definition, workers receive their pensions later than existing pensioners and consequently the amount to be put aside to cover the liabilities of workers is proportionately smaller given that this capital sum can be invested over a longer period of time.

SYSTEMIC REFORMS : 2 KEY FACTORS TO BE CONSIDERED

RATES OF RETURN FOR PAYG + FUNDED SYSTEMS (BASELINE FORECASTS 2000-2050)	TRANSITION BURDEN (IMPLICIT DEBT OF THE PAYG SYSTEM - % OF GDP)

BASELINE SCENARIO ASSUMES ROUGHLY A 3 ¼ to 3 ½% POINTS DIFFERENTIAL IN FAVOUR OF FUNDING

PAYG 1¾ to 2¼   **FUNDED 5 ¼ to 5 ½**

BASELINE SCENARIO for the EU

PAYG (2000-50)
PAYG RETURNS EXPECTED TO FALL SIGNIFICANTLY RELATIVE TO LAST 30-40 YEARS AND MAY, FOR CERTAIN INDIVIDUAL CONTRIBUTORS, BE NEGATIVE

FUNDING (2000-50)
RETURNS FROM FUNDING PREDICTED TO BE SIMILAR TO LAST 30-40 YEARS
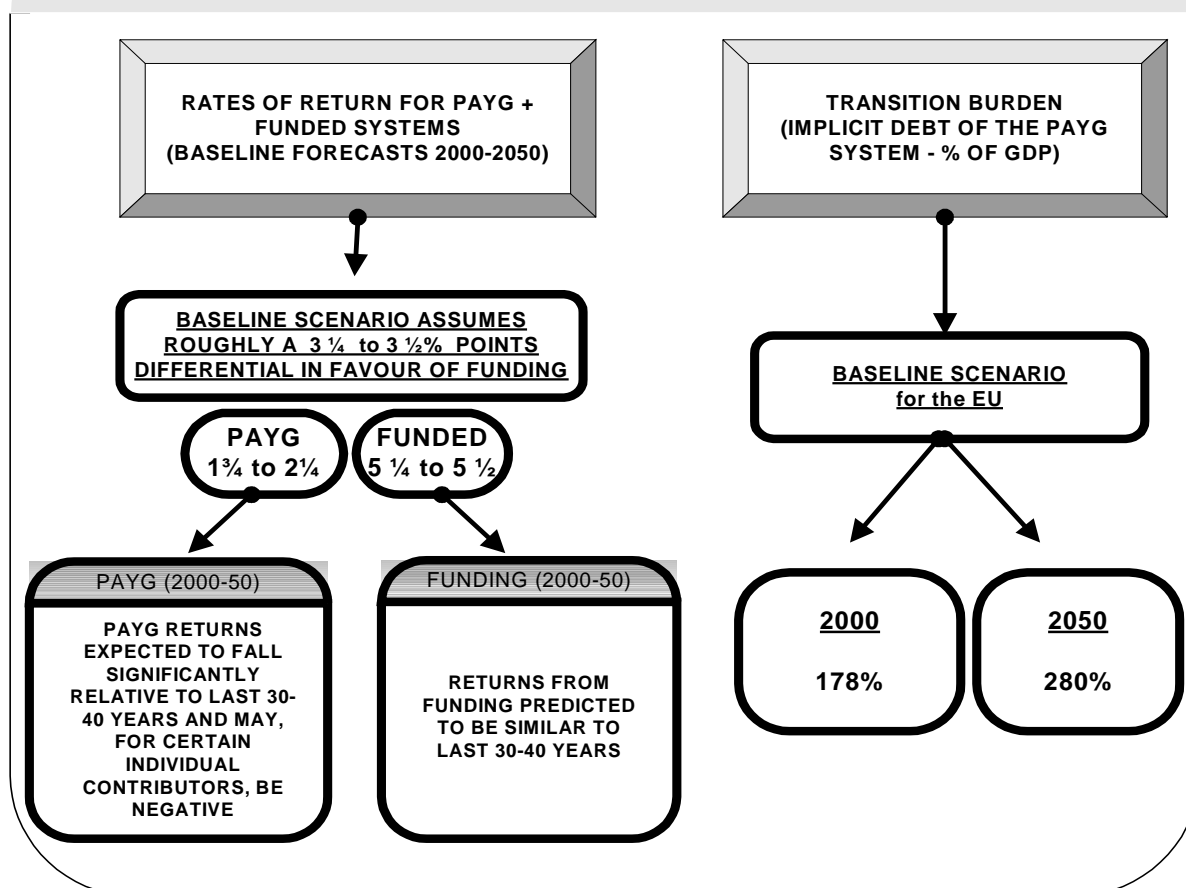
2000
178%

2050
280%

TABLE 11 : TRANSITION BURDEN - SENSITIVITY ANALYSIS :

PARTIAL EQUILIBRIUM* RESPONSE OF THE TRANSITION BURDEN (TOTAL LIABILITIES OF PAYG PENSION SYSTEM) TO VARIOUS SHOCKS

	TOTAL PAYG LIABILITIES		LIABILITIES ACCRUED BY WORKERS		LIABILITIES ACCRUED BY PENSIONERS	
BASELINE SCENARIO						
	2000	**2050**	**2000**	**2050**	**2000**	**2050**
PAYG LIABILITIES - NET PRESENT VALUE OF PENSIONS TO BE PAID (ABSOLUTE VALUE OF LIABILITIES AS % OF GDP)	**178**	**280**	**98**	**105**	**80**	**175**
VALUES OF KEY CONTRIBUTING VARIABLES UNDERLYING THE BASELINE	**2000**			**2050**		
OLD AGE DEPENDENCY RATIO (RATIO OF PENSIONERS TO WORKING AGE POPULATION)	(28%)			(54%)		
NET REPLACEMENT RATIO (GENEROSITY OF PENSION SYSTEM - PROPORTION OF FINAL NET REAL WAGE)	(74%)			(74%)		
REAL INTEREST RATE (%)	(5 ½)			(5 ¼)		
SENSITIVITY OF TRANSITION BURDEN CALCULATIONS TO VARIOUS INDIVIDUAL SHOCKS (CHANGE RELATIVE TO BASELINE)**						
	% CHANGE IN 2050 IN TOTAL PAYG LIABILITIES		**% CHANGE IN 2050 IN LIABILITIES ACCRUED BY WORKERS**		**% CHANGE IN 2050 IN LIABILITIES ACCRUED BY PENSIONERS**	
30% IMPROVEMENT IN DEPENDENCY RATIO DUE TO A PHASED INCREASE IN EFFECTIVE RETIREMENT AGE TO 65	**-23**		**-13**		**-28**	
40% REDUCTION IN GENEROSITY OF PENSION SYSTEM DUE TO A PHASED MOVE FROM 100% WAGE TO 100% PRICE INDEXATION***	**-31**		**-31**		**-31**	
1% POINT DECLINE IN REAL INTEREST RATE (WITH FULL EFFECT IN 2000)	**+13**		**+22**		**+9**	
1% POINT INCREASE IN REAL INTEREST RATE (WITH FULL EFFECT IN 2000)	**-11**		**-17**		**-8**	

*   PARTIAL EQUILIBRIUM = KEEPING EVERYTHING ELSE CONSTANT EXCEPT THE SHOCKED VARIABLE.

**   INTEREST RATE SHOCKS WERE INTRODUCED IMMEDIATELY IN THE YEAR 2000 WHEREAS FOR THE REPLACEMENT RATE AND DEPENDENCY RATE SHOCKS THEY WERE INTRODUCED GRADUALLY OVER THE 50 YEAR PERIOD, FALLING BY A SIMILAR AMOUNT EACH YEAR.

*** SOCIAL SECURITY CONTRIBUTIONS ADJUST AUTOMATICALLY TO THE CHANGE IN THE REPLACEMENT RATIO.

Following on from section 4 where the key factors to be considered in any move to funding have been laid out, the present section goes on to provide a series of systemic simulations, where the internal rate of return and transition burden issues raised in the previous section are to the fore. While the simulation possibilities in this area are enormous the objective of the present section is to highlight a number of basic scenarios which illustrate key choices for a funded system, in particular the choice between a compulsory V voluntary system (sections 5.1 and 5.2) and whether a mixed PAYG / funded system provides a credible alternative to one or other system. In fact, as this section will make clear, a mixed pension system (75% PAYG / 25% funded) can be seen as a realistic scenario for the EU at the present time in that the size of the transition burden would appear to preclude an immediate shift out of the PAYG system, due to the large financial burden which would be placed on workers if such a shift was to be considered over only one generation. This is where the big contrast with the US starts to manifest itself since, according to Modigliani et al (2000), the US could make such a 100% transition to funding in a relatively painless way since "the US is in the lucky position of being able to provide all the additional resources needed to fund the system without ever raising payroll contributions", although the authors do go on to stress that in order to achieve this, the transition period required would be long - many decades in fact.

5.1 100% SHIFT TO FUNDING : COMPULSORY SAVINGS OPTION

In order to allow comparisons with the PAYG system, in this first systemic simulation the funded system is set up as a defined benefit scheme guaranteeing the same net replacement rate to pensioners as under the existing PAYG scheme[27]. The impact of an immediate 100 per cent switch to a fully funded pension system is then simulated, with the PAYG system abolished completely in the year 2000, and with the accrued rights (i.e. the transition burden) built up under the latter system fully taken into account. While it could be argued that it would be more realistic to abolish the PAYG system over a period of decades rather than immediately, the underlying explanatory variables would not change. Consequently, the purpose of the present simulation is simply to illustrate the main mechanisms at work using as simplified a framework as possible.

There are a number of alternative approaches available to present such an illustrative scenario but the one preferred here is in terms of the costs to workers of making the transition since it is the latter group which will be faced with the so-called "double" burden. This "double" burden is imposed on the generation that decides to make the switch to a fully-funded system, with workers having to fund not only their own pensions under the new system but also having to continue to finance, through some form of taxation or social security contributions, the pensions of those who retired

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[27] Given the replacement rate under the funded scheme and the evolution of the average duration in retirement, the contribution rate is determined by equalising, at each date, the present discounted value of pension contributions to the present discounted value of the funded pension the worker can expect in the future.

under the PAYG system as well as part of the future pensions of existing workers who had built up rights in the previous system.

As can be seen from Graph 17a the overall pension contribution rate for workers is therefore made up of two separate components:
- firstly, a component which is essentially a mandatorily imposed form of savings, with the latter savings being placed by workers in a private or government controlled pension fund;[28] and
- secondly, a further contribution rate, which could take the form of SSC's, which is used to fund the implicit debt of the previous PAYG system.

GRAPH 17 : IMMEDIATE SWITCH TO FULLY FUNDED SYSTEM IN 2000 + TRANSITION BURDEN

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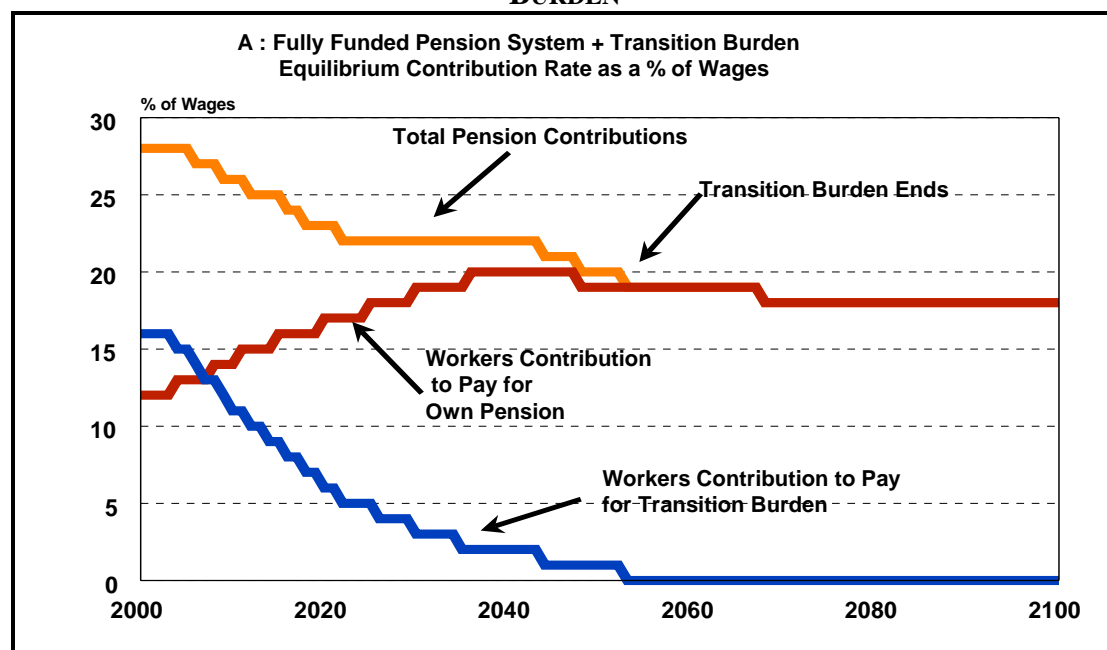
[28] Since this simulation is purely illustrative, there are a number of simplifications introduced, the effects of which will be looked at in the second half of this sub-section. Firstly, while such a mandatorily imposed form of retirement savings would, in certain circumstances, be implemented with the help of government tax incentives or subsidies, this extra cost is not allowed for here. Secondly, the contentious issues of both the relatively high administration costs associated with funded pension schemes and the issue of replacing a defined benefit (DB) PAYG system with a defined contribution (DC) funded approach is avoided. Both these latter concerns can be excluded from the present simulation, for ease of exposition, by modelling this shift to funding through the use of a perfectly competitive annuities market where the contributor and the pension fund operator basically enter into a formal contract where a net replacement rate is agreed and the required annual contribution rates (as a percentage of wages) needed to achieve this degree of pension generosity are fixed accordingly. While this particular annuites market approach simplifies the explanation of the basic mechanisms at work in a shift to funding, it is still a close reflection of what happens in practice, with workers normally agreeing to pay a pension fund or insurance company a set percentage of their salary for an agreed number of years and with the final pension paid being dictated by the rate of return earned on the accumulated assets. In the present example, it is assumed that the rate of return will be equivalent to the 5 ¼ - 5 ½ per cent real interest rate assumed in the baseline. One important difference with the real world situation however is that the model does not allow for uncertainty in that it assumes that the real rate of return will not be as volatile as it is in practice and consequently this methodology will produce results which are closer to a DB, PAYG scheme, rather than a DC, funded scheme. In fact it would be entirely logical for such a shift to funding from the PAYG system to continue to be channelled through the low cost national tax system. Both the PAYG and present funding simulations are both in essence compulsory savings systems, with a properly ring-fenced, government controlled, funded system having the advantage of the government underwriting the volatility risk of a private funded system. The cost to government of underwriting this risk would be low since governments, unlike private institutions, have the unique advantage of being able to spread the risk over a number of generations. A more detailed description of this annuity market approach is given in Annex 1.

B : Equilibrium Contribution Rates as a % of Wages
100% PAYG V 100% Funded
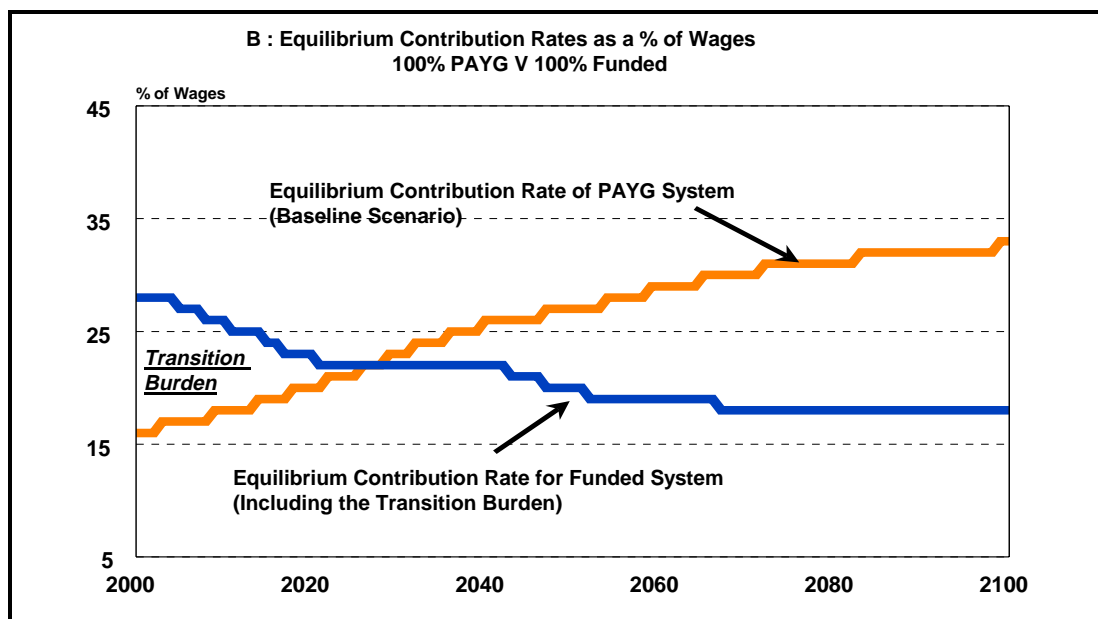
As can be seen from the graph, the "savings" contribution rate for workers to fund their own pension rises over the next number of decades before falling slightly and stabilising. This is a pattern which one should not find that surprising since it is based on a typical worker, making 40 years of contributions, at a contribution rate relative to wages which would give him a defined net replacement rate when he retires which is broadly equal to that of the PAYG system in 2000 (i.e. 74 per cent). Of course to be able to fix the contribution rate the pension fund must assume a certain average real return / GDP growth rate over the period of years to be covered. In the model this real return is set equal to the real interest rate which in fact is very similar to the average pension fund returns achieved in a large number of EU countries over the last 35 years.[29] However, the real rate of interest declines substantially over the transition period due to the immediate abolition of the PAYG system[30] and this decline in the rate of return, coupled with the ongoing increase in life expectancy, is reflected in the upward movement in the equilibrium contribution rate (ECR) for the funded system over the initial 40 years of the 100 year period shown in the graph. It is interesting to remark that following 2050, the real interest rate starts to rise again reflecting the fact that the additional savings generated over the transition period to a funded system start to be gradually unwound[31]. This increase in the real interest rate after the end of the transition period is shown in Graph 17a as a fall in the equilibrium contribution rate for the funded system. Finally, it should also be clear from the graph that if both life expectancy and the real interest rate remain constant then the ECR of the funded system also remains unchanged over the period in question.

As regards the contribution rate to cover the implicit debt of the PAYG system, as the graph shows, this burden on workers declines gradually over the period until the last

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[29] According to research quoted in Miles and Timmermann (1999), the average return on an equal-weighted portfolio of equities and bonds was of the order of 5 ¼ per cent in Europe over the 30 year period up to 1995 and the real interest rate in the model is also of the order of 5 ¼ - 5 ½ per cent and consequently represents a good proxy for tracking the evolution of pension fund returns over the next 50 years.

[30] This sharp reduction in the real return for funding is likely to be significantly attenuated in the event of a more gradual abolition of the PAYG system.

[31] As the initial build up in savings is unwound so also is the initial gain in terms of growth.

person under the previous system dies. This transition burden could of course be financed by instruments such as "recognition" bonds etc but given the magnitude of the implicit debt which would have to be made explicit in 2000 (i.e. of the order of 180 per cent of GDP), efforts to simulate such a financing option proved impractical and consequently financing is assumed to occur through labour taxation i.e. SSC's.

In broad terms what this simulation is saying, and as shown graphically in Graph 17b, is that the overall pension contribution burden on workers over the next number of decades under a 100% funded pension system would initially (because of the "double" burden) be close to 12 percentage points higher, as a proportion of wages, than in the baseline PAYG system, with the burden easing gradually over the subsequent 25-30 years until the combined contribution rate for the funded system, in other words the cost of the new pension system, would finally fall below that of the PAYG system. It is only when this cross-over point occurs that workers would see a gain from moving to a funded scheme, with the space in Graph 17b between the two lines which represent the 100 per cent PAYG and 100 per cent funded systems providing a clear graphical representation of the cost of moving to a fully funded approach, as measured by the additional costs imposed on workers of the transition generation. However, as Graph 17B also shows once this transition burden has been removed the gains from funding are considerable, with the longer term gains from such a shift more than compensating for the short-run costs. Finally in terms of growth, as Table 12 shows, the gains in terms of GDP should not be exaggerated - with a full shift to funding giving an increase of a little over 5 per cent in level terms relative to the baseline, thereby boosting the EU's potential growth rate over the next 50 years by a small, but nevertheless very welcome, 0.1 of a percentage point on an annual average basis, with both workers and pensioners gaining from the switch to funding as long, of course, as the system is set up along the lines described in the present simulation.

TABLE 12 : REPLACE PAYG WITH A COMPULSORY FUNDED SYSTEM

	GROWTH	INCOME DISTRIBUTION	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	WORKING AGE POPULATION CONSUMPTION (% DIFF. FROM BASELINE)	PENSIONERS CONSUMPTION (% DIFF. FROM BASELINE)
2000	0.0	0.0	0.0
2030	+5.0	+4.4	+6.0
2050	+5.1	+3.9	+6.6

TRANSITION COSTS FOR WORKERS INCREASE DRAMATICALLY IF THE RATE OF RETURN DIFFERENTIAL IN FAVOUR OF FUNDING IS ERODED BY ADDITIONAL ADMINISTRATION, TAX INCENTIVES + INSURANCE COSTS ASSOCIATED WITH FUNDING : It should be underlined that the above scenario only allows for the transition burden of moving from the PAYG to a funded system. For some commentators this is not a sufficiently "realistic" scenario, especially if the funded system is set up in the private sector, as opposed to simply changing the way that the SSC's of workers are exploited in a publicly managed funded as opposed to PAYG system. In this first systemic simulation we have in effect simply channelled the

SSC's which workers compulsorily paid into a PAYG system into a system which essentially invests those contributions along the lines of a normal private sector pension fund. In fact this system can be set up in any number of ways where worries concerning public sector control could be allayed by tendering out, on a competitive basis, the management of the SSC funds to specialised pension fund operators.

If governments decide to go for a totally private run funded pension system then it is important to ensure that the comparison with the PAYG approach is a fair one and consequently allowance must also be made for additional costs often linked with the move to private funding, namely the budgetary costs associated with the government tax incentives or subsidies[32] needed to boost the take up of funded schemes (although these costs should be small if it is a compulsory funded approach); the high level of administration costs often associated with such schemes, especially a system based on individual accounts, relative to those of a centralised system such as PAYG;[33] and finally, if a defined contribution (DC) as opposed to defined benefit (DB) scheme is used, for the cost of an insurance scheme to underwrite the DC pension schemes since in this reform proposal one is replacing a DB retirement income under the PAYG system with a system which historically has returned higher, but much more volatile, returns[34]. If one was to allow for the impact of all these additional costs in terms of reducing the internal rate of return differential in favour of funded schemes relative to the PAYG system, the transition burden or cost imposed on workers would be significantly higher than that indicated in Graph 17b. This significantly higher transition burden is shown graphically in Graph 18 which indicates the impact of, for example, a 1% point decline in the internal rate of return of the funded system from 5 ¼ to 4 ¼% due to the impact of these additional costs.

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[32] In terms of the cost of tax incentives, according to the 2001 OECD report on trends in "Net Social Expenditure", tax breaks (in the form of tax exemptions for contributions to private pension funds) aimed at stimulating the take up of private pension plans vary enormously from country to country. For example for the year 1997 tax breaks for private pensions were of the order of 1% of GDP in the Netherlands and the US compared with voluntary private pension expenditure of 3.2% and 3.6% respectively suggesting that tax incentives may represent close to 30% of the contributions made to voluntary private pension funds. This ratio is even higher in the case of Ireland and the UK and substantially lower in the case of Germany. This latter figure for Germany is a little surprising in the light of the figures being mentioned in relation to the recently agreed German pension reform proposals where a much higher budgetary cost is assumed - for example some estimates suggest that the generation of an additional DM90 billion of private pension fund assets in Germany will cost the German exchequer around DM20 billion in tax incentives.

[33] A recent study by Murthi, Orszag and Orszag (2001), which looked at the specific experience of the UK with a decentralized system of individual pension accounts, suggests that the administration costs issue is a serious one. According to this study the average lifetime costs for a typical worker associated with an individual pension account is made up of a combination of fund management / administration costs, coupled with alteration fees and the cost of annuitising the fund upon retirement and that all these costs in total consume, over the individuals working life, an incredible 40 to 45 percent of the value of the pension account.

[34] Most private sector DC schemes around the world have a system of insurance in operation to recognise the greater risk associated with DC schemes, with these insurance instruments having the effect of smoothing out the volatility of returns, thereby limiting the potential losses which any individual could be faced with in a funded scheme. In terms of the actual insurance costs of providing a minimum rate of return for defined contribution pension schemes, the World Bank, using option-pricing models similar to those used in derivatives markets, estimates that "for a reasonable set of assumptions, the cost of the minimum absolute and relative rate-of return guarantees is of the order of 4-7 percent of total assets per year". Source : "Guarantees - Counting the cost of guaranteeing defined contribution pensions" : World Bank's Pension Reform Primer.

GRAPH 18 : EFFECT OF 1% POINT DECLINE IN THE RATE OF RETURN ON THE EQUILIBRIUM CONTRIBUTION RATE OF THE FUNDED SYSTEM*
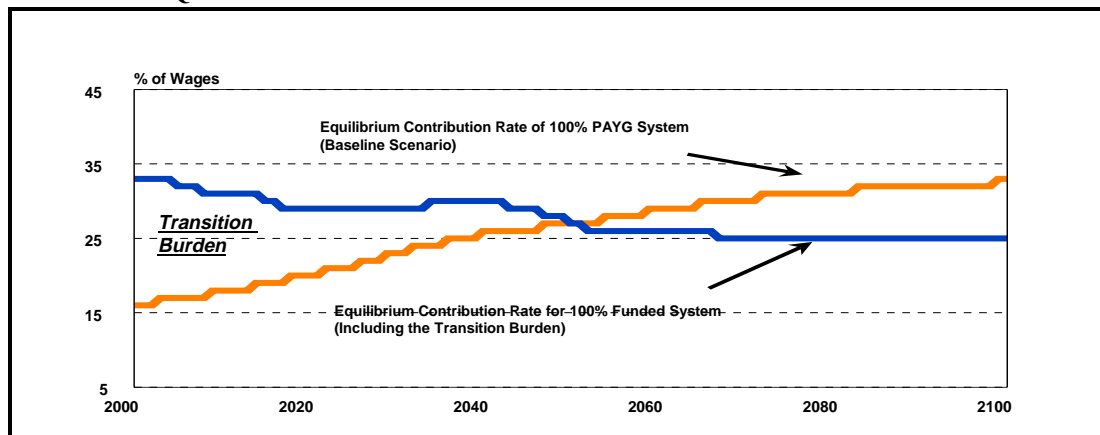
* Rate of return is reduced due to additional costs of funding relative to PAYG in areas such as administration, tax incentives and insurance.

In overall terms, therefore, while funded (i.e. investment based) schemes have a favourable return differential relative to the PAYG system[35], the size of the transition burden, in the form of the implicit debt of the old PAYG system, coupled with any additional budgetary, administration and insurance expenses associated with the move to funding, is at a level that even if the EU wished to completely scrap the PAYG system it would not be feasible to do so, over one generation, given the unrealistically heavy burden placed on the generation of workers on which the transition is imposed.

5.2 100% SHIFT TO FUNDING : VOLUNTARY SAVINGS OPTION

The purpose of this simulation exercise is simply to show what would happen to the income of workers and pensioners if a voluntary, as opposed to a compulsory, funded pension system was to be introduced and especially how workers may react in terms of their consumption / savings patterns to the prospect of having to fund their own pensions as opposed to relying on the state. As table 13 and graph 19A indicates, this simulation suggests that there is a sizeable positive GDP effect from abolishing the PAYG system, due to the significant boost to workers income from the abolition of the SSC's. There is also a large fall in the real return on pension fund assets (i.e. as proxied by changes in the real interest rate) from their average over the last number of decades of around 5 ¼% to less than 4% in 2050. As graph 19B shows, there is some increase in the financial wealth position of households due to an increase in the private savings rate but the big question is whether the increase in savings is able to compensate for the loss of the previously provided public pension. If one looks (Graph 19c) at the trend in the private replacement rate (which is calculated using the change in the private financial assets held by households compared with the baseline scenario) the answer to this last question is clearly no. It would appear that a lot of the

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[35] It should be pointed out that the positive rate of return differential in favour of funding of roughly 2 ¾% points which underpins Graphs 17a and 17b (and 1 ¾% points for Graph 18) should, if anything, be higher due to the following factors. One of the key reasons explaining the decline in the rate of return for funding in these compulsory savings simulations is that the PAYG system is abolished immediately but clearly this decline can to a large extent be offset by adopting a more gradual approach. Furthermore, the rates of return for the PAYG system used in the simulations may, on the other hand, be unduly optimistic since firstly, these baseline rates of return assume no change in the replacement rate of the PAYG system over the next 50 years (i.e. the NRR stays at 74% versus an assumption of a fall to 58% using the EPC's own assumptions); and secondly, they are based on a real wage growth assumption which uses GDP per person employed rather than compensation per employees, with the latter growing, on average, at a 1% point lower annual rate than the former over the last number of decades.

gain from the fall in payroll taxes is spent by workers and not saved, with this small increase in savings leading to a serious underfunding of pension income - in fact the private net replacement ratio reaches less than 25% in 2050 compared with well over 70% for the PAYG system for the same year.

TABLE 13 : REPLACE PAYG WITH A VOLUNTARY FUNDED SYSTEM

	GROWTH	INCOME DISTRIBUTION	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	WORKING AGE POPULATION CONSUMPTION (% DIFF. FROM BASELINE)	PENSIONERS CONSUMPTION (% DIFF. FROM BASELINE)
2000	0.0	0.0	0.0
2030	+9.3	+27.8	-41.8
2050	+14.6	+48.1	-53.4

It is clear in terms of the change in the financial wealth of households that while workers do increase their stock of financial assets, a much greater savings drive would be needed to offset the loss of the PAYG pension system. Finally, this significant underfunding of retirement income shows up clearly in Table 13 and Graph 19D where the big gainers from abolishing the PAYG system are workers because of the reduced tax burden but pensioners suffer significant losses thereby ensuring that the distribution issue, as well as emerging calls for government help to offset the deterioration in pensioners incomes, would quickly loom large on the political horizon. One of the essential conclusions to be drawn from this stylised scenario, compared with section 5.1, is the importance of the "compulsory" savings aspect of the present PAYG system which policy makers should be loathe to change unless an effective system is put in place to ensure a similar level of savings in any of the alternative approaches. This latter point needs emphasising if governments, as mentioned above, do not wish to be faced by growing calls later on to address the income distribution problems which will inevitably follow if workers fail to make adequate provision for their retirement income. These results may suggest a genuine "market" failure in terms of pension income provision with large numbers of households systematically undersaving for their retirement needs.

GRAPH 19 : SHIFT TO FUNDING : VOLUNTARY SAVINGS OPTION
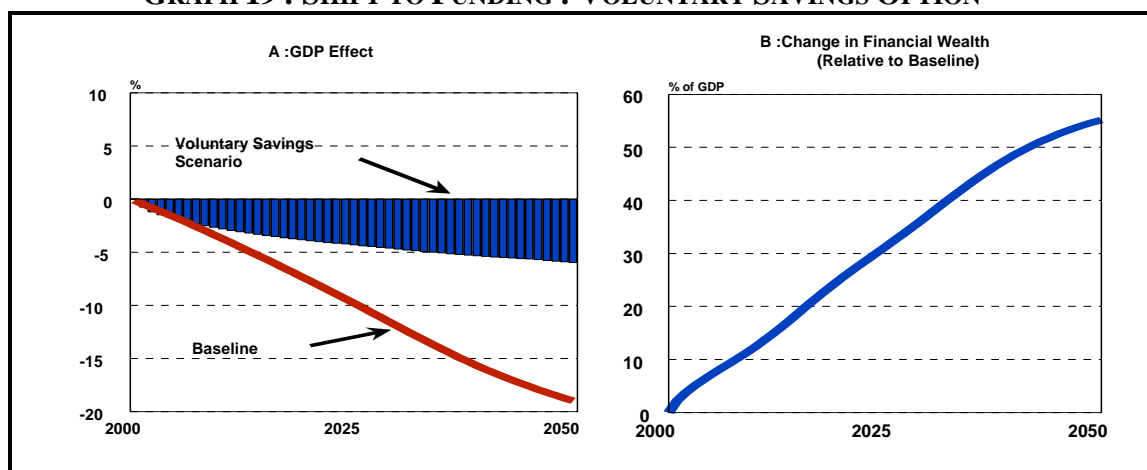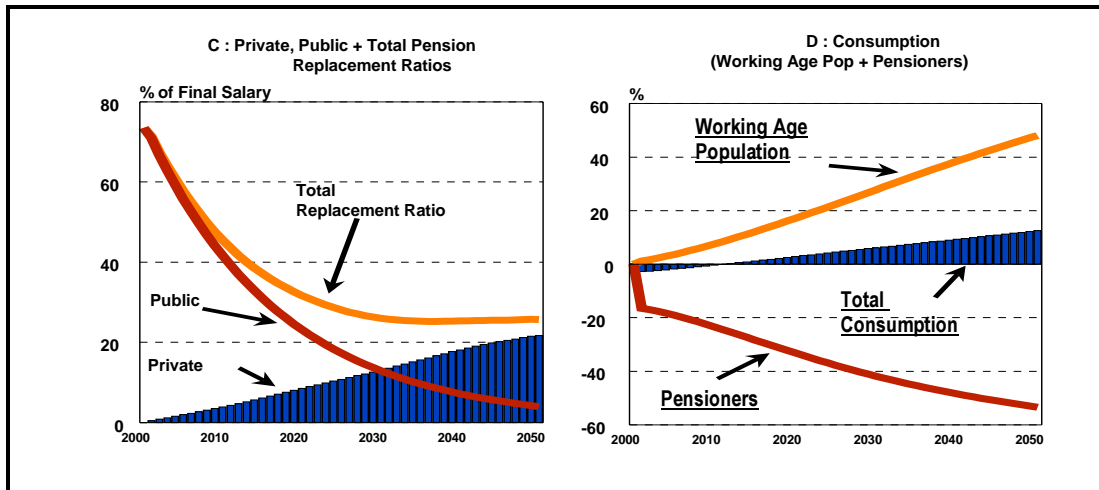
The final simulation in this sub-section assesses the potential effectiveness of government tax incentives or interest rate subsidies in boosting the take up of private pension plans. This shock is introduced in the model as an interest rate subsidy equivalent to 1% of GDP. As graph 20 shows this incentive to take up a private pension plan does boost the overall financial wealth of the household sector, with the financial assets of the latter sector growing by between 25 to 30% of GDP which in turn pushes up the private replacement rate to 32% of the net final wage in 2050 compared with 22% in the simulation excluding the subsidy. What this simulation shows is that substantial government subsidies would be needed to bring the accumulated financial assets of the private sector up to a level where replacement rates would come close to those presently existing in the PAYG system.

GRAPH 20 : IMPACT OF INTEREST RATE SUBSIDY IN BOOSTING THE TAKE-UP OF PRIVATE PENSIONS
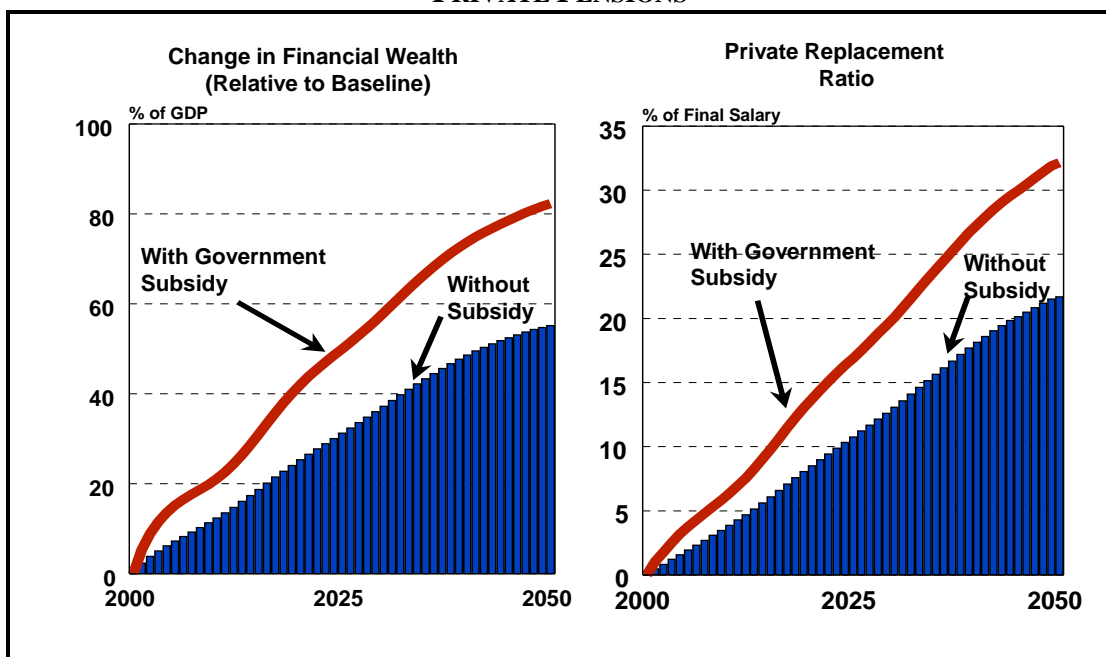
This final systemic scenario presents the effects of a partial shift to funding, and explains that this partial shift is the first stage of a two-stage "optimal" EU pension reform process. This so called "optimal" strategy is discussed in more detail in section 6, with the present sub-section focussing on some empirical results. From the simulations presented in sections 3 to 5, it should come as no surprise that the present paper advocates a two-pronged pension reform strategy,

- firstly, to stabilise the transition burden by bringing the PAYG system back into equilibrium through the introduction of a broad range of labour market, generosity and retirement age reforms; and

- secondly, to start on the road to 100% funding, with this long run objective driven by a realisation of the significant demographic risk which the PAYG system is exposed to and in order to avail of the higher historical returns which have been achieved by funding and which, on the basis of the simulations in this paper, are likely to persist over the next 50 years.

However, in order to achieve the long run objective of a fully funded pension system, what is absolutely clear from the simulations presented so far in section 5 is that such a transition to funding is not possible in the EU over one generation. Due to the transition burden on workers, a full shift to funding is not feasible and consequently a smaller shift to funding should only be contemplated at the present time[36].

This latter less radical shift is what is considered in the final simulation which examines the possibility of a 25%[37] move to funding, combined with a broad range of reforms of the PAYG system aimed at stabilising the transition burden. With regard to bringing the PAYG system back into equilibrium, in operational terms this is achieved by stabilising the transition burden (which is equivalent to stabilising the contribution rate of the PAYG system at its 2000 level), with a clear preference expressed in this paper that this should be achieved through supplementing the EPC announced labour market and pension generosity reforms by bringing the effective retirement age (ERA) back up to the statutory level. Indeed, an even bolder move should not be ruled out, namely to reduce the transition burden by delaying retirement until even later through, for example, linking the effective age of retirement to future changes in life expectancy.

While this equilibrium in the PAYG system is being achieved, governments can simultaneously shift out a proportion of the system to a funded pillar. The case for this partial shift to funding is based on the results of the baseline scenario in which it was shown that the funding option, as mentioned earlier, is likely to retain its cost advantage over the next 50 years (i.e. in terms of a lower equilibrium contribution rate -ECR- relative to the PAYG system) and consequently there will always be an incentive to avail of the higher returns from an investment-based approach. In terms of a move to funding, countries have a wide range of options to choose from, ranging

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[36] Given that the transition process will have to occur over more than one generation, it is essential that the transition burden is stabilised as quickly as possible since if the implicit debt of the PAYG system as a % of GDP continues to grow, the transition process is further complicated.

[37] This 25% figure is purely illustrative - depending on the transition burden faced by individual Member States a much higher % shift could be contemplated.

from establishing a funded system within the public sector or by going for a system of private "own" accounts, although the experience so far with a completely decentralised version of "own accounts" has shown it to be an expensive option in terms of administration costs.

TABLE 14 : SYSTEMIC REFORMS : PARTIAL 25% SHIFT TO FUNDING

|	GROWTH	PENSION PROVISION COSTS		INCOME DISTRIBUTION	
	GDP PER CAPITA (% DIFF. FROM BASELINE)	PUBLIC PAYG PENSION CONTRIBUTIONS (% OF WAGES)	PRIVATE PENSION CONTRIBUTIONS (% OF WAGES)	WORKING AGE POPULATION CONSUMPTION (% DIFF. FROM BASELINE)	PENSIONERS CONSUMPTION (% DIFF. FROM BASELINE)
2000	0	16.1	0	0	0
2030	+18.5	13.3	2.8	+17.1	+12.6
2050	+27.7	12.8	2.9	+29.3	+15.0

The key conclusions to be retained from this final scenario are as follows:

- In terms of growth, the EU economy makes a large gain from pension reform, with the level of GDP rising by close to 28 per cent relative to the baseline scenario, thereby more than wiping out the negative effects of ageing in terms of growth. However, it should be pointed out that the largest proportion of the growth gains in this scenario emanate from the EPC announced labour market reforms and the increase in the retirement age, with only a small proportion which can be associated with the partial shift to funding (this is also the conclusion from the simulation in 5.1). Consequently, while growth is not the only measuring rod in terms of a shift to funding, policy makers should not expect enormous gains in terms of living standards from simply adopting a different pension financing strategy since the final growth impact is essentially dictated by the increase achieved in terms of national savings.[38]

- As the graph showing the total net replacement ratio indicates, the overall generosity of the system is assumed to fall over the period (EPC assumption), with pension income under this final scenario coming from two sources, with the largest proportion, by definition, still coming through the PAYG system. In terms of the equilibrium contribution rates (ECR's) of the PAYG and funded systems, the latter are set at the levels needed to maintain the 75/25 per cent distribution, on average, over the time horizon covered by the simulation.

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[38] The importance of keeping the savings issue to the forefront of discussions needs to be underlined since this is the factor which will ultimately decide the success of a funded approach. While credible arguments can be made in favour of funded schemes regarding their potential benefits in terms of savings, unfortunately a review of the empirical literature in this area points to no conclusive evidence to this effect. In this regard, the voluntary savings simulation in Section 5.2 shows clearly that, in the absence of some element of mandatory savings, the boost to overall savings from funding will be muted and could in fact lead to serious underfunding problems in terms of future retirement income provision.

- In terms of the fiscal impact, this scenario is particularly favourable, with reductions in both SSC's and government pension expenditure to levels well below those assumed under the baseline scenario.

- Finally, in terms of income distribution, this scenario can also be recommended, with pensioners income as well as that of the working age population both showing significant increases over the simulation horizon.

GRAPH 21 : PARTIAL SHIFT TO FUNDING + STABILISATION OF PAYG SYSTEM
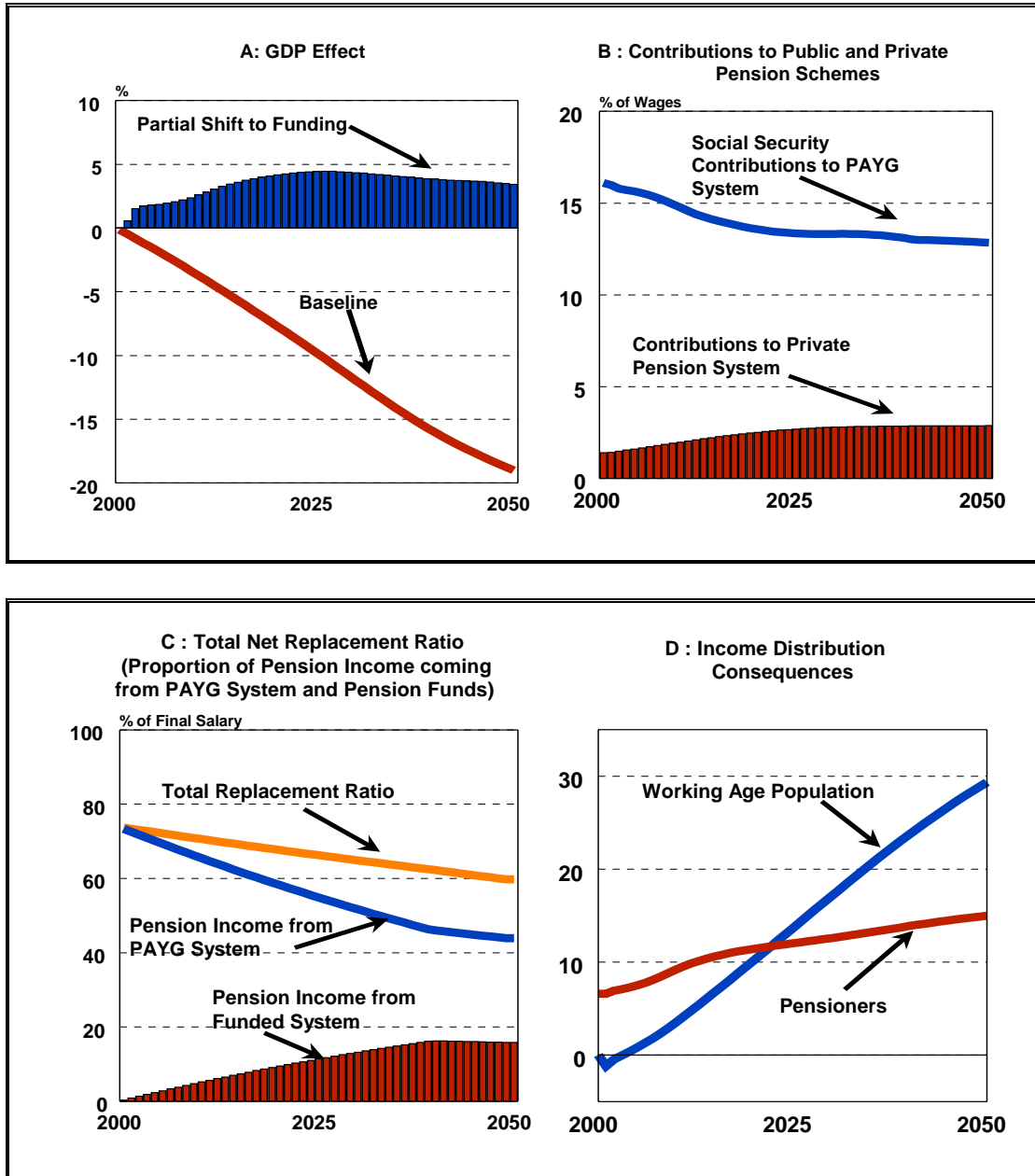
SYSTEMIC SCENARIOS : FULL V PARTIAL SHIFT TO FUNDING

1. 100% SHIFT TO FUNDING (COMPULSORY SAVINGS OPTION)

SIMILARITIES WITH PAYG SYSTEM

1. COMPULSORY
2. DEFINED BENEFIT
3. LOW ADMINISTRATION COSTS

TRANSITION COSTS LAST FOR AT LEAST 25-30 YEARS

FUTURE GAINS FROM FUNDING MORE THAN OFFSET THE TRANSITION COSTS (Mechanics of Shift to Funding are crucial)

ANNUAL GROWTH RATE GAIN OF 0.1 (2000-2050)

SHIFT TO FUNDING IS POSITIVE FOR BOTH PENSIONERS + WORKERS

2. 100% SHIFT TO FUNDING (VOLUNTARY SAVINGS OPTION)

LARGE UNDERFUNDING OF RETIREMENT INCOME

POSITIVE FOR GROWTH

LARGE SHIFTS IN INCOME DISTRIBUTION - POLITICALLY SUSTAINABLE ?

3. PARTIAL SHIFT TO FUNDING + STABILISATION OF PAYG SYSTEM (STAGE ONE OF TWO STAGE SHIFT TO FULL FUNDING)

BIG GAINS FOR THE EU IN TERMS OF GROWTH + PUBLIC PENSION EXPENDITURE + INCOME DISTRIBUTION		
ANNUAL GROWTH RATE BOOSTED BY ½%	**PUBLIC PENSION SPENDING ACTUALLY DECLINES FROM 10½% OF GDP IN 2000 TO 8 ½% IN 2050**	**WORKERS + PENSIONERS BOTH GAIN FROM REFORM**

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The purpose of this final section is to bring together all the strands of the pension reform analysis which have been highlighted in the previous sections and to present an "optimal" pension reform strategy for the EU to be implemented progressively over the coming decades. Optimal for these purposes is defined as a strategy which boosts growth, eases the budgetary strains of ageing and does not provoke politically unsustainable changes in income distribution. EU governments are faced with a large array of reform choices, ranging from a substantial reform of the PAYG system to a shift to funding, with, in the case of the latter option, governments needing to devise an optimal transition path which minimises the transition costs involved. In addition to these two basic options, some form of mixed system involving elements of both the funded and PAYG systems is also possible, with a wide range of hybrid systems and options to choose from, amongst which prefunding of the PAYG system (described in Annex 2) is becoming increasingly utilised. Any decisions regarding the exact final form which a particular pension system should take is as much driven by political and institutional factors as by the economic rationale put forward in this paper and should consequently be left to the individual member states.

BASIC POLICY CHOICES FOR EU GOVERNMENTS : While conscious of the many "hybrid" / mixed pension systems which are possible, what the present paper hoped to achieve was to lay out the economic arguments to be taken into account when assessing the two most basic pension reform choices namely the choice between retaining and reforming the PAYG system or a full / partial shift to funding.

- **1. RETAINING AND REFORMING THE PAYG SYSTEM** : If a particular government wishes to retain the PAYG system then of course it is possible to reform the latter in the way outlined in section 3 of this paper so that the effects of ageing are bearable at least. Failure to implement the reforms suggested (or some alternative measures with equivalent effects) would ultimately call into question the viability of the system as a whole, as the effects of ageing start to be felt. In the EU, PAYG contribution rates are already at a high level (over 16% of wages) relative to previous decades and with the projections suggesting rates of up to 27% in 2050, allied to the prospect of negative returns for individual PAYG contributors, the intergenerational solidarity which presently underpins the system will be increasingly tested. This solidarity has been a feature of the PAYG system in previous decades because of the high rates of return achieved relative to funding and since replacement rates were both generous and relatively stable. Since changes in the rate of return for the PAYG system are to a significant extent dictated by the growth rate of the working age population relative to that of pensioners[39] and since this dependency ratio is going to change dramatically over

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[39] While it is accepted that rates of return in the PAYG system are equal to the growth rate of the real wage bill and consequently the potential exists for changes in real wages to partially offset the effects of ageing on working age population / employment developments, it is important to underline that the latter developments in terms of employment are to a significant extent influenced by the level of taxation / SSC's paid by workers. It would be simplistic not to expect some negative consequences on employment from the disincentive effects arising from an increase in SSC's from 16% in 2000 to 27% in 2050, as is assumed in the baseline, and this would be especially the case if SSC's were to be perceived by workers as purely another form of taxation unlike the case assumed in the baseline of 50% being treated as taxation and 50% as savings for retirement.

the coming decades, the set of fundamentals which promoted the use of a PAYG system initially is fast disappearing. In order to retain this system and to avoid its costs "ballooning" out of control, governments will have to bring more contributors into the system through labour market reform and will have to keep them in the system for longer than at present (i.e. the effective retirement age will have to increase). If one accepts the present Eurostat population projections there is no escaping this inevitability since the PAYG system is in essence a transfer system where resources are transferred from the present working population to the present generation of pensioners. This system can only effectively function as long as the population of working age continues to grow which on the basis of the present population projections will not be the case in the future.

Consequently without implementing the reforms outlined in section 3, the PAYG system is not tenable in either political or economic terms, with the minimum requirements being a stabilisation of the equilibrium contribution rate for PAYG contributors and a series of system design changes aimed firstly at reducing disincentives and increasing the transparency of the system and secondly, clearly laying out the distributional objectives which are being targeted by the system. One interesting development in this regard are the "notional" defined contribution schemes which have been set up in countries such as Sweden and Italy. The latter systems are unfunded, with no accumulation of capital assets, as is the case with a typical PAYG system, and pay a "notional" rate of interest (linked to real wage / real growth rate developments) on the contributions paid into the system throughout the contributors working life, with the accumulated sum annuitized on retirement and with life expectancy at the time of retirement explicitly taken into account. While there are no additional savings generated, as the system is still unfunded, a number of the disincentive effects of typical PAYG systems have been addressed in these "notional" DC schemes and, moreover, these reforms are an explicit recognition that future demographic changes will pose significant problems for pure PAYG transfer systems.

- **2. FULL / PARTIAL SHIFT TO FUNDING** : A progressive 100% shift to funding is this papers preferred scenario and is discussed in detail in sub-section 6.1 below. For EU governments which wish to move to funding the key issue will be how they should handle the transition path from the present PAYG system. The preference of the authors on this point is for a two pronged strategy which involves a phased shift to funding involving firstly bringing the PAYG system back into equilibrium and gradually moving to a 100% funding system. In this context the speed of any transition process will be dictated by the size of the transition burden and a range of political choices such as the number of generations to spread the burden over etc.

6.1 PREFERRED SCENARIO : PROGRESSIVE 100% SHIFT TO FUNDING USING A TWO STAGE OPTIMAL TRANSITION PATH

From the empirical and theoretical analysis which has been undertaken so far, it should now be fairly clear what are the main advantages and disadvantages of PAYG and funded pension systems. The case for funding rests essentially on advantages in terms of higher rates of return relative to those achievable under the PAYG system

and more contentious, although credible, assertions that funding is positive for growth through effects on labour supply, savings and the efficiency of financial markets. As explained in sections 4 and 5, these advantages of a higher return for funding, coupled with other potentially positive economic effects, have to be balanced against the transition costs of moving from the PAYG system and any additional costs associated with funding which, if not properly controlled, would significantly reduce the attractiveness of the funding option.

The basic points to emerge from the analysis so far are :

- **firstly**, the internal rate of return for the PAYG system has in the past compared favourably with funding but this has been falling over recent decades and on average over the next 50 years the baseline return differential in favour of funding is forecast to be of the order of 3¼-3½ percentage points. In addition, for a worker starting to contribute to the PAYG system in the year 2000 his rate of return could turn out to be lower than 1% which is less than what he would achieve by simply putting his social security contributions into government bonds. In addition, as the sensitivity analysis in section 4 highlighted, there is a strong possibility that future contributors to the PAYG system could be faced with negative returns;

- **secondly**, regarding the internal rate of return for funding, according to the baseline simulations in section 4 the returns to funding will persist at the levels experienced over the period 1960-2000 over the next 50 years i.e. of the order of 5-5½%. However, the volatility of these returns is a serious concern since small changes in the latter can provoke large adjustments in terms of the contribution rates which workers have to make in order to ensure a fixed wage replacement ratio in retirement;

- **thirdly**, any attempt to exploit the natural advantage of funding is complicated by the large transition burden which exists in the EU, by a number of additional cost factors mainly associated with voluntary, defined contribution, pension plans and by the fact that any precipitous move into funding could result in a significant decline in the real rate of return for pension funds, although a long transition phase would neutralise these negative interest rate effects;

- **fourthly**, the growth gains associated with simply changing the mode of financing retirement income from a system based on PAYG to a funded one are of the order of 0.1%-0.2% annually and would be significantly boosted over the transition phase to funding by a series of reform efforts aimed at stabilising the transition burden as a % of GDP (i.e. bringing the PAYG system back into equilibrium);

- **finally**, any objective analysis of the relative merits of both systems would suggest than an "optimal" EU pension reform strategy must over the long run (i.e. over more than one generation) aim at a 100% shift to funding, with the focus of policy makers being on ensuring an optimal transition path which minimises the transition costs of such a change.

TWO STAGE OPTIMAL TRANSITION PATH : Given that the preferred EU pension reform scenario cannot be achieved over one generation due to the large EU transition burden, this transition path should be divided into two stages, which depending on the particular circumstances pertaining in an individual country (most notably the size of the transition burden) can be achieved simultaneously or sequentially:

- **Stage One** : Stabilise the PAYG system + Partial Shift to Funding

- **Stage Two** : 100% Funded system (Public + Private Pillars).

- **STAGE 1 : STABILISE THE PAYG SYSTEM + PARTIAL SHIFT TO FUNDING** : The focus for EU governments in Stage 1 should be on stabilising the PAYG system through a broad package of labour market, generosity and retirement age reforms. This latter reform strategy would yield a double benefit, firstly fully offsetting the forecast ½ percentage point loss for the EU's annual growth rate due to ageing and secondly significantly easing the transition path to funding. The details regarding such a scenario have already been given in Section 5.3.

- **STAGE 2 : 100% FUNDED SYSTEM (PUBLIC + PRIVATE PILLARS)** : This fully funded system should have both public and private funded pillars, with the % split between the two being determined at the national level. The public pillar should act as a replacement for the old PAYG system and be a compulsory savings, defined benefit (DB), system, with the private pillar being a voluntary, defined contribution (DC), system.

GENERAL CONSIDERATIONS REGARDING THE COMPULSORY (PUBLIC) + VOLUNTARY (PRIVATE) PILLARS : The percentage breakdown between these two pillars should, as mentioned previously, be determined at the national level based on a series of diverse factors ranging from what individual countries deem acceptable as a "reasonable", guaranteed, standard of living in retirement, to considerations such as the existing national breakdown between the public and private sectors in terms of retirement income provision.

COMPULSORY (PUBLIC) PILLAR : With regard to the public pillar, despite calling for the abolition of the PAYG pension system, the present study would argue strongly that a clear justification for public sector involvement in retirement income provision still exists, with a compelling case to be made based on the following factors:
- **POSSIBLE MARKET FAILURE - INTERVENTION NEEDED TO AVOID UNDERSAVING FOR RETIREMENT:** Strong empirical evidence to suggest that if people are left to themselves they would systematically under-provide for their retirement income needs. This view is widely shared in the literature and is the essential conclusion to be drawn from the voluntary savings simulation described in section 5.2.
- **NECESSARY TO ENSURE THAT PENSION REFORM IS INTRODUCED** : The provision of a funded, defined benefit, public pillar similar to the old PAYG system is in many cases a necessary measure to ensure that pension reform becomes a reality[40]. Pension reform carried out in this way would allay the fears which many

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[40] Resistance to funding is in many cases linked to an erroneous view that if one moves to funding that the latter can only be carried out in the private sector. By moving from a compulsory PAYG to a compulsory funded system all one is in effect doing is providing the guarantes of the PAYG system on an individual as opposed to a collective basis. This move towards a closer actuarial link at the individual level is what many countries are now implementing in their own existing PAYG systems, so such a policy suggestion is not as radical as it may initially appear. By advocating funding one is simply increasing the degree of transparency of the PAYG system. This issue of transparency is only now becoming important since governments use of the contributory PAYG system in the past to fund part of the non-contributory pension system was broadly acceptable to workers as long as the latter felt that they were still getting a reasonable return on their SSC's. Given the likelihood that in the case of a worker which started to contribute to the PAYG system in 2000 that he or she will receive relatively low or even negative rates of return, it is clear that this implicit redistributive role for the PAYG system will be more difficult to sustain politically once the burden on workers starts to intensify in future decades. Before these strains start to emerge it is incumbent on governments to clearly

policy makers understandably hold regarding a move to funding, especially in terms of inappropriately exposing large sections of the population to the vagaries of the financial markets. Given the continuing strong public support for the PAYG system, reform efforts which fail to address the legitimate concerns of citizens regarding a reasonably secure minimum standard of living in retirement, at least with some of the guarantees associated with the PAYG system, have little chance, in the immediate future at least, of being enacted into legislation.

- **GOVERNMENTS ARE ABLE TO SPREAD RISK AND PROVIDE GUARANTEES OVER MORE THAN ONE GENERATION** : The public sector is in the unique position to be able to provide many of the politically popular features of the existing PAYG system at a lower cost to that of the private sector, with for example the cost of underwriting the volatility which is inherent in any funded system (in order to provide a defined benefit income in retirement) being lower in the public sector due to the latter's ability to spread risk over more than one generation.

- **LOW ADMINISTRATION COSTS** : The cost advantage of utilising the existing public taxation system as a collection channel for the compulsory savings of workers is a very appealing feature, compared with the very high "administration" costs often associated with an individual accounts based system.

However, while a prima facie case exists for a public pillar, as so often stressed in this report, the design features of this pillar are vital. Funds need to be properly ring-fenced within the public sector and adequate attention needs to be devoted to the moral hazard / asymmetric risks involved of providing public guarantees regarding returns from a funded, market-based, system. In addition, there is a strong case to be made that day-to-day management of the accumulated funds should be contracted out to either private sector financial institutions with the requisite pension fund expertise or to a specially created public body, with the selected fund managers having to respect normal regulatory and prudential rules and any specific public sector imposed conditions. This outsourcing should be carried out on the basis of an open, competitive, tendering process.

VOLUNTARY (PRIVATE) PILLAR : While basic guarantees would appear appropriate for a certain proportion of the average citizens retirement income, this should not however apply to it all. In this regard, citizens wishing to top up their defined benefit, public, pension should be able do so through a vibrant private pillar set up as a voluntary, defined contribution, system. This latter "choice" rationale provides the underlying justification for a voluntary pillar, allied to the normal gains associated with any competitively based private sector activity. Once governments have ensured that all citizens have a minimum standard of prosperity in their old age which will be provided through the public pillar, the private voluntary pillar will allow individuals to express their own preferences regarding their target level of income in retirement and the implications of this target in terms of their work / leisure choices during their working lives and in terms of their desired retirement age. If, for example, workers wish to retire early and are prepared to accept the financial penalties in terms of a lower standard of living in retirement then this degree of flexibility should be allowed for. Finally, since the modalities of how funding is introduced are absolutely

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distinguish the redistributive part of the public pension system and fund it adequately from general taxation, as opposed to SSC's, and replace the old PAYG system with a publicly controlled, individualised, funded system.

fundamental to its ultimate economic success, Governments will be required to set up the appropriate regulatory framework and to intervene on a range of limited, clearly defined, issues.

6.2 "OPTIMAL" STRATEGY MAXIMISES THE GROWTH RATE EFFECTS FROM PENSION REFORM (+ FUNDING OFFERS THE POSSIBILITY OF ADDITIONAL GROWTH GAINS)

Given that ageing will reduce average annual growth rates in the EU from 2 ¼% to 1 ¾% on an annual average basis over the next 50 years, it is clear that a key objective of any "optimal" pension reform strategy must be to reduce these negative growth effects. In this regard it should be stressed that while the PAYG reform simulations point to large growth gains, these gains are not due to the PAYG financing method itself but reflect the effects of the labour market and retirement age changes which are needed to stabilise the transition burden associated with a shift to funding. It is clear that such labour market and retirement age changes if introduced in the systemic reforms would equally boost the growth rate effects from funding and it can be legitimately argued that these reforms should be introduced irrespective of which pension financing system is in operation in order to counteract the growth rate effects of ageing populations. In addition, it is widely acknowledged in the literature that funding at least offers the possibility of higher growth rates compared with the PAYG system because of positive effects from funding on labour market incentives, on savings and capital accumulation and, in certain circumstances, from financial market effects. While it is not possible on the basis of the simulations given in this paper to make an exhaustive comparison of the growth rate effects of the various pension systems, it is nevertheless possible to provide some insights into the channels through which pension reform impacts on growth and on why the "optimal" strategy of stabilising the transition burden and a full shift to funding offers the best option for overcoming the ageing growth loss.

The growth implications of different types of pension reforms depend crucially on the following factors:
• Change in the effective labour force.
• Change in aggregate savings.
• Output elasticity of capital and labour.
• Financial market effects

CHANGE IN THE EFFECTIVE LABOUR FORCE. : The reform package presented in section 3 scores particularly high when one takes this labour force factor into account in terms of the growth impact. Due to increases in both the retirement age and the labour force participation rate, coupled with a decline in the rate of structural unemployment, the effective labour force increases significantly under the "broad based" reforms simulation, described in sub-section 3.3. For the systemic reform simulation involving a 100 per cent move to funding, it is assumed that there is no change both with respect to labour force participation, structural unemployment or the retirement age (i.e. no real economy reforms are introduced into the system). Consequently, as mentioned earlier, one should not directly compare the growth rate effects from Section 3 with those involving systemic reforms since one is not

comparing like with like. However, since a shift to funding is being advocated one needs to look at the effects on labour supply from a switch to a funded pension system. These effects are not easy to assess since they depend on a number of related factors, the most important of which are the following :

- How are social security contributions perceived by households - taxation or savings ?
- What is the income and wage elasticity of labour supply?
- How do wages respond to an increase in labour supply?

Potentially the labour supply response from a move to funding could be large, provided that households would regard all pension contributions within a PAYG system as taxes and create no link between their contributions and future pensions, whilst regarding the contributions to a funded scheme as a form of private savings. In this case a move to funding would be perceived as a large increase in net wages, potentially accompanied by a large increase in labour supply. To the extent to which workers regard their current contributions as influencing their future pensions the perceived net wage effect would be smaller. In the model simulations in this paper a 50 : 50 rule is applied i.e. 50% of social security contributions are regarded as taxes and 50% as savings for retirement. There may also be an income effect which limits the labour supply expansion. Suppose the funded system yields a higher return than the PAYG scheme, then the expected future income from a marginal unit of current labour supply will be larger, which means that households can enjoy more leisure with the same future pension under a funded scheme. This income effect could affect labour supply negatively. The net effect on labour supply then depends on the relative size of wage and income elasticities.

Estimating the size of the labour supply elasticity is an empirical matter. The consensus seems to be that male labour supply elasticities are fairly small if not negligible while female labour supply responds more strongly to changes in net real wages. However, it should be kept in mind that it is difficult to empirically identify a labour supply equation. For example, is the observed expansion of the female labour force participation rate a response to the observed increase in female wages (suggesting a strong labour supply elasticity) or should we interpret the simultaneous increase of wages and labour force participation as the result of better training and a stronger career orientation of women? A lower birth rate, as observed since the late 1960s, would just be another manifestation of that change in female work attitudes. If the latter interpretation is correct, the observed co-movement between female wages and hours worked could also be consistent with a low labour supply elasticity.

A final effect that needs to be taken into account is the response of wages to an expansion of the labour supply. If labour demand is very elastic with respect to wage costs, then an increase in labour supply would result in lower wages which would itself limit further expansions in labour supply.

In overall terms therefore the effects on labour supply from pension reform are clearly difficult to assess empirically with a large range of outcomes theoretically possible. The present paper has tried to allow for these uncertainties by allowing for some distortionary effects from SSC's i.e. as mentioned earlier only 50% of the latter are considered as retirement savings. However, in allowing for these disincentive effects

in terms of labour supply from the PAYG system one must remain conscious of the efforts of a small number of Member States to address this issue by creating a closer actuarial link between contributions and benefits in their existing PAYG systems. However, since such reform efforts are limited at the moment essentially to Sweden and Italy, for the EU as a whole there should be some additional gains in terms of labour supply, including retirement behaviour, from shifting to funding.

CHANGE IN AGGREGATE SAVINGS : With regard to the second growth promoting factor (i.e. savings), since the fraction of low saving retirees is reduced and that of the relatively high saving working age population is increased, aggregate national saving increases under the "broad based" PAYG reform option in 3.3 relative to the baseline but again as with the labour supply change, this increase in savings reflects an increase in the retirement age which therefore makes it difficult to compare with the savings response in the funded simulations since an increase in the effective retirement age is not allowed for. This is why in the first systemic simulation that the effects on aggregate savings are not as significant as one would imagine given the large increase in mandatory savings imposed on the wages of workers. Since there is no reduction in the share of pensioners in the overall population equivalent to that which occurs in the "broad based" PAYG reforms scenario (i.e. due to the increase in the effective retirement age), this somewhat surprising savings effect is also due to other factors, including the fact that both existing and "new" pensioners (with high marginal propensities to consume) are not suffering any income loss in the shift to funding. However, while the savings effect may not be as strong as expected, the aggregate savings rate for the population as a whole clearly increases in the transition phase to the creation of a funded system due to the sharp increase in the savings rate of workers which boosts the overall savings of the population of working age.[41]

The sensitivity of the results to changes in ones assumptions regarding savings needs to be forcibly underlined. In an additional simulation with the model it is assumed that working age households incorporate the effects of increased life expectancy in their future consumption calculations and adjust their savings propensities in a logically consistent upward direction. If one adopts this savings assumption the baseline results are changed significantly with the interest rate falling by 1 ¼ percentage points compared with the baseline scenario described in section 2 where it was assumed that the interest rate effects of ageing would be equivalent to a drop of a

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[41] It is important to be aware that there could be an additional factor at play in terms of attenuating the savings and growth impact from a move to funding which is linked to the way consumption is modelled. Consumers in the model are forward looking and find it optimal to smooth consumption over time. Once the decision is taken to set up the funded system and once households realise that they are in effect building up a future stock of financial assets, their behaviour may change because of the associated wealth effects. These wealth effects are triggered by the fact that consumers perceive the created fund as an increase in their permanent income and consequently households will start to spend a share of this future financial wealth, with this additional consumption being financed from reduced levels of savings out of current income or even by liquidating certain financial assets which they hold, other than of course the pension fund assets. While this wealth effect is theoretically plausible the size of the effect is essentially an empirical issue. Other simulations which were carried out with the model to see the sensitivity of the savings effects from varying the relative proportions in the model of wealth and liquidity constrained households (i.e. the proportion of consumers which base their consumption decisions on calculations of lifetime wealth -human and financial wealth- versus those which effectively consume out of current income) suggest that the savings and growth effects could be increased significantly if a large share of households were deemed to be liquidity constrained. In the case of a 100 per cent shift to funding, for example, plausible parameter settings suggest that the annual average growth rate effects over the next 50 years could be increased from the 0.1 predicted in this study to as high as 0.2.

¼ of a % point. This additional simulation result is included here simply to underline the sensitivity of the results to what happens to overall national savings[42].
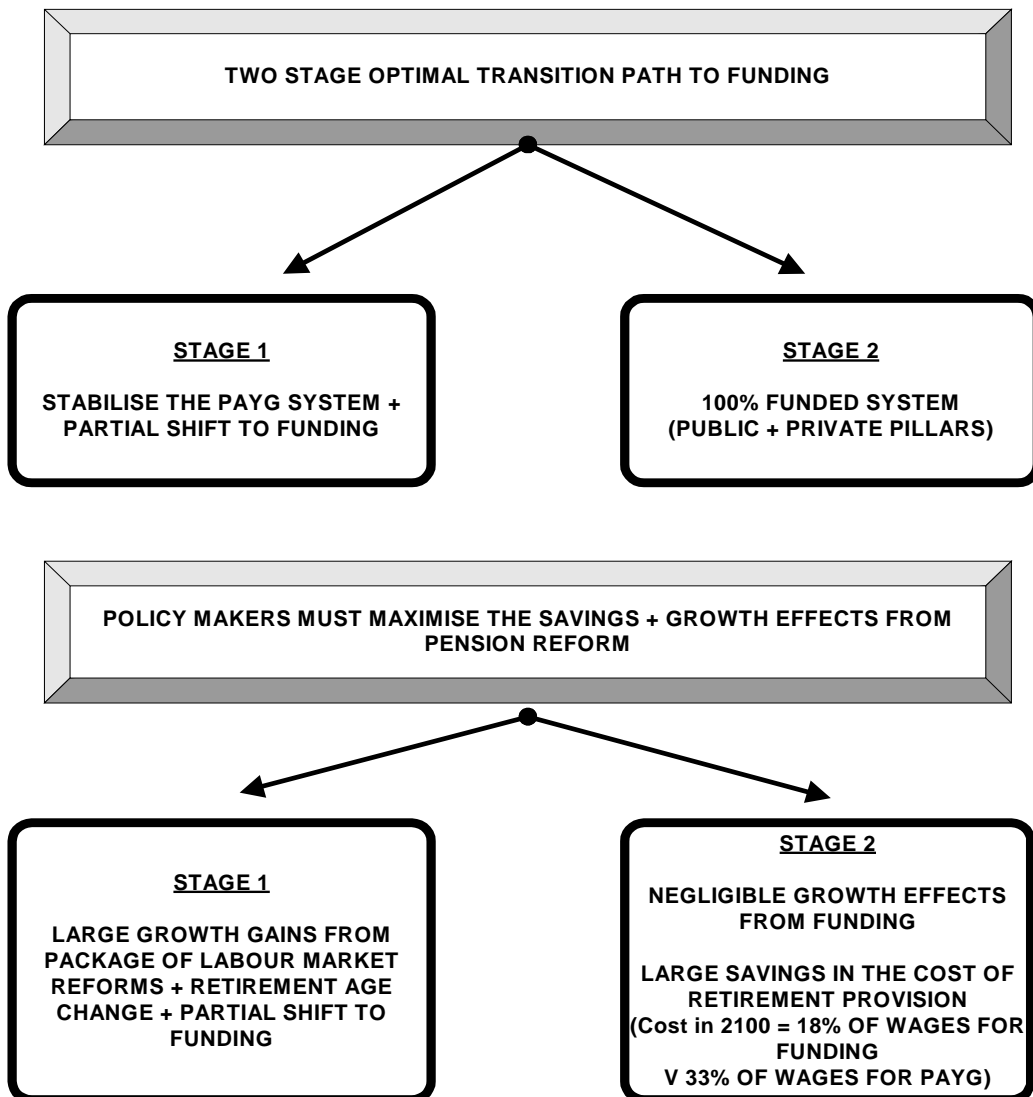
OUTPUT ELASTICITY OF CAPITAL AND LABOUR : Regarding the third growth factor mentioned earlier, the GDP effect of any additional capital accumulation depends crucially on its output elasticity and the effect of new investment on the rate of technical progress. While the growth effects emanating from the increase in the capital stock are taken into account in both the PAYG and funding simulations, the possibility that this increase in the technical capacity of the economy would in turn impact on economy-wide productivity growth through embodiment effects is excluded in these simulations. Allowing for this latter channel of "vintage"/efficiency effects would of course boost the growth effects from both the PAYG reforms and from the move to funding.

FINANCIAL MARKET EFFECTS : Finally, while this paper advocates a move to funding, in the view of the authors, any gains from pension reform in terms of positive financial market effects are likely to be small for a highly developed financial system such as that which exists in the EU. In addition, it would be extremely difficult to disentangle any gains from pension reform from those reaped from the wider process of globalisation and the progressive integration of the EU's financial system. In any case, harmonisation of the EU's regulatory framework and ensuring effective levels of competition are likely to yield significantly more financial market benefits for policy makers than any drive towards funding of pensions.

OVERALL CONCLUSION IN TERMS OF GROWTH : In overall terms while this section has highlighted the high degree of uncertainty associated with the growth effects arising from the different types of pension reform, on the basis of the simulations carried out in sections 3 to 5 of this paper it would appear that the best strategy for governments in terms of boosting growth rates would be through stabilising the PAYG system via a process of labour market reforms, including an increase in the retirement age, allied to the prospect of some additional growth gains from a shift to funding. Such a scenario would constitute an effective strategy in that the negative effects of ageing would be wiped out whilst simultaneously stabilising the liabilities of the PAYG system and thereby easing the transition path to funding. In aggregate terms, as explained earlier, the growth effects from stabilising the PAYG system are likely to yield annual average growth rate gains of the order of ½ a percentage point over the next 50 years, with the growth effects from a full shift to funding yielding growth gains of the order of 0.1 on an annual average basis. Consequently, what is manifestly clear from the simulations is that simply changing the mode of financing of pensions from PAYG to funding, despite the higher rate of return for funding, will yield only small gains relative to the growth gains to be achieved from the labour market and retirement age reforms underpinning the PAYG reform simulations. This is why the present paper argues strongly for a phased shift to funding, with the first phase aimed at stabilising the PAYG system through a series of "real economy" reforms which are very favourable for growth.

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[42] Given the type of uncertainties regarding what will happen to aggregate savings, arguments over the effects of ageing on specific sections of the population, such as workers or pensioners, could be considered to be an issue of secondary importance.

OPTIMAL EU PENSION REFORM STRATEGY

TWO STAGE OPTIMAL TRANSITION PATH TO FUNDING

STAGE 1

STABILISE THE PAYG SYSTEM +
PARTIAL SHIFT TO FUNDING

STAGE 2

100% FUNDED SYSTEM
(PUBLIC + PRIVATE PILLARS)

POLICY MAKERS MUST MAXIMISE THE SAVINGS + GROWTH EFFECTS FROM PENSION REFORM

STAGE 1

LARGE GROWTH GAINS FROM
PACKAGE OF LABOUR MARKET
REFORMS + RETIREMENT AGE
CHANGE + PARTIAL SHIFT TO
FUNDING

STAGE 2

NEGLIGIBLE GROWTH EFFECTS
FROM FUNDING

LARGE SAVINGS IN THE COST OF
RETIREMENT PROVISION
(Cost in 2100 = 18% OF WAGES FOR
FUNDING
V 33% OF WAGES FOR PAYG)

SUMMARY OF MAIN POINTS

AGEING MAKES PENSION REFORM INEVITABLE : The implicit assumption which permeates the present study is that ageing is devastating for PAYG pension systems. In this regard, while it was relatively easy in previous decades to agree to improvements in both the coverage and generosity of the system, due to steady increases in the working age population and low numbers of pensioners, this environment will change dramatically over the coming decades. Radical pension reform will become essential to overcome the basic problem for the PAYG system which, in simple terms, is that less resources will be going in, due to fewer workers, and more resources will be going out to meet the obligations built up to an ever increasing cohort of pensioners. In terms of the budgetary sustainability issue, the fiscal choices are bleak if no reform occurs, with ageing inevitably leading to either increased social security contributions, reductions in the generosity of pensions or forced declines in other areas of government expenditure such as, for example, education or health.

Already a number of EU member states have started down the reform road but given the conflicting pressures on policy makers it was inevitable that governments would initially pursue a rather narrow agenda in terms of the policy objectives to be achieved. In this regard, this study argues in favour of widening the policy focus of the reform efforts, with governments urged to assess the range of pension reform options which are available against 3 key policy objectives, namely the economic growth impact, budgetary sustainability and the income distribution consequences of changing pension systems in terms of the differential impact of the various pension reforms on the working-age population and on pensioners. Up until now ministers have, understandably, focussed their pension reform efforts on alleviating the budgetary implications of ageing populations, with little real assessment of the growth impact of their actions and, in some Member States, insufficient attention being focussed on the income distribution consequences, in terms of the changes to the purchasing power of workers and of pensioners, which, in the long run at least, are vital for the political sustainability of the reform process.

Failure to tackle the pensions issue will inevitably result in large increases in social security contributions being imposed on future generations of workers. This increased burden will gradually erode the intergenerational solidarity which underpins the present PAYG system, with the political legitimacy of the latter system not being seriously tested at the moment since annual internal rates of return for individual workers contributing to the PAYG system are still positive, although declining, with this study however pointing to not only the prospect of very low future returns from the PAYG system but also the distinct possibility of even negative returns.

In the context of the above plea for a widening of the policy focus, and reiterating again the fact that the simulations in this paper refer to the situation in the EU15 as a whole and consequently must not be regarded as an analysis of the pension reform policies pursued by individual Member States, the simulations give an idea of the

magnitude of the impact of some selected pension reforms as well as their simultaneous effect on a range of economic variables, focussing in particular, on growth, the public finances and intergenerational fairness.

ANALYSIS OF LAST 40 YEARS HIGHLIGHTS SIGNIFICANT DIFFERENCES BETWEEN THE UNDERLYING PERFORMANCE OF THE US AND EU PENSION SYSTEMS : Following an overview of the key issues and concepts in the pension reform debate, section one provides an analysis of the main driving forces underlying the growing calls for pension reform. This analysis highlighted significant differences between the EU and US pension systems both in terms of the extent of the pensions crisis to be faced and in terms of how their respective systems have developed over recent decades. It was concluded that the EU will face a more difficult time over the coming decades compared with the US with regard to both the negative growth and public pension expenditure implications of ageing populations. While some of these differences between the EU and US pension systems are purely demographic in nature, a significant difference lies in the historical development of the US and EU labour markets, with the EU's labour market performance over the last 40 years adding significantly to the cost of the pension system whereas in the US the labour market actually helped to reduce pension expenditure costs as a % of GDP. While section one goes on to show the results of the recent joint EPC / OECD exercise for forecasting future pension spending to 2050, which suggests that EU countries intend to introduce a range of labour market reforms aimed at easing the pension expenditure pressures, it is clear that despite these efforts EU pension spending will grow by significantly more than that of the US over the next 50 years.

STUDY ANALYSES TWO KEY QUESTIONS IN RELATION TO PENSION REFORM : Arising out of both the historical analysis and the future projections, the study focuses in on the situation in the EU, with the remainder of the study devoted to analysing the main pension reform options which are available to EU policy makers. Detailed empirical assessments of the effectiveness of these various reforms are presented in terms of the growth, budgetary and income distribution effects of introducing the respective reforms. Since a large amount of options are discussed, it was important to avoid confusion by presenting them under broad categories, with the PAYG / systemic reform breakdown utilised in this regard. It should be pointed out that this categorisation was only used for exposition purposes and it is clear, in the case of the PAYG reforms section, that reforms are included which could equally be mentioned under the systemic heading. This is particularly the case with the labour market reforms aimed at increasing participation rates, reducing structural unemployment and the increase in the retirement age - such reforms are necessary for alleviating the growth loss to be suffered over the coming decades due to ageing and the implementation of these reforms would be equally beneficial to both the PAYG and funded systems. With this in mind the rest of the paper should be seen as seeking to answer two basic questions about pension reform:

- **QUESTION 1** : If governments wished to retain the PAYG system what would be needed to ensure that the present cost of the system (as measured by the implicit debt of the system as a % of GDP) to stay at its 2000 level over the next 50 years. This analysis is also of course important for the assessment of the funding option since one of the main factors to be considered in terms of a shift to funding are the transition costs of abolishing the PAYG system i.e. the transition burden.

- **QUESTION 2** : The second question addressed in the paper was whether a shift to funding, despite the clear gains to be made from such a move in terms of rates of return, would be economically justifiable given the transition burden and any additional costs often associated with funding in the areas of administration, tax incentives and insurance.

QUESTION 1 : WHAT POLICY MEASURES ARE NEEDED TO BRING THE PAYG SYSTEM BACK INTO BALANCE : Bearing in mind the qualifications expressed in the previous paragraph regarding the excessively simplistic breakdown of the various pension reforms into PAYG / systemic, the study goes on to assess what would be needed to stabilise the PAYG pension system. In this regard a number of individual and combined reform scenarios were presented. Regarding the individual reforms, the impact of two options were analysed: namely (i) a reduction in the generosity of the PAYG pension system brought about through changes in the systems replacement ratio and (ii) an increase in the retirement age. With regard to reductions in generosity, while such a reform option provides clear budgetary gains, less success is discernible in terms of easing the growth loss associated with ageing and income distribution difficulties are evident. No such problems exist with the retirement age simulation which suggests large gains in terms of growth (i.e. a gain of over 13 per cent relative to the baseline), budgetary sustainability and income distribution. With regard to the fiscal gain, the retirement simulation suggests that the public expenditure impact of an increase in the effective retirement age is of the order of 1 for 1 (i.e. for each additional year worked before retiring, the public expenditure impact on pensions is reduced by close to 1 percentage point of GDP). Of all the reforms analysed in Section 3 of the paper, a strong preference is expressed for an increase in the effective retirement age, since an extension to the average working life is the only one of the reforms scrutinised which simultaneously meets the three policy objectives of boosting growth, reducing budgetary pressures and being politically sustainable in terms of income distribution changes. Given these significant gains, it is hardly surprising that this paper would strongly support the growing calls in the literature to go even further than the present proposal of increasing the effective retirement age to 65 and in fact link the latter to changes in life expectancy.

In addition to the individual reform simulations, the paper also assessed the impact of 2 "packages" of reforms aimed at addressing the problems of the PAYG system, firstly the "EPC" scenario which provided an assessment of the impact of the labour market and pension generosity assumptions underlying the EPC's recent ageing work, and secondly a set of reforms which included the EPC assumptions plus an increase in the effective retirement age. The reforms outlined in the "EPC" scenario are clearly significant (with strong ambitions in terms of boosting participation rates, reducing structural unemployment and curbing the generosity of pensions) and constitute a welcome step in the right direction but according to the simulations do not go far enough either in terms of bringing the PAYG pension system back into equilibrium or in terms of overcoming the negative consequences of ageing in terms of economic growth. Both of the latter objectives could however be achieved if, in addition to the EPC reforms, the effective retirement age was brought back up to the statutory age. In fact, such a comprehensive package of reforms (i.e. "EPC" reforms + an increase in the effective retirement age) has, on its own (i.e. without recourse to any systemic changes), the potential to more than fully offset the negative effects of ageing in terms of standards of living and in terms of ensuring that government expenditure on

pensions will be stabilised at its 2000 level of 10 ½ per cent of GDP over the next 50 years, rather than increasing by 7 percentage points as predicted in the baseline scenario.

QUESTION 2 : IS A SHIFT TO FUNDING JUSTIFIED GIVEN THE SIZE OF THE TRANSITION BURDEN AND THE POSSIBLE ADDITIONAL COSTS IN TERMS OF ADMINISTRATION, TAX INCENTIVES AND INSURANCE ? : In addition to the parametric reform simulations, the ageing model was also used to assess the possibility of a shift to funding, with three specific options for systemic reforms being analysed: namely (i) a 100 per cent switch into a, compulsory savings, funded system; (ii) a 100% switch into a, voluntary savings, funded system; and (iii) a partial (25 per cent) move to funding combined with reforms aimed at stabilising the transition burden. While the models baseline simulation suggests that the present return differential in favour of funding would broadly persist over the next 50 years, this differential would contract considerably if there was to be an immediate 100 per cent shift into funding, although this rate of return effect would be neutralised if the transition period to funding was to be a long one. This is an important point since small changes in the differential provoke large adjustments in terms of the respective costs of the individual pension systems. From a baseline differential of around 3 ½ percentage points, the differential would fall to roughly 2 ¾ percentage points if there was to be an immediate abolition of the PAYG system.

In addition, the simulations suggest that it would be politically difficult, at the EU level at least, to go for an immediate 100% move to funding since the transition burden from the PAYG system is so high. The first systemic simulation suggests that the burden on workers would be considerable, with the social security contributions needed to finance the transition burden only falling slowly over the next number of decades and with workers forced to save an additional 12-20 per cent of their wages to provide for their own pensions outside the PAYG system. However, as Graph 17b in the text makes clear once the transition burden has been cleared, after about 25-30 years, the gains from funding are very considerable, with an equilibrium contribution rate for the funded system in 2100 of 18% compared with 33% for the PAYG system.

Another big uncertainty for policy makers is how much of the natural advantage for the funded approach will be eroded by the need to take cognisance of the additional costs of using a funded system, namely the government tax incentives which may be needed to boost the take-up of the various schemes[43], the costs of any insurance-based guarantee fund which may be required to reduce the inherent risk in funded systems, as reflected in the high degree of volatility of returns from defined contribution pension plans, and finally the additional administration costs often associated with certain variants of the funded approach. Even if one accepts, after taking account of all the latter factors, the persistence over time of the positive return differential in favour of funded systems, which is in fact a necessary condition for a dynamically efficient long run growth path, systemic reform in the EU aimed at exploiting this cost advantage will be complicated politically by the fact that allowing for the, above mentioned, large transition debt burden inevitably means that at least one generation

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[43] A crucial ingredient in making funding economically beneficial is the need to ensure an increase in the savings rate either by making the funded pillar mandatory or by providing tax incentives to boost the voluntary pillar.

of workers must lose in any transition process.   Clearly therefore what we have in the EU is a classic transition problem, with the long term gains from funding significantly outweighing the short run transition costs. What governments therefore need to focus their efforts on is on devising the most optimal transition path to funding.

PREFERRED EU PENSION REFORM SCENARIO : PROGRESSIVE 100% SHIFT TO FUNDING USING A TWO STAGE OPTIMAL TRANSITION PATH : While an immediate full shift to funding would appear difficult in terms of the size of the transition burden to be serviced by EU workers, a smaller shift of, for example, 25 per cent appears feasible, as the first stage of a two stage process aimed at a full move to funding. This endorsement of the funded approach reflects firstly the baseline simulation forecast of a continuing advantage in favour of funding in terms of the rate of return differential relative to the PAYG system and secondly, the possibility of some additional growth gains from funding due to favourable labour supply and savings effects. This first stage on the road to funding should also be combined with a broad range of labour market, retirement age and pension generosity reforms aimed at stabilising the PAYG system which would produce the double gain of firstly, reducing the burden imposed on workers in the move to funding and secondly, boosting the growth rate gains considerably due to the strong expansion of the EU's labour supply. Such a scenario is assessed in the final systemic simulation presented in Section 5.3, with, not surprisingly, strong gains for all the key policy variables which are targeted, namely a 28 per cent increase in the level of GDP compared with the baseline, a substantial reduction in the transition burden imposed on workers and overall gains in terms of the consumption of both the working age population and pensioners. The final stage of the shift to full funding should be implemented as soon as circumstances permit whilst also bearing in mind that the mechanics of any shift to funding need to be carefully examined in order to ensure that the natural benefits of this approach for contributors and for the economy generally, are not partially or, in some cases, completely eroded by the transition costs involved.

FUNDED SYSTEM SHOULD HAVE PUBLIC + PRIVATE PILLARS (DISTRIBUTION TO BE DECIDED NATIONALLY): A fully funded system should however have both public and private pillars with the percentage breakdown determined at the national level. The present PAYG system should be replaced by a compulsory, defined benefit, funded system with the social security contributions paid into the present PAYG system being simply diverted to the new funded pillar. This suggestion not only has the attraction of avoiding any serious disruption to the present arrangements but also has advantages in terms of its compulsory nature and the fact that the taxation system provides an extremely low administration cost route to operationalising this proposal. It also eases fears regarding a mass privatisation of the pension provision function, with this policy proposal simply opening up the possibility of lower pension financing costs by in effect individualising the present PAYG system, thereby increasing transparency and possibly incentive effects.   The remaining pillar of the pension system should be set up as a voluntary, defined contribution, funded system run by the private sector, with clear guidelines laid down by governments on a range of issues, including normal prudential provisions and other issues such as "appropriate" levels of administration costs.

CASE FOR FUNDING IS PERSUASIVE ALTHOUGH PAYG REFORM IS GOING IN THE RIGHT DIRECTION OF GREATER TRANSPARENCY AND ACTUARIAL FAIRNESS: From the

paper it is clear that the range of pension reform options available to governments is plentiful but a lot of the research which is published in this area, justifiably in the view of the authors of the present paper, underlines the superiority of the funding option as a system for retirement income provision. From this paper's analysis it is clear that the return differential in favour of funding is significant and that although many of the other, often quoted, advantages of funded systems can to a certain extent be provided by the PAYG system by addressing existing design flaws, it is clear that a majority of the EU's member states have, as yet, not fully tackled these concerns. However, governments who do not wish to contemplate a move towards widespread funding can introduce many sensible policy adjustments to their existing PAYG systems aimed at making current public pension systems more sustainable. The undertaking of a range of parametric reforms aimed at increasing transparency and improving work incentives would be particularly helpful in this regard, with particular gains to be achieved by introducing a clear actuarial link between PAYG contributions and benefits. Reforms along these latter lines have in fact already been introduced in countries such as Sweden and Italy, with their "notional" defined contribution schemes underlining the fact that it is the incentives built into the pension system which is important rather than the financing method per se. Such reforms also help dispel the notion that social security contributions paid into a PAYG scheme are simply another form of taxation, compared with similar pension fund contributions which are clearly seen by workers as savings for retirement.

POLICY MAKERS MUST FOCUS THEIR ATTENTION ON THE SAVINGS / GROWTH EFFECTS OF THEIR POLICY ACTIONS IN ORDER TO ENSURE AN OPTIMAL TRANSITION PATH TO FUNDING : On the assumption that governments do decide to move towards a fully funded pension system, this study underlines the importance of keeping the savings issue to the forefront of discussions since this is the factor which will ultimately decide the success of a funded approach[44]. In this regard, while credible arguments can be made in favour of funded schemes regarding their potential benefits in terms of savings, unfortunately a review of the empirical literature in this area points to no conclusive evidence to this effect[45]. In addition, from the simulations which have been carried out in this paper it would appear that without incentives on behalf of governments or without making part of the savings mandatory in some way, the boost to overall savings will be muted and could in fact lead to serious underfunding problems in terms of future retirement income provision. These latter concerns constitute one of the main reasons for retaining the compulsory savings part of the present PAYG system in any future funded system.

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[44] This is a point which is underlined in the Feldstein and Liebman chapter on "Social Security" for the forthcoming Handbook of Public Economics "It is clear that simply shifting the composition of the existing Social Security trust fund from government bonds to private securities without any increase in national savings would raise the rate of return to the Trust Fund, thereby lengthening the period before its balance is exhausted, but it would do nothing to increase national income. The extra return earned in the Trust Fund would be balanced by the lower return earned by those who sold the private securities and purchased government bonds. Any gain to national income from increased investment must be the result of increased national savings. Indeed, if national savings is increased, either by requiring individuals to contribute to an enlarged fund or by using a budget surplus that would otherwise be used to finance public or private consumption, it does not matter whether those funds are invested in private stocks and bonds or in government securities."

[45] According to Barr (2000) in a review of the literature in this area "The magnitude of the impact of funding on growth is controversial. Though there is some empirical evidence that funding contributes to higher savings in the United States, there is no robust evidence of a similar effect elsewhere".

Furthermore, while a politically feasible shift to funding will bring significant gains in terms of budgetary sustainability, the size of the growth gains, as mentioned earlier, should be kept in perspective, with a direct comparison between a compulsory funded and a compulsory PAYG system yielding a growth rate gain of 0.1% per year over the next 50 years (with an upper limit of the order of 0.2%). These direct growth rate benefits from a shift to funding are boosted in the optimal transition path scenario by the measures taken to stabilise the PAYG system, especially the labour market and retirement age changes. In this context, regarding the overall GDP gain of 28 per cent from the first stage of the two stage shift to funding (i.e. the 25% partial shift), by far the largest proportion of the gain clearly emanates from the labour supply reforms, with the increase in the effective retirement age being the single most potent pension reform option.

OFFSETTING THE NEGATIVE GROWTH EFFECTS OF AGEING POPULATIONS WILL THEREFORE REQUIRE MUCH MORE THAN A SHIFT TO FUNDING - LABOUR MARKET REFORM + AN INCREASE IN THE EFFECTIVE RETIREMENT AGE MUST ALSO FORM PART OF THE PACKAGE OF MEASURES TO BE TAKEN : To summarise therefore, while a shift to funding will ease the growth loss from ageing, it is important that this shift is accompanied by significant labour market reforms in the EU which, independent of the pension regime in place, is vital for offsetting the growth loss associated with ageing. It would be a mistake to think that while funding may bring some labour supply and savings gains that these will be of a magnitude necessary to offset the growth loss. This can only be achieved by a package of reforms, including the shift to funding, which are aimed at boosting labour force participation rates, reducing structural unemployment and increases in the effective retirement age.

Consequently, while the growth gains from funding are not insignificant, on the basis of the simulation results it appears that what is even more important from a growth perspective is that governments introduce the fundamental real economy measures which are necessary for economies to adjust to the changes brought about by ageing populations. In terms of pension reform, ageing has significantly altered the underlying economics of the pension system and it is incumbent on policy makers to bring the system back into a new equilibrium which reflects the twin "certainties" of ongoing increases in life expectancy and lower birth rates compared with previous decades. In this regard, in addition to a shift to funding and labour market reforms, action may be necessary to firstly bring the relationship between the number of years spent in employment relative to the years spent in retirement (i.e. the passivity ratio) back towards the levels witnessed in the 1960's and 1970's, and secondly at the level of economic policy to recognise that whilst budgetary sustainability is an important measuring rod for pension reform measures, policy makers must retain economic growth considerations as their central objective.[46]

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[46] It should be stressed that the simulation results presented in this paper endorse the findings of mainstream empirical research, especially with regard to the large gains to be achieved from an increase in the effective retirement age and also with regard to pension policy reforms which focus on the need to sustain and promote economic growth. In addition, the policy course suggested in section 6 of a gradual shift to funding is also a position which commands considerable support in the literature. In this regard, despite the initial transition burden, funding is still the most attractive method of pension financing given the significant longer run cost advantage which it provides. Finally, this favourable return differential is likely to persist over time as long as the practical operational details of any shift to funding are carefully scrutinized.

Based on Eurostat's latest EU population projections[47] the analysis in this paper would suggest that the following are the key conclusions to be retained:

- **1. A Gradual 100% Shift to a FUNDED SYSTEM IS THE PREFERRED OPTION** : A gradual 100% move to funding in the EU is justified for two essential reasons :
  - **firstly**, a retirement income regime which is based on a pure transfer system such as PAYG can ultimately only continue to operate in an environment of growing populations since with a lengthening in life expectancy, and consequently larger numbers of pensioners to support, the PAYG system needs growth in the working age population to sustain it. On the basis of Eurostat's central population projections these conditions will not hold over the coming decades, with in fact the situation actually worsening in terms of growing dependency burdens. If one accepts these population projections the intergenerational strains on the PAYG system will become increasingly unbearable with the strong possibility of future workers actually getting negative returns from their social security contributions to the PAYG system.[48]
  - **secondly**, even if the demographic projections turn out better than expected, a system of retirement income provision based on funding is on balance economically superior to that of a PAYG system. While it must be accepted that the empirical supporting evidence in favour of positive spillover effects from funding on labour supply, savings and financial market gains is far from convincing, it is the considered view of the authors that at least funding offers the opportunity to reap these additional growth gains, with it incumbent on policy makers to consider this possibility given the type of growth challenges which ageing populations are going to present. While being deliberately cautious in terms of the growth effects from funding, the present study suggests that a shift from PAYG to funding could yield an annual average growth rate gain of 0.1% or possibly 0.2%, each year over the next 50 years,

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[47] Since Eurostat's central demographic projection underpins all the analysis in this paper, future work will concentrate on devising the most optimal transition path to funding in the face of demographic uncertainty. In this regard a demographic sensitivity analysis will be undertaken to assess the implications for the transition path from using the pessimistic and optimistic variants of Eurostat's projections. However, while the outlook may look a little worse or a little better, there is no denying the case for reform - it is only the depth of the reform process which is in question. In this regard, policy makers would do well to remember that the degree of uncertainty associated with population projections is much smaller than for a lot of other economic forecasts. While uncertainties clearly exist regarding long term demographic trends, 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.

[48] The question of intra- and intergenerational burden sharing is an important one to bear in mind and the extent to which the political underpinnings of the present PAYG system, both within and across generations, will be able to withstand the extent of the age-related budgetary 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 to 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.

with these annual gains being significantly higher at over ½ a percentage point if pension reform is accompanied by the EPC announced labour market reforms plus an increase in the effective retirement age.

- 2. **POLICY MAKERS MUST FOCUS THEIR EFFORTS ON DESIGNING AN OPTIMAL TRANSITION PATH, OVER MORE THAN ONE GENERATION OF WORKERS, BASED ON GROWTH, BUDGETARY AND INCOME DISTRIBUTION CONSIDERATIONS** : In the context of the EU situation, given the size of the transition costs of moving from the predominantly PAYG pension system which presently exists in the EU (roughly 90% of the total) to a funded system, coupled with justifiable concerns in relation to the possible additional administration, insurance and tax incentive costs which may be associated with a voluntary, defined contribution, privately run, funded system, the transition path to funding will clearly be a difficult one. To be optimal, in the sense of maximising the growth, budgetary and income distribution gains to be achieved, this shift to funding should only be attempted using a two-stage transition process:
  - Stage 1 : Stabilise the PAYG system + a partial shift to funding
  - Stage 2 : 100% funded system

  This two-stage process would have the main advantage that the transition costs to funding would be significantly eased, with the potential to accelerate the shift to funding if circumstances permitted, whilst at the same time the negative growth effects associated with ageing over the next fifty years would be more than wiped out, the present public expenditure fears would be allayed, and both pensioners and the working age population would both gain in the transition phase. These highly favourable effects result both from the changes in the pension financing method but also, and more importantly, from the labour market and retirement age reforms which underpin this scenario.

- 3. **NEW 100% FUNDED SYSTEM SHOULD HAVE PUBLIC AND PRIVATE SECTOR PILLARS :** The new 100% funded system should be a two pillared pension system split between the public and private sectors, with Member States free to choose the respective shares of each pillar on the basis of an appropriate country-specific mixture of economic, political and institutional factors. Regarding the public pillar, this would essentially replace the old PAYG system and would share many of the latter's features - namely be a defined benefit, compulsory savings, system with low administration costs. The essential differences with the old PAYG system would be that the new system would be an individualised, more transparent, system with a clear actuarial basis linking contributions to benefits. In addition, the actual management of the pension fund assets may be outsourced to specialised private sector pension operators with this outsourcing done on the basis of an open, competitive, tendering process. The private pillar should be a voluntary, defined contribution, system with the specific design features of this pillar being crucial to its ultimate success, such as the regulatory and competitive framework, normal prudential requirements and the avoidance of excessive administration costs.

KEY POLICY CONCLUSIONS

1. EU PENSION SYSTEM SHOULD IN THE LONG RUN BE 100% FUNDED FOR TWO KEY REASONS

**1 : AGEING IS DEVASTATING FOR THE COST OF PAYG PENSION SYSTEMS
+
STABILISING THE COST WILL REQUIRE POLITICALLY DIFFICULT REFORMS**

2. FUNDING IS ECONOMICALLY SUPERIOR TO PAYG AS A SYSTEM OF RETIREMENT INCOME PROVISION IN TERMS OF BOTH BUDGETARY SAVINGS + GROWTH GAINS

2. OPTIMAL TRANSITION PATH REQUIRES A TWO STAGE PROCESS DUE TO THE SIZE OF THE TRANSITION BURDEN IN THE EU

STAGE ONE

STABILISE THE PAYG SYSTEM + PARTIAL SHIFT TO FUNDING

STAGE TWO

100% FUNDED SYSTEM

3. 100% FUNDED SYSTEM SHOULD HAVE PUBLIC + PRIVATE PILLARS

PUBLIC PILLAR

REPLACES OLD PAYG SYSTEM

COMPULSORY, DEFINED BENEFIT, SYSTEM

PRIVATE PILLAR

VOLUNTARY, DEFINED CONTRIBUTION, SYSTEM

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An EU15 aggregate version of DG ECFIN's QUEST Model has been used for the scenarios. Concerning the medium and long run, the model can be characterised as a neoclassical growth model with its short run properties dictated by Keynesian features arising from adjustment costs and nominal rigidities. Details of the model specification can be found in Roeger (2000). One important modification has been made for the purpose of the ageing scenarios: in order to capture intergenerational issues the private household sector of the model has been disaggregated into working age population and retiree households, along the lines suggested by Gertler (1999). This is a generalisation to the Blanchard/Yaari life cycle framework which constitutes the standard specification in QUEST. The Gertler model can also be interpreted as a generalisation of simple overlapping generation models by allowing for realistic average lengths of life, work and retirement. This Annex discusses in particular the OLG modifications to the household sector

POPULATION DYNAMICS

In the model, individuals have finite lives and they go through three distinct stages of life: youth (0 - 20 years), work (21years - retirement age), and retirement (retirement age+1 - expected end of life). The number of children in period t is given by N^y. Each period bN^y children are born and average duration in childhood is $1/(1-\lambda^y)$ where λ^y is the fraction of young people turning age 21. Child population dynamics is given by

$$(1) \qquad N_{t+1}^y = bN_t^y + (1-\lambda_t^y)N_t^y .$$

The working age population in period t is given by N^w. Each period $\lambda^y N^y$ children enter the working age population cohort. The mean duration of staying in this cohort is $1/(1-\lambda^w)$ where λ^w is the fraction of the population in working age which goes into retirement within the current period. Thus the population of working age evolves over time as follows

$$(2) \qquad N_{t+1}^w = \lambda_t^y N_t^y + (1-\lambda_t^w)N_t^w . \qquad\qquad (1)$$

There are N^r pensioners at date t, they are joined by $\lambda^w N^w$ new retirees, while a fraction $(1-\lambda^r)$ incumbent retirees survive to the next period. This gives the following law of motion for the retiree population

$$(3) \qquad N_{t+1}^r = \lambda_t^w N_t^w + (1-\lambda_t^r)N_t^r . \qquad\qquad (2)$$

HOUSEHOLDS

Consumption of retirees and workers is proportional (up to variations in real interest rates) to financial and human wealth as implied by an intertemporal CES utility function. Retiree consumption is given by:

(4) $C_t^r = ar(A_t^r + S_t^r)$ (3)

Where A^r is financial wealth held by pensioners and S^r represents the present discounted value of pensions

$$S_t^r = \sum_{j=0}^{\infty}(1 + r_{t+j} + \lambda_{t+j}^r)^{-j} rep_{t+j} w_{t+j}(1 - tl_{t+j} - ssc_{t+j}) part_{t+j}^r N_{t+j}^r.$$ (4)

Notice, the finiteness of a pensioner's life is taken care of by including the probability of death in the discount rate. The higher discount rate results from a perfect annuities market (like in Yaari (1965) and Blanchard (1985)). The annuities market works as follows: each retiree turns over his wealth to a mutual fund which invests the proceeds. Those retirees which survive to the next period receive the total return, while those who die do not receive anything. Therefore the gross return of a retiree, surviving to the next period on his financial wealth is $1 + r + \lambda^r$. Pensions are proportional to net wages at rate rep_t, where tl is the labour tax rate and ssc is the rate of social security contributions. Only those retirees who have participated in the labour force are entitled to a pension, where the average participation rate of retirees is given by ($part_t^r$)

Each member of the working age population[49] also consumes a fraction of financial (A^w) and human wealth (H) net of labour taxes and pension contributions. A third element entering the consumption and savings decision of workers is the value of social security payments workers can expect once they retire (S^w).

$$C_t^w = aw(A_t^w + H_t + S_t^w)$$ (5)

with $$S_t^w = \sum_{j=0}^{\infty}(1 + r)^{-j} prob(ret_{t+j})\frac{ar}{aw}\hat{S}_{t+j}^r$$ (6)

S^w is the capitalised value of future pensions the worker can expect after retiring. This expression is composed of two terms, namely $prob(ret_{t+j})$ which represents the probability that the worker retires in $t+j$ and $\hat{S}_{t+j}^r$, the present discounted value of pensions of the average worker he can expect when he retires in $t+j$. Worker households evaluate future pensions with the ratio of the marginal propensity to consume in retirement and in work[50]. This reflects the value to a worker of being able to consume today from wealth to be received in retirement.

At each moment in time the sum of S^r and S^w constitute the unfunded liabilities of the PAYG system[51]. They are endogenously calculated by the model together with

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[49] This includes consumption of children.

[50] This ratio is close to 2.

[51] Corrected for the marginal propensity to consume differential in order to obtain the pure financial burden without utility evaluation.

time paths of the interest rate and wages, given the future evolution of the retirement age, life expectancy, the participation rate and the replacement ratio.

The transition to funding is modelled by phasing out the replacement rate of new retirees over the working life of the youngest worker cohorts, starting at the date of transition, while keeping the replacement rate of incumbent retirees at the historical level. A funded scheme for the current working age population is introduced by setting up an annuities market where each worker contributes a certain percentage of his wage income to a mutual fund which invests the proceeds. After switching into retirement the fund pays a pension to the worker. In order to allow comparisons with the PAYG system, the funded scheme is set up as a defined benefit scheme guaranteeing the same net replacement rate to pensioners as under the previous PAYG scheme. Given the replacement rate under the funded scheme and the evolution of average duration in retirement, the contribution rate (co_{t+j}) is determined by equalising at each date, the present discounted value of pension contributions

$$CL_t = \sum_{j=0}^{\infty} (1 + r_{t+j} + \lambda_{t+j}^w)^{-j} co_{t+j} w_{t+j} . \tag{7}$$

to the present discounted value of the funded pension ($PDV(SL)_t$) the worker can expect in the future

$$PDV(SL)_t = \sum_{j=0}^{\infty} (1 + r_{t+j})^{-j} prob(ret_{t+j}) SL_{t+j} . \tag{8}$$

where SL_{t+j} is the present discounted value of the pension from the mutual fund.

FIRMS

Firms in each region operate in a monopolistically competitive environment. Output (GDP) is produced with a constant returns to scale Cobb Douglas production function with capital, energy and employment as inputs.

$$Y_t = F(K_t, L_t)\Gamma_t = K_t^{1-\alpha} L_t^{\alpha} (e^{\pi t})^{\alpha} \tag{9}$$

Technical progress grows with an exogenous rate. As decision rules for investment and employment the standard neo-classical relations emerge linking factor demand to the level of output and real factor prices.

Capital stock changes according to the rate of fixed capital formation J_t and the rate of geometric depreciation

$$K_t = J_t + (1 - \delta) K_{t-1}. \tag{10}$$

Total investment expenditures are equal to investment purchases plus the cost of installation. The unit installation costs are assumed to be a linear function of the

investment to capital ratio with a parameter ϕ. Total investment expenditure is therefore given by

$$I_t = J_t\left(1 + \frac{\phi}{2}\left(\frac{J_t}{K_t}\right)\right).$$

(11)

In order to facilitate aggregation we interpret I as the physical requirement of a composite investment good. This composite good is composed of domestic and imported brands. These brands are combined using a CES technology which is identical to the CES sub-utility function of consumers. Workers are leaving firms at rate s. In order to recruit new workers, the firm has to open up job vacancies O_t and advertise actively. The recruitment costs for each vacancy is v_t and it is assumed that it evolves proportional to the nominal wage rate at rate v_0. It is assumed that firms can fill existing vacancies within one period. Employment thus changes according to the following equation

$$L_t = O_t + (1-s)L_{t-1}.$$

(12)

The corporate sector in country i maximises the net present value of its cash flow

$$V_t = E_t \sum_{j=0}^{\infty} \prod_{k=0}^{j} (1+r_{t+k})^{-1}\left\{(1-t_c)\left[Y_{t+j} - w_{t+j}L_{t+j} - v_{t+j}O_{t+j}\right] - (I_{t+j}^d + e_{t+j}I_{t+j}^f)\right\}$$

(13)

subject to the technology, the adjustment cost, the capital accumulation and the employment adjustment constraint. Define with λ^k and λ^l the multipliers associated with the constraint on capital and labour respectively. Differentiating the objective function with respect to $K_{t+j}, J_{t+j}^d, J_{t+j}^f, L_{t+j}$ and O_{t+j} (j=0,1....), gives the following system of stochastic Euler equations (subject to the transversality condition)

$$(1-t_c)(1-\alpha)\frac{Y_{t+j}}{K_{t+j}} = (r_{t+j}+\delta)\lambda_{t+j}^k - \frac{\phi}{2}\left(\frac{J_{t+j}}{K_{t+j}}\right)^2 - E_{t+j}\left[\lambda_{t+j+1}^k - \lambda_{t+j}^k\right]$$

(14)

$$\left(\phi\frac{J_{t+j}}{K_{t+j}}+1\right)p_t^c = \lambda_{t+j}^k$$

(15)

$$\left(\frac{1-\xi}{\xi}\right)^{\sigma}\left(\frac{I_t^d}{I_t^f}\right) = e_t^{\sigma}$$

(16)

$$(1-t_c)\alpha\frac{Y_{t+j}}{L_{t+j}} = (r_{t+j}+s)\lambda_{t+j}^l + (1-t_c)w_{t+j} - E_{t+j}\left[\lambda_{t+j+1}^l - \lambda_{t+j}^l\right]$$

(17)

$$\lambda_{t+j}^l = v_{t+j}(1-t_c)$$

(18)

Equation (14) is the equation of motion of the marginal shadow value of capital λ^k. Equation (15) is the first order condition for total investment and it implies that the cost of a marginal unit of capital, including both its purchase and adjustment costs, must equal the shadow value of capital λ^k. The cost of capital includes both the pure rental price and adjustment costs. Equation (16) determines the optimal choice of domestic and foreign investment goods as a function of the relative price. Equations (17) and (18) define the law of motion of the shadow value of labour and show that labour demand is a positive function of output and a negative function of total labour costs. Because it is costly for firms to fill existing vacancies, total labour costs are the sum of pure wage costs and vacancy costs. It will be assumed in our analysis that vacancy costs are proportional to wages at rate v_0.

LABOUR MARKET

Market clearing for goods and financial markets is assumed in this models specification since the focus is on the medium to long run results. Persistently high unemployment rates in Europe make it necessary to depart from the neo-classical specification of labour supply. Instead a standard bargaining and search framework (see, for example Pissarides (1998)) is used to model the labour market. By allowing for market power of workers/trade unions, persistent involuntary unemployment can be modelled within this framework since net wages are set as a mark-up over the reservation wage. The wage mark-up depends positively on labour market tightness. The reservation wage itself is determined by the level of unemployment benefits. The extent to which social security contributions are shifted onto wages depends crucially on how benefits are indexed to social security contributions. To the extent to which they are not indexed, workers try to shift contributions onto wages in order to preserve a mark-up. With full indexation of benefits, social security contributions would not distort wages. In the simulations a 50 per cent indexation of benefits to wages is assumed thus mitigating negative labour market effects from rising pension contributions. In effect this 50 per cent indexation rule means that workers regard only 50 per cent of their SSC's as savings, with the remaining 50 per cent perceived as simply another form of labour taxation. Labour force participation is kept exogenous.

In terms of a more detailed description of the labour market, as mentioned earlier we follow closely the search model discussed in Pissarides (1990, 1998). The basic incentive for search activities in the labour market by both workers and firms are the profit opportunities in present value terms which are associated with a successful job match for both parties. In the case of households, this is given by the difference between the present value of labour income a household can earn in the case of a successful current job match, versus the net present value of labour income in the presence of a failure, given by $\left(H^l - H^u\right)$.

Here we observe that the human capital of employed and unemployed households which we denote with H^l and H^u respectively is given by two arbitrage equations. The return from the human capital of an employed worker consists of three components: the current net wage rate, the expected capital loss from a job separation given by

$s(H^l - H^u)$, where s is an exogenous separation rate, and the expected capital gain from an expected change in H^l.

$$(\pi + r_t)H_{t,z}^l = (1 - t_l)w_t + s(H_{t,z}^u - H_{t,z}^l) + E_t[\Delta H_{t+1,z}^l] \tag{19}$$

Corresponding to this equation we can write an arbitrage equation for the human capital of an unemployed household as

$$(\pi + r_t)H_{t,z}^u = z_t + p(.)(H_{t,z}^l - H_{t,z}^u) + E_t[\Delta H_{t+1,z}^u] \qquad \text{where} \quad p(.) = O_t/(1 - L_t) \tag{20}$$

The return in this case consists of unemployment benefits, the expected capital gain from finding a job with probability p(.), and a capital gain from any expected change of H^u itself. Since we make the assumption that firms can fill vacancies within one period the probability of finding a job is equal to the ratio between vacancies and the number of unemployed workers. For the firm, the return from a successful job match is given by λ^l.

We assume that each firm employs many workers and is large enough to eliminate all uncertainty about the flow of labour. Both parties also know about the profit opportunities of the other players. Wages are determined by an implicit bargain at the individual level, i.e. the firm engages in Nash bargains with each individual worker by taking the wage of all other employees as given. Thus wage contracts are set such as to maximise the product

$$\underset{\{w_t\}}{Max}(H_t^l - H_t^u)^\beta (\lambda_t^l)^{(1-\beta)} \tag{21}$$

This agreement is based on the relative bargaining position of the two parties. The bargaining strength of workers is characterised by the parameter β (0≤β≤1) which determines the fraction of the total return from a successful job match going to workers. Maximising (26) with respect to w_t yields the familiar sharing rule for the division of the surplus where the fraction of the total surplus from a job match going to the worker depends on his bargaining strength

$$H_{t,z}^l - H_{t,z}^u = \beta(H_{t,z}^l - H_{t,z}^u + \lambda_t^l). \tag{22}$$

Using this sharing rule the following wage equation van be derived

$$w_t = (1 - \beta)\frac{z_t}{(1 - t_l)} + \beta\left(\alpha\frac{Y_t}{L_t} + v_t\frac{\Delta L_t + sL_{t-1}}{1 - L_t}\right). \tag{23}$$

According to this rule, wage costs are a weighted average of the reservation wage and labour productivity plus an additional mark-up term that depends positively on labour market tightness. From this wage rule together with the labour demand equation it can easily be seen that the gross wage rate is set by workers and firms in such a way as to guarantee a certain mark-up of net wages over unemployment benefits. The mark-up will generally depend on economic conditions, such as the unemployment rate for

example, but also on structural characteristics of the labour market such as adjustment costs for labour, the bargaining strength of trade unions etc[52].

GOVERNMENT

The government pays unemployment benefits and consumes domestic and foreign goods and services (G_t^d, G_t^f). These expenditures are financed by taxes on capital, labour and consumption as well as deficits. The tax rates on wages (t_l) and corporate income (t_c) as well as the consumption tax rate (t_v) are assumed to be constant. Alternatively, the government can issue debt. A debt rule which adjusts transfers to households such that a long run debt to GDP target is met guarantees the intertemporal solvency of the government. Thus the government budget constraint is given by

$$B_{t+1} = (1 + r_t)B_t + (1 - L_t)z_t + G_t^d + e_t G_t^f + T_t - t_l w_t L_t - t_c (Y_t - w_t L_t - v_t O_t) - t_v (C_t^d + e_t C_t^f)$$

(24a)

The government also manages a PAYG pension system where pension contributions are set in each period in such a way as to finance total pension expenditures for a given replacement rate. Given the replacement rate, the rate of pension contributions (ssc) are set as follows :

$$ssc_t w_t L_t = rep_t w_t (1 - tl_t - ssc_t) part_t^r N_t^r$$

(24b)

Lump sum transfers are adjusted proportionally to the gap between the debt to GDP ratio and its target level b_0 according to the following rule

$$\Delta T = -\psi_1 (\frac{B_t}{Y_t} - b_0) - \psi_2 (\frac{B_t}{Y_t} - \frac{B_{t-1}}{Y_{t-1}}) .$$

(25)

The government fixes its consumption as a share of GDP at rate g_0 and consumes domestic and foreign goods by maximising the same CES sub-utility function as consumers. Government consumption of domestic and foreign goods is thus determined by the following equation

$$\left(\frac{1-\xi}{\xi}\right)^\sigma \left(\frac{G_t^d}{G_t^f}\right) = e_t^\sigma .$$

(26)

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[52] It should be pointed out that this formulation is not restricted to union bargaining models but is a feature of many labour market models. Search models and efficiency wage models of the labour market imply similar wage rules. For an exposition see, for example, Pissarides (1995).

The market clearing conditions for the goods market in countries 1 and 2 are :

$$Y_{1t} = C_{1t}^d + C_{2t}^f + I_{1t}^d + I_{2t}^f + G_{1t}^d + G_{2t}^f \tag{27}$$

$$Y_{2t} = C_{2t}^d + C_{1t}^f + I_{2t}^d + I_{1t}^f + G_{2t}^d + G_{1t}^f . \tag{28}$$

All bonds and equity supplied by the domestic government and the corporate sector are held by domestic households. The market clearing condition for internationally traded bonds is

$$F_{1t} + F_{2t} = 0 . \tag{29}$$

Output prices in both countries serve as numéraire. The competitive equilibrium of this economy consists of a sequence of prices (r_t, r_t^*, e_t) and allocations $(C_{it}^d, C_{it}^f, I_{it}^d, I_{it}^f, G_{it}^d, G_{it}^f, K_{it}, F_{it}, B_{it})$ that satisfy the first order conditions of households and firms, the budget constraints of households, governments and firms and goods and bond market equilibrium conditions. Real wages (w_{it}) are determined by the wage contracting rule (23) and firms set employment optimally according to the first order condition (17-18). The labour market equilibrium can coexist with involuntary unemployment. Furthermore, the evolution of the economy is subject to initial conditions $(K_{i0}, L_{i0}, F_{i0}, B_{i0})$ and a sequence of fiscal instruments $(t_r, t_l, t_c, t_v \ b_0, g_0)$ as well as a rule that ensures sustainability of government debt. Interest rates, wages and the exchange rate also ensure that an intertemporal equilibrium condition holds between national saving and investment in both countries. Technical details concerning model solution can be found in Roeger and In't Veld (1999).

MODEL CALIBRATION

In order to assess some basic predictions of the model against observed correlation patterns we calibrate the model for two regions, namely the US and Europe (EU15). To select parameter values we largely follow standard procedures, i.e. we base these values on evidence from growth observations and some microeconomic evidence. In cases where this is not possible parameters are chosen close to those of existing studies. The rate of time preference θ is set equal to 0.01 and the intertemporal elasticity of substitution is set to 0.5 which is more consistent with micro studies rather than a log utility specification which is often used in macro studies. The output elasticity of labour is set equal to the average wage share. The depreciation rate is set to 2% per quarter which corresponds to the mean rate in our data set over the sample period. The adjustment cost parameter is more difficult to pin down on the basis of information on first moments only. It has, however, been noted before (see, for example, Mendoza (1991)) that the parameter φ has a crucial effect on the volatility of investment. It is therefore set in such a way as to make investment about 3 times as volatile in the US and twice as volatile in Europe. With respect to the separation rate s we draw on information provided by Layard et al. (1990) from data on gross labour

market flows. According to their figures the inflow rate into unemployment fluctuates narrowly around two per cent for the reported European countries per quarter. For the US they obtain an estimate of 6.6% per quarter. Our assumption that vacancies can be filled within a quarter is based on studies on vacancy duration. A study by van Ours and Ridder (1992) reports average vacancy durations of 45 days for the Dutch economy. Similar estimates can be found for Germany (see Erdmann (1990)). Blanchard and Diamond (1989) report durations of less than one month for the US. The parameter β referred to as the bargaining strength of workers is set to .5 for the EU and to 0.25 for the US.

The level of unemployment compensation determines the reservation wage. Unfortunately, internationally comparable figures on unemployment compensation are not easy to obtain, since countries do not only differ with respect to the replacement ratio but also with respect to benefit duration and coverage. To cover all these different aspects, Layard et al. (1990) have calculated expenditures on benefits per unemployed person as a per cent of output per worker for major OECD countries for the year 1987. According to these figures the ratio within Europe is highest for Denmark (42%) and lowest for Italy (4%) and no calculations are presented for Portugal and Greece. The European average is slightly below 20%. We therefore assume that unemployment benefits amount to roughly 40% of gross wages. The figures for the US suggest that the US replacement ratio is about half the European level. Given the fact that all other parameters have been chosen, the parameter vc_0 can be selected such that the model replicates the steady state unemployment rate in both countries.

We set the price elasticity of imports in both regions equal to one. A value in this neighbourhood can often be found in empirical studies on import and export equations. The share of imports in total GDP is set to 10% in both regions, which is the mean value over the period 1975 to 1992 for the US and extra EU trade. Finally, the labour and wage tax rates are taken from Mendoza *et al.* (1994).

TABLE 1. PARAMETER VALUES

	EUROPE	US	DESCRIPTION
UTILITY FUNCTION			
θ	0.01	0.01	RATE OF TIME PREFERENCE
ω	0.5	0.5	INTERTEMPORAL ELASTICITY OF SUBSTITUTION
σ	1.0	1.0	IMPORT PRICE ELASTICITY
ξ	0.9	0.9	SHARE OF DOMESTIC GOODS
TECHNOLOGY			
α	0.65	0.65	OUTPUT ELASTICITY OF LABOUR
δ	0.02	0.02	DEPRECIATION RATE
φ	8.0	5.0	ADJUSTMENT COST PARAMETER (INVESTMENT)
LABOUR MARKET			
S	0.015	0.066	SEPARATION RATE*
β	0.5	0.25	BARGAINING STRENGTH OF WORKERS
z_0	0.40	0.20	UNEMPLOYMENT BENEFIT REPLACEMENT RATIO
v_0	0.13	0.09	VACANCY COST (AS SHARE OF WAGES)
FISCAL PARAMETERS			
t_p	24%	23%	EFFECTIVE CORPORATE TAX RATE
t_l	37%	24%	EFFECTIVE LABOUR TAX RATE
t_c	26%	10%	EFFECTIVE CONSUMPTION TAX RATE
g_0	20%	14%	GOVERNMENT CONSUMPTION (% OF GDP)
ψ_1	0.025	0.025	DEBT TARGETING RATE
TR/Y	19%	9%	GOVERNMENT TRANSFERS (% OF GDP)

* Frequency with which workers change jobs.

ANNEX 2 : PREFUNDING WITHIN THE PAYG SYSTEM : INTERGENERATIONAL EQUITY OBJECTIVE

It is important to stress at the outset that there are many different variants of prefunding, with this particular reform variant being distinguished by two key aspects:

- firstly, the prefunding is carried out mandatorily through the taxation system thereby essentially creating a mixed system in the public sector by introducing a funded element into the unfunded PAYG system.
- secondly, its objective is not to increase the pensions of those actually making the contributions, which is the more normal variant of prefunding/funding, but to ensure greater intergenerational fairness.

The basic rationale underlying this proposal is that workers pay SSC's at a rate above the required equilibrium contribution rate (ECR) for a period of years in order to build up a stock of assets which would then be invested with the objective of using the returns to reduce the SSC burden on future generations. Prefunding in this sense recognises that the present generation, by having fewer children relative to the previous generation, has an obligation to ease the future SSC burden which will be imposed on their children through the PAYG system.

The shock given to the model is a labour tax increase of 5 percentage points for 5 years which builds up a permanent capital fund[53], the interest on which is used to lower future SSC's. The results of this simulation are mixed, with future reductions in SSC's and the income distribution consequences both being reasonably positive but with the overall GDP effect in 2050, relative to the central scenario, being zero to negative. This latter effect is perhaps not that surprising when one realises that in economic terms this variant of prefunding amounts to little more than a transfer of funds from one generation to the next, with the simulation results suggesting that the impact in terms of overall national savings over the period as a whole would be neutral to negative.

In the first five years of the simulation, when the fund is being accumulated, there is an overall negative effect on growth, with the negative labour market impact of the increase in labour taxes more than outweighing the positive effects of the additional "forced" savings (due to higher taxation levels) which are positive for investment. Over the remaining 45 years of the simulation up to 2050, the positive labour market effects coming through from the reduced level of SSC's are offset by a wealth effect in consumption which reduces savings and capital accumulation and consequently growth. This wealth effect is triggered by the fact that future generations perceive the created fund as an increase in the wealth/assets of the overall household sector (i.e. a form of bequest rather than personal savings). While this wealth effect is theoretically plausible, the extent of the effect is essentially an empirical issue with the present simulation results suggesting that the size of the wealth effect would be sufficient to offset any positive growth effects emanating from the fall in SSC's, with the overall effect on growth from the creation of the fund being close to zero.

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[53] This permanent fund can equally be set up in the public or private sectors with the results being identical in both cases, with only the transmission effects being different in terms of the impact of the fund on the net wealth of households and consequently on the latter's consumption and savings patterns.

Given this lack of a clear economic justification for this variant of prefunding, governments would need to be sure that politically this approach could be sold from an inter-generational equity point of view. While workers may in principle agree with the logic of easing the burden on the next generation, in practice it may be more difficult to get support for an increase in labour taxation of 5% points for a period of 5 years at a time when taxation levels on workers are already at very high levels in many Member States. In addition, it could be argued that there may be greater disincentive effects associated with such additional SSC's since, with workers already having difficulty distinguishing SSC's (which should logically be perceived by workers as a form of enforced savings for funding pensions) from general labour taxation, they could perceive these additional payments even more negatively since they themselves will not receive any additional pension benefits. Finally, such a move towards this type of prefunding would also appear to go in the opposite direction of recent, positive, moves towards ensuring greater actuarial fairness in many national pension systems, with closer links being established between pension contributions and future benefit entitlements.