

**40TH EUROPEAN CONGRESS OF THE
EUROPEAN REGIONAL SCIENCE ASSOCIATION
29 August-1 September in Barcelona**

**DEMOGRAPHIC PATHS IN COMING DECADES IN CATALONIA.
GROWTH, AGE STRUCTURE AND LABOUR FORCE**

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Introduction

The Statistical Office of the Catalan Government (Idescat) has produced, as a part of its statistical programme, two sets of population projections for Catalonia by sex and age since 1998. The first set has covered the period 1996-2030 with no breakdown for geographical areas. The second has focused on the period 1996-2010 and offers data on a territorial basis for 41 comarques (or counties). These projections provide data to explore the main demographic characteristics in coming decades in a long time horizon (2030) in the first set and in a local basis in the second one.

In the last twenty years Catalonia, as many others South European Regions, has experienced a process of ageing, with increasing proportion of older people in age distribution. The ageing process has been a result of the evolution of the age pyramid (larger cohorts born before the Civil War reaching the retirement age) along with a dramatic fall in fertility levels that has been combined with lowering mortality rates in older ages and a net migration near zero. Demographic projections allow analysing developments further on future trends in growth population and in ageing processes.

Concern about ageing arises from the changing ratio of working-age population to the retired (potential support ratio) and the ageing of the workforce. These issues have been discussed recently in a study carried out by the United Nations which emphasises on the need of large replacement migration in order to avoid the decline of the numbers of inhabitants in active age and to keep unchanged the potential support ratio (UN, 2000). In fact, the size and the age composition of the labour force are determined by two different factors, firstly the purely demographic trends (considered in the UN study) and secondly the evolution of age-specific labour force participation rates and specially the changes in female participation. This last factor has not been included in the UN study. Other studies carried out by Eurostat (De Jong, 1999) or by the Economic Commission (2000) not only offer quite different pictures on the future evolution of population but include an outlook on the labour participation trends in European countries and regions.

The Catalan Statistical Office (Idescat) is responsible for producing a set of derived projections, on the basis of the previous demographic projections by sex and age, in particular labour force projections. This article presents some preliminary works on labour force projections for the Catalan population and tries to answer different questions about what would be the future number of people in both active and retired ages, and the future size and sex composition of the workforce.

Idescat population projections 1996-2030

Population forecasts are based on the cohort-component model. The model projects the future population by age and sex on the basis of the assumptions about future changes in fertility, mortality and migration by every age and sex. To generate population projections, we must make assumptions about an unknown future. The assumptions are a crucial point and, in fact, they are more important for the success or failure of demographic forecast than a sophisticated methodology is (Duchêne, J. and Ph. Wanner, 1999).

There are many ways of making these assumptions. To produce demographic projections for the Catalan population, it was decided to discuss the initial assumptions with a large group of local and international experts. Their views about the most likely future demographic trends were taken into account to produce population projections based on expert opinion about the future paths of fertility, mortality and migration (Idescat, 1998). The results of such a discussion were translated in terms of Total Fertility Rate, Life Expectancy, for both men and women, and Net Migration considering two origins: from the rest of Spain and from the rest of the world. The values of these indicators are shown in tables 1 to 3.

One important point of agreement between the experts was that demographic projections are highly uncertain and the users should be aware of that. To encourage users to take uncertainty into account, it was decided to produce several scenarios, to allow introducing personal judgement at the time of choosing a scenario. Each scenario characterises different demographic paths in terms of both growth and age structure.

To reflect the degree of uncertainty of the proportions of elderly people, two alternative scenarios have been calculated. The Low (or old) scenario supposes that fertility, mortality and net migration will keep low in the period 1996-2030. This scenario is rather unlikely, but it allows to measure an extreme process of population ageing and to answer the question of how much old the age distribution could become.

At the opposite side, the High (or young) scenario assumes a rebound on fertility, a high net migration and only a moderate increase of life expectancy. This combination yields the highest demographic growth of Idescat projections and represents the youngest age structure by 2030. In this scenario, the lowest ratio is projected between population in retired ages to population in active ages.

There are two intermediate scenarios: the Central and the Baseline. Both scenarios represents the more likely trends assumed by a majority of experts: medium levels of fertility and net migration, combined with alternative assumptions on mortality: a low increase of life expectancy in the Central scenario and a high increase of life expectancy included in the Baseline scenario.

Trends in population growth

According to the demographic scenarios the Catalan population will continue to increase in the next decade, from 6,1 millions in 1996 to attain between 6,2 and 6,6 millions in 2010 (see table 4). In the considered most likely scenario, the Baseline, the population would reach 6,5 millions in 2010. Between 1996 and 2010 the growth will be the result of a net natural increase of 183,000 (996,000 births minus 888,000 deaths) and a net migration gain of 166.000. According to the Baseline scenario, statistics in 2010 will register about 75.000 births, 62.000 deaths and a net migration of 14.000. Compared to the nineties, the biggest change is in the number of migrants and in the number of births, while deaths will show a weaker trend.

In the long run, by 2030, the number of people living in Catalonia is much more uncertain: according to the most likely assumptions, population would continue to increase to reach 6,7 millions according to the Baseline scenario. Population could even attain 7,2 millions if demographic evolution is close to the one projected in the High

scenario. Only the Low scenario assumes that the Catalan population would begin to decline after 2015 to be back to its current size by 2030.

It is expected that a linear trend of growing net migration will continue after 2010. In the period 2026-2030 yearly net migration will range between 18.000 (Low scenario) and 33.000 (High scenario). The Central and Baseline scenarios assume that yearly net migration will be around 21.000 in the same period.

The trend of natural increase after 2010 would be rather different from that the previous years. A fall in the number of births is expected because the entries in reproductive age of cohorts of small size born at the end of the XX century. In contrast, deaths would tend to increase because of growing numbers of people in older ages. As a result of the opposite evolution of births and deaths, the natural increase around 2015 would be very small and even will show negative values. After, when more large cohorts, to be born in the first decade of XXI century, will enter in reproductive age, births will rebound again. Thus, by 2020, it is likely that natural growth will begin to increase once more.

Population age structure

The last two decades of the XX century have registered a dramatic fall in number of people aged 0-15, from 1,4 million in 1986 to 0,9 million by 2000. Instead, a net increase in the youngest population age group is expected by 2010. The more likely scenarios (Central or Baseline) suppose 1,14 million, an increase of 23% (in absolute terms 200.000 more people in the age 0-15 than the number estimated by 2000). A steady increase until 2015 would be followed by a weaker trend onwards. By 2030 the number of people aged 0-15 will be almost the same that the one estimated by year 2000. High scenario expects 1,2 million and only the Low or Old scenario foresees a net decrease of numbers of young people compared to year 2000.

In the last decades Catalonia has registered a continuous increase of people at working ages. In 1996 census population between 16-64 has attained 4,2 million, an increase of 7% from 1986. The trend will be rather different as the number of people

reaching 16 years in the next few years will certainly decrease. Most cohorts entering in the base of the 16-64 age group are smaller than the ones attaining 65 and leaving the active ages. As all persons that will be aged 16-64 by 2010 are already born and mortality is not very important in this age group, only migration will reduce or increase the size of cohorts in the 16-64 age group.

As net migration in working ages is likely to be positive, a very significant decline of population in working ages is not expected in the next few years. According to the High scenario, which includes a net migration of about 195.000 in all the period 2001-2010, population aged 16-64 would remain 4,1 millions, close to the current number. The Central and Baseline scenarios, including a net migration of about 120.000 in the next decade, also foresee population aged 16-64 to be above 4 millions of people. Only the Low (or old) scenario foresees a slight decline of 2% in the population 16-64 by 2010. In that scenario a net migration of only 60.000 would not be enough to counteracts the negative difference between those becoming 16 years old and those celebrating their 65 birthday.

In the long run uncertainty about the size of the 16-64 age group is much more important because not only migration but also fertility has to be taken into account. By 2030 people aged 16-64 will include cohorts that are not yet born. These cohorts, to be born in years 2000-2015, are expected to be much larger than those born at the end of the XX century. Thus, by 2020 a more favourable balance is expected between people entering and people leaving the 16-64 age group.

By 2030, if both fertility and net migration components have a medium trend, as is assumed in the Central and Baseline scenarios, the size of population in working ages will stand about 4,1 million, practically the same number estimated in the year 2000. It could even increase to 4,4 million, according to the High (or young) scenario, as a result of both of high migration and fertility levels. Instead, the trends of the Low (or old) scenario leads the number of people in working ages in 2030 to decline to 3,8 million, as a consequence of persistent low levels in both migration and fertility. Nevertheless, at the light of recent developments registered in births and net migration, the evolution of the Low scenario seems rather unlikely. It is much probable that by 2030 the absolute number of people in working ages would be close to the current numbers.

To analyse the dynamics of the 16-64 age group it is interesting to look at figure 3. In the short run the youngest group (16-24) will tend to decrease but by 2030 its size will probably recover. The largest group (25-44) will tend to decrease in the medium run and to reverse this trend after 2025. The numbers of people aged 45-64 will certainly increase in the projection period. The overall result will be a trend of increasing mean age in the 16-64 age group.

The future trends in population aged 65 and over are much more certain because all cohorts attaining their 65 birthday until 2030 have already been born. The evolution of these cohorts will depend mainly on the trends in mortality. Also, in the long run, past trends in net migration will also modify the size of the 65+ age group, as migrants, who use to arrive at active ages, become old themselves as the times goes by.

By 2010 is expected around 1,2 millions of people aged 65 and over. In 2030 the range is between 1,62 (Baseline) and 1,46 (Central). The increase of the old age group will be very important until at least 2040, when large cohorts born by 1975 will attain their 65 birthday. As the path of mortality is the same in the Central and High scenarios, migration accounts for the difference between the projected numbers of people in the retired age group by 2030.

The old age dependency ratio (defined as the number of people aged 65 and over divided by those aged between 16 and 64) is an important factor in discussions about the future of pension systems. At present the ratio is above 25% (see figure 4). In the short run the ratio will show only a moderate increase, because of the small size of the cohorts entering in the retired age group. By 2010 the ratio will yield between 30 (Low or old scenario) and 28% (High or young scenario). Instead, by 2030 when larger cohorts will attain 65 years, a dramatic increase is quite likely as the old ratio dependency will range between 33% (High or young scenario) and 42% (low or old scenario). This means that in 2030 for every person older than 65, there will be 3 (High or young scenario) or 2 (low or old scenario) people in working ages, whereas by 1996 the ratio was about 4.

Two general conclusions stand out about demographic trends in Catalonia.

Firstly, there is a clear path of growth in the next few years because the numbers of births and migrants will increase. In the medium run (2010-2030) natural growth will have a weaker trend because become small cohorts of births born in the last decades of XX century entering at reproductive ages. By 2030 the Catalan population will range between 6,5 millions (Intermediate scenarios) and 7,2 millions (High scenario). Only the Low (or Old) scenario foresees a moderate decline in the Catalan population beginning in 2015 that would lead Catalan population to current numbers in 2030.

Secondly, the trend to ageing is a very clear one, with increasing numbers in people aged 65 years and over in all the projection period. By 2010 the population in retirement ages will be 7% or 11% larger than in 2000. But in all the period 2001-2030 the increase would range between 34% and 47%. On the other hand it seems quite clear that the numbers of young will also increase and the cohorts aged 0-15 in 2010 will be about 20% larger than the current ones. Regarding the population aged 16-64 the trend is less clear. In the short run, the inertia of demographic structure will lead to stagnation or even to a slight decrease of its size until 2015. But in the long run, according to the Intermediate scenarios it is expected that population in active ages will be back to current numbers by 2030. Furthermore, with moderately high levels of migration and fertility population in working ages it could even increase by 7%.

Trends on Labour Force

The Statistical Office of the European Union (Eurostat) has commissioned Statistics Netherlands to project the future evolution of Labour Force in the European Union. This work includes a geographical breakdown by regions at NUTS level at 2025 horizon (De Jong, 2000). See also the work of Fernandez Cordon (1995) on the projection of labour participation rates in Spain.

The EU projections consider three scenarios: Low, Baseline and High. In the Baseline scenario the most important change is the increase in women labour participation. The Low Scenario supposes low economic growth, difficulties to find jobs

for young people and important early retirement; the High Scenario assumes very high economic growth and rising labour demand, implying more young people combining education and paid employment and also complete retirement at older ages.

The results of EU projected rates have been applied to the previously projected Catalan population by sex and age to have a first insight about the future trends on its labour force. According to the Labour Force Survey (Idescat, 2000) current participation rates in Catalonia yields between the 2020 Low and High rates of EU scenarios for most age groups. Only women aged between 35 and 60 years show in 1999 rates below the EU target rates in Low Scenario by 2020. Nevertheless, participation of women in paid work has suffered a dramatic change in younger cohorts. Catalonian participation rate of women aged between 25 and 29 years is today not only higher than in any other EU country, but 5 points higher than the target 2020 value in the Baseline EU scenario. It is also very close to the 2020 target value in the High EU scenario.

As a part of preliminary works of the projection of the labour force in Catalonia, it has been assumed that by the year 2020 the participation rates for every sex and age group will attain the same target values of the three EU scenarios. Between the years 2020 and 2030 it is assumed that the sex and age participation rates would remain constant.

For the intermediate years between 1999 and 2020 it is assumed that the registered 1999 participation rate will increase or decrease linearly to attain the 2020 target value. The participation rate by the year 2020 will take a different value for every sex and age group for each one of the three EU scenarios: Low, Baseline and High. If r_{2020} is the participation rate in the year 2020 and r_{1999} is the participation rate registered in 1999, the value of the participation rate in the year t , r_t , is:

$$r_t = r_{1999} + (2020 - t) * (r_{2020} - r_{1999})/21 \text{ for } 2020 > t > 1999.$$

$$r_t = r_{2020} \text{ for } 2030 \geq t \geq 2020.$$

The only specific hypotheses that have been made concerns women aged between 30 and 59 years. According to the Baseline and High scenarios these age

groups will increase very much their participation in the next few years. Taking into account the important changes occurred in recent cohorts, it has even assumed that this important increase of rates will take place at a very quick pace. As stated above, in 1999 Catalan women aged 25-29 have registered a very high participation rate. The high score of these cohorts allows to presume that they would also have high participation rates in the future; thus, it has been supposed that the EU target value for the 30-34 age group will be already attained by the year 2004. The same in 2009 for women aged 35-39 and so on.

In formal terms we have:

Women rate participation for 30-34 age group in year t:

$$r_t = r_{1999} + (2004 - t) * (r_{2004} - r_{1999})/5 \text{ for } 2004 > t > 1999$$

$$\text{and } r_t = r_{2020} \text{ for } 2030 \geq t \geq 2004$$

Women rate participation for 35-39 age group in year t:

$$r_t = r_{1999} + (2009 - t) * (r_{2009} - r_{1999})/10 \text{ for } 2009 > t > 1999$$

$$\text{and } r_t = r_{2020} \text{ for } 2030 \geq t \geq 2009$$

Women rate participation for 40-44 age group in year t:

$$r_t = r_{1999} + (2014 - t) * (r_{2014} - r_{1999})/15 \text{ for } 2014 > t > 1999$$

$$\text{and } r_t = r_{2020} \text{ for } 2030 \geq t \geq 2014$$

Women rate participation for 50-54 age group in year t:

$$r_t = r_{1999} + (2019 - t) * (r_{2019} - r_{1999})/20 \text{ for } 2019 > t > 1999$$

$$\text{and } r_t = r_{2020} \text{ for } 2030 \geq t \geq 2019$$

These same formulas are used for the Low scenario, except for women aged 30-34, supposed to show a participation rate practically constant after 1999.

To have a first insight about the evolution of labour force between 2000 to 2030 in Catalonia, future numbers in labour force have been computed multiplying the projected population of Idescat scenarios by the three scenarios of labour participation

rates for every sex and age between years 2000 and 2030. The High population scenario has been combined with the high participation while the population in Low scenario has been multiplied by low participation. Baseline population scenario has been combined with the baseline participation rates.

According to the first results, labour force in 2010 will range between 2,7 million (Low scenario) and 3,2 million (High scenario), whereas the Baseline scenario expects labour force to be about 3 million. By 2030 there is a much more wide range: Under the assumptions included in Low scenario the active population will decline to 2,3 millions (a decrease of 9% in 30 years). Instead, the High scenario supposes 3,6 millions population in active ages by 2030, a size of 22% larger than the estimated in 2000. The most likely scenario, Baseline, assumes that labour force will be very stable in all the projection period. According to this scenario is rather likely that in 2030 the number of active people will be about the same to that estimated at the onset of the projection period (see figure 5).

It is very interesting to look at future trends of labour force by gender (see Figure 6). According to the Labour Force Survey (Idescat, 2000), women represents currently about 41% of economically active people. In the future, an increase of women's share in the Labour Force is quite likely. At the end of projection period the share of women in labour force will be around 45%.

In the Baseline scenario the stability of the overall labour force size will be the result of rather different trends by gender. Numbers of women in labour force would increase about 7% from 2000 to 2030 while an slight decrease of 5% is expected for male labour force of in the same period. According to the High labour force scenario, both male and female will contribute to the increase of labour force, but female labour force will increase about 34% while male labour will increase by 13%. The Low scenario foresees a more important decline of male rather than of female people in the workforce by 2030

Conclusions

According to the results of Idescat's demographic projections, moderate levels of net migration would be enough to avoid a serious decline in the population in working ages. If both migration and fertility are actually above of the medium assumptions a significant growth on population aged 16-64 years by 2030 is probable.

Regarding the trends on labour force, it seems quite clear, according to the Baseline scenario, that increasing women participation would keep labour force in current numbers in the next decades. A combination of higher participation rates with high demographic growth, as foreseen in the High scenario, would suppose an important increase of labour force at the end of the projection period. The results of Idescat's labour force projection will be available in the next few months and will offer a much more detailed picture on the future of labour force in Catalonia.

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Table 1
Total fertility rate per woman. Catalonia. 1985-2030.

Year	Low	Medium	High
1985	1,50	1,50	1,50
1990	1,20	1,20	1,20
1995	1,10	1,10	1,10
2000	1,14	1,32	1,43
2005	1,32	1,62	1,73
2010	1,43	1,72	1,88
2015	1,45	1,76	1,98
2020	1,44	1,76	1,99
2025	1,43	1,71	1,92
2030	1,42	1,66	1,85

Table 2
Life expectancy at birth. Catalonia. 1985-2030.

Year	Men		Women	
	Medium	High	Medium	High
1985	72,6	72,6	78,4	78,4
1990	74,1	74,1	80,0	80,0
1995	73,9	73,9	80,9	80,9
2000	74,8	76,0	82,3	83,2
2005	75,2	76,9	82,6	84,0
2010	75,6	77,7	82,9	84,7
2015	76,0	78,4	83,2	85,3
2020	76,5	79,1	83,4	85,7
2025	76,8	79,7	83,6	86,2
2030	77,2	80,3	83,7	86,6

Table 3
Net migration. Catalonia. 1986-2030.

Period	Low	Medium	High
1986-1990	37.601	37.601	37.601
1991-1995	4.739	4.739	4.739
1996-2000	8.950	44.053	61.453
2001-2005	26.011	60.039	88.539
2006-2010	41.063	66.940	103.940
2011-2015	58.515	77.510	126.440
2016-2020	77.460	91.485	147.455
2021-2025	84.100	99.235	157.175
2026-2030	87.505	106.205	164.150

Table 4
Projected population. Catalonia. 1986-2030.

x 1.000.000

Year	Low	Medium	Baseline	High
1986	5,98	5,98	5,98	5,98
1991	6,06	6,06	6,06	6,06
1996	6,11	6,11	6,11	6,11
2000	6,11	6,15	6,17	6,19
2005	6,15	6,27	6,31	6,36
2010	6,21	6,39	6,46	6,55
2015	6,24	6,45	6,56	6,73
2020	6,23	6,48	6,62	6,86
2025	6,20	6,50	6,66	7,00
2030	6,17	6,54	6,73	7,17

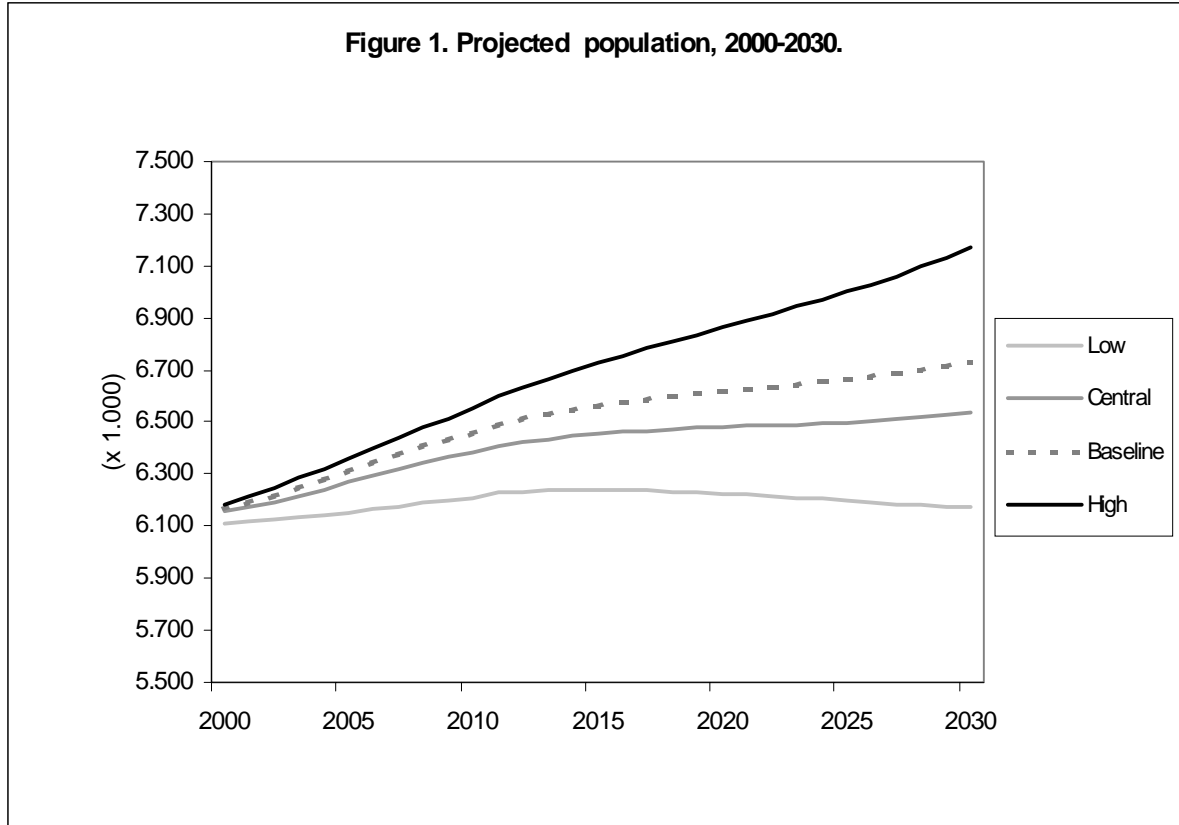


Figure 2. Population projected by main age groups, 2000-2030.

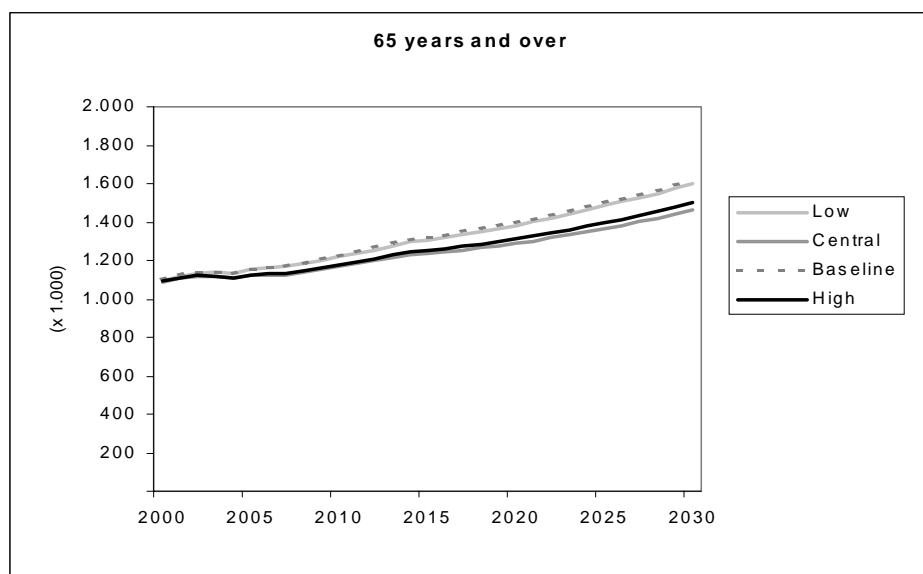
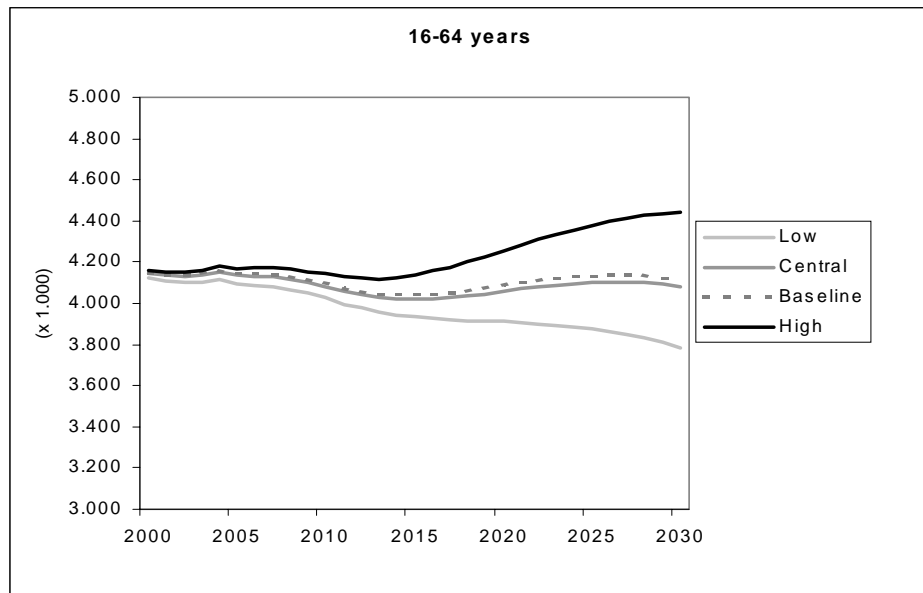
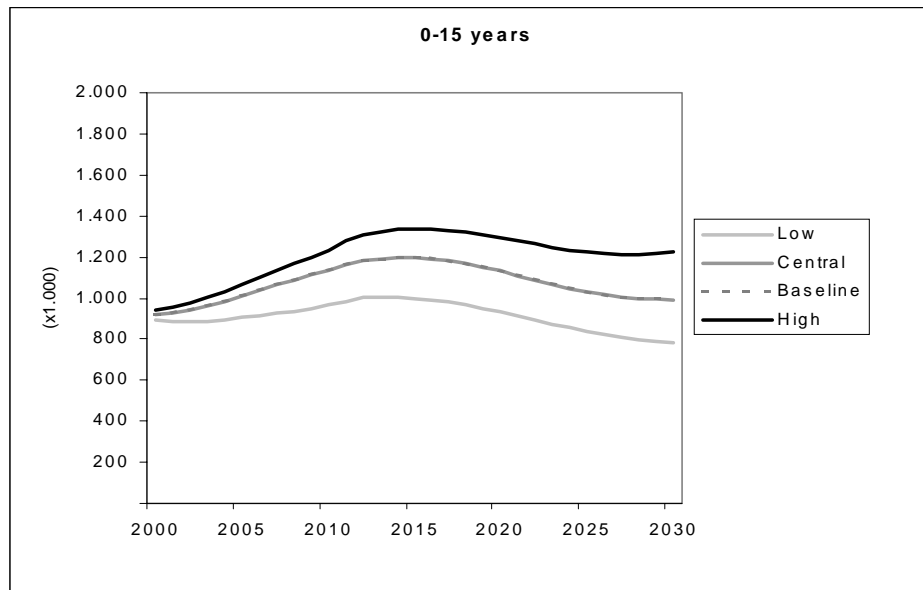
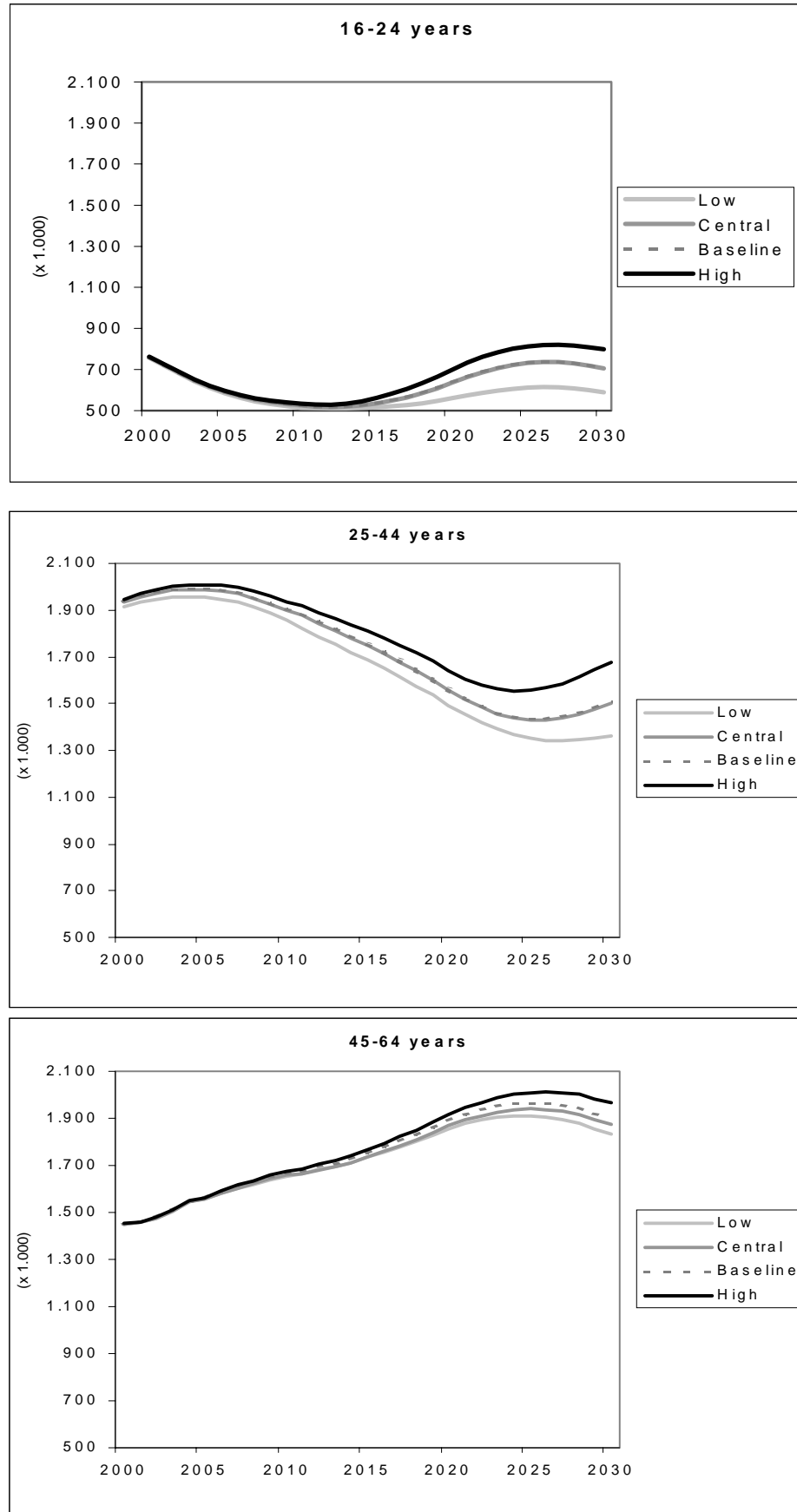


Figure 3. Projected population in active ages, 2000-2030.



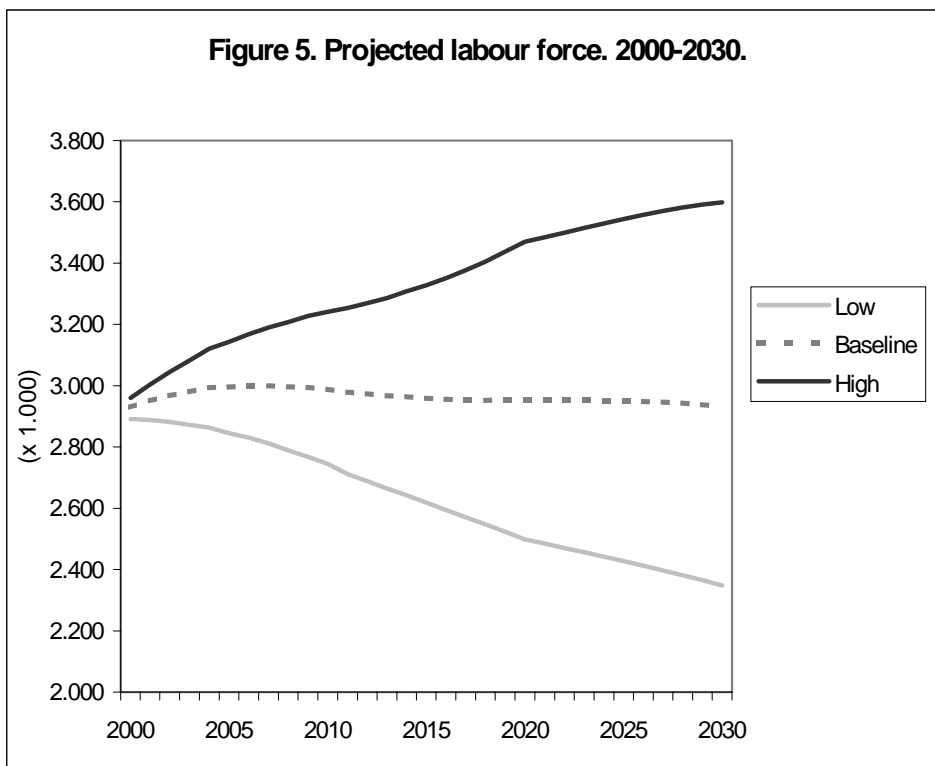
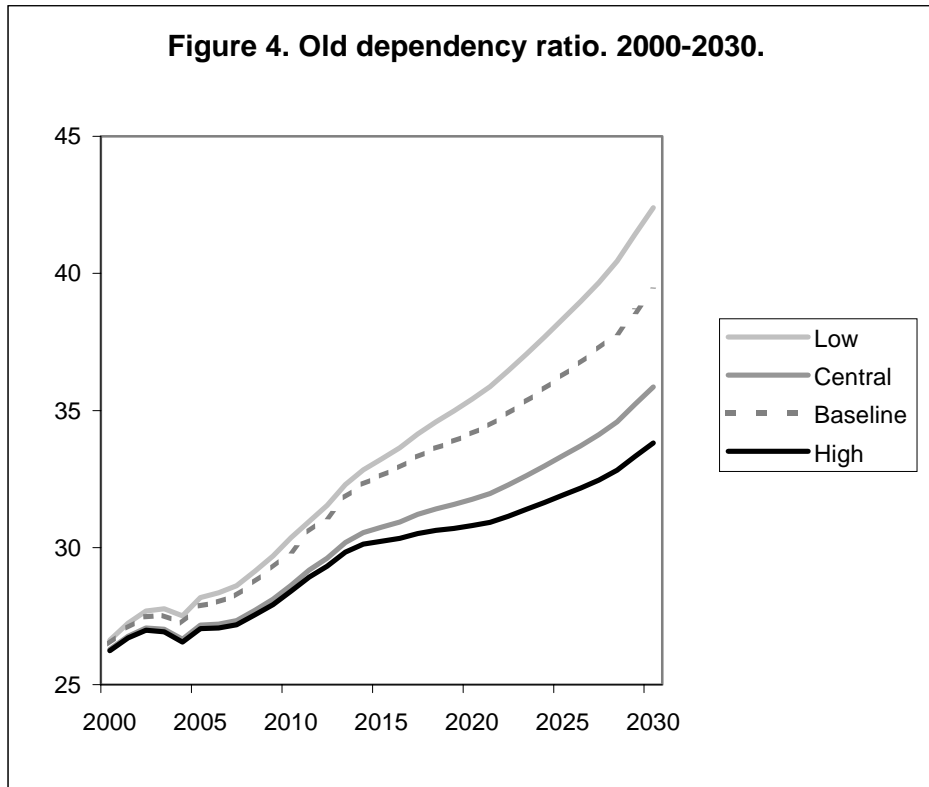


Figure 6. Projected Labour Force by gender, 2000-2030.

