Population ageing and its effect on GDP.
Can increased labour productivity and/or employment compensate for the shrinking working age population?

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Contents:

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1. Introduction

The world population is increasingly becoming 'old'. Between 1950 and 2000 the proportion of 'older people' — those aged 60 and over — in the world has grown from 8.1 per cent to 11.0 per cent. According to the UN, by 2050 the proportion of older people in the world could be as high as 25 per cent (UN, 2005).

The fact that the population age structure is becoming older is referred to as 'population ageing'. The phenomenon can be observed in all countries and continents. However, so far, actual proportions vary widely. And so are the direct causes for the increases. By and large, in the developing countries, where the proportions are still relatively low (about 9% for Asia and Latin America and the Caribbean; a mere 5.2% for sub-Saharan Africa) [1], the main cause for the increases is the decline in fertility; on the other hand in the more developed countries, with much higher proportions (12.4% for Northern America; 20.2% for Europe), the immediate cause is an increase in life expectancy, more specifically a lowering of mortality at higher ages (Schoenmaeckers, 2009).

Individual countries and international organisations [2] are becoming increasingly aware of the vast consequences that 'population ageing' may have on societies. As can be expected, given the vast differences in their socio-economic situation countries face a variety of challenges (Schoenmaeckers & Vanderleyden, 2009).

One serious concern of the richer developed countries is that an older age structure would undermine the sustainability of the social security systems. The increasing numbers of older people would put a burden on the existing pension systems (pay-as-you-go systems are only sustainable on the condition that the younger generations are more numerous than the older ones) and on health care (older people are more vulnerable and therefore would cost more). Furthermore, the shrinking numbers of people in the work force would imply a reduction of economic output and hence a decrease in GDP. Frequently heard remedies would be keeping people longer in the work force (i.e., to increase retirement age) and/or to compensate for the shrinking numbers in the work force by attracting more migrants. However, as research results indicate, increasing the retirement age is not very popular among European citizens (Schoenmaeckers *et al.*, 2006). As for migration, over the years, the numbers needed may be that vast that it would not be a realistic solution (not to speak about the fact that to some citizens the presence of non-European migrants is not always a welcoming idea).

It is the purpose of this paper to point that other, more 'down to earth' solutions exist. Increasing activity rates and labour productivity — the two corner stones of GDP — may largely (albeit not completely) offset the negative consequences of 'population ageing' on the economy. The attractiveness of this alternative solution is that it should be acceptable to all citizens (for some, increasing retirement age may be regarded as putting the clock back to pre-Bismarckian times [3]).

The paper is not innovative to the extent that it is largely an up-date of an earlier study by Schoenmaeckers (2005) of which the results were presented at the European Population Conference organised by the Council of Europe in Strasbourg on 7-8 April 2005 (and where it was very much welcomed by the present policy makers).

Contrary to the study prepared for the Council of Europe, which included data for all Council of Europe member states, this paper is limited to the situation in the EU Member States [4].

The paper starts by giving an overview of the differences in the demographic situation between the 15 'old' and the 12 'new' Member States (paragraph 2). In the next paragraph (paragraph 3) the likely consequences of an older age structure on GDP are explored: activity rates and labour productivity are

being kept constant at their levels in 2001 while demographic change correspond to the latest population projections prepared by EUROSTAT (Giannakouris, 2008). The 'core' of the paper is presented in paragraph 4: what level of GDP can be expected with increased levels of activity rates and labour productivity? Different scenarios are applied; each scenario corresponds to a combination of a specific level of activity rates and of annual growth in labour productivity. A basic (and realistic) scenario is derived from the observed activity rates in the Scandinavian countries — called the 'Scandinavian' model.

To conclude, there are some afterthoughts with respect to the increase in GDP per capita and the effect of migration on the dependency ratio (paragraph 5) and some suggestions to policy makers (concluding paragraph 6).

Finally, the reader should note that the idea of the paper stems from long before the current financial and economic crisis. In the view of its authors this does not make it less relevant. It has never been the intention to make a forecast of economic evolution. We repeat that the main purpose of the paper is to present an alternative to 'popular' solutions in coping with 'population ageing'. In fact, we believe that the solutions that are presented here should be taken seriously before considering others. We hope that this will become clear in the following lines.

2. The EU: A socio-economic union with two demographic regimes

In many social, cultural, and certainly economical aspects the 27 EU Member States are still a quite heterogeneous lot. This is also the case with respect to demographics. Combined they may stand out as quite distinctive with respect to other geographical groups (including the Northern America countries) but there are still remarkable differences in fertility and mortality between the individual countries. One divide that can not be ignored in the present paper is the East-West divide, or the difference between the 15 'old' Member States (the more affluent countries) and the 12 'new' Member States (the countries with 'economies in transition'). The differences between both groups of countries become apparent by just looking at the proportions of older people.

Figure 1 presents the prospected evolution in the proportion of people aged 65 and over and of those aged 80 and over in the EU Member States from 2008 to 2061. The data stem from EUROSTAT's 'convergence scenario'.

On average, in 2008 the EU12 countries had a somewhat lower proportion of 65-year olds than the EU15 countries: 14.6 per cent compared to 17.7 per cent. In the next decades, both groups will experience a significant increase in their proportions. The difference between the groups is, however, expected to reverse and the gap to widen. By 2060, the proportion of 65-year olds in EU12 countries could be as high as 34.7 per cent; for the EU15 countries, by that time, it would be a 'mere' 30.0 per cent.

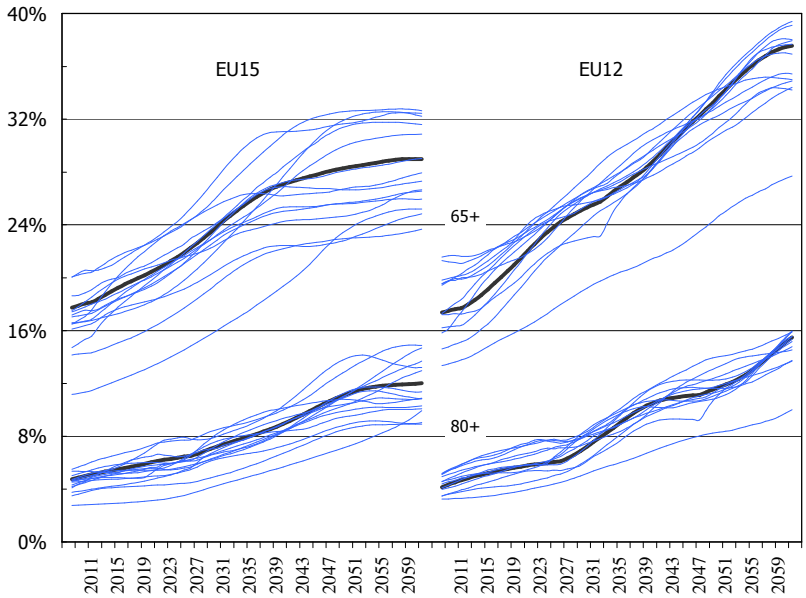
On the other hand, both groups of countries have in common that the increase in the proportion of elderly will come to an end. For the EU15 countries, the attenuation already starts some 25 years from now, between 2035 and 2040. For the EU12 countries, this will not happen before the end of the 2050s. The explanation lies in the differences (and the changes) in fertility.

The percentage of 65-year olds is very sensitive to changes in fertility (this is, for example, illustrated in Schoenmaeckers, 2009). In the EU15 countries, the increase is the result of the drastic decline in fertility that started in the 1960s (to under replacement level), which has become known as the 'second demographic transition (Lesthaeghe & Van de Kaa, 1986; van de Kaa, 1987). This rather sudden (and

unexpected) decline has provoked an imbalance with the relatively large number of births of the 1950s, known as the 'baby boom'. The result has been an increase in the proportions of older people. By 2030, the 'baby boomers' will have reached age 80 and their weight in the population will gradually taper off — and, eventually, so will the increase in the proportion of older people.

Figure 1 – Prospected evolution of the proportion of people aged 65 and more and of the proportion of people aged 80 and more in the Member States of the European Union according to EUROSTAT's 'convergence scenario', by sub-group (EU15, EU12), 2008-2061

Source: Europop2008 (EUROSTAT, 2008)



Note: Thin lines correspond to individual country estimates; thick line to weighted average in each sub-group

The situation in the EU12 countries has been somewhat different. The Eastern European countries have not experienced a post-war 'baby boom' as the EU15 countries. On the other hand, towards the end of the 20th century fertility declined even further. By the turn of the century, 8 out of the 12 'new' Member States (67%) had experienced fertility levels below 1.3 children. Other Southern European countries such as Greece, Italy and Spain — all known as very catholic or Christian-orthodox countries —, experienced similar low levels. Until then, such low levels had never been heard of. The new phenomenon has been given the name of 'lowest low fertility' and has been the subject of various studies (see, for instance, Kohler *et al.*, 2002).

Also with respect to mortality there are marked differences between the EU15 and the EU12 countries. By the turn of the century on 'average' (we are using here the median value) life expectancy (both sexes) in EU12 countries was about 5.5 years lower than in the EU15 countries, i.e., 72.5 years vs 79.0 years. It has not always been like this. In the 1960s both groups of countries experienced quite similar levels of life expectancy, of 69.5 and 70.2 years, respectively. The explanation would be the collapse of the health care systems that many countries with 'economies in transition' experienced in the aftermath of the ending of their communist regimes (Bobak, 1999). As a result, by 2008, EU12 countries showed in relative terms much lower proportions of people aged 80 and over than EU15 countries, a mere 3.1 per cent as opposed to 4.7 per cent (see Figure 1) — or about 35 per cent less [5].

- ***EUROSTAT's 'convergence' scenario***

One finds the differences with respect to mortality and fertility between the EU15 and the EU12 countries reflected in the 'convergence' scenario. The 'convergence' scenario corresponds to the 'most likely' scenario in EUROSTAT's latest population projections (Giannakouris, 2008). The basic assumption of the convergence scenario is that by 2150 all EU Member States will experience the same levels of life expectancy and fertility. As shown in Figure 2, between 2010 and 2060 [6] the 'gap' between both groups of countries is indeed narrowing. In essence, EUROSTAT's convergence scenario is quite similar to the assumptions that underline the latest *Population Prospects* prepared by the UN (UN, 2005) [7].

The fact that both the UN and EUROSTAT apply similar assumptions in their projections should not be a surprise. According to these authors the question is not that much whether convergence will take place, but rather when this will happen. One may also question the actual levels that are used.

With respect to fertility, both the UN and EUROSTAT assume a gradual increase to close to replacement level (2.1 births). Given the current levels that are observed — in both EU15 and EU12 countries — one may question the validity of this assumption. On the other hand, some countries (Denmark, Finland, France, Sweden, the UK) [8] show (again) TFR-values of above 1.8 (France as high as 1.98). Moreover, expect for the UK, all these countries show an increase with the level they experienced about 20 years ago. Some increase toward replacement level is therefore not to be excluded [9]. However, as is shown in Figure 2, for most EU12 countries also a modest level of close to replacement is still a long way to go; according to the 'convergence' scenario, by 2060 with a median value of 1.53 most countries will still experience a TFR-value that is substantially below replacement.

Figure 3 (and the adjoining table) presents an overview of the prospected changes in population size and in the age structure (by broad age groups) in the EU15 and the EU12 Member States resulting from the 'convergence' scenario.

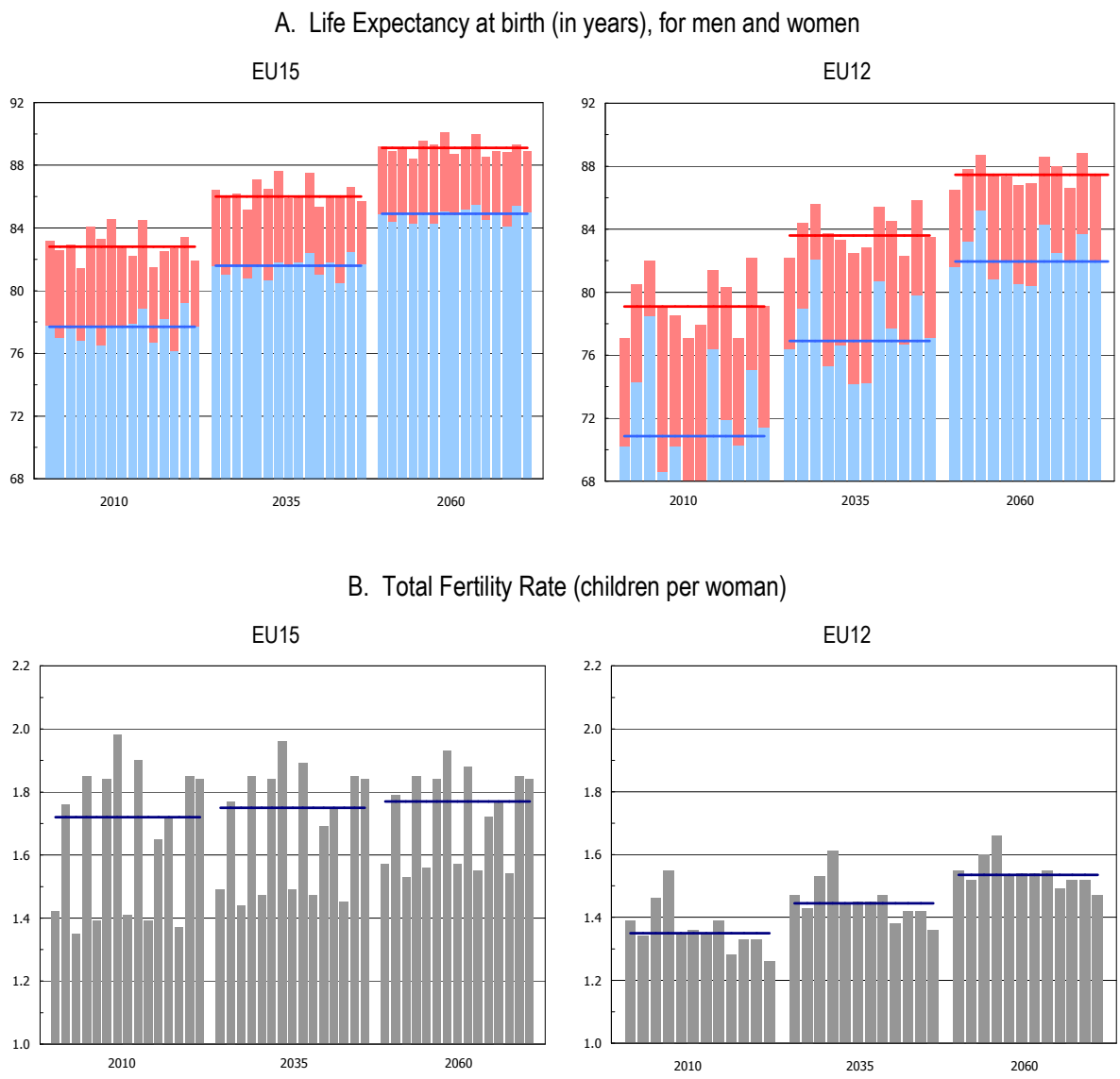
In the next decades in both groups of countries populations will become much older. In the EU15 countries, by 2060, the 65-year-olds will represent 30 per cent of the entire population. This is an increase by over 60 per cent compared to the situation 50 years earlier (see panel B). In the EU12 the percentage of 65-year-olds will be no less than 35 (!) per cent — an increase by 134 per cent. The change in the proportion of 80-year-olds is even more important: +140 per cent in the EU15 (from 5.0% to 1.02%) and +281 per cent in the EU12 (from 3.4% to 12.9%).

In both groups there is a substantial shrinking of the working age population (those aged 15-64 years): -15 per cent in the EU15 (from 66.2% in 2010 to 56.5% in 2060); and -24 per cent in the EU12 (from 70.4% to 53.5%).

The biggest differences between the two groups are with respect to population size. Between 2010 and 2060 the total population of the EU15 countries would experience a modest increase by 6 per cent, and grow from a total of 396 million to a total of 421 million. By contrast, the EU12 countries will see their total population size decline, from a total of 103 million to 85 million — a reduction by 17 per cent. This decline is of course the result of the very low fertility levels (see Figure 2).

The increase in population size in the EU15 countries may come as a surprise since also these countries experience fertility levels below replacement level. The explanation is in-migration. According to the convergence scenario, by 2060 the share of cumulative net migration over the entire projection period (2008-2060) would be 11.5 per cent for the EU27 area (Giannakouris, 2008) [10].

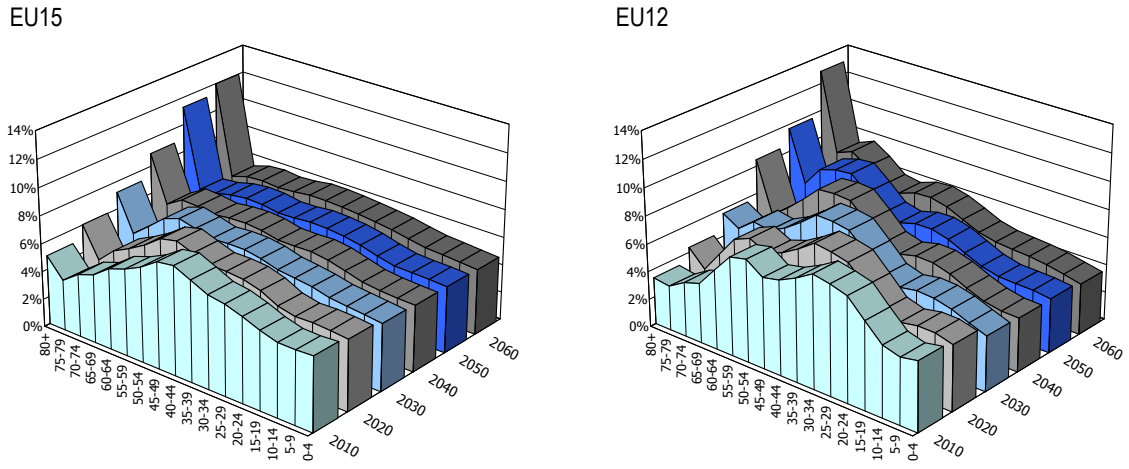
Figure 2 – Changes in Life Expectancy and Total Fertility Rate in the Member States of the European Union according to EUROSTAT's 'convergence scenario', by sub-group (EU15 & EU12) and year (2010, 2035, 2060)



Notes: Individual countries are ordered alphabetically (see list footnote 4)
Panel A (Life Expectancy): the light shaded (blue) area in the diagram indicates the life expectancy of men; the darker part (red) corresponds to the extra years lived by women.
Both panels: horizontal lines correspond to the median value for each sub-group/time period.

Source: Europop2008 (EUROSTAT, 2008)

Figure 3 – Prospected age composition (in %) of the population of the EU Member States according to EUROSTAT's 'convergence scenario', by sub-group (EU15 & EU12), selected years



A. Age composition by broad age groups

	EU15						EU12					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
0-14	15.7%	15.5%	14.9%	14.4%	14.5%	14.5%	14.8%	14.8%	13.1%	11.9%	12.1%	11.8%
15-64	66.2%	64.1%	61.3%	58.5%	57.2%	56.5%	70.4%	66.8%	64.7%	62.4%	57.0%	53.5%
65+	18.0%	20.4%	23.9%	27.1%	28.4%	29.0%	14.8%	18.5%	22.2%	25.8%	30.9%	34.7%
80+	5.0%	6.0%	7.2%	8.9%	11.3%	12.0%	3.4%	4.4%	5.7%	8.5%	9.7%	12.9%
Tot. pop. size (in millions)	396.39	411.87	420.85	425.17	424.88	420.53	103.00	101.97	99.09	94.93	90.43	85.19

B. Relative change (in %) with respect to the situation in 2010

	EU15						EU12					
	2010	2020	2030	2040	2050	2060	2010	2020	2030	2040	2050	2060
0-14	---	-2%	-6%	-8%	-8%	-8%	---	0%	-11%	-20%	-18%	-20%
15-64	---	-3%	-7%	-12%	-14%	-15%	---	-5%	-8%	-11%	-19%	-24%
65+	---	13%	32%	50%	57%	61%	---	25%	50%	74%	109%	134%
80+	---	21%	45%	79%	126%	140%	---	29%	67%	151%	186%	281%
Tot. pop. size	---	4%	6%	7%	7%	6%	---	-1%	-4%	-8%	-12%	-17%

Source: Europop2008 (EUROSTAT, 2008)

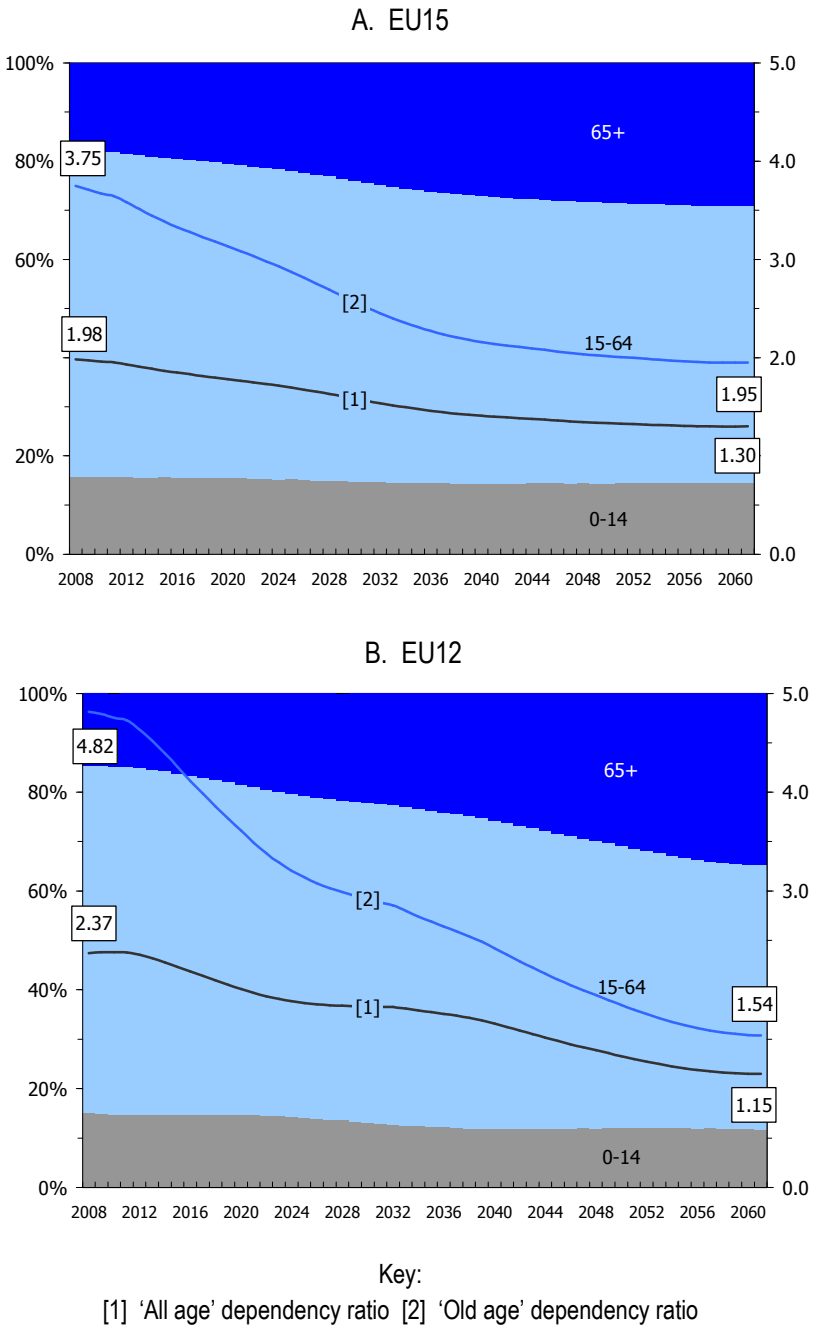
- ***Prospected changes in the dependency ratio***

As the previous figure, also Figure 4 deals with the prospected changes in the age composition. Only the three broad age groups are shown: ages 0-14, 15-64, and 65 and over. In addition, Figure 4 shows

what can be regarded as the crux in discussing the socio-economic effects of 'population ageing', namely the downward pattern in the dependency ratios.

Figure 4 – Prospected evolution in the age composition (broad age groups, left scale), and in the 'all age' and 'old age' dependency ratio (right scale) in the EU Member States, according to EUROSTAT's 'convergence' scenario, by sub-group (EU15, EU12), 2008-2060

Source: Europop2008 (EUROSTAT, 2008)



A dependency ratio translates the balance that exists between the economically 'active' and 'non-active' segments in the population. It can be calculated in different ways. Here are retained the 'all age' and the 'old age' dependency ratio. The former one is calculated as the ratio of the numbers at working age (those aged 15-64) over the youngest age group (0-14) and the older age group (65 and more) together. The latter one is simply the ratio of those at active age over those at older ages [11].

Regardless of the type of dependency ratio that is taken into account, the data show a downward trend. Indeed, in all instances the message is that there will be less and less people at active age compared to the numbers at non-working age. In other words, the proportion of people in the population that keeps the economy running is going down, with the result that there would be less resources for paying the cost of education, of pension and of health care, while the expenditures of pensions and health care are rising — an unsustainable situation.

In the EU15 countries, between 2008 and 2061, the 'all age' dependency ratio, would decrease from 1.98 to 1.30, i.e. from close to 200 'active' persons for every 100 'non-active' ones hardly 130 'active' persons for 100 'non-active' persons. In the EU12 countries, the change appears even more problematic, a decline by a whole 50 per cent, from 2.4 to 1.2.

The figures may not be precise; the actual figures will depend on the demographic evolution. But there should be no doubt that in the future the 'health of the economy' will depend on fewer hands — while at the same time there will be more older people relying on social security benefits. Working longer — i.e., expanding the active age group from 15-64 to, say, 15-74 — would push the dependency ratio upwards and appears to be a logical solution. However, as will be shown in the next lines, there seem to be alternatives.

3. GDP, demographic change, and different scenarios for activity rates and increase in labour productivity

Our starting point in the exercise is to have a look at current activity rates [12]. These are shown in Figure 5. They include the data for all individual EU Member States (except Portugal and Malta) and are presented by sub-group (EU15 or EU12) and by sex. The data stem from the last round of censuses that took place around 2001 (see EUROSTAT's website at http://ec.europa.eu/eurostat).

- ***Current activity rates and the 'Scandinavian model'***

It is clear that there exists a large variation between individual countries. It is also clear that, in general, activity rates for women are lower than those for men, and this at every age.

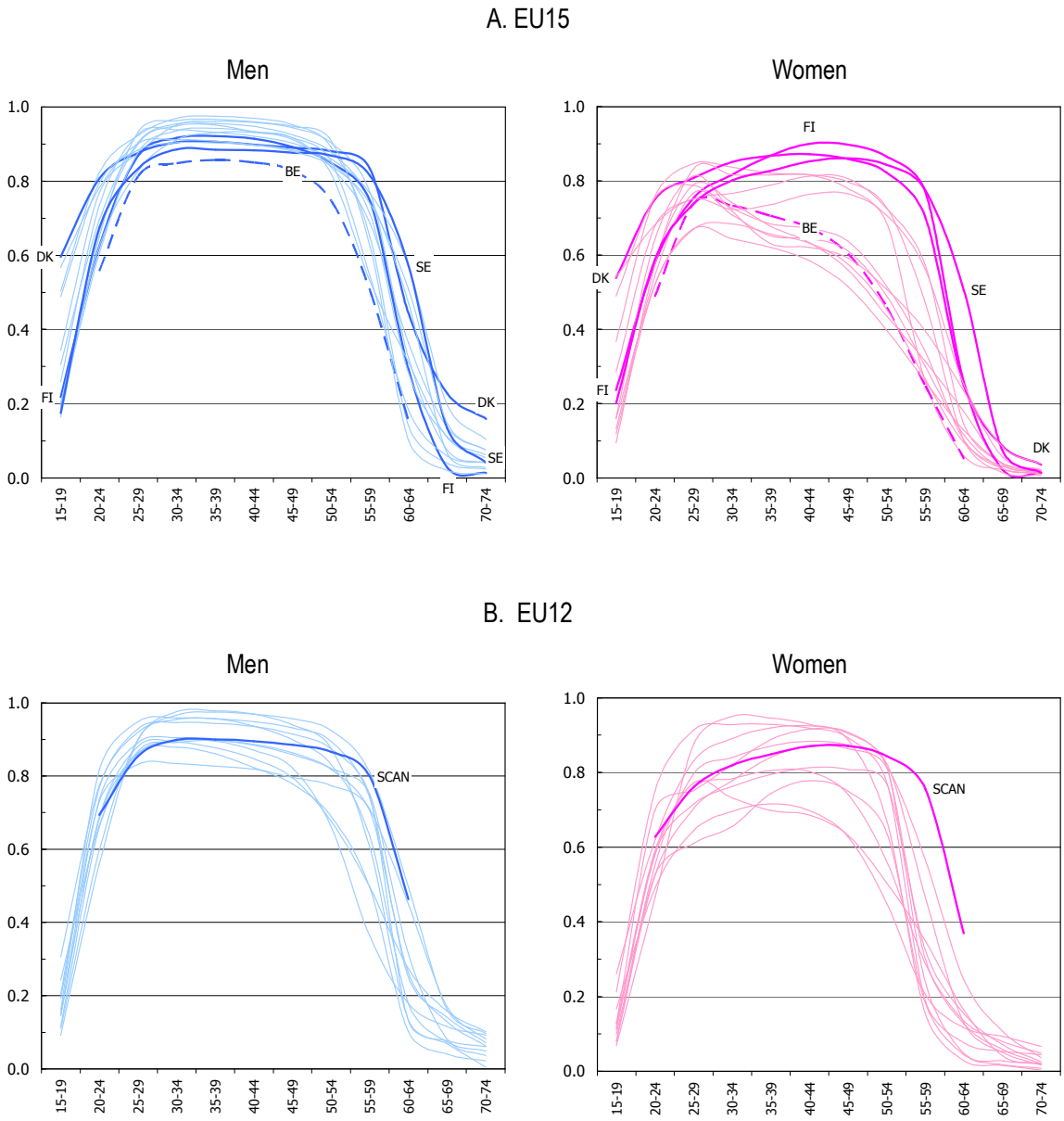
A remarkable observation is that, although in most countries legal retirement age is at 65, the activity rate shows a steep decline after age 50 in about all countries. The exceptions to this pattern appear to be the Scandinavian countries: Denmark, Finland, and Sweden. In the other EU15 countries, by ages 50-54 activity rate has already dropped to 0.853 (meaning that 15% of those at working age are no longer part of the labour force); by ages 55-59 activity arte is only 0.687. For the EU12 countries, the values are 0.826 and 0.708, respectively.

Amongst the EU15 countries the lowest activity rates are observed for Belgium. By ages 50-54 only three-quarters of those at working age are still part of the labour force; by ages 55-59 only half of them are still part of it. At these ages, only Hungary, Poland and Romania show lower rates [13].

The drop in activity rates some 10-15 years before legal retirement age has several causes. One is of course the inability of people to keep on working because of increased health problems. But another reason are the policies of pre-retirement put in place in the 1980s. The idea was that pre-retirement schemes for 'older' workers would create more job opportunities for younger ones. However, in many countries younger people continue having problems in entering the labour market. The problem of early school leaving is one cause (youngsters leave school before graduation). Another problem is that they sometimes do not have the same experience that older workers have; older and younger workers are not directly interchangeable. In the meantime, employers regard the pre-retirement schemes as a

way to make their older (and more costly) employees redundant (while for the employees it is an opportunity for enjoying retirement sooner without too much financial loss). The popularity of pre-retirement schemes In Belgium (and the large benefits that accompany them) may explain the very steep drop in activity rates after age 50.

Figure 5 – Activity rates by 5-year age group in the EU Member States, by sub-group (EU15, EU12) and sex, situation around 2001



Notes: (a) Values for Portugal (in EU15) and Malta (in EU12) are missing;
(b) In panel B (EU12) the individual country values for DK, FI, and SE are replaced by the group values 'SCAN' (limited to ages 20-64).

SOURCE: EUROSTAT, 2001 census data

Eventually, the relatively high activity rates that are observed in the Scandinavian countries, especially after age 50 made us decide to use these as reference and to derive the different scenarios from the 'Scandinavian model' [14]. We will return to this later (see Table 2). The relative position of the three Scandinavian countries is highlighted in Figure 5: in panel A (EU15) by identifying the curves for each individual country; in panel B (EU12) by adding the curve 'SCAN' (the activity rates for the three countries combined, calculated as the weighted average, on the basis of the observed rates and the age composition in each country).

- ***The basic formula and scenarios with respect to activity rates and growth of labour productivity***

GDP (Gross Domestic Product) per inhabitant is a function of labour productivity, the employment rate, and the share of the population at working age in the total population. The formula can be written as follows:

$$GDP_{inhabitant} = [\, GDP / P_{employed} \,] \times [\, P_{employed} / P_{working\ age} \,] \times [\, P_{working\ age} / P_{total} \,]$$

$$= [\text{ labour productivity }] \times [\text{ employment rate }] \times [\text{ share of total population at working age }]$$

In the simulation exercises that follow it will be assumed that unemployment is being kept constant. As such, it is possible to make simulations by means of the activity rate, or the proportion of the population at working age (ages 15-64) that is 'economically active' and thus in the labour market — irrespective whether a person is effectively employed or not (i.e., also those unemployed but searching for a job are being included) [15].

Only the third (last) component in the formula is a 'purely' demographic component: the share of the population at working age depends entirely on 'demographics'. The following sub-paragraph presents the effect on GDP of demographic change.

- ***GDP and demographic change***

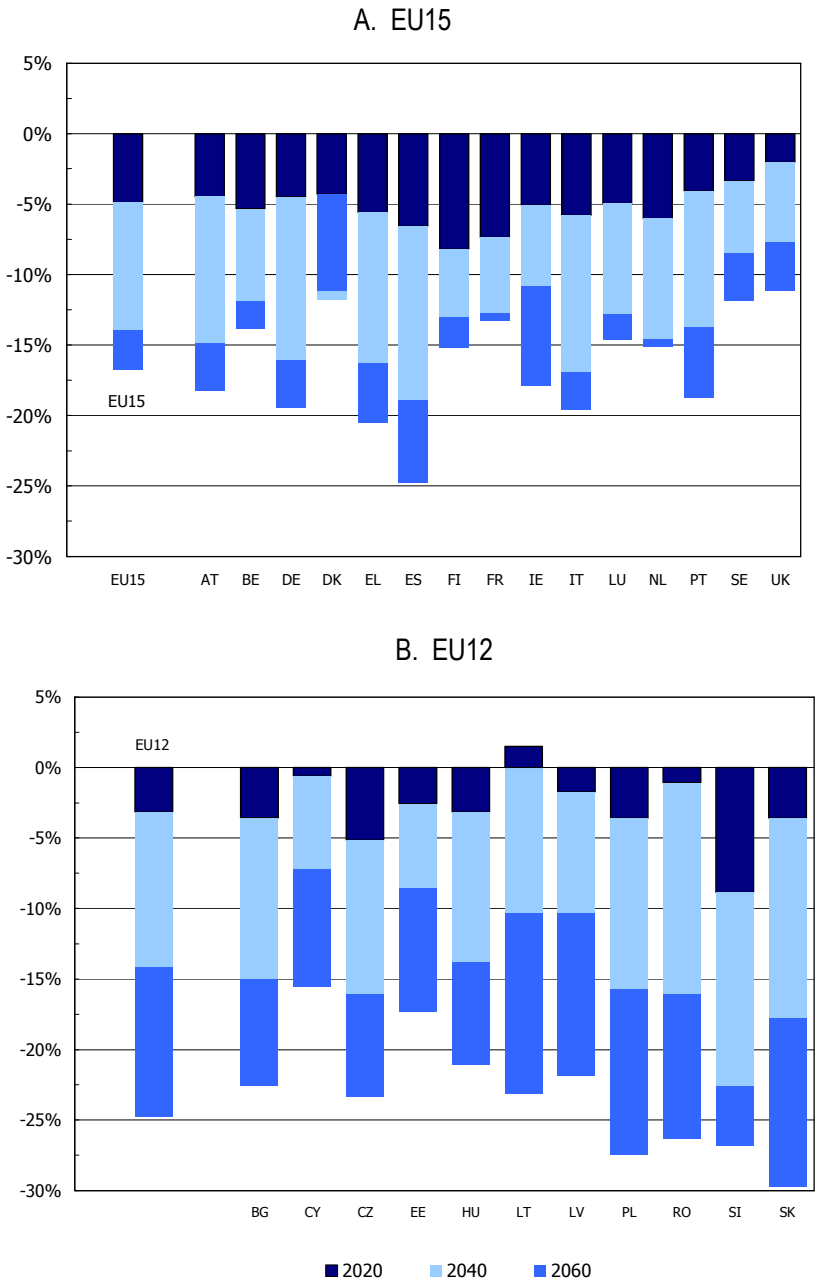
The purpose of the exercise is to measure the effect demographic change will have on GDP-levels assuming that the economic parameters, i.e., labour productivity and employment — see formula — remain constant at their 2001-level of 2001 [16]. The results are presented in Figure 6.

Figure 6 gives the percentage change in GDP for the years 2020, 2040, and 2060 compared to its 'starting' level in 2008. The results indicate that, for the entire EU15 area, demographic change could imply a decrease in GDP by some 5 per cent between 2008 and 2020; by 9 per cent between 2020 and 2040; and by another 3 per cent between 2040 and 2060 — or in total a decrease by no less than 17 per cent in 2060 compared to its level in 2008. As for theEU12 area, the total decrease in GDP would be (practically) 25 per cent. Within each group, there are quite important differences. The countries in the EU15 group that will be hardest hit (a decrease of near or above 20%) are Germany (-19.4%), Greece (-20.5%), Spain (-24.8%), and Italy (-19.6%). In the EU12 group the worst hit countries (a decrease of more than one-fourth) are Poland (-27.5%), Romania (-26.3%), Slovenia (-26.8%), and Slovakia (-29.7%).

The EU15 and EU12 countries differ to the extent that in the former the largest changes will occur quite soon, i.e., between 2008 and 2040), whereas in the latter the largest changes will not occur before 2020, but rather in the years 2020-2060). In the EU15 countries, 86 per cent of the total decrease

between 2008 and 2060 will happen before 2040. By contrast, in the EU12 countries 82 per cent of the total decrease can be expected to happen after 2020 [17].

Figure 6 – Change in GDP (in %) compared with its level in 2008, as the result of changes in the age composition ('convergence' scenario), by sub-group (EU15, EU12), years 2020, 2040, and 2060



Notes:

(a) Results correspond to those of Scenario 0, i.e. constant productivity levels and constant activity rates, equal to the values as observed around 2001;

(b) Activity rates for Portugal (in EU15) and Malta (in EU12) are missing. In the exercise have been used the median values between the other countries in each respective sub-group

Source: Europop2008 (EUROSTAT, 2008); EUROSTAT, 2001 Census data

These differences reflect the differences that exist in demographic change between the two groups of countries. After 2040, in the EU15 countries demographic change will have become rather limited. As a result, also the negative effect on GDP will be rather small (note that, as shown in Figure 6, in Denmark GDP will slightly increase between 2040 and 2060). These observations are in line with the patterns of change in the dependency ratio and the evolution in the proportions of older people, as already shown in Figures 4 and 1, respectively. Unlike the EU15 countries, the EU12 countries will be hardest hit by changes in the age structure after 2020.

Clearly, without any compensatory changes in the economic parameters, demographic change will have serious downwards effects on GDP, in both EU15 and EU12 countries. Let us now look at what the effects of increases in activity rates and labour productivity would be. For this we have developed some scenarios. They are presented in the next paragraph.

- ***Scenarios for increases in activity rates and labour productivity***

The various scenarios and the corresponding hypotheses are presented in Table 1.

Table 1 – Various scenarios with respect to increases in activity rates (scenarios 'A') and in labour productivity (scenarios 'B')

SCENARIO '0' corresponds to the 'base-line' scenario. Hypotheses are as follows:		
Activity rates and labour productivity are assumed to remain constant at their 2008-level. Changes in GDP are therefore the sole result of demographic changes (which correspond to Eurostat's 'convergence' scenario — see Giannakouris, 2008); results are presented in Figure 6 above.		
SCENARIOS 'A' are with respect to increases in activity rates. Hypotheses are as follows:		
	Activity rates Men	Activity rates Women
Scenario A1	RTS Men = RTS SCAN	RTS Women = RTS as observed
Scenario A2	RTS Men = RTS SCAN	RTS Women = (RTS as obs. + RTS SCAN)/2
Scenario A3	RTS Men = RTS SCAN	RTS Women = RTS SCAN
Scenario A4	RTS Men = RTS SCAN*	RTS Women = RTS SCAN*
	RTS SCAN* = RTS SCAN x 1.05 for ages below 50 = RTS SCAN x 1.10 for ages equal to 50 and above	
SCENARIOS 'B' are with respect to increases in labour productivity. Hypotheses are as follows:		
Scenario B1	Increase at 0.50% per annum	
Scenario B2	Increase at 0.75% per annum	
Scenario B3	Increase at 1.00% per annum	
Scenario B4	Increase at 1.25% per annum	
Scenario B5	Increase at 1.50% per annum	
Scenario B6	Increase at 1.75% per annum	
Scenario B7	Increase at 2.00% per annum	
Scenario B8	Increase at 2.25% per annum	
Scenario B9	Increase at 2.50% per annum	
Scenario B10	Increase at 2.75% per annum	
Scenario B11	Increase at 3.00% per annum	

Scenario '0' (or zero) can be considered to the 'base-line' scenario. With scenario '0' it is assumed that the economic parameters remain constant at their 2008-level. Changes in GDP are the sole result of demographic change. The results are already presented in Figure 6 above.

Scenarios 'A' are with respect to increases in activity rates. The basis for the various scenarios are the rates that are observed for the three Scandinavian countries. The Scandinavian countries show relatively high activity rates compared to the other EU countries. More specifically, they show high rates beyond age 50 and for women — specific items where there appears room for 'improvement' for many countries. Moreover, by taking observed rates as a reference, we avoid using an unrealistic hypothesis. As is the case for demographic change, also in the case of activity rates one may hypothesize that all EU countries gradually converge to a common pattern.

Scenarios 'A' mainly differ to what extent the 'Scandinavian' rates are applied for men, for women, or for both. Note that in the exercise the 'national' (5-year age-specific) rate is only substituted by the 'Scandinavian' rate when the latter also appears to be the highest. The highest rates are applied in scenario A4. Here the national rates are not only substituted by the 'Scandinavian' rates (when higher) but the latter are also increased, by 5 per cent below age 50 and by 10 per cent for ages 50 and above.

Scenarios 'B' are with respect to the increases in labour productivity. Increases in labour productivity are customarily expressed at an annual rate. The present exercise foresees a total of 11 levels, starting at a quite low rate of 0.5 per cent per annum (scenario B1) up to a quite high rate of 3 per cent per annum (scenario B11). The rates are more or less arbitrarily fixed. Note, however, that rates of 1.5 to 2 per cent are considered to being 'normal'. Note that in its latest Annual Report, the Belgian 'Study Commission on Ageing' (*Studiecommissie voor de vergrijzing*, 2009) has used, to calculate the budgetary cost of 'ageing' for the period 2008-2060, as lowest and highest rate of increase in labour productivity 1.25 and 1.75 per cent, respectively, with 1.50 per cent being the 'reference' scenario.

4. Increases in GDP by scenario

What now are the effects on GDP assuming increases in activity rates and in labour productivity as assumed in the various scenarios outlined above? The basis for the calculations are the population numbers by 5-year age groups in the years 2020, 2040 and 2060 corresponding to EUROSTAT's convergence scenario. To these numbers are applied the activity rates s.q. increases in labour productivity corresponding to the various scenarios. From these can be inferred the 'new' GDP value, which can than be compared to its 'original' value, i.e. the GDP level that would result without taking into account any increases in activity rates (or labour productivity), i.e. the one associated with the 'zero' scenario.

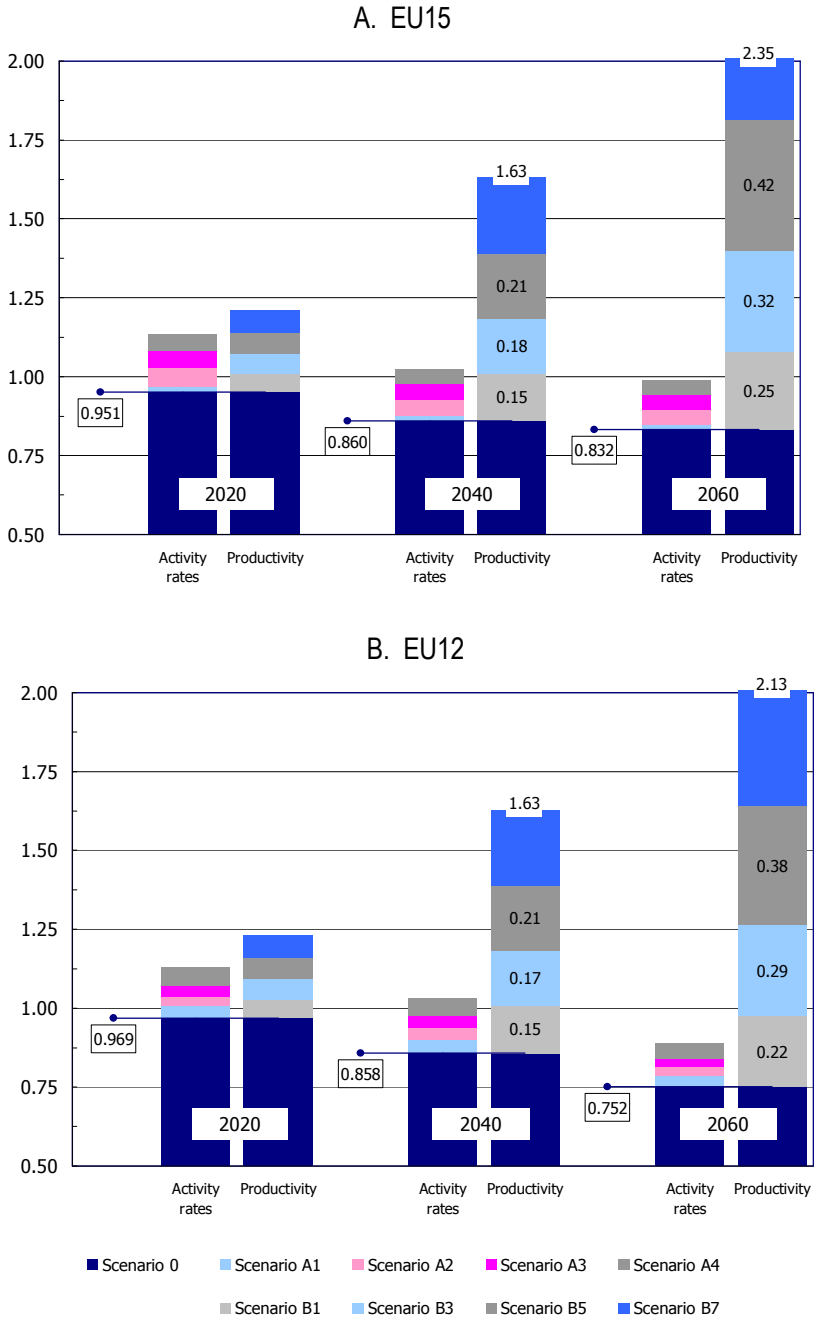
Before going into more detail — i.e., before estimating the *combined* effects of both increases in activity rates and labour productivity —, let us first have a look at the separate effects of each economic component on GDP individually. This preliminary exercise will already reveal some results that should be interesting for policy makers. Let us now turn to Figure 7.

- ***Compensatory effects on GDP of increases in activity rates and of labour***

Figure 7 shows the separate effects on GDP of increases in activity rates and labour productivity for the years 2020, 2040 and 2060. Panel A presents the results for the EU15 countries; panel B for the EU12 countries. The bottom end of each bar diagram corresponds to the relative value of GDP (with respect to its 2008-level) without taking into account any possible increases in activity rates, c.q. labour

productivity. The actual values — 0.951, 0.860 and 0.832 for the years 2020, 2040 and 2060, respectively for the EU15 countries — are indicated next to the bar diagram [18] (note that these values could already be inferred from the bar diagrams for EU15 and EU12 shown in Figure 6).

Figure 7– Prospected GDP-levels relative to its 2008 level by taking into account (a) increased activity rates (see scenarios in Table 1); and (b) increased productivity (*idem*); and after taking into account changes in the age composition corresponding to EUROSTAT's 'convergence' scenario, by sub-group (EU15, EU12), situation years 2020, 2040 and 2060



Source: Europop2008 (Eurostat, 2008); EUROSTAT, 2001 Census data

Furthermore, each segment in the bar diagram indicates the extra 'gain' in GDP that would be achieved between scenarios [19]. For example, assuming an increase in labour productivity by 0.05 per cent per annum (scenario B1) would lead, as indicated in the figure, for the EU15 countries in 2040 to a gain of 0.15 'percentage points' (implying a GDP value equal to its 2008 level). Scenario B7 (the 'highest'

scenario for an increase in labour productivity included in the figure) would lead to a GDP that is 1.63 times the 2008 value [20].

The ratio of 1.63 — the relative GDP-value that would be obtained in 2040 assuming an increase in labour productivity by 2 per cent annually (scenario B7) — over 0.860 — its value assuming no change in labour productivity (scenario 0) — provides a 'multiplier' indicating the 'strength' of scenario B7. These 'multipliers' are thereafter used to calculate the composite indices associated with the scenarios — for both series 'A' and 'B' — that are shown in Table 2 (and in Table 3 for EUROSTAT's convergence scenario *without* migration). These composite indices will be discussed at more length in the next sub-paragraph. But let us first return to the individual impact that increased activity rates or increased labour productivity may have on the evolution of GDP.

It is clear from Figure 7 that the increases in labour productivity have a much larger relative impact on GDP than increased activity rates, and this in both the EU15 and the EU12.

With an annual growth of 2 per cent (Scenario B7) — which can be considered high, but not *exceptionally* high —, increased labour productivity could for the EU15 countries, in spite of the negative effects of demographic change (see Figure 6), lead to a GDP that is 2.35 times higher in 2060 than its 2008-level. Perhaps somewhat less spectacular, but for the EU12 countries the result is quite similar. Also here, one might expect a GDP that is more than twice its 2008-level [21].

The results in Figure 7 stem from a crude exercise. But the results show that in their search for pursuing a positive growth in GDP policy makers cannot ignore the importance of increased labour productivity — and hence the importance of investing in education and research.

The effects of increased activity rates are much more modest. Of course, here the results, more specifically the number of people at work, that increased activity rates would entail, are much more dependent on the age structure and the number of people in the population. Note in this respect that for the EU15 countries the results for 2040 and 2060 are hardly different; as already said, for the EU15 countries the major changes will occur in the next 20-30 years.

A comparison of the individual effects by scenario reveals another important message for policy makers. Figure 7 shows that the largest effects on GDP from increased activity rates would stem from scenarios A2 and A3. In other words, the largest effects on GDP would be from attracting more women to the labour market. This appears to be particularly the case in the EU15 countries, where more female labour participation alone would constitute about 60 per cent of the 'gain' that can be expected from higher activity rates.

Let us now turn to Table 2, which includes the composite indices for the combined effects of increased activity and increased labour productivity on GDP.

- ***Composite indices for relative change in GDP taking into account changes in activity rates and increase in labour***

As already said, the composite indices are related to the 'multipliers' that are associated with a specific scenario. A composite index is calculated by applying the multipliers — one for a specific 'A' scenario, one for a specific 'B' scenario — on the relative GDP value for a given year (2020, 2040, 2060), i.e. its value relative to its 2008-level resulting from demographic change only (scenario 0). In other words, the composite index corresponds to the relative GDP value (for a given year) after taking into account the combined effects of (a) demographic change; (b) increased activity rates (scenario Ai); and (c) increased labour productivity (scenario Bj). For example, for the EU15 countries, because of demographic change by 2020 GDP would be 4.87 per cent smaller than in 2008. However, with the

combined effect of scenarios A1 and B1, the decrease would be only 2.10 per cent; and by assuming scenarios A4 and B11 GDP could be about 50 per cent higher than its 2008-value.

Table 2 – Composite indices for relative change in GDP compared to its 2008-value (index=1), taking into account demographic change (Eurostat's 'convergence' scenario with migration), by increase in activity rates and increase in labour productivity, by sub-group (EU15, EU12), for years 2020, 2040, and 2060 (Table A1 gives the composite indices by individual country)

	EU15						EU12					
			Multipliers with respect to activity rates						Multipliers with respect to activity rates			
	2020	0.9513 *	Scenario A1	Scenario A2	Scenario A3	Scenario A4	**2020**	0.9685	Scenario A1	Scenario A2	Scenario A3	Scenario A4
			0.9692	1.0261	1.0831	1.1353			1.0059	1.0380	1.0702	1.1285
Multipliers with respect to labour productivity	Scenario B1	1.0618	0.9790	1.0365	1.0941	1.1468	Scenario B1	1.0618	1.0345	1.0676	1.1006	1.1606
	Scenario B2	1.0942	1.0088	1.0681	1.1274	1.1817	Scenario B2	1.0942	1.0660	1.1001	1.1341	1.1960
	Scenario B3	1.1275	1.0395	1.1006	1.1617	1.2177	Scenario B3	1.1275	1.0985	1.1336	1.1687	1.2324
	Scenario B4	1.1618	1.0712	1.1341	1.1971	1.2548	Scenario B4	1.1618	1.1319	1.1681	1.2043	1.2699
	Scenario B5	1.1972	1.1038	1.1687	1.2335	1.2930	Scenario B5	1.1972	1.1664	1.2037	1.2409	1.3086
	Scenario B6	1.2337	1.1374	1.2043	1.2711	1.3324	Scenario B6	1.2337	1.2019	1.2403	1.2787	1.3485
	Scenario B7	1.2712	1.1720	1.2409	1.3098	1.3729	Scenario B7	1.2712	1.2385	1.2781	1.3177	1.3895
	Scenario B8	1.3100	1.2077	1.2787	1.3497	1.4148	Scenario B8	1.3100	1.2763	1.3170	1.3578	1.4318
	Scenario B9	1.3499	1.2445	1.3177	1.3908	1.4578	Scenario B9	1.3499	1.3151	1.3571	1.3991	1.4755
	Scenario B10	1.3910	1.2824	1.3578	1.4332	1.5022	Scenario B10	1.3910	1.3552	1.3985	1.4418	1.5204
	Scenario B11	1.4333	1.3215	1.3991	1.4768	1.5480	Scenario B11	1.4333	1.3964	1.4411	1.4857	1.5667
	2040	0.8601	Scenario A1	Scenario A2	Scenario A3	Scenario A4	**2040**	0.8583	Scenario A1	Scenario A2	Scenario A3	Scenario A4
			0.8770	0.9275	0.9779	1.0250			0.9003	0.9379	0.9755	1.0318
Multipliers with respect to labour productivity	Scenario B1	1.1735	0.8852	0.9361	0.9870	1.0345	Scenario B1	1.1735	0.9067	0.9446	0.9825	1.0392
	Scenario B2	1.2712	0.9589	1.0141	1.0692	1.1207	Scenario B2	1.2712	0.9823	1.0233	1.0644	1.1258
	Scenario B3	1.3771	1.0388	1.0985	1.1583	1.2140	Scenario B3	1.3771	1.0641	1.1085	1.1530	1.2195
	Scenario B4	1.4918	1.1253	1.1900	1.2547	1.3152	Scenario B4	1.4918	1.1527	1.2009	1.2491	1.3211
	Scenario B5	1.6161	1.2190	1.2891	1.3592	1.4247	Scenario B5	1.6161	1.2487	1.3009	1.3531	1.4311
	Scenario B6	1.7507	1.3205	1.3965	1.4725	1.5434	Scenario B6	1.7507	1.3527	1.4092	1.4658	1.5503
	Scenario B7	1.8965	1.4305	1.5128	1.5951	1.6719	Scenario B7	1.8965	1.4654	1.5266	1.5879	1.6794
	Scenario B8	2.0544	1.5497	1.6388	1.7279	1.8111	Scenario B8	2.0544	1.5874	1.6538	1.7201	1.8193
	Scenario B9	2.2255	1.6787	1.7753	1.8719	1.9620	Scenario B9	2.2255	1.7196	1.7915	1.8634	1.9708
	Scenario B10	2.4109	1.8186	1.9232	2.0278	2.1254	Scenario B10	2.4109	1.8628	1.9407	2.0186	2.1350
	Scenario B11	2.6117	1.9700	2.0833	2.1966	2.3024	Scenario B11	2.6117	2.0180	2.1023	2.1867	2.3128
	2060	0.8322	Scenario A1	Scenario A2	Scenario A3	Scenario A4	**2060**	0.7519	Scenario A1	Scenario A2	Scenario A3	Scenario A4
			0.8483	0.8964	0.9444	0.9895			0.7853	0.8129	0.8405	0.8877
Multipliers with respect to labour productivity	Scenario B1	1.2969	0.9156	0.9675	1.0194	1.0681	Scenario B1	1.2969	0.7658	0.7927	0.8196	0.8656
	Scenario B2	1.4770	1.0427	1.1018	1.1609	1.2163	Scenario B2	1.4770	0.8721	0.9027	0.9334	0.9857
	Scenario B3	1.6820	1.1875	1.2548	1.3221	1.3852	Scenario B3	1.6820	0.9932	1.0281	1.0629	1.1226
	Scenario B4	1.9155	1.3523	1.4290	1.5056	1.5775	Scenario B4	1.9155	1.1310	1.1708	1.2105	1.2784
	Scenario B5	2.1815	1.5401	1.6273	1.7146	1.7965	Scenario B5	2.1815	1.2881	1.3333	1.3786	1.4559
	Scenario B6	2.4843	1.7539	1.8533	1.9526	2.0459	Scenario B6	2.4843	1.4669	1.5184	1.5700	1.6580
	Scenario B7	2.8292	1.9974	2.1105	2.2237	2.3299	Scenario B7	2.8292	1.6705	1.7292	1.7879	1.8882
	Scenario B8	3.2220	2.2747	2.4036	2.5324	2.6534	Scenario B8	3.2220	1.9025	1.9693	2.0361	2.1504
	Scenario B9	3.6693	2.5904	2.7372	2.8840	3.0218	Scenario B9	3.6693	2.1666	2.2427	2.3188	2.4489
	Scenario B10	4.1787	2.9501	3.1172	3.2844	3.4413	Scenario B10	4.1787	2.4674	2.5540	2.6407	2.7889
	Scenario B11	4.7588	3.3596	3.5500	3.7404	3.9190	Scenario B11	4.7588	2.8099	2.9086	3.0073	3.1761

Note : *Values in boxes correspond to the relative value of GDP with respect to its 2008-estimate as the result from demographic change only

The results in Table 2 show a far less gloomy picture of the future than one might expect on the basis of the demographic prospects. The great majority of the composite indices show a value of 1 or (much) more. This means that increases in activity rates and labour productivity can largely compensate for the negative effects demographic change is likely to have on GDP. Not only would it be possible to maintain the level of 2008, but in many instances gains could be quite substantial, by 30 per cent or more. This also applies to the more 'realistic' scenarios.

The combination of scenario A3 (the 'Scandinavian' model) with scenario B6 (an annual increase of 1.75% in labour productivity) would lead, in both EU15 and EU12, to a GDP-level in 2040 that would be close to 50 per cent higher than its 2008-level (even with a even more modest increase in labour productivity of 1.50% annually the gain would be more than 40%).

This is not to say that things will be easy. Even a modest growth in activity rates will not be achieved without efficient policy measures. However, the point we wish to make here is that even with 'realistic' gains in increased activity, comparable to those observed in the Scandinavian countries, and in labour productivity, of not more than 1.50 to 1.75 per cent annually, are likely to fully compensate for the negative effects of demographic change on GDP and could even produce levels that are substantially higher than its 2008-level.

- ***Continued economic growth? Yes, but different perspectives for EU15 and EU12***

Table 2 presents a range of possible combinations between activity (or employment) and labour productivity that would maintain GDP, in spite of the negative demographic evolution, at its level of 2008, and even higher. The fact that these possibilities exist might be reassuring. However, in the real world their relevance is limited. Healthy economies are supposed to grow. Remaining at a constant level, even under difficult demographic circumstances, is not enough (e.g. a rising labour productivity in combination with zero economic growth implies rising unemployment ...). The purpose of the present paragraph is to identify these combinations, if any, which could allow continued growth, similar to the one observed in the recent past.

As we will see, this exercise will also reveal the intrinsic differences that exist between the EU15 and the EU12 with respect to economic development.

Figure 8 presents the prospected evolution of GDP per capita in the EU15 and the EU12 area that can be expected on the basis of past trends. The prospected values for the years 2009 to 2060 are obtained by simple extrapolation, after applying the annual growth rate as observed for the years 1995-2007 on the GDP per capita for the year 2008.

According to the results, assuming a continued average growth rate of 1.89 per cent in the EU15 countries GDP per capita would increase from 27,808 Euro (expressed in PPP equivalents) [22] to about 51,000 Euro in 2040 and 74,000 Euro in 2060 [23].

Between 1995 and 2007, the EU12 countries have experienced a much higher annual growth in GDP per capita, no less than 4.34 per cent. This much higher growth rate (more than twice the EU15 average) should enable the 'new' EU Member States — the majority of them joined the EU only 5 years ago, in May 2004 (see footnote 4) — to 'catch up' with the 15 'old' member States beginning of the 2030s; by that time both groups of countries should enjoy a GDP per capita of around 45,000 Euro.

It is not realistic to assume that such a high economic growth rate can be maintained over a very long period of time. In Figure 8, beyond 2040 the trend in economic growth that the EU12 countries would experience should be seen as purely 'theoretical'; hence the use of a dotted line [24].

But what now would be the (combination of) scenarios that could ensure continued economic growth similar to the one observed in the last years? To answer this question, the composite indices of Table 2 have been re-calculated into values of GDP per capita (not shown). The exercise was limited to the EU15 countries only. The results are shown in Figure 9.

Figure 8 – Future trend of GDP per capita as derived from observed growth 1995-2007, by sub-group (EU15 and EU12)

Notes:

1. Values 1995-2007 are chain-linked values with reference = '2000'
2. Observed 2008-value and trend values 2009-2060 are expressed in €PPS (purchasing power standards)

Source: Europop2008 (Eurostat, 2008); Eurostat database 2009

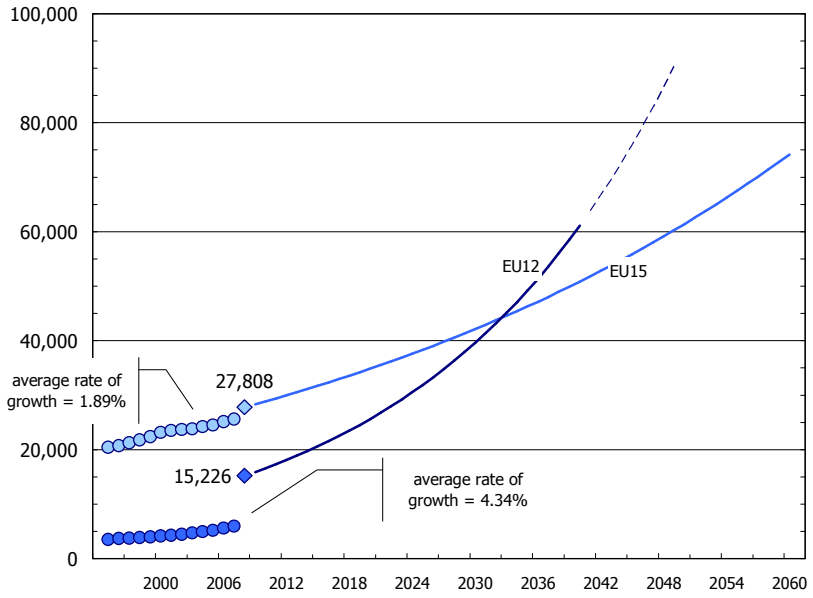


Figure 9 – Comparison between assumed growth of GDP per capita and values that can be expected on the basis of a selected set of scenarios (see Table 2), EU15 Member States, 2008-2060

Notes:

1. Average growth of GDP per capita = 1.89% (see Figure 8)
2. Observed 2008-value and trend values 2009-2060 are expressed in €PPS

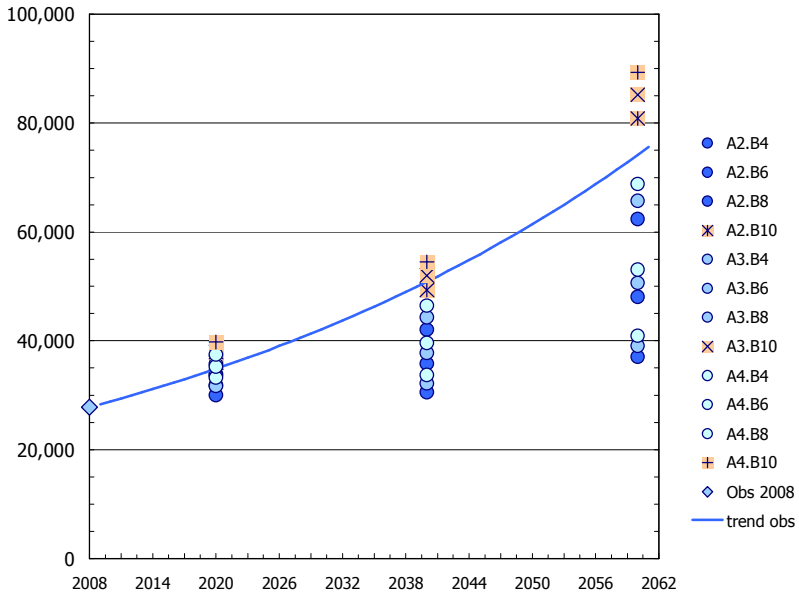


Figure 9 shows the trend line in GDP per capita that can be expected with a constant growth of 1.89 per cent per annum (cf. Figure 8) and the values of GDP per capita for the years 2020, 2040 and 2060 by scenario (as can be derived from the composite indices in Table 2).

Obviously, for every year there is a set of scenarios that should allow maintaining an economic growth of close to 2 percent per annum. In fact, there is a particular set — scenarios A2.B10, A3.B10, and A4.B10 — that would even 'overshoot' the target value as set out by the trend line; by 2060, they would imply levels of GDP per capita that are 10–20 per cent higher than the target value (values of GDP per capita of 81,000 to 89,000 Euro compared to 74,000 Euro).

The two sets of combinations giving the highest values of GDP per capita — the one just above the trend line in 2060 (see above) and the one just below it (scenarios A2.B8, A3.B8, and A4.B8, not identified in the figure) — have in common that they all include high increases in labour productivity, of 2.25 to 2.75 per cent per annum. The small differences between the combinations within each set are the result of different activity rates; it is no surprise that the scenario with the highest rates (A4) also shows the highest GDP per capita values.

From the results one may deduct that an increase in labour productivity of 2.50 per cent (not used in the exercise) one would obtain a GDP per capita that is right 'on target'.

One and the other again point at the importance of increased labour productivity. Regardless the increase in activity rate, in order to maintain an economic growth of close to 2 per cent there is the need of an average increase in labour productivity by a minimum of 2.25 per cent. This is a high value. However, is it totally unrealistic? It is, for example, not that much higher than the 'reference' scenario used by the Belgian 'Study Commission on Ageing' in its latest report (1.5%). The alternative would be to 'accept' an economic growth of 'only' 1.5 per cent per annum. In a period where there are more and more voices [25] defending the need for more 'sustainable' development — as opposed to 'continued' economic growth — this alternative scenario should perhaps be taken seriously.

At any rate, there is another issue that deserves more attention. It concerns the fact that, for the time being, EU12 countries experience much less economic prosperity than the EU15 do. As already seen in Figure 8, at current levels GDP per capita in the EU12 countries (15,226 Euro) is, on average, only 55 per cent of the one that is observed for EU15 countries (27,808 Euro). From this observation it follows that increases in labour productivity of even 2.75 per cent per annum will not suffice to 'catch up' with the levels observed in the EU15 area. But how high should the level of increase be? The answer is given by the results in Figure 10.

Figure 10 presents a comparison of values of GDP per capita between EU15 and EU12 countries by combination of scenarios. The block diagrams indicate the cumulative value that can be expected from each scenario. Clearly, also with an increase in labour productivity by 2.75 per cent (scenario B10) EU12 countries will continue to lag behind. In fact, with this scenario the gap in economic prosperity would become even larger, at least in purchasing power parities. In 2008, the difference is about 13,000 Euro less; by 2060 this will have increased to no less than 29,000 Euro (note, however, that in relative terms, the difference would remain nearly unchanged, about -42%).

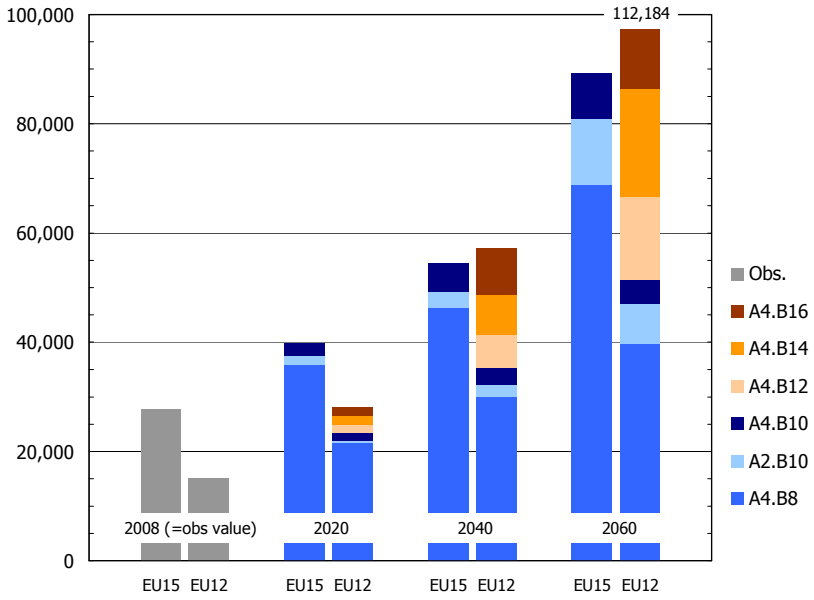
To fully catch up with the EU15 countries by 2040 — earlier would appear, according to the present exercise, impossible — the EU12 countries would need to sustain an increase in labour productivity of 3.75 per cent per annum (B14) [26].

Clearly, the EU12 countries will need to do an extra effort, not only to balance economic growth with demographic change, but also to attain the levels of economic prosperity already enjoyed by the EU15 countries. To paraphrase the wordings of colleague Andras Klinger (2002), "for the transition economies […] there are in addition [to coping with demographic change] the more fundamental issues of economic development and catch up."

Figure 10 – Comparison of growth of GDP per capita between EU15 and EU12 Member States, based on cumulative outcome of several scenarios (see Table 2), with starting point scenario A2.B10, years 2020, 2040, and 2060

Notes:

1. All values expressed in €PPS
2. Scenarios A4.B12-A4.B16 are not included in Table 2.



5. EUROSTAT's 'convergence' scenario without migration

In its latest population projections, EUROSTAT has also included a 'convergence' scenario assuming 'no migration'. Under this assumption the demographic changes would be the sole result of 'natural' change, i.e. the product of the evolution in fertility and mortality alone.

Unfortunately, besides the information that, in the 'convergence' scenario with migration the cumulative net migration over the entire projection period (2008–2060) would be 11.5 per cent for the entire EU27 area (Giannakouris, 2008), not much more is readily available about the underlying internal migration patterns and from those from countries outside of the EU area. The only 'extra' information that can be found on EUROSTAT's web site are the size and age structure of the population by individual Member States corresponding to the two types of 'convergence' scenario. In spite of the scarcity in information it seemed justified to include a paragraph on the differences on the outcomes between the two types of 'convergence' scenario. As already indicated in the introductory paragraph, in-migration is often regarded as an instrument against 'population ageing' — and its negative effects on economic growth.

Table 3 presents a comparison between the two sets of data.

Assuming migration, population size of the EU15 would total by 2060 421 million inhabitants, an increase by grossly 7 per cent compared to the total in 2008; without migration the total would be only 337 million or 20 per cent less (and implying a decrease compared to 2008 by 14%). The low total in the case of no migration is of course the result of the extremely low levels of fertility, below replacement level, as seen in Figure 2 above.

The EU12 countries present a different picture. Here one can expect a decrease in the population numbers for both types of scenario; also in the scenario assuming migration (including migration from outside the EU), between 2008 and 2060 total population size is likely to decline by some 17 per cent, from 103 million to 85 million — and even by 23 per cent when assuming no migration.

There are of course also differences between countries. These differences reflect the different patterns in migration (in combination with the particular levels in fertility and mortality). Amongst the EU15 countries the largest differences in population size (of more than 25%) with and without migration are found in Spain (-29%), Austria and Portugal (both -27%), Italy (-26%); and also tiny Luxemburg (-40%). Amongst the EU12 countries the largest differences (of more than 15%) are found in Czech Republic (-17%), Slovenia (-16%), and Hungary (-14%); extremely high values are found in the islands of Cyprus (-43%) and Malta (-87%).

Table 3 – Total population size in 2060 (in millions) in EU countries. Estimates based on EUROSTAT's convergence scenario (comparison of results with and without migration); and relative size compared to 2008-estimate, for sub-groups (EU15, EU12) and individual Member States

	EU15	AT	BE	DE	DK	ES	FI	Fx	GR	IE	IT	LU	NL	PT	SE	UK
Tot. Pop. 2008	392.222	8.334	10.656	82.179	5.476	45.283	5.300	61.876	11.217	4.415	59.529	0.482	16.404	10.617	9.183	61.270
Convergence scenario																
with migration	420.530	9.037	12.295	70.759	5.920	51.913	5.402	71.800	11.118	6.752	59.390	0.732	16.596	11.265	10.875	76.677
without migration	336.785	6.577	9.707	57.883	5.220	36.728	4.948	64.787	8.569	5.242	43.810	0.442	15.157	8.243	8.866	60.605
Relative size to 2008-estimate																
with migration	1.0722	1.0843	1.1538	0.8610	1.0811	1.1464	1.0193	1.1604	0.9912	1.5294	0.9977	1.5175	1.0117	1.0610	1.1843	1.2514
without migration	0.8587	0.7892	0.9110	0.7044	0.9534	0.8111	0.9337	1.0470	0.7639	1.1874	0.7359	0.9165	0.9240	0.7763	0.9655	0.9891
													Md between individual Member States (with migration) =			1.084
													Md between individual Member States (without migration) =			0.917
Difference																
absolute figure	83.745	2.460	2.587	12.876	0.700	15.185	0.453	7.013	2.549	1.510	15.579	0.290	1.439	3.022	2.009	16.072
per cent	-19.91%	-27.22%	-21.04%	-18.20%	-11.82%	-29.25%	-8.39%	-9.77%	-22.93%	-22.36%	-26.23%	-39.60%	-8.67%	-26.83%	-18.47%	-20.96%
													Md between individual Member States =			-21.04%

	EU12	BG	CY	CZ	EE	HU	LT	LV	MT	PL	RO	SI	SK
Tot. Pop. 2008	103.172	7.642	0.795	10.346	1.339	10.045	3.365	2.269	3.365	38.116	21.423	2.023	5.399
Convergence scenario													
with migration	85.189	5.485	1.320	9.514	1.132	8.717	2.548	1.682	2.548	31.139	16.921	1.779	4.547
without migration	79.759	5.332	0.759	7.875	1.111	7.489	2.591	1.671	0.339	30.384	16.432	1.498	4.278
Relative size to 2008-estimate													
with migration	0.8257	0.7177	1.6617	0.9196	0.8459	0.8677	0.7570	0.7415	0.7570	0.8170	0.7899	0.8793	0.8423
without migration	0.7731	0.6978	0.9554	0.7612	0.8298	0.7455	0.7700	0.7362	0.1006	0.7972	0.7670	0.7407	0.7924
							Md between individual Member States (with migration) =						0.830
							Md between individual Member States (without migration) =						0.764
Difference													
absolute figure	5.430	0.152	0.561	1.639	0.022	1.228	-0.044	0.012	2.209	0.755	0.489	0.280	0.269
per cent	-6.37%	-2.77%	-42.51%	-17.22%	-1.90%	-14.09%	1.72%	-0.71%	-86.71%	-2.42%	-2.89%	-15.76%	-5.92%
									Md between individual Member States =				-4.41%

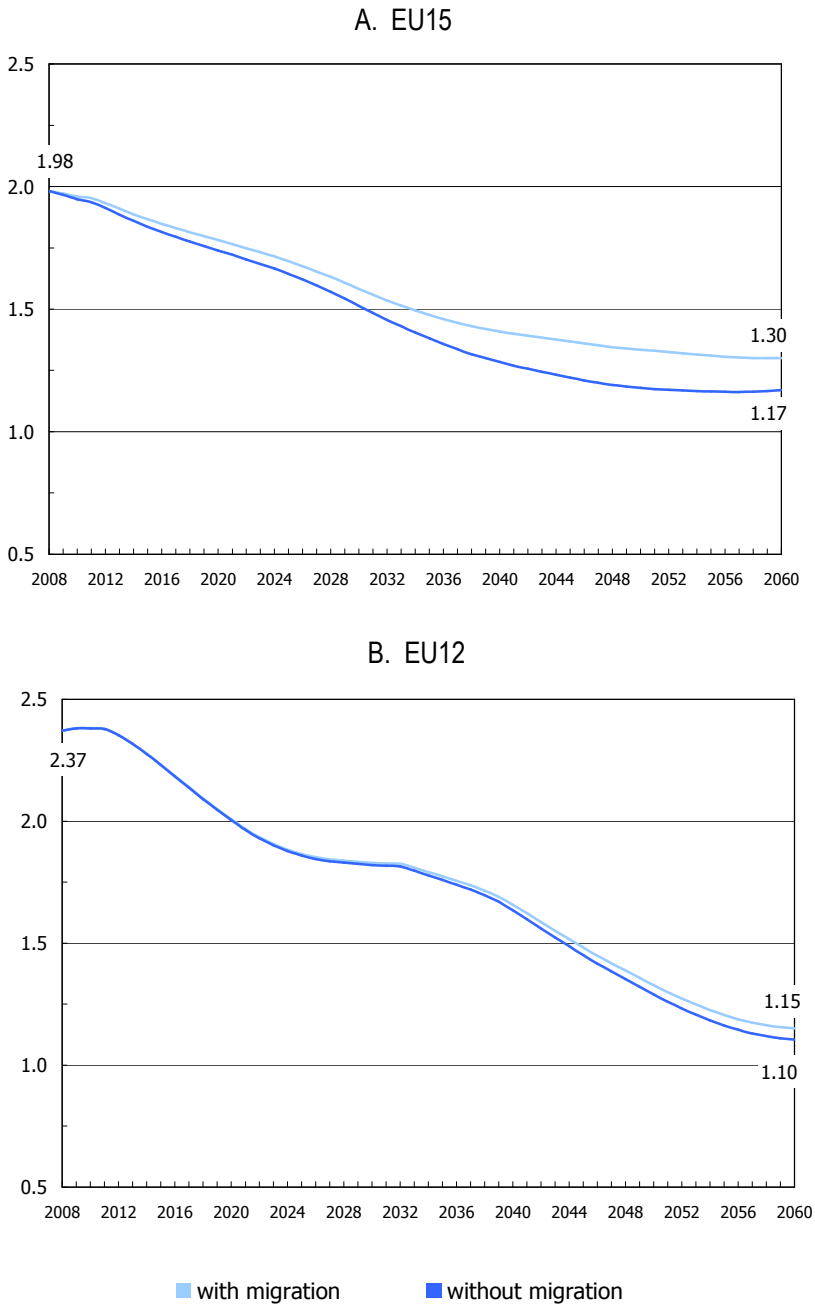
To the extent that in-migration is seen as an instrument against the negative socio-economic effects of 'population ageing', it is believed that it would 'rejuvenate' the population. If this is indeed the case, it should be reflected in the evolution of the dependency ratio. This is shown in Figure 11; the graphs correspond to the 'all age' dependency ratio (see Figure 4).

The graphs in Figure 11 indicate that, as already been argued elsewhere (see, for example, Lesthaeghe, 2000) in-migration is clearly not an instrument against 'population ageing': both graphs — *with* and *without* migration — show a downward trend in the dependency ratio. Without in-migration the number of people at working age might be even less than in the case of migration, but the difference is

small: 117 instead of 130 people at working age for 100 people at non-working age. In both instances, over the next 50 years, one can expect a decline by well over 30 per cent.

Figure 11 – Evolution in the 'all age' dependency ratio, by type of 'convergence' scenario (assuming migration or no migration), by sub-group (EU15, EU12), 2008-2060

Source: Europop2008 (EUROSTAT, 2008); EUROSTAT, 2001 Census data



The EU12 countries show a similar pattern, only the difference is smaller (and, as already seen in Figure 4, the decline is steeper).

Since the increase in the dependency ratio is small and even negligible, more migrants in the population are not immediately a solution for maintaining economic growth. In fact, one may even argue that their presence would be counterproductive to economic prosperity. Indeed, whereas an

influx of migrants may contribute to an increase in GDP *per se* — more people at work produce a greater economic output — they do not guarantee a higher GDP per capita. This is illustrated in Figure 12.

Figure 12 – Relative change in GDP and in GDP per capita with respect to their 2008-value (index=1), by scenario (see Table 2), by type of 'convergence' scenario (with or without migration), EU15 Member States

Note: Composite indices for relative change in GDP without migration are shown in Table A2

Source: Europop2008 (EUROSTAT, 2008); EUROSTAT, 2001 Census data

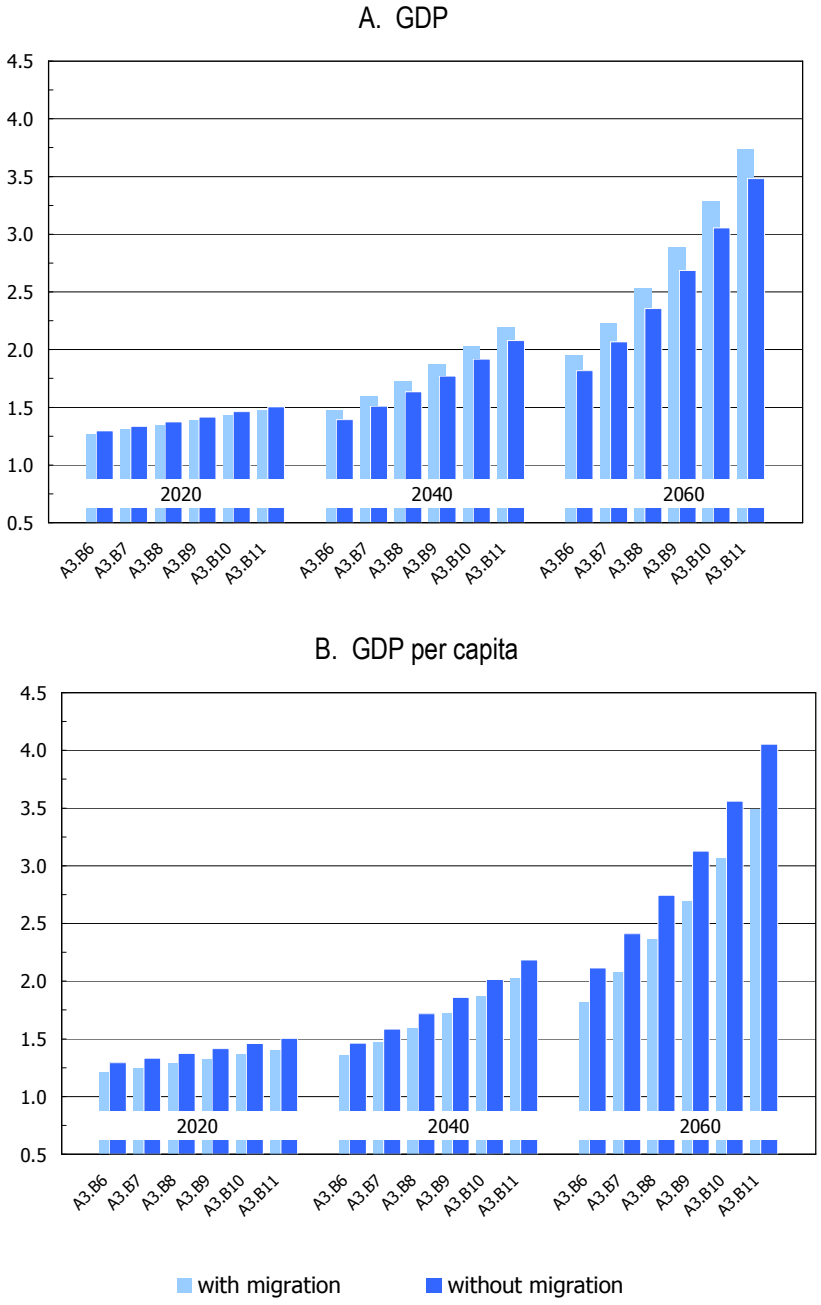


Figure 12 shows the relative change in GDP (panel A) and in GDP per capita (panel B) for several combinations of increased activity rates and labour productivity by type of 'convergence' scenario, i.e., with or without migration. In other words, one set of values in Figure 12 — those in panel A corresponding to the 'convergence' scenario with migration — are equal to the composite indices in

Table 2. The other (three) sets of values are also composite indices, but corresponding to the 'convergence' scenario without migration and GDP per capita.

As could be expected, GDP values will be higher in the case of migration. However, one observes a reverse pattern for GDP per capita; moreover the differences between with and without migration would be more important, especially by 2060.

These findings should not be interpreted as an argument against migration *per se*. If anything, the results again show the importance of increased labour productivity. But clearly, migration is not necessarily a solution for guaranteeing economic growth. We will come back to this in the concluding paragraph.

6. Conclusions: some considerations policy makers should take note of

According to macroeconomic theory ageing populations imply on the one hand slower economic growth, labour shortages (because of the shrinking of the population at active age), with possibly even smaller GDP levels; and on the other hand rising public expenditures because of more people at retirement age (the paying of pensions may become unsustainable) and of higher health care expenditures (older people need more health care).

The results presented above (Figure 6) indeed indicate that because of changes in the age structure European countries can expect substantive declines in GDP over the next coming decades. Between 2010 and 2060 the relative share of people at active age in the population will decline by 15 (EU15) to 24 per cent (EU12); at the same time, the relative share of those 65 and over will increase by 61 (EU15) and 134 per cent (EU12) (see table at bottom of Figure 3).

As already noted above, a "popular" measure to compensate for the shrinking work force would be to work longer, implying to increase the statutory age at retirement. Some countries are seriously considering rising retirement age from the now legal age of 65 to 67 years. There are fierce discussions about the subject in, for example, Belgium and the Netherlands; Germany has already taken the step (retirement age is now 67 years, although the measure will be introduced gradually; see Vanderleyden and Schoenmaeckers, *forthcoming*). The fact that the increase in retirement age is taken seriously in broad circles is illustrated by a recent 'Special Report' on 'Ageing Populations' by the weekly *The Economist* (June 27th, 2009). The conclusion of the — quite comprehensive and interesting — 'special report' is that "by far the most effective method to restrain pension spending is to give people the opportunity to work longer, because it increases tax revenues and reduces spending on pensions at the same time". One will observe that there is no explicit plea for increasing legal retirement age. However, the title of the 'leader' (of the same issue) is as follows: "Demography means virtually all of us will have to work longer. That need not be a bad thing"; and, as opposed to policies that would increase legal age to 67 or 68 years of age, at the end of the leader, Denmark is commended for its "radical step of [having indexed] the pensionable age to life expectancy" [27].

However, as shown by the results above, the future does not need to be as bleak as it may seem at first sight. By taking measures to increase activity rates — what also implies working longer, although not beyond the current retirement ages —, and by looking for ways to guaranteeing higher labour productivity, governments could boost future GDP levels that would equal and even be greater than current levels; it should be even possible to maintain the growth levels of the recent past.

Would these measures be easily implemented? Certainly not. In many countries it would imply taking an opposite direction of what was pursued in the not so distant past by pre-retirement policies with the idea of creating more job opportunities for young people (These policies by and far proved

ineffective because of mismathces between demand for and supply of labour). Raising activity rates will also imply getting more women into the work force. At first sight, this could be contradictory with the measures intended to improve on the combination between work and family life. But is this so? Those countries showing relatively high activity rates for women, like Denmark, Finland, Sweden, but also France and the UK (the latter not identified in Figure 5), also experience fertility levels that are well above average [28].

Therefore, are these measures difficult to achieve? Most likely, although clearly not impossible either. After all, the simulations (and the scenarios Ai and Bj underlying them) are derived from observed situations, i.e., those that are experienced in the Scandinavian countries — hence the use of the name 'Scandinavian model'. The most difficult — probably most challenging — part will be to increase labour productivity. But difficult as it may seem, do European countries have a choice here? To remain competitive in an increasingly global market, with emerging economies, aren't they forced to invest in new technologies — and hence education? and by doing so, to increase labour productivity? The need to do so is not the result of the negative effects of demographic change. It is simple economic strategy in an ever more competitive world. At the same time, it may be regarded as a sign of prosperity. The time that the welfare of the state was drawn solely from coal mines and the steel industry lies already (far) behind us; it is clear that the future is the service industry.

Not to focus on increasing retirement age would also have the advantage that policy measures could be closer to the wishes and desires of citizens. Although there are signs that in the recent past OECD countries have witnessed a rise in the actual age at retirement (Kinsella and He, 2009) [29], it is clear that in general, European citizens wish to retire before the legal retirement age. This is shown in several studies. It is the conclusion of the Dialog-study that was conducted under the auspices of the European Commission early in the 21st century in several European countries (Schoenmaeckers *et al.*, 2006). It is also shown by the results of third wave of the European Social Survey (EVS) conducted in 2006-2007 (Sweet, 2009). Finally, the desire to retire before statutory (or expected) retirement age is also one of the salient conclusions in the afore-mentioned study by Vanderleyden and Schoenmaeckers (*forthcoming*), which is based on a recent survey (2008) among Flemish citizens. In all instances the results point at large differences between the ideal (or wanted) age and the legal age at retirement. According to the EVS-the ideal age for retirement would be 57.9 years for women and 61.2 years for men — considerably lower than the legal age, in most countries 65 years [30].

One remarkable conclusion in the EVS study is that (Sweet, 2009: p. 6; own italics) "there is a consensus across all of Europe that retirement should occur *in advance of the onset of old age*. All of the societies studied have cultures that believe individuals should be able to exit the workforce *while they are still young enough to enjoy some years later in life free from the need to labor*". This desire is perhaps not in line with what economic theories advance. But are econometrics the only guiding principle?

The first to defend economic principles are entrepreneurs with the principal aim to make a profit by increasing productivity — i.e., economic output and hence GDP — at the least possible cost. This is by all means a sound principle. However, should it be the only guiding principle? Or should we also have eyes for the fact that there may be circumstances where GDP is perhaps not maximised, but there is an increase in *GDP per head*, the situation that could result in case of no immigration (see Figure 11).

Personally, we would favour the latter (an increase in GDP per head). However, the point we wish to make is that if governments can contribute in giving citizens the opportunity to enjoy years after retirement, this might be considered as real progress, more so than experiencing increased life expectancies. This would be enhancing the quality of life. And in doing so, governments would respond to its most important objective, i.e., enhancing the well-being of its citizens (Verlet and

Devos, 2008). The only real obstacle for pursuing this goal would be that it is unaffordable. But the simulation results in this study indicate the contrary.

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ANNEX

Table A1 – Composite indices for relative change in GDP compared to its 2008-value (index=1), taking into account demographic change (EUROSTAT's 'convergence' scenario with migration), by increase in activity rates and increase in labour productivity, by individual country, for years 2020, 2040, and 2060

	AT - Austria				BE - Belgium				DE - Germany			
2020		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.9554 *	1.0344	1.0791	1.1139	0.9469	1.1358	1.2278	1.3002	0.9554	0.9983	1.0281	1.0677
Scen. B5	1.1972	1.1832	1.2344	1.2742	1.1972	1.2877	1.3919	1.4739	1.1972	1.1419	1.1759	1.2212
Scen. B6	1.2337	1.2193	1.2720	1.3130	1.2337	1.3269	1.4343	1.5188	1.2337	1.1766	1.2117	1.2584
Scen. B7	1.2712	1.2564	1.3107	1.3530	1.2712	1.3673	1.4780	1.5651	1.2712	1.2125	1.2486	1.2967
Scen. B8	1.3100	1.2947	1.3506	1.3942	1.3100	1.4089	1.5230	1.6127	1.3100	1.2494	1.2867	1.3362
Scen. B9	1.3499	1.3341	1.3917	1.4367	1.3499	1.4518	1.5694	1.6618	1.3499	1.2874	1.3259	1.3769
2040		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.8514	0.9188	0.9566	0.9865	0.8808	1.0514	1.1345	1.2006	0.8390	0.8749	0.8998	0.9330
Scen. B5	1.1972	0.9366	0.9751	1.0056	1.1972	1.1087	1.1963	1.2660	1.1972	0.8788	0.9039	0.9373
Scen. B6	1.2337	1.0866	1.1335	1.0362	1.2337	1.2342	1.3342	1.3046	1.2337	1.0334	1.0642	0.9658
Scen. B7	1.2712	1.1197	1.1680	1.0678	1.2712	1.2718	1.3748	1.3443	1.2712	1.0649	1.0966	0.9952
Scen. B8	1.3100	1.1538	1.2036	1.1003	1.3100	1.3105	1.4167	1.3853	1.3100	1.0973	1.1300	1.0255
Scen. B9	1.3499	1.1889	1.2403	1.1338	1.3499	1.3504	1.4598	1.4275	1.3499	1.1307	1.1644	1.0568
2060		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.8178	1.0344	1.0791	1.1139	0.8611	1.1358	1.2278	1.3002	0.8056	0.9983	1.0281	1.0677
Scen. B5	1.1972	1.0128	1.0566	1.0907	1.1972	1.1710	1.2658	1.3404	1.1972	0.9628	0.9915	1.0297
Scen. B6	1.2337	1.0436	1.0887	1.1239	1.2337	1.2066	1.3044	1.3812	1.2337	0.9921	1.0217	1.0610
Scen. B7	1.2712	1.0754	1.1219	1.1581	1.2712	1.2434	1.3441	1.4233	1.2712	1.0224	1.0529	1.0934
Scen. B8	1.3100	1.1082	1.1561	1.1934	1.3100	1.2813	1.3850	1.4666	1.3100	1.0535	1.0849	1.1267
Scen. B9	1.3499	1.1419	1.1913	1.2297	1.3499	1.3203	1.4272	1.5113	1.3499	1.0856	1.1180	1.1610

	DK - Denmark				EL - Greece				ES Spain			
2020	0.9569	0.9652	0.9722	1.0110	0.9441	1.0678	1.1702	1.2207	0.9344	1.0120	1.0861	1.1271
Scen. B5	1.1972	1.1058	1.1138	1.1583	1.1972	1.2069	1.3226	1.3798	1.1972	1.1321	1.2150	1.2609
Scen. B6	1.2337	1.2212	1.2740	1.1936	1.2337	1.3229	1.4300	1.4218	1.2337	1.1509	1.1852	1.2993
Scen. B7	1.2712	1.2584	1.3128	1.2299	1.2712	1.3632	1.4736	1.4651	1.2712	1.1859	1.2213	1.3389
Scen. B8	1.3100	1.2967	1.3528	1.2674	1.3100	1.4047	1.5184	1.5097	1.3100	1.2220	1.2585	1.3797
Scen. B9	1.3499	1.3362	1.3940	1.3060	1.3499	1.4475	1.5647	1.5557	1.3499	1.2592	1.2968	1.4217
2040	0.8819	0.8891	0.8950	0.9303	0.8372	0.9512	1.0417	1.0894	0.8111	0.8788	0.9428	0.9817
Scen. B5	1.1972	0.9387	0.9450	0.9822	1.1972	0.9534	1.0442	1.0920	1.1972	0.8534	0.9156	0.9533
Scen. B6	1.2337	1.1254	1.1741	1.0121	1.2337	1.1732	1.2682	1.1253	1.2337	0.9990	1.0288	0.9823
Scen. B7	1.2712	1.1597	1.2098	1.0430	1.2712	1.2089	1.3068	1.1595	1.2712	1.0294	1.0601	1.0123
Scen. B8	1.3100	1.1950	1.2467	1.0747	1.3100	1.2457	1.3466	1.1949	1.3100	1.0608	1.0924	1.0431
Scen. B9	1.3499	1.2314	1.2846	1.1075	1.3499	1.2837	1.3876	1.2312	1.3499	1.0931	1.1257	1.0748
2060	0.8881	0.9652	0.9722	1.0110	0.7946	1.0678	1.1702	1.2207	0.7522	1.0120	1.0861	1.1271
Scen. B5	1.1972	1.0263	1.0337	1.0750	1.1972	1.0159	1.1132	1.1614	1.1972	0.9113	0.9780	1.0150
Scen. B6	1.2337	1.1334	1.1823	1.1077	1.2337	1.1135	1.2037	1.1967	1.2337	0.9264	0.9540	1.0459
Scen. B7	1.2712	1.1679	1.2183	1.1415	1.2712	1.1474	1.2403	1.2332	1.2712	0.9546	0.9831	1.0777
Scen. B8	1.3100	1.2034	1.2554	1.1762	1.3100	1.1824	1.2781	1.2707	1.3100	0.9837	1.0130	1.1106
Scen. B9	1.3499	1.2401	1.2937	1.2120	1.3499	1.2184	1.3170	1.3094	1.3499	1.0136	1.0439	1.1444

Note : *Values in boxes correspond to the relative value of GDP with respect to its 2008-estimate as the result from demographic change only

Table A1 – *Continued*

	FI - Finland				Fx - France				IE - Ireland			
2020		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.9554 *	0.9447	0.9505	0.9929	0.9469	0.9981	1.0306	1.0676	0.9554	1.0122	1.0726	1.1103
Scen. B5	1.1972	1.0806	1.0873	1.1358	1.1972	1.1315	1.1683	1.2102	1.1972	1.1577	1.2268	1.2699
Scen. B6	1.2337	1.1136	1.1204	1.1703	1.2337	1.1660	1.2039	1.2471	1.2337	1.1929	1.2642	1.3086
Scen. B7	1.2712	1.1475	1.1545	1.2060	1.2712	1.2015	1.2405	1.2851	1.2712	1.2293	1.3027	1.3485
Scen. B8	1.3100	1.1824	1.1897	1.2427	1.3100	1.2381	1.2783	1.3242	1.3100	1.2667	1.3424	1.3895
Scen. B9	1.3499	1.2184	1.2259	1.2806	1.3499	1.2758	1.3172	1.3645	1.3499	1.3053	1.3832	1.4319
2040		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.8514	0.8946	0.8999	0.9398	0.8808	0.9369	0.9653	0.9990	0.8390	0.9524	1.0103	1.0476
Scen. B5	1.1972	0.9119	0.9173	0.9580	1.1972	0.9879	1.0179	1.0534	1.1972	0.9567	1.0148	1.0524
Scen. B6	1.2337	0.9924	0.9985	0.9872	1.2337	1.0846	1.1198	1.0855	1.2337	1.0477	1.1103	1.0844
Scen. B7	1.2712	1.0226	1.0289	1.0173	1.2712	1.1176	1.1539	1.1186	1.2712	1.0796	1.1441	1.1174
Scen. B8	1.3100	1.0537	1.0602	1.0482	1.3100	1.1516	1.1890	1.1526	1.3100	1.1125	1.1789	1.1515
Scen. B9	1.3499	1.0858	1.0925	1.0802	1.3499	1.1867	1.2253	1.1877	1.3499	1.1464	1.2148	1.1865
2060		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.8178	0.9447	0.9505	0.9929	0.8611	0.9981	1.0306	1.0676	0.8056	1.0122	1.0726	1.1103
Scen. B5	1.1972	0.9250	0.9307	0.9722	1.1972	1.0290	1.0624	1.1006	1.1972	0.9761	1.0345	1.0708
Scen. B6	1.2337	0.9532	0.9590	1.0018	1.2337	1.0603	1.0948	1.1341	1.2337	1.0059	1.0660	1.1034
Scen. B7	1.2712	0.9822	0.9882	1.0323	1.2712	1.0926	1.1281	1.1686	1.2712	1.0365	1.0984	1.1370
Scen. B8	1.3100	1.0121	1.0183	1.0637	1.3100	1.1259	1.1625	1.2042	1.3100	1.0681	1.1319	1.1717
Scen. B9	1.3499	1.0429	1.0493	1.0961	1.3499	1.1602	1.1979	1.2409	1.3499	1.1006	1.1663	1.2073

	IT - Italy				LU - Luxemburg				NL - Netherlands			
2020	0.9569	1.0886	1.1873	1.2470	0.9441	1.0787	1.1574	1.2094	0.9344	1.0303	1.0979	1.1519
Scen. B5	1.1972	1.2472	1.3603	1.4287	1.1972	1.2192	1.3082	1.3669	1.1972	1.1526	1.2282	1.2886
Scen. B6	1.2337	1.1153	1.1222	1.4722	1.2337	1.1625	1.2003	1.4086	1.2337	1.1668	1.2365	1.3278
Scen. B7	1.2712	1.1493	1.1563	1.5170	1.2712	1.1979	1.2368	1.4515	1.2712	1.2023	1.2741	1.3683
Scen. B8	1.3100	1.1843	1.1916	1.5632	1.3100	1.2344	1.2745	1.4957	1.3100	1.2389	1.3129	1.4099
Scen. B9	1.3499	1.2204	1.2278	1.6108	1.3499	1.2720	1.3133	1.5412	1.3499	1.2767	1.3529	1.4529
2040	0.8819	0.9586	1.0426	1.0957	0.8372	0.9859	1.0565	1.1029	0.8111	0.9304	0.9884	1.0360
Scen. B5	1.1972	1.0121	1.1008	1.1568	1.1972	0.9882	1.0590	1.1055	1.1972	0.9035	0.9598	1.0060
Scen. B6	1.2337	1.0279	1.0342	1.1920	1.2337	1.0309	1.0644	1.1391	1.2337	1.0128	1.0733	1.0367
Scen. B7	1.2712	1.0592	1.0657	1.2284	1.2712	1.0623	1.0969	1.1738	1.2712	1.0437	1.1060	1.0682
Scen. B8	1.3100	1.0914	1.0981	1.2658	1.3100	1.0947	1.1303	1.2096	1.3100	1.0754	1.1397	1.1008
Scen. B9	1.3499	1.1247	1.1316	1.3043	1.3499	1.1280	1.1647	1.2464	1.3499	1.1082	1.1744	1.1343
2060	0.8881	1.0886	1.1873	1.2470	0.7946	1.0787	1.1574	1.2094	0.7522	1.0303	1.0979	1.1519
Scen. B5	1.1972	1.1574	1.2624	1.3259	1.1972	1.0262	1.1011	1.1506	1.1972	0.9278	0.9886	1.0373
Scen. B6	1.2337	1.0351	1.0414	1.3663	1.2337	0.9785	1.0103	1.1856	1.2337	0.9392	0.9953	1.0688
Scen. B7	1.2712	1.0666	1.0732	1.4079	1.2712	1.0083	1.0410	1.2217	1.2712	0.9678	1.0256	1.1014
Scen. B8	1.3100	1.0991	1.1058	1.4508	1.3100	1.0390	1.0728	1.2589	1.3100	0.9973	1.0569	1.1349
Scen. B9	1.3499	1.1326	1.1395	1.4950	1.3499	1.0706	1.1054	1.2973	1.3499	1.0277	1.0890	1.1695

Table A1 – *Continued*

	PT - Portugal				SE - Sweden				UK - United Kingdom			
2020		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.9554 *	1.0335	1.0910	1.1429	0.9469	0.9770	0.9813	1.0295	0.9554	1.0184	1.0507	1.0982
Scen. B5	1.1972	1.1821	1.2480	1.3074	1.1972	1.1076	1.1124	1.1671	1.1972	1.1648	1.2018	1.2561
Scen. B6	1.2337	1.2181	1.2860	1.3472	1.2337	1.1413	1.1463	1.2026	1.2337	1.2003	1.2384	1.2943
Scen. B7	1.2712	1.2552	1.3251	1.3882	1.2712	1.1761	1.1812	1.2392	1.2712	1.2368	1.2761	1.3337
Scen. B8	1.3100	1.2935	1.3655	1.4305	1.3100	1.2119	1.2172	1.2770	1.3100	1.2745	1.3150	1.3744
Scen. B9	1.3499	1.3329	1.4071	1.4740	1.3499	1.2488	1.2542	1.3159	1.3499	1.3133	1.3550	1.4162
2040		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.8514	0.9349	0.9882	1.0373	0.8808	0.9249	0.9289	0.9745	0.8390	0.9584	0.9882	1.0325
Scen. B5	1.1972	0.9530	1.0074	1.0574	1.1972	0.9753	0.9795	1.0276	1.1972	0.9628	0.9927	1.0372
Scen. B6	1.2337	1.0856	1.1460	1.0896	1.2337	1.0616	1.0663	1.0589	1.2337	1.0542	1.0876	1.0688
Scen. B7	1.2712	1.1186	1.1809	1.1228	1.2712	1.0940	1.0987	1.0911	1.2712	1.0863	1.1207	1.1013
Scen. B8	1.3100	1.1527	1.2169	1.1570	1.3100	1.1273	1.1322	1.1243	1.3100	1.1194	1.1549	1.1349
Scen. B9	1.3499	1.1878	1.2539	1.1922	1.3499	1.1616	1.1667	1.1586	1.3499	1.1534	1.1900	1.1694
2060		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4		Scen. A2	Scen. A3	Scen. A4
	0.8178	1.0335	1.0910	1.1429	0.8611	0.9770	0.9813	1.0295	0.8056	1.0184	1.0507	1.0982
Scen. B5	1.1972	1.0119	1.0682	1.1190	1.1972	1.0072	1.0116	1.0613	1.1972	0.9822	1.0133	1.0591
Scen. B6	1.2337	1.0427	1.1007	1.1531	1.2337	1.0379	1.0424	1.0936	1.2337	1.0121	1.0442	1.0914
Scen. B7	1.2712	1.0744	1.1343	1.1882	1.2712	1.0695	1.0742	1.1270	1.2712	1.0429	1.0760	1.1246
Scen. B8	1.3100	1.1072	1.1688	1.2244	1.3100	1.1021	1.1069	1.1613	1.3100	1.0747	1.1088	1.1589
Scen. B9	1.3499	1.1409	1.2044	1.2617	1.3499	1.1357	1.1406	1.1966	1.3499	1.1074	1.1425	1.1941

Table A2 – Composite indices for relative change in GDP compared to its 2008-value (index=1), taking into account demographic change (EUROSTAT's 'convergence' scenario without migration), by increase in activity rates and increase in labour productivity, by sub-group (EU15, EU12), for years 2020, 2040, and 2060

	EU15						EU12					
			Multipliers with respect to activity rates						Multipliers with respect to activity rates			
	2020	0.9585 *	Scenario A1	Scenario A2	Scenario A3	Scenario A4	**2020**	0.9427	Scenario A1	Scenario A2	Scenario A3	Scenario A4
			0.9773	1.0366	1.0959	1.1494			0.9794	1.0148	1.0452	1.1002
Multipliers with respect to labour productivity	Scenario B1	1.0618	0.9946	1.0550	1.1153	1.1698	Scenario B1	1.0618	0.9803	1.0157	1.0461	1.1013
	Scenario B2	1.0942	1.0249	1.0871	1.1493	1.2054	Scenario B2	1.0942	1.0101	1.0467	1.0780	1.1348
	Scenario B3	1.1275	1.0561	1.1202	1.1843	1.2421	Scenario B3	1.1275	1.0409	1.0785	1.1108	1.1694
	Scenario B4	1.1618	1.0883	1.1543	1.2204	1.2799	Scenario B4	1.1618	1.0726	1.1114	1.1447	1.2050
	Scenario B5	1.1972	1.1214	1.1895	1.2575	1.3189	Scenario B5	1.1972	1.1053	1.1452	1.1795	1.2417
	Scenario B6	1.2337	1.1556	1.2257	1.2958	1.3591	Scenario B6	1.2337	1.1389	1.1801	1.2154	1.2795
	Scenario B7	1.2712	1.1908	1.2630	1.3353	1.4005	Scenario B7	1.2712	1.1736	1.2160	1.2525	1.3184
	Scenario B8	1.3100	1.2270	1.3015	1.3760	1.4431	Scenario B8	1.3100	1.2094	1.2531	1.2906	1.3586
	Scenario B9	1.3499	1.2644	1.3411	1.4179	1.4871	Scenario B9	1.3499	1.2462	1.2912	1.3299	1.4000
	Scenario B10	1.3910	1.3029	1.3820	1.4611	1.5323	Scenario B10	1.3910	1.2841	1.3306	1.3704	1.4426
	Scenario B11	1.4333	1.3426	1.4241	1.5055	1.5790	Scenario B11	1.4333	1.3232	1.3711	1.4121	1.4865
	2040	0.8344	Scenario A1	Scenario A2	Scenario A3	Scenario A4	**2040**	0.8627	Scenario A1	Scenario A2	Scenario A3	Scenario A4
			0.8525	0.9034	0.9542	1.0011			0.9051	0.9456	0.9820	1.0372
Multipliers with respect to labour productivity	Scenario B1	1.1735	0.8348	0.8846	0.9344	0.9803	Scenario B1	1.1735	0.9162	0.9573	0.9941	1.0500
	Scenario B2	1.2712	0.9043	0.9583	1.0122	1.0620	Scenario B2	1.2712	0.9925	1.0370	1.0769	1.1374
	Scenario B3	1.3771	0.9797	1.0381	1.0965	1.1504	Scenario B3	1.3771	1.0752	1.1234	1.1666	1.2322
	Scenario B4	1.4918	1.0612	1.1245	1.1878	1.2462	Scenario B4	1.4918	1.1648	1.2169	1.2637	1.3348
	Scenario B5	1.6161	1.1496	1.2182	1.2868	1.3500	Scenario B5	1.6161	1.2618	1.3183	1.3690	1.4459
	Scenario B6	1.7507	1.2454	1.3197	1.3939	1.4625	Scenario B6	1.7507	1.3669	1.4281	1.4830	1.5664
	Scenario B7	1.8965	1.3491	1.4296	1.5100	1.5843	Scenario B7	1.8965	1.4807	1.5470	1.6065	1.6968
	Scenario B8	2.0544	1.4615	1.5486	1.6358	1.7162	Scenario B8	2.0544	1.6040	1.6759	1.7403	1.8382
	Scenario B9	2.2255	1.5832	1.6776	1.7720	1.8592	Scenario B9	2.2255	1.7376	1.8154	1.8852	1.9913
	Scenario B10	2.4109	1.7150	1.8173	1.9196	2.0140	Scenario B10	2.4109	1.8824	1.9667	2.0423	2.1571
	Scenario B11	2.6117	1.8579	1.9687	2.0795	2.1817	Scenario B11	2.6117	2.0391	2.1304	2.2124	2.3368
	2060	0.8012	Scenario A1	Scenario A2	Scenario A3	Scenario A4	**2060**	0.7262	Scenario A1	Scenario A2	Scenario A3	Scenario A4
			0.8178	0.8653	0.9129	0.9572			0.7593	0.7891	0.8153	0.8598
Multipliers with respect to labour productivity	Scenario B1	1.2969	0.8497	0.8992	0.9486	0.9947	Scenario B1	1.2969	0.7152	0.7432	0.7678	0.8098
	Scenario B2	1.4770	0.9677	1.0240	1.0803	1.1328	Scenario B2	1.4770	0.8145	0.8464	0.8744	0.9223
	Scenario B3	1.6820	1.1021	1.1662	1.2303	1.2900	Scenario B3	1.6820	0.9275	0.9639	0.9958	1.0503
	Scenario B4	1.9155	1.2551	1.3281	1.4011	1.4691	Scenario B4	1.9155	1.0563	1.0977	1.1341	1.1961
	Scenario B5	2.1815	1.4293	1.5125	1.5956	1.6731	Scenario B5	2.1815	1.2029	1.2501	1.2915	1.3622
	Scenario B6	2.4843	1.6277	1.7224	1.8171	1.9053	Scenario B6	2.4843	1.3700	1.4236	1.4708	1.5513
	Scenario B7	2.8292	1.8537	1.9616	2.0694	2.1699	Scenario B7	2.8292	1.5601	1.6212	1.6750	1.7666
	Scenario B8	3.2220	2.1110	2.2339	2.3567	2.4711	Scenario B8	3.2220	1.7767	1.8463	1.9076	2.0119
	Scenario B9	3.6693	2.4041	2.5440	2.6839	2.8142	Scenario B9	3.6693	2.0234	2.1026	2.1724	2.2912
	Scenario B10	4.1787	2.7379	2.8972	3.0565	3.2048	Scenario B10	4.1787	2.3043	2.3945	2.4740	2.6093
	Scenario B11	4.7588	3.1180	3.2994	3.4808	3.6498	Scenario B11	4.7588	2.6242	2.7270	2.8175	2.9715

Note : *Values in boxes correspond to the relative value of GDP with respect to its 2008-estimate as the result from demographic change only

Endnotes:

[1] The percentage values refer to the situation in 2005.

[2] For example, the UN has thus far convened two international assemblies on 'ageing'. The First World Assembly was held in Vienna in 1982; the Second World Assembly took place twenty years later in Madrid. In both cases, the outcome was an international plan of action on ageing (the latter is known as the Madrid International Plan of Action on Ageing or MIPAA).

[3] Otto von Bismarck was the first to introduce in 1889 a formal pension for older workers. Retirement age was put at 70. In those days life expectancy of the Prussian population was about 45 years.

[4] The EU (European Union) currently includes 27 Member States. The 15 'old' Member States are (ordered alphabetically, on the basis of the official EU abbreviations): AT (Austria), BE (Belgium), DE (Germany), DK (Denmark), EL (Greece), ES (Spain), FI (Finland), FX (France metropolitan), IE (Ireland), IT (Italy), LU (Luxembourg), NL (Netherlands), PT (Portugal), Sweden (SE), and the United Kingdom (UK). They were joined on May 1, 2004 by CZ (Czech Republic), Cyprus (CY), EE (Estonia), HU (Hungary), LV (Latvia), LT (Lithuania), MT (Malta), PL (Poland), SI (Slovenia) and SK (Slovakia); on January 1, 2007 they were joined by BG (Bulgaria) and RO (Romania) — bringing the total to 27.

[5] The proportion of people at age 80 and above is a much more sensitive measure to mortality than the proportion of people at age 60 and above, which is to a large extent the result of changes in fertility.

[6] Note that the latest projections cover the period 2008-2061.

[7] At the time of writing, the very latest *Population Prospects*, the *2008 Revision*, was not yet available.

[8] Ireland has been omitted from the list. Its relatively high value (a TFR of 1.9) is part of a *descending* trend.

[9] The reasons for low fertility within the context of the 'second demographic transition' remain the subject for much research. One key question in the debate is whether low fertility would be a temporary phenomenon or not. This discussion is not the subject of this paper. However, on the basis of own research, we would say that some optimism is justified. It is clear that much of the decline is related to the postponement of the first birth. The result is that many women have fewer children than they would actually like to have (Schoenmaeckers *et al.,* 2001; Van Peer, 2000). To the extent that in the future more women will have better access to treatment of sub-fecundity at late age, one can expect an increase in fertility. Another reason to believe in a (modest) fertility increase is that one may assume that extra-marital fertility will become socially more acceptable in all countries (Schoenmaeckers & Lodewijckx, 1997)

[10] No separate statistics are available EU15 and EU12 areas. At individual level, countries can be divided into three groups: (1) three countries with very high levels of net migration, of above 20 per cent: CY (30%), LU (25.4%), ES (22.2%); 10 with high levels of net migration: PT (20.5%), EL (16.6%), IT (19.9), AT (16.4%), BE (13.5%), IE (12.7%), CZ (13.0%), MT (12.3%), DE (11.4%), HU (11.4%); seven with moderate levels: SE (11%), SI (10.7%), UK (10.1%), DK (6.5%), FI (6.1%), FX (6%), SK (5.6%); four countries with low levels: NL (3.0%), RO (2.1%), PL (1.7%), BG (0.8%); and three countries with (small) negative levels of net migration: EE (-0.1%), LT (-0.2%), LV (-0.3%).

[11] We have deviate here from the more classical way of calculating, which is simply the reverse. We believe that this alternative way leads to a better understanding of the crux of the matter.

[12] For all clarity. 'In activity' includes all those who are actually employed and those persons who are unemployed (but are looking for employment'); or in other words, all those people who are potentially active in the labour force.

[13] At ages 50-54, activity rates are 0.689 for Hungary; 0.676 for Poland; and 0.661 for Romania.

[14] The 'Scandinavian model' is base don the data of Denmark, Finland, and Sweden only. Norway has been omitted. Norway is not an EU member. Moreover, Norway's economy is quite peculiar since it is highly dependant on oil exploitation and fishery.

[15] In the real world the assumption of constant unemployment is of course unrealistic. It should however be remembered that the present paper is not an econometric exercise or for that matter an economic forecast. Its purpose is rather a 'what if' exercise (based on simulations) indicating the consequences of changes in the population age composition and to what effect these can be counterbalanced by increases in activity rates and labour productivity.

[16] The ideal would have been to use the data for 2008, i.e. the 'base' year in the exercise. The 2001 census data are used by lack of more recent data. However, it should be remembered again that the purpose is not an econometric forecast. In this respect, the use of the census data seems to be an acceptable 'compromise'.

[17] Percentages are based on the median values between individual countries.

Endnotes (cont'd):

[18] In other words, a decrease in GDP of 5%, 14% and 17% by 2020, 2040 and 2060, respectively compared to the 2008 level.

[19] It should be noted that for clarity the effects of only a limited number of scenarios are included in the figure: see legend at bottom.

[20] Or 0.860 ('original' level corresponding to scenario 'zero') + 0.149 (gain scenario B1) + 0.175 ('extra' gain scenario B3) + 0.206 ('extra' gain scenario B5) + 0.241 ('extra' gain scenario B7, not shown in figure) = 1.631.

[21] It is also worthwhile reminding that, as can be observed in figure 6, the negative effect of demographic change is likely to be greater in the EU12 countries than in the EU15 countries.

[22] Or Purchasing Power Parity.

[23] These values are not indicated in figure 8.

[24] What can be realistically assumed is that the EU12 countries would indeed enjoy similar levels of GDP per capita as those observed in the EU15 area. Past experiences with 'new' Member States (for example, Spain and Portugal in 1990s; Ireland in 1990s and early 2000s) show that this is realistically possible. 'Convergence' in economic prosperity is one of the objectives of the European Union. It is an argument for also believing in EUROSTAT's 'convergence' scenario.

[25] See, for example the EU Sustainable Development Strategy (SDS), which was renewed in June 2006, and which sets out a coherent approach to how the EU will more effectively live up to its long-standing commitment to meet the challenges of sustainable development.

[26] Note that the multipliers for scenarios B12 and above are not included in table 2. The reason is that these are excessively high values that cannot realistically be maintained over longer periods; furthermore they are only used in this exercise. As for the lower values, also here, each step assumes an additional increase by 0.25%.

[27] The complete paragraph reads as follows: "Above all [other measures] the retirement ages for state pensions need to be put back. Recent increases to 67 or 68 are doing no more than compensate for the likely rise in life expectancy: 70 would be a better figure. So far only Denmark has taken the radical step of indexing the pensionable age to life expectancy." The Economist is correct by indicating that increases to 67 or 68 years are only a partial solution. In fact, also 70, although "better', can only be regarded a partial or temporary solution. As we have previously illustrated ourselves (Schoenmaeckers *et al*., 20xx), increasing retirement age by some years is bound to be a temporary measure to the extent that life expectancy is likely to increase further, although, as some suggest (see, for example, Olshansky *et al.,* 2005), at a (much?) slower pace as what has been observed in the last century. Therefore, the only 'sustainable' solution would indeed be the "radical step" taken by Denmark. But as argued in the present article, it is likely not the only solution, and certainly not the most attractive one.

[28] According to EUROSTAT's 'convergence' scenario (see Figuer 2) the median TFR value of the EU15 Member States in 2010 would be 1.72. Finland and the UK would experience a TFR of 1.84; Denmark and Sweden of 1.85; and France of no less than 1.98. As we have argued elsewhere, (Schoenmaeckers and Lodewijckx, 1997), TFR levels must be largely dependent on cultural indicators such as the status of woman in the society.

[29] This rise appears to be concurrent with increased labour force participation of 'older men', i.e. those aged 55 and above (Kinsella and He, 2009: Chapter 9). This could be the result of the abandonment of the early retirement schemes introduced in the 1980s (see above). The phenomenon would also apply to women (*idem*: p. 106): "Among women in many developed countries, there has been an increase in labor force participation at older ages for at least the past two decades". One and the other can be interpreted as a sign that the suggested increases in activity rates are a realistic policy measure, indeed.

[30] In the EVS gives 56.0 and 59.8 years for Belgian women and men, respectively. These figures are similar, although lower, to those of the Flemish study, where, contrary to the EVS survey where the answers are from all respondents, irrespective of work history, the results are based on the responses of 40-to-65-year olds who at the time of the survey were still working or who had worked before: 59.7 for women and 61.2 for men.