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INFORMATION ON THE PROJECT

The Swedish case study is part of the project "Social Security, Family and Household in Aging Societies," conducted at IIASA in collaboration with the Netherlands Interdisciplinary Demographic Institute (NIDI).

Other papers related to the project are listed below:

WP-92-30	Demographic Trends and the Pension Problem in Finland, by Jarl Lindgren
WP-92-24	Socio-Demographic Changes and the Pension Problem in France, by Jean-Louis Rallu
WP-92-23	Demographic Trends and the Pension Problem in Poland, by E. Fratczak and J. Józwiak
CP-91-15	The Effects of Changing Marital Status Patterns on Social Security Expenditures in the Netherlands, 1985-2050, by N. Keilman
CP-91-02	Demographic Changes and their Implications on Some Aspects of Social Security in the Unified Germany, by N. Ott, T. Büttner, and H.P. Galler
WP-90-22	Socio-Demographic Changes and the Pension Problem in Austria, by J.-P. Gonnot
WP-90-15	Demographic, Social and Economic Aspects of the Pension Problem: Evidence from Twelve Countries, by J.-P. Gonnot
WP-89-107	Pension Systems and Social Security Trends and National Characteristics, by J.-P. Gonnot and C. Prinz
WP-89-34	Recent Trends in Living Arrangements in Fourteen Industrialized Countries, by J.-P. Gonnot and B. Vukovich

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ABSTRACT

The present study describes the effect that different demographic developments will have on the Swedish pension system. Projections of expenditures for old age pensions, survivor pensions, and disability pensions were made for the period 1985-2050 on the basis of future developments of the population and its structure (age, sex, and marital status). Six demographic scenarios were formulated: Benchmark, High Fertility, Low Mortality, West European, National 1, and National 2 scenarios. Together they cover a wide range of demographic developments, not to say all probable developments.

A model of the current Swedish pension system is combined with all six demographic scenarios. Projections of expenditures as well as of contributions and benefits in the pension system are made. The pension system will be put under severe strain whatever the demographic development. In all scenarios, expenditures will continue to increase until 2030, in the beginning as a result of the maturing of the system, but after the turn of the century mainly as a result of demographic changes. Expenditures will increase by about 75% in the "most favorable" scenarios (Benchmark/High Fertility, Western European) and by 100% to 130% in the "least favorable" scenarios (Low Mortality, National 1 and 2). After 2030, expenditures decrease in all scenarios except in National 2 where they remain constant. The contribution rates will have to be increased from about 20% in 1985 to between 36% (National 1) and 49.9% (Low Mortality) of the wage sum in 2030.

The impact on contributions and benefits of three selected policy measures are studied: a raising of the retirement age by two years, an extension of the number of years on which benefits are based and an increase in labor force. All three measures will ease the pressure on the system but only to some extent. The main conclusion is that there is a need for a fundamental change in the Swedish pension system.

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DEMOGRAPHIC EFFECTS ON THE SWEDISH PENSION SYSTEM

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In Sweden as in many other West European countries, the public pension system is designed principally as a "pay-as-you-go" system, i.e. a system where the contributions in one year are used for payments of pension benefits in the same year. Such systems are sensitive to population trends and most of all to shifts in the relation between the number of persons in the labor force and the number of pensioners. The aging population revealed by demographic projections gives cause for disquiet, and has resulted in a number of alarm reports both from the OECD and from individual countries.

The aim of the present study is to describe what effects different demographic developments will have on the Swedish public pension system. The report constitutes the groundwork of a major comparative study of the effects of demographic changes on the pension systems of 12 countries. This work is being carried out at the International Institute for Applied Systems Analysis in Laxenburg, Austria, where a demographic model and a pension model have been designed.

This study begins with a short description of the Swedish pension system and, from a historical perspective, the Swedish demographic development. Then the demographic model is described together with projections of the population and the resulting labor force. The pension model of IIASA, adjusted to the Swedish pension system, is presented. By connecting the demographic model and the pension model, projections are made of contributions and benefits in the pension system.

1. THE SWEDISH PENSION SYSTEM

The Swedish public pension system consists of a basic pension, the *folkpension*, which is the same for everybody, and a supplementary pension based on previous income although with limitations on lower and upper income counted as pensionable income (the "floor" and the "ceiling") and the number of years of pensionable income. Both systems feature early retirement pensions, including

disability pensions, old age pensions and provision for survivors.[1] The public pension system is price-indexed in that benefits are linked to a so-called base-amount (B), which broadly speaking follows the consumer price index.

Both the basic pension and the supplementary pension are organized on the pay-as-you-go system. Both are financed by means of payroll taxes. The basic *folkpension* was introduced in 1913 and the *allmänna tilläggspensionering* (general supplementary pension scheme, referred to below by the customary abbreviation of ATP) in 1960, benefits first being paid in 1963.[2] Table 1 gives certain details of the Swedish pension system in 1985.

The scale of pensioners' consumption, and therefore the apportionment of consumption between employed persons and pensioners, is determined to a large extent by the pension system. Figure 1 shows how this apportionment evolved between 1970 and 1984.

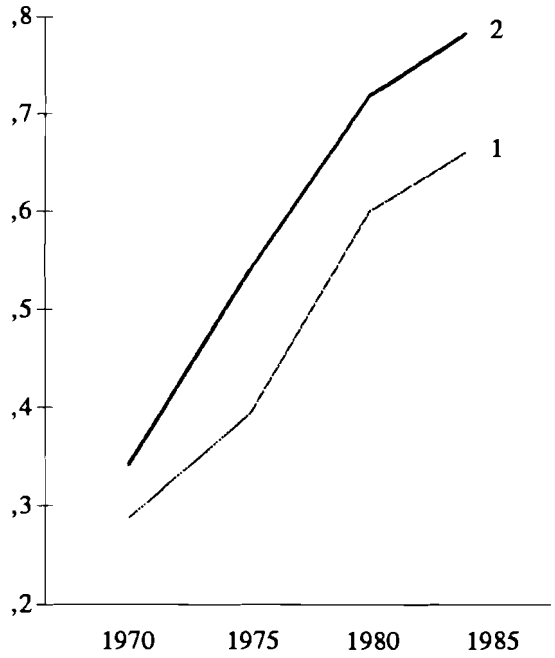

Figure 1. Old age pension per person aged 65 years and over in relation to wage per person aged 20-64. Curve 1 shows the proportion excluding other retirement pensions; curve 2 includes other retirement pensions. Source: Kruse 1988.

[1]In addition to these public pension systems there are negotiated pension schemes agreed between parties on the labor market as well as a wide variety of private insurances. These insurances are not dealt with in this report. They form only a small proportion of total pensions as far as today's pensioners are concerned, but this proportion is expected to grow.

[2]For a description of the system's history, see Bengtsson and Fridlizius, 1992a.

Table 1. Characteristics of the Swedish pension schemes, 1985. Source: SOS 1985/1986; RFV 1987.

	Basic Pension		Supplementary Pension
Number of pensions paid (1000s)			
old age	1,480		1,036
disability	323		270
survivors	72		307
Total benefits paid (billion SEK)			
old age	28.3	(36.9*)	35.0
disability	5.9	(8.8*)	10.0
survivors	1.3	(1.5*)	4.6
Average old age pension benefit (SEK)	19,122	(24,392*)	33,792
Contribution rate	9.45		10.0
Income bases for calculating benefits	-		Average of 15 best years
Number of years required to qualify for			
any pension	-		3
full pension	-		30
Floor (ceiling) for calculating			
benefits	-		yes (yes)
contributions	no (no)		no (no)

* including pension supplement, municipal housing allowance, children and handicap supplement.

The sharp rise in average pensions relative to wages is due partly to the fact that the ATP system is still in its building-up phase, which is characterized by generous transitional rules, and partly to the indexation method relating pension benefits to inflation instead of growth rate. The system is now fully built out but is still in a process of maturity that will not be concluded until about the turn of the century or shortly thereafter. During the initial phase of ATP, contributions were fixed at a higher rate than necessary in order to cover benefit payments, and this gave rise to some accumulation of funds. These funds amount today to about 360,000 million SEK. This figure can be viewed in relation to the annual outgoings, which amounted to 53,000 million SEK in 1989. Between 10 and 15% of disbursements on supplementary (ATP) pensions were financed by interests earned by the funds in certain years during the 1980s when revenue from contributions did not suffice to cover pension benefits.

Supplementary pension benefits under the ATP regulations are established not as a proportion of contemporaneous wage-incomes but as a proportion of the pensioner's average income during the best fifteen years. The value of this income is protected by means of the consumer price index, as are pension benefits. Determining pension benefits in this way means, firstly, that the system has a "memory" of earlier economic events, and secondly, that all adaptation to changes in incomes and/or demographic structure is thrown on to the contributions side, i.e. on the employed in the form of changed contribution rates. The National Swedish Insurance Board makes calculations of the contribution rate necessary to cover the pension expenditures according to today's pension rules. Through its "memory" the Swedish pension system is sensitive to the economic growth rate. In Table 2 calculations given different growth rates are shown.

Table 2. Expenditures on the basic pension[3] and ATP as a share of the wage bill. Source: RFV 1987.

	Yearly growth rate in GDP		
	0%	1%	2%
1995	26.3	23.6	22.4
2015	43.8	33.7	26.4
2035	50.1	30.0	22.5

Evidently the pension system is extremely sensitive to the economic growth rate. At a yearly growth rate of 2%, only rather small increases in the contribution rate will be necessary, both compared to the contribution rate of today (ca. 20%) and compared to the contribution rates that will be necessary with lower growth rates. This is due partly to the fact that at a higher growth rate the contribution base grows faster and partly because the ceiling in ATP limits the pension benefits to an increasing proportion of pensioners. There will be tensions in the system regardless of whether the economic growth is high or low. At low growth rates we certainly can expect tensions as the contributions have to be raised by 50% or more. At higher growth rates we can expect tensions as the link between previous income and pension benefits is weakened. Pressure not to keep the ceiling is probable which in turn will mean that contributions will have to be raised.

Both the legally established and the actual retirement ages (65 and 63 years respectively) are the same for men and women. Each individual can begin drawing pension benefits between the ages of 60 and 70 years by electing for advanced or deferred withdrawals of pension rights with a resultant actuarially-calculated reduction or augmentation of benefit. There are also provisions for partial pensions

[3]Only expenditures financed by pay-roll tax are included, that is about 80% of the expenditures on basic pension. Thus the figures are an underestimation.

between the ages of 60 and 65, and for early retirement pensions. Disability pensions are eligible to all age groups but early retirement pensions have been granted not only on health grounds but also for labor market reasons to persons between 60 and 65 years of age. Also, in this age group a milder form of disability test is made. The availability of early retirement pensions for labor market reasons was changed in 1991. Since that time no new early retirement pensions for labor market reasons have been granted. Very limited advantage has been taken of the advanced withdrawal option, in contrast to both partial retirement and early retirement pensions for labor market reasons. This is not very surprising since both the latter options contain a large element of subsidy (see Kruse and Söderström, 1989). The placing of floor and ceiling on the benefit side and not on the contribution side, the 15-year rule for the calculation of pension benefits, and the fact that 30 years suffice for entitlement to full pension means that from the individual's point of view, the link between contributions and benefits received is very weak. The effect of these rules is that the pension system subsidizes leisure time or non-market oriented work and creates incentives for a diminution of the labor supply.

2. THE DEMOGRAPHIC DEVELOPMENT

The pattern of demographic development during the twentieth century has been similar in most industrial countries. Birth rates and family size have gradually diminished while average life expectancy has increased. The decreasing number of births is the major determinant of the aging process, i.e. the increasing proportion of elderly. However, the trend towards declining births has been interrupted from time to time. A substantial rise, a "baby boom", occurred during the 1940s. There was another such rise in the 1960s although not as strong as in the 1940s. These periodical booms have resulted in long-term wave-like movements as well as deformations of the age structure of the population. Sweden furnishes an example of this (Figure 2). As regards the timing, strength and duration of the waves of births, however, the trend has not always been the same in different countries.

In a number of countries, including England, Denmark and Sweden, the rise in the birth rate during the 1940s was considerably sharper than during the 1960s. In other countries, such as West Germany, Austria and Norway, the birth peak of the 1960s was the dominant one. In all of these countries the rises were of relatively short duration. However, in other countries again, including the United States, the rise in births was of longer duration.

Thus, birth rates in Sweden have followed the general trend--long-term falling birth rates interrupted by temporary rises--while at the same time the pattern has been unique in that timing, strength and duration have not always coincided with the trend in other countries. This is underlined by the fact that even today Sweden shows birth rates which differ from those in the outside world. Birth rates have increased remarkably during the last few years, which means that if birth rates do not decline again, Sweden's population is self-reproducing, a phenomenon which is

almost unique in the industrialized western world today even though several countries are experiencing an increase in their birth rates just now.[4]

When birth rates are rising rapidly, as during the 1940s and 1960s, these factors act together. Which factor is of most significance varies. That the crude birth rate was considerably higher during the 1940s than during the 1960s (the figure was 29% higher in 1944 than in 1964) is attributable primarily to the higher proportion of females of childbearing age during the 1940s. This is shown, for instance, by the fact that the TFR (Total Fertility Rate), which is independent of the age structure, was only insignificantly higher during the 1940s than during the 1960s (Figure 3; in 1944 it was only 5% higher than 1964).[5]

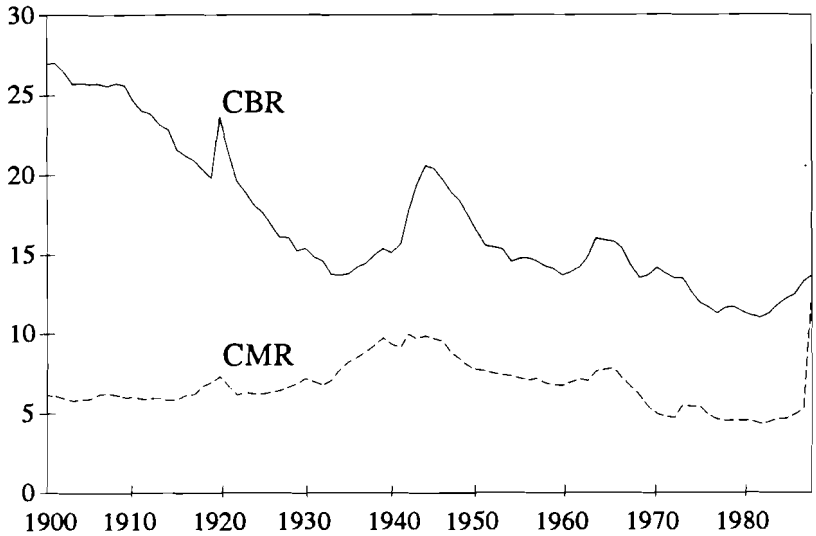

Figure 2. Crude birth rate (CBR) and crude marriage rate (CMR), 1900-1989; per mille.

[4]One West European country which also has high fertility is Ireland. Some of the East European countries such as Poland and Czechoslovakia also have high fertility.

[5]The period cumulative fertility is accordingly not affected by the age structure of the population. On the other hand it is affected by the timing of childbearing in the families. In making prognoses, therefore, it is preferable to base oneself on the cumulative fertility for each generation separately, i.e. the cohort cumulative fertility, which is a measure of how many children a female who herself belongs to a certain birth cohort bears in the course of her whole fertile period. This measure is independent of whether childbearing is concentrated within a certain period or not. The cohort aggregated fertility has changed during the twentieth century on very similar lines in the majority of European countries apart from France and England but at different levels. See Bourgeois-Pichat, 1986. Cohort cumulative fertility is a great help in enabling future fertility to be estimated, but when it comes to the significance of fertility for changes in the age structure of the population it is not this measure which is of greatest interest but the overall birth rate, i.e. the number of births per 1000 of mean population.

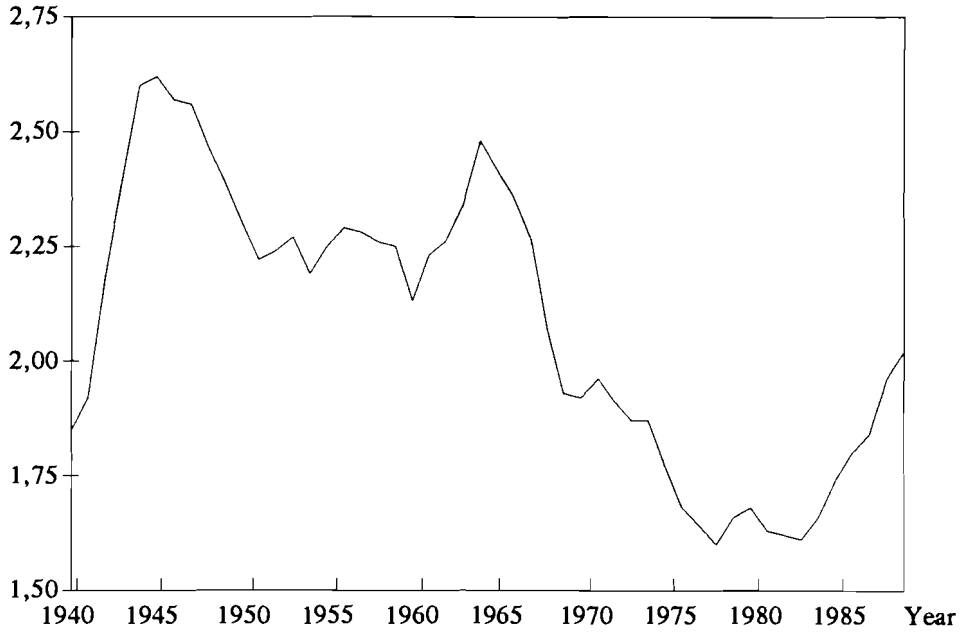

Figure 3. Total fertility rate (TFR), 1940-1989.

The TFR today is almost 2.1. The question is whether it will continue rising to the same level as during previous peak years, i.e. to 2.5-2.6. In the official population prognosis for 1989, which is based on analysis of the cohort fertility, it was estimated that the TFR would already be diminishing during 1990, which turned out to be incorrect. Despite the fact that the prognosis underestimated the birth rate in the short term it is still unlikely that fertility would reach the level of the 1960s. One reason among others is that the large number of mothers belonging to the 1940s generation will soon be moving out of the fertile age range. By virtue of the fact that the proportion not living in paired relationships has increased it is hardly likely that the females bearing children in the immediate future will manage to compensate both for this group and for the low fertility of the 1940s generation.

Marriage frequency and birth rates have followed each other during the past fifty years, which was not the case in the early years of the twentieth century when birth rates halved while marriage rates remained stable. As a rule, when the marriage frequency increases temporarily the marriage age falls (Table 3).

The changes during 1989 deviate from this pattern and merit comment. From 1988 to 1989 the number of married persons per 1000 of population more than doubled, from 5.20 to 12.80. The bulk of the increase occurred during the last month of 1989. The marriage age of both males and females increased by 3.1 years (Table 3). Thus couples who were already living together got married. The reason for this unprecedented marriage peak was that the pension regulations were to be altered on 1 January 1990. In point of fact only a few were affected by the changes but in the public debate it appeared as if people who were cohabiting without being married were going to be big losers.

Table 3. Age at first marriage for men and women; number of divorces per 1,000 married women; 1950-1989.

Year	Men	Women	Difference	Divorces
1950	28.3	25.6	2.7	25.2
1960	27.3	24.3	3.0	26.8
1970	26.2	24.0	2.2	40.2
1980	29.0	26.4	2.6	59.0
1985	30.1	27.5	2.6	51.7
1988	30.6	27.9	2.7	40.1
1989	33.7	31.0	2.7	17.3*

* the decline is due to an increase in marriages in 1989.

However, it is not the trend of marriage rates which attracts the greatest interest during the postwar period but cohabitation and divorce. Between 1970 and 1980 the divorce frequency almost doubled in Sweden (Table 3). Another characteristic feature is that cohabitation outside matrimony increased rapidly from the 1960s onwards. It is true that cohabitation has ancient roots in Sweden, but it is only recently that it has attained widespread dissemination. Among young people cohabitation is the wholly predominant mode of life together, while one-third of all who live together between ages 30-34 are cohabiting. Even though cohabitation has become increasingly common in many West European countries, Sweden (along with the other Nordic countries) does occupy a special position (Figure 4).

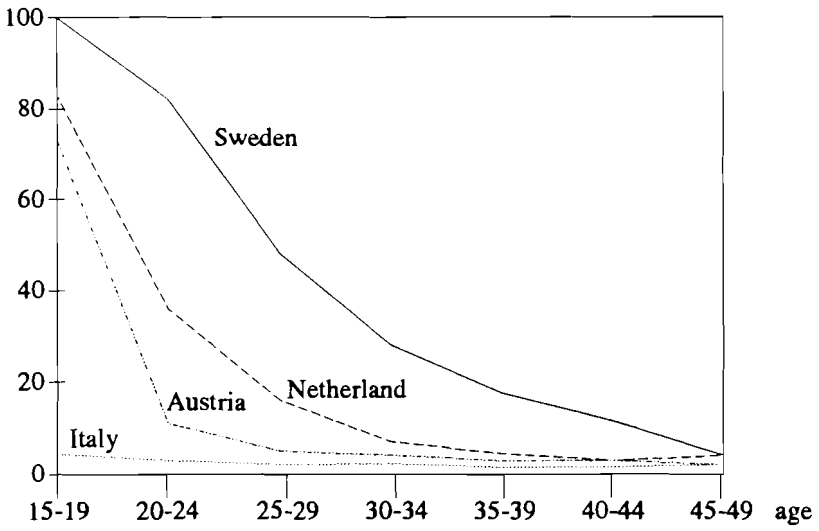

Figure 4. Proportion cohabiting (persons living in consensual unions in relation to persons married plus cohabiting) in Sweden, Netherlands, Austria and Italy, 1985.

The new outlook on living together has led, from the 1960s onwards, to a continuous increase in the proportion of children born outside wedlock (Figure 5). Today fewer than half of all children are born in wedlock.

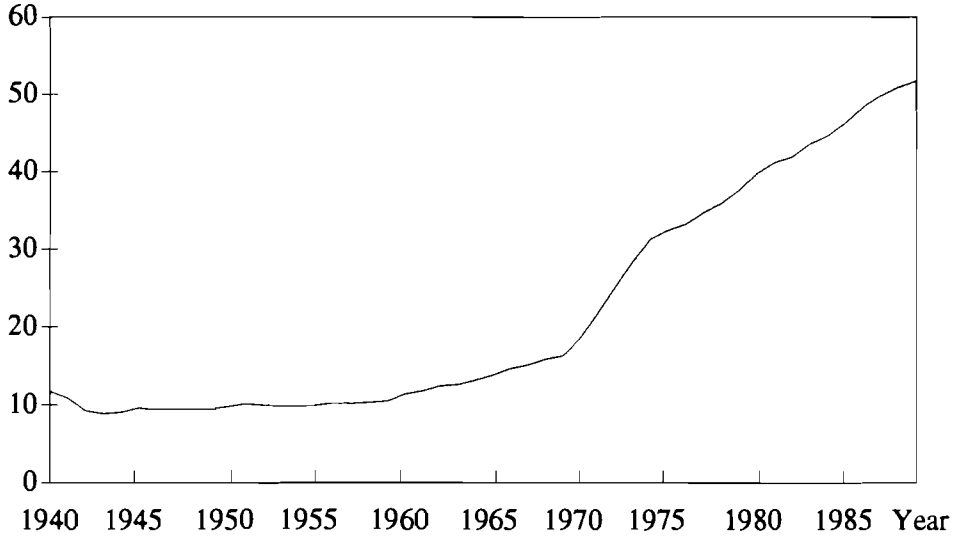

Figure 5. Number of extramarital births in relation to the total number of births, 1949-1989; in percent.

The trend of population in most industrialized countries during the twentieth century is characterized not only by falling birth rates and decreasing family size but also by increased average life expectancy. Here, too, developments in Sweden have been similar to those in other countries, more so than in the case of births. As in many other countries, death risks have fallen more rapidly for females than for males during the postwar period (see U.N., 1987). In Sweden, however, the increase in average life expectancy at birth has developed similarly for both sexes during the 1980s. While the difference in average life expectancy at birth was 2.7 years in favor of females in 1950, it was 5.8 years in 1988 (Table 4). The entire increase results from differences in death risk at age 60 years and over. At the same time excess mortality among males was greater below age 60 than above. This may seem paradoxical but since the death risks are very small at active ages, the wide differences between males and females of active age affect the differences in average life expectancy to an insignificant degree.

The difference in mortality trends between females and males since the beginning of the 1950s results from the fact that mortality from diseases of the circulatory organs diminished more among females than among males. The main cause seems to have been improved diagnosis.

Another feature which also seems to be common in many industrialized countries is that married people have significantly lower mortality than unmarried. Divorced males show a specially high mortality. This seems attributable in part to a selection

process--alcohol problems underlie both divorces and premature death--and in part to changed lifestyles following divorce.

Table 4. Life expectancy at birth and at age 60, and number of survivors at age 80 per 1000 born; men and women; 1950-1989.

Year	e_0 w	e_0 m	e_0 diff	e_{60} w	e_{60} m	e_{60} diff	survivors at 80 yrs	
							women	men
1950	72.5	69.8	2.7	18.3	17.2	1.1	379	320
1960	74.9	71.2	3.7	19.3	17.3	2.0	434	330
1970	77.1	72.2	4.9	20.9	17.8	3.0	518	356
1980	78.8	72.8	6.0	22.1	17.9	4.2	571	360
1985	79.7	73.8	5.9	22.7	18.3	4.4	600	385
1989	80.6	74.8	5.8	23.4	19.2	4.2	629	423

The large number of females alive in relation to the number of males, especially at ages over 80 years, means that many women are compelled to spend a considerable part of their lives as pensioners without life partners (Table 4). The high divorce frequency reinforces this phenomenon.

3. THE AGE STRUCTURE OF THE POPULATION

The age structure of the population is changed when fertility and mortality are changed.[6] Migration can affect the age structure as well. The fact that the proportion of older people in the majority of industrialized countries is much higher today than it was at the beginning of the century is almost exclusively the result of falling birth rates (see Coale, 1957). Declining mortality has therefore had only a slight effect up to the last decades. If fertility is stabilized at the same time as mortality continues to fall, e.g. through improved diagnosis and improved methods of treatment, the extension of the motorway network or reduced smoking or other factors, nevertheless it is mortality which will chiefly affect age structure in future.

That Sweden today, with 18% of its population in the 65-plus age group, has the highest proportion of old people in the world therefore results from the fact that the decline in the birth rate was steeper in Sweden than in other industrialized countries. On the other hand the proportion of people over 65 in Sweden will not

[6]With the same birth and death rates, all populations would gradually attain the same age structure.

increase for some time ahead--though the proportion of the very old will increase.[7] However, this primarily affects the costs of nursing, care and accommodation, not pension payments. Those becoming pensioners today have higher pensions of course than those who retired earlier.

Today there are over 30 old age pensioners to every 100 persons of working age. The corresponding figure in the middle of the nineteenth century was fewer than 10. The increase has come about mainly during the postwar period, i.e. simultaneously with the expansion of the pension system.[8]

Despite the fact that the proportion of older people is much higher in Sweden than in other countries, still the total dependency burden, measured as numbers of children and old people in proportion to numbers of working age, is not that much higher. This is due to the low birth rate of the 1970s and that the "baby-boom" generation still belongs to the labor force.

Accordingly a gradual decline in fertility has caused the proportion of older people to increase. But because of the birth peaks of the 1940s and 1960s and the latter half of the 1980s, the proportion at different ages varies widely in step with the passing of the birth groups through the population pyramid. Large birth cohorts first increase the pressure on maternity clinics, then on day nurseries and nursery schools, and then on the school system. But since not all individuals attend school for the same length of time, entry into working life, and starting to cohabit, takes place more gradually. The effects on the labor market, as on the housing market, will therefore not be equally accentuated. It will still not be negligible, as the great housebuilding programs of the 1960s testify. The age of parents at the birth of the first child also varies, which means that the effect of a "baby boom" will not be equally strong. But because the pension age is fixed the whole effect will recur at retirement. Therefore when the 1940s generation reaches retirement, which will take place about the year 2010 given the present pension age, the number of pensioners will increase rapidly. In addition to the strain to which the pensions and care systems are subjected by virtue of the fact that the number of older people is increasing in the long term, they will thus also be subjected to the type of strain that schools suffered, for example, when the number of children was varying up and down.

4. THE POPULATION MODEL

The model which is used for the projections was developed at IIASA. It is a kind of standard projection with the help of current condition and transition intensities.

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[7]There is also a tendency to underestimate the numbers of the very old because of the projection methods which are used. This is primarily because period and not cohort death risks form the groundwork for the prognoses and partly because of the methodology employed. See SCB, 1987.

[8]A sharp rise occurred during the 1880s as well. See Bengtsson and Fridlizius, 1992b.

It utilizes aggregated data of different conditions (categories, regions, states). In the present case it employs, in addition to the categories male and female, four categories of civil status, viz. single never previously married, married, divorced and widow/widower. Unlike gender, transitions occur here between several of the various categories. Transitions can take place simultaneously for both sexes but between different categories of civil status. Thus a single woman never previously married, for example, may marry a divorced man. In this way one event, in this case a marriage, affects several transfers and conditions simultaneously. Another joint effect is that the number of married persons must always be the same for males and females. Divorces and widowhood are other examples of joint effects. Other transitions again affect only one category. This applies to births as well as to deaths among single persons.

The starting point for this study is the number of females and males in every five-year age group in the four different categories of civil status in 1985. Another starting point consists of actual transition intensities between different conditions in the period 1980-84, i.e. births, marriages, divorces, changes of residence, deaths etc. A projection is made on the basis of this information for every fifth year up to the year 2050. This projection constitutes a "benchmark", i.e. a reference point, and shows the result of unchanged transition intensities, i.e. that the behavior we had in 1980-84 will continue until the year 2050. Further, net external migration for different sexes and ages are assumed to be zero. These assumptions are quite unrealistic of course. Nor is it the aim to describe the most probable development. However, the result comes very close to the prognosis made by Statistiska Centralbyrån (SCB) in 1986. Benchmark projections are being made for all countries included in the study.

Five more projections are made in addition to this benchmark scenario, making six projections in all. As well as the benchmark scenario three other scenarios are based on assumptions which are common to all countries included in the study. The reason why certain assumptions are the same is that the purpose of the comparative study of which this report gives the Swedish groundwork is not to make the most realistic projection but rather to examine how a number of possible demographic changes affect the age structure of the population and the civil status of old people and how this in turn affects the pension system and only then results are comparable to the other studies.

The following four scenarios are accordingly common to all countries:

1. The *benchmark scenario*, where the transition intensities from 1980-84 remain unchanged, shows the structure, and the behavior which is already present among the population. The assumptions are therefore the same for all countries but the values vary.

2. The *high-fertility scenario*, where fertility is assumed to return to "replacement level" in the year 2005, remaining constant thereafter. This means an increase for all countries except Czechoslovakia and Poland. Other assumptions are as in the benchmark scenario.

3. The *low-mortality scenario*, in which death risks are assumed to fall by 30% for females and 45% for males up to the year 2005, remaining constant thereafter. The diminution implies a rise in average age of about 8-10 years for males and 4-5 years for females. Other assumptions are as in the benchmark scenario.

4. The *West European scenario*, in which the most extreme values in Europe up to now are combined. In all countries fertility in the year 2005 is assumed to have reached West Germany's present level, i.e. a cumulative fertility of 1.28. Mean life expectancy is assumed to be as in Switzerland, i.e. 74 years for males and 81 years for females. Marriage and divorce frequencies are assumed to be as in Sweden where one-third never marry, the marriage age is 28 years for women and 30 for men, and one-third of all marriages are dissolved by divorce.

The benchmark scenario has already been commented on. As has already been observed, it lies close to the 1986 population prognosis. Despite the fact that Sweden today has already reached the level of fertility assumed in the high-fertility scenario, this projection nevertheless justifies its appellation. The reason is that fertility is not expected to become any higher. The fall in death risks in the low-mortality scenario is significant, so this scenario too shows an extreme situation. In the fourth joint scenario several assumptions are combined simultaneously, and this applies also to the two national projections. However, as far as Sweden is concerned it is only the assumption about fertility that is changed, since the marriage assumptions refer to Sweden and since average life expectancy is broadly the same in Switzerland and Sweden. The West European scenario therefore becomes a pure low-fertility scenario for Sweden. The advisability of using Swedish marriage and divorce frequencies for other countries' projections must be questioned since the extent of cohabitation is quite different in Sweden compared with the other countries in the study. Cohabitation also affects the realism of the projections for Sweden, a point to which we shall revert. Another general reflection is that it seems quite improbable that all changes in transition intensities will cease after the year 2005. In some cases, e.g. as regards mortality, it is to be expected instead that there will be more change after that year than before.[9] At all events it is not realistic that the processes will be frozen in 2005.

5. The *National 1 scenario* is based on the same assumptions as the main alternative in the official 1989 prognosis (see SOS 1989). It is therefore based on analysis of the cohort fertility and the assumptions about this in the future. These cohort assumptions have then been converted to period assumptions. The result is that the period to the TFR is estimated to decline over the next few years and then climb slowly until the year 2010, when it will be 1.9 for all females regardless of whether they are married or not. It is assumed that it will then be constant. The assumptions about mortality are based on analysis

[9] An important factor which seems to favor such a development is the reduced smoking among children and young people.

of the period mortality, not the cohort mortality. Mortality is assumed to be independent of civil status and to decrease until the year 2010, remaining constant after that. The decrease corresponds to an increase of 1.4 years in mean life expectancy of males and of 2.0 years in that of females compared with 1989. The national prognoses differ from the four joint ones in the migration assumption. In the National 1 prognosis Sweden's immigration surplus is assumed to fall from 29,000 in 1988 to 10,000 in 2010, which is the main alternative in the official 1989 prognosis. In the four joint scenarios net migration is assumed to be nil. The aim of the National 1 scenario is in the first place to compare the prognosis methodology on which the IIASA-prognosis is based with that employed in the official SCB prognosis. The latter is based on one-year age groups and is made for every year. In the second place, the National 1 projection supplements the official one in that it shows how the proportion of single persons will develop in future given the population structure and the divorce frequencies we have today.

The result of the National 1 scenario turns out to coincide almost completely with the official prognosis. The difference is biggest in the year 2025, the last year of the official prognosis, when the total population according to National 1 is just under one percent below the official prognosis. Bearing in mind that the projections are based on different starting years, and that National 1 is based on five-year figures, not 1-year figures like the official one, the result is very good. National 1 can therefore be said to be *identical to the main alternative in the 1989 prognosis.*

6. The *National 2 scenario* is based on the assumption that fertility changes to 1.8 in the year 2010 and is then constant, while at the same time mortality decreases even after the year 2010. The rate of decrease is assumed to be the same as in SCB's low alternative, which means an increase of 2.2 years for males and 2.8 years for females until the year 2010 compared with 1989. Death risks are assumed to continue falling thereafter at the same rate as before, which is justified by the argument that only then do new and more smoke-free cohorts come up to the risk age-zone.

Two further projections have been made based on the benchmark scenario. In the one case the actual death risks for different categories of civil status have been used instead of the same death risk regardless of marital status. Married persons, as already discussed, have lower death risks than single persons, especially divorcees. The differences are greatest in the 30-40 year age range but are very low despite this compared with the death risks for older persons. The differences in death risk among the gainfully employed therefore do not lead to any major differences in life expectancy. The excess mortality of single persons diminishes with age but is still 20-40% higher at age 65 than it is for married persons.

In the second case, account has been taken of cohabitation. In this case, too, the starting point is the benchmark scenario. As was noted above, cohabitation is much more widespread in Sweden than in any other country. The calculations of future population according to marital status must therefore be supplemented by figures in which regard is also paid to cohabitation. This problem is far too complex in

terms of both content and data to permit it from being analyzed in detail here. A separate study of cohabitation will therefore be carried out shortly. The results which are discussed here are based on a simplified model and data only from 1986. Despite this it is hoped that the result gives some clue as to the direction in which cohabitation affects the other results.

5. FUTURE POPULATION

Sweden's population will decrease continually unless immigration continues to be greater than emigration, as is shown by Figure 6, which gives total population according to the six scenarios. In both national scenarios, population increases until about 2030, which is therefore attributable to net immigration.

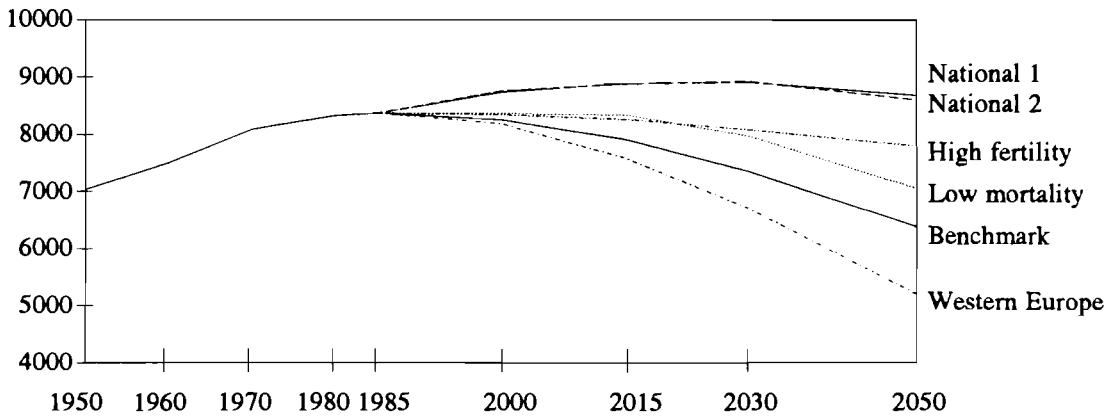

Figure 6. Population size 1950-1985 and forecasts until 2050 according to the different scenarios; in thousands.

The gap between the scenario giving the lowest population, i.e. the West European, and the two national ones is very wide. Population in the year 2050 will be only 5.2 million if fertility declines to the same level as prevails today in West Germany and many other countries, including Denmark, and if net immigration is nil. According to the national scenarios the population will be just over 8.6 million in that year. The difference will therefore become large in time, but even before the year 2010 it will be more than a million. Then how extreme are these scenarios? Neither of them is especially extreme. Many countries today show the same fertility as the scenarios are based on. Therefore the conclusion must be that there is considerable uncertainty as to whether Sweden's population will increase or decrease in future but that any increase presupposes an immigration surplus.

All scenarios show a pronounced rise in the proportion of older people after the turn of the century whether the population increases or decreases (Appendix Table A1). Only on the assumption that fertility is high does the proportion diminish somewhat, and even then not until after the year 2030. The increase will apparently be greatest in the West European scenario, according to which 38 percent of the

population will be over 60 years of age in the year 2050, but the low mortality alternative gives similar figures also. The major part of the increase takes place as early as the beginning of the century.

However, the number of pensioners in proportion to the gainfully employed population is of greater interest than the mere proportion of pensioners bearing in mind the way in which their pensions, medical care, etc., are financed today. Figure 7 shows the proportion of pensioners in proportion to the population aged 15-64 years (see also Appendix Table A2). Between the years 2000 and 2015 the number of pensioners per persons aged 15-64 years will rise from 0.21-0.22 to 0.27-0.33. Thereafter it continues to rise in all scenarios until about the year 2030. The nation's total dependency burden is also expected to increase sharply during this period, as is revealed by Figure 8, which shows the proportion under 15 years and over 65 years in relation to the population aged 15-64 years (see also Appendix Table A2). Further into the next century only about 55 percent of the population will be of working age.

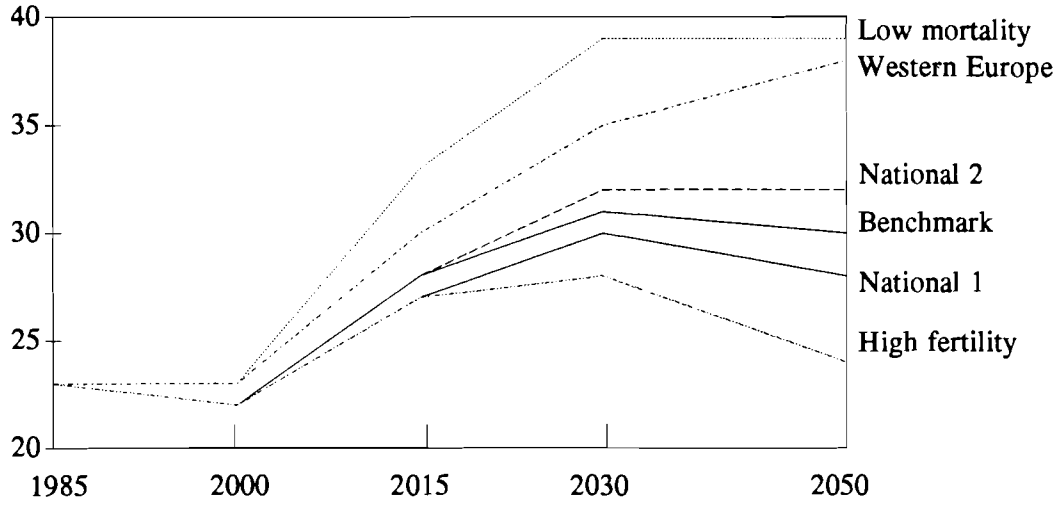

Figure 7. Number of persons age 65 years and above in relation to population aged 15-59; 1985-2050; in percent.

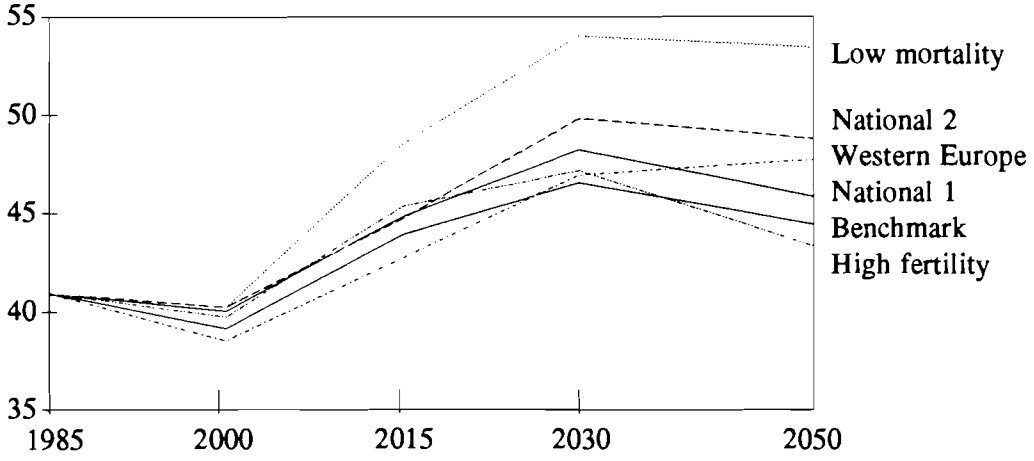

Figure 8. Number of persons aged 0-14 and 65 years and above in relation to population aged 15-59; 1985-2050; in percent.

Given the marriage and divorce frequencies which we have today, the proportion of persons aged 60 years and over living alone will increase sharply regardless of future fertility and mortality (Appendix Table A3). In all scenarios the proportion single, i.e. persons who have never been married, rises from about 10 percent to about 30 percent in the year 2050. The proportion of married persons may decline from today's 45 percent to about 20-25 percent while at the same time the proportion of widows and widowers also declines. The low marriage and high divorce rates are totally dominant--different fertilities and mortalities lead to only minor modifications. Therefore the conclusion must be that the proportion of elderly persons living alone can be expected to rise sharply unless our social patterns change completely. A rise in the number of unmarried persons increases the load not only on the pension system but even more so on the medical and care services, as they often live alone.

In all scenarios death risks are assumed to be equally high regardless of civil status. As an alternative to the benchmark scenario this assumption has been dropped and actual death risks for the period 1980-84 have been employed instead. Since the death risks for single persons are higher than for married persons this ought to moderate the rise in the proportion of single persons.

The proportion of married persons becomes distinctly higher if account is taken of differences in death risks between different categories of civil status, as shown in Table 5. The number of married women increases by 3-4 percentage points compared with the benchmark. The equivalent figures for men are 4-6 percentage points. The rise in the proportion of single persons is therefore distinctly less when the assumption of equal death risks is dropped, but it will still be very large. The processes of family formation and dissolution are paramount.

Table 5. Proportions married according to the benchmark scenario and according to an alternative calculation in which mortality by civil status is considered, 1985-2050.

	Women			Men		
Year	Benchmark	Alternative	Difference	Benchmark	Alternative	Difference
1985	45.0	45.0	0.0	69.1	69.1	0.0
2000	37.2	40.5	3.3	59.4	63.6	4.2
2015	33.2	37.0	3.8	49.9	55.3	5.4
2030	27.0	30.8	3.8	41.5	47.3	5.8
2050	24.9	28.7	3.8	39.4	45.6	6.2

As has already been pointed out, many people today live together without being married. However, this is true of pensioners to only a limited extent. Only about two percent of this category were cohabiting outside matrimony in 1985. What is the

future pattern likely to be in this respect? Is cohabitation generation-related, so that the proportion of older people cohabiting will increase in future? There is much to indicate that this is so. Taking the 1985 transition intensities between unmarried, cohabiting and married persons of different ages as a starting point, certain calculations can be made. Interplay effects between single/cohabiting categories and mortality have not been taken into account in this. The figures show that the proportion of persons cohabiting over 60 years of age will gradually increase (Figures 9 and 10).

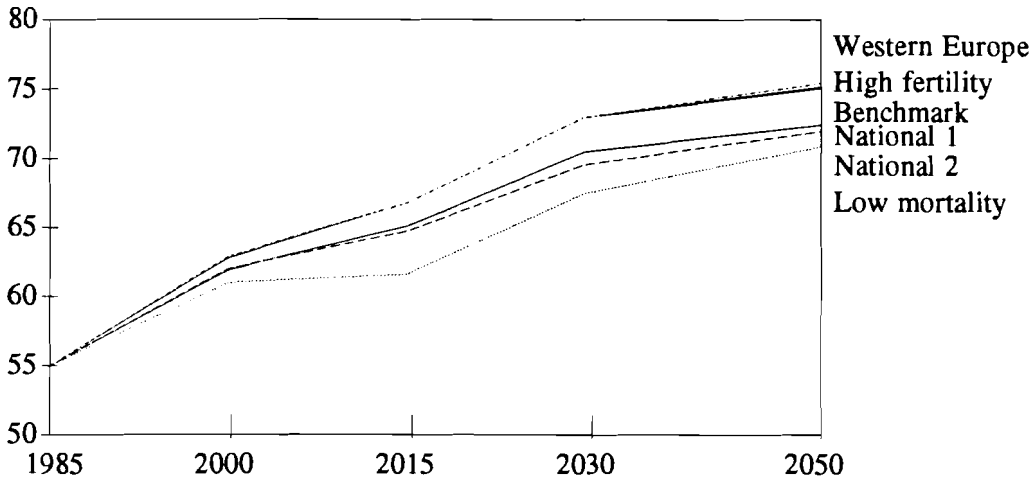

Figure 9. Number of single women aged 60 years and above in relation to the total number of women aged 60 years and above; 1985-2050; in percent.

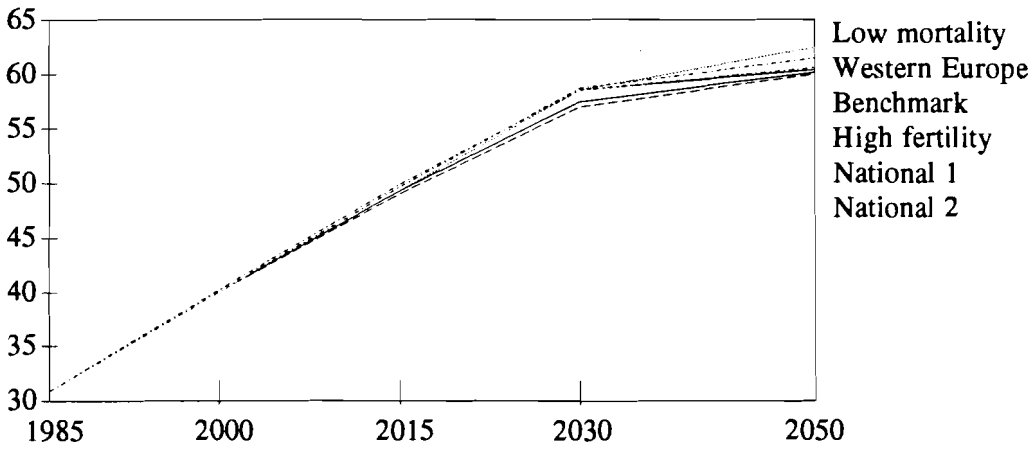

Figure 10. Number of single men aged 60 years and above in relation to the total number of men aged 60 years and above; 1985-2050; in percent.

According to these alternative calculations to the benchmark scenario a considerable part of the decline in the proportion of married people will be offset by the rise in the proportion cohabiting. Since changes in patterns of marriage and

cohabitation can take place swiftly, as the rise in marriage frequency in 1989 has shown, and because our model is not quite complete, we refrain from presenting any figures. A separate study will be made instead. The conclusion is unambiguous, however. With present patterns of family formation, part of the decline in the proportion of married people over 60 years of age will be offset by increased cohabitation. The proportion of single persons will increase, however, but the negative effects of an increased proportion of single persons on the pension system and especially on medical care will be moderated somewhat.

6. THE SWEDISH LABOR MARKET

Since the end of the 1960s, the labor force measured as the number of persons has increased considerably more than the number of persons of working age. Thus, for example, the number of persons aged 20-64 years rose by 75,000 between 1970 and 1985, while the labor force rose by 592,000 during the same period. This is attributable exclusively to increased female participation in the labor market--the percentage of females at work rose from 59.3% to 79.2% during the period while that of males fell by 1 percentage point. Despite this increase in the number of persons composing the labor force, the number of hours worked fell by an average of 0.2% per year, partly because of longer holidays and increased parental leave (i.e. paid leave of absence from work, taken by either parent, following childbirth). Figures 11 and 12 show the labor force participation rates (LPR) of males and females at work in different age groups since 1963.

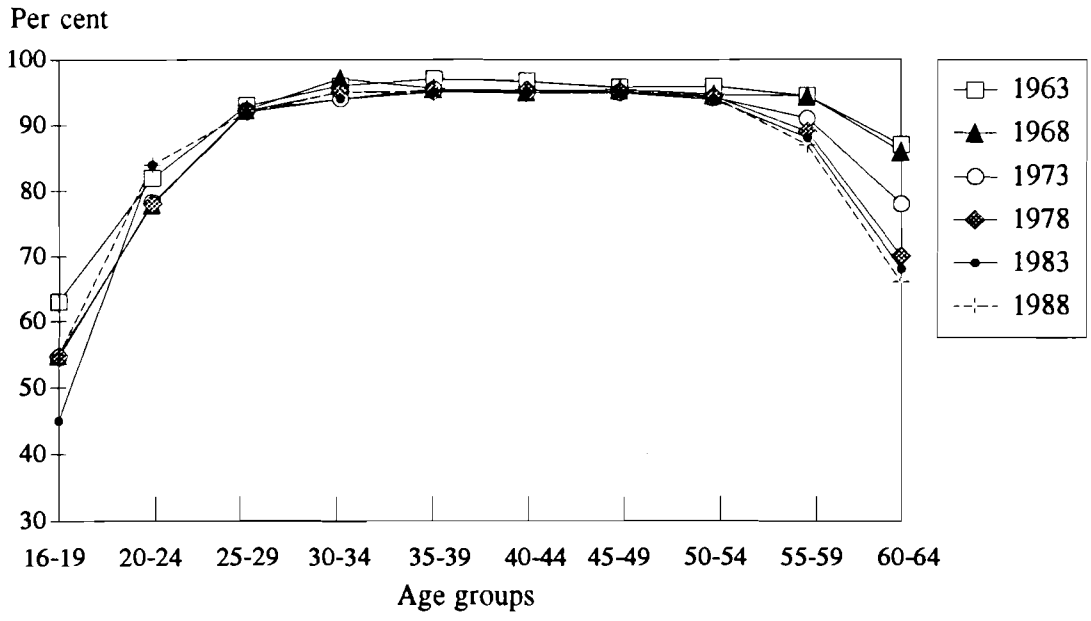

Figure 11. Labor-force participation rates for males in different age groups 1963-88. Source: Jonung and Persson, 1990.

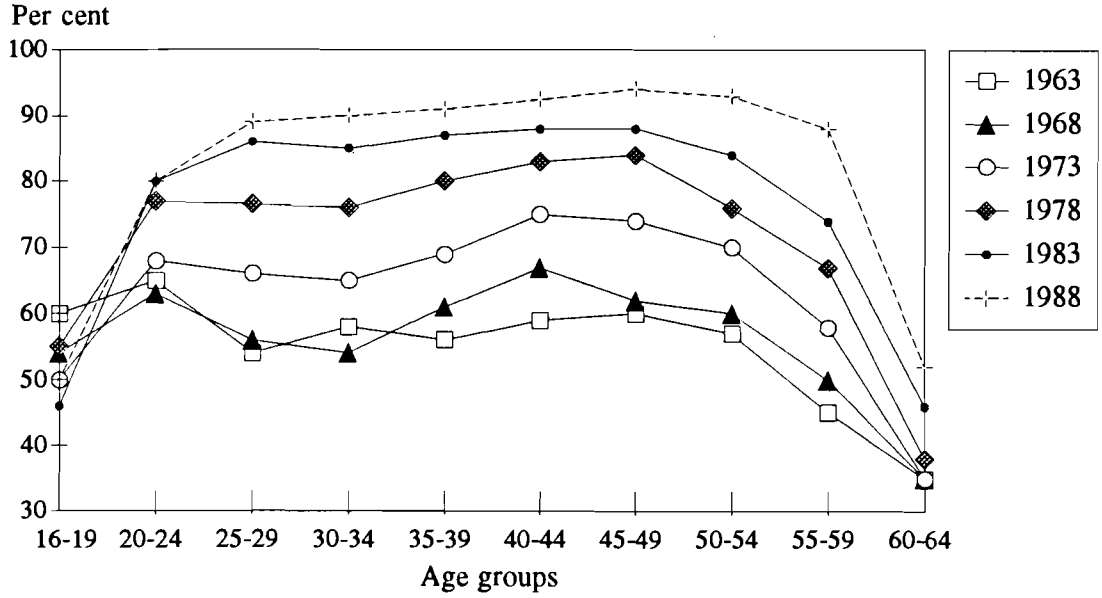

Figure 12. Labor-force participation rates for females in different age groups 1963-88. Source: Jonung and Persson, 1990.

During the 1960s and early 1970s, the curves for females in employment manifest a distinct M-shape, signifying that to a large extent women stay out of the labor market during the years when they have small children and return to it later. This pattern has now completely disappeared, and in 1988 the proportion of females aged 25-55 belonging to the labor force was about 90%. The M-shape does recur, however, although to a less marked extent, if we measure instead the proportion of females actually in gainful employment, which is indicated by the percentage gainfully-employed figure shown in Figure 13.[10]

One explanation of the differences between these two measures for females is parental leave, which was greatly augmented during the period and which gives 90% compensation for twelve months' loss of income for each child and another 3 months with lower compensation. Very little advantage is taken of this provision by males.

Measured in terms of labor-force participation rates the differences today between male and female participation in the labor market are small. However, females work part-time to a considerably greater extent than males even though there is some equalization arising from the fact that during the period 1963-1988 females increased their average working week by 5.9 hours at the same time as males were reducing theirs by 7.7 hours.[11]

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[10]The concept has been introduced by Jonung and Persson (1990): Unemployed persons and persons absent on holiday, sick leave and leave of absence have been deducted from the numerator.

[11]See Tables 3.3 and 3.4 in Jonung and Persson, 1990.

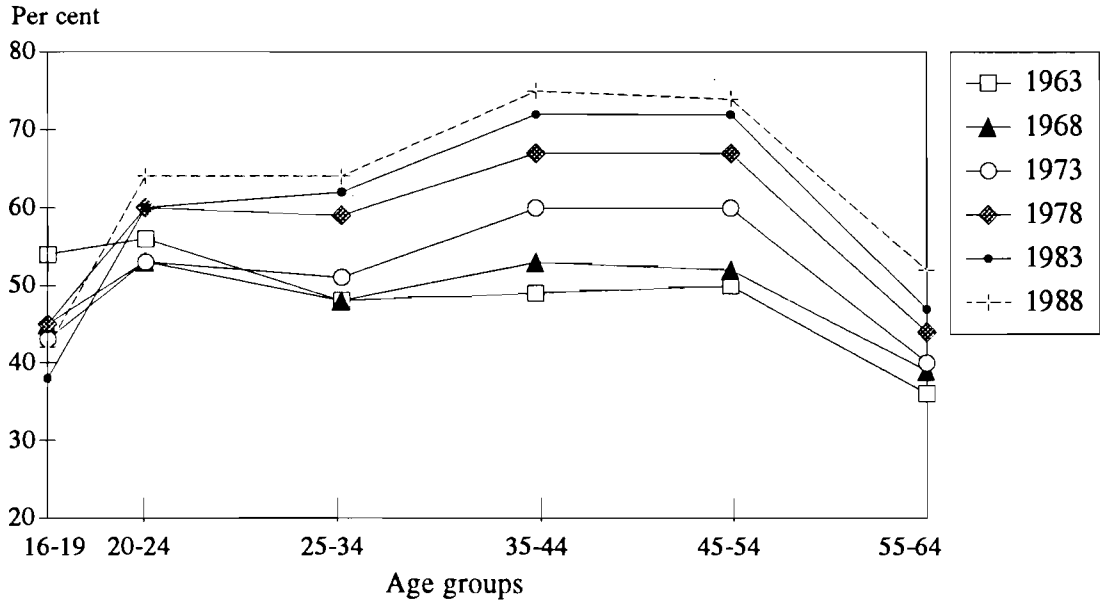

Figure 13. Percentages of females actually in the labor market in different age groups 1963-88. Source: Jonung and Persson, 1990.

Historically speaking, a changed employment pattern has been the paramount factor underlying changes in the labor force, and at the same time this means that the role played by population changes has been much obscured. Despite this, in making projections of the labor force we have elected to proceed in terms of constant labor-force participation rates and unchanged figures for working females in the various age groups (1985 values). In this way the significance of demographic change is isolated. It may be pointed out that as the labor force participation rates of Swedish women are very high, both historically and compared with most other countries, we do not expect any dramatic changes in this labor market pattern. Nevertheless, our assumption of constant rates constitutes a limitation. Effects on the pension system of the trend of labor force participation rates assumed by SCB (1990) are therefore discussed in the chapter on impact of selected policy measures.

In Appendix Table A4 projections of the labor force based on 1985 labor market figures are shown. In Table 6, changes in the labor force are shown.

Table 6. Change in the labor force 2000-2050; in percent.

	1985/2000	2000/15	2015/30	2030/50
National 1	+6.4	-2.6	-3.1	-1.1
National 2	+6.4	-1.8	-4.4	-3.7

The labor force will increase up to the turn of the century.[12] After the turn of the century the labor force will diminish regardless of scenario, see Table 4 (see also Appendix Table A4).

One underlying factor is that the age structure is changed (see Appendix Table A5). The proportion of the labor force which is at its "most active working age", 35-54 years, will decline.

7. THE PENSION MODEL

In all the countries included in the IIASA studies, public pension systems are organized as pay-as-you-go systems (PAYG), the characteristic feature of which is that the contributions of the gainfully employed in a given year are used for paying out pension benefits to current pensioners. The functioning of such a system can be summarized in the following equation:

$$q \cdot y \cdot L = b \cdot R$$

where q is the contribution rate, y is average wage income, L is labor force, b is average pension benefit and R is number of retirees.

The left-hand term of the equation gives the total revenue from contributions and the right-hand term the sum of pension benefits disbursed. q and b are the pension system's parameters, which must be changed when there are changes in any of the other variables in order to bring revenue and disbursements into balance. L and R are determined partly by purely demographic factors such as fertility, mortality and migration, but also by labor force participation rates, age at entry to the labor market, and retirement age. To a certain extent the latter aspects of L and R are influenced by political decisions and can thus be viewed as parameters in the pension system. Another factor affecting the labor income as well as the age structure of the labor force is the number of hours worked.

The equation for a pure PAYG scheme shows that if pension benefit, b, is fixed by the regulations and income grows, then ceteris paribus the contribution rate, q, can be reduced and if q is fixed then b can be raised. In the present study interest is concentrated on the purely demographic factors and the way in which expected changes in the latter influence the pension system, i.e. q and/or b. Therefore income, y, is assumed to be constant. The Swedish pension system is, as mentioned earlier, extremely sensitive to economic growth (see Table 2). The National Swedish Insurance Board recurrently calculates the development of the pension system at different growth rates under the assumption of a specific demographic development. There is no reason to repeat these calculations here. However, calculations of the effects of different demographic scenarios on the pension system have not been

[12]Assuming that the labor-force participation rates for females will continue to move closer to that for males, the labor force will increase up to the year 2005 and decrease thereafter (see SCB, 1990).

made before. Our calculations, with constant income which means that the effects of demographic changes are isolated, may thus be seen as complementary to the calculations made by the National Swedish Insurance Board.[13]

The IIASA pension model is based on the general formula for "pay-as-you-go" systems modified with country-specific features. The following model is used for Sweden.

Total contributions are defined as:

$$\textit{contribution rate} \cdot \left(\sum_{x=1}^{10} p_x \cdot L_x \right) \cdot B$$

where p_x = average pension points in the x-th cohort (5-year age groups) 1985, and L_x = number of persons in the labor force in the x-th cohort. Due to lack of data on incomes below the floor and above the ceiling the calculation of the contributions are based on total average income in this version. B is the base amount. Pension points, p, are calculated as

$$p = \frac{y-B}{B} \textit{ for } B \leq y \leq 7.5\ B$$

Total pension benefits are determined by:

$$\sum_{j=1}^{R} 0.6 \cdot p_j \cdot (t/N)_j \cdot B$$

$$\textit{where } p_j = \frac{\sum_{i=1}^{15} p_i}{15}$$

for the 15 highest p_i which the j-th individual had while gainfully employed. p_j is estimated by p_x, t/N is the proportion of full pension and is the actual values for those who were pensioners in 1985 and estimated values for those who were in the labor force in 1985. The values for p_x and t/N are shown in Appendix Tables A6 and A7. R is the number of pensioners.

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[13]Another reason to proceed on the supposition of constant incomes is that if contributions are determined as a proportion of wages and the resultant revenue is applied to the payment of current pensions, the trend of income has no significance as regards the development of the pension system.

The model underestimates the total number of pensioners in 1985 by about 7%. The group includes old age pensioners and early retirement pensioners over 55 years of age. The underestimate can be partially explained by lack of information on new-entrant early retirement pensioners, who have therefore been estimated as the difference between the number of early retirement pensioners for different years. Benefits are underestimated, partly because of the understatement of the total number of pensioners and partly because orphans' pensions, early retirement pensions prior to age 55 and widows' pensions prior to age 55 have been excluded. For these reasons, the results presented in this report ought not to be regarded as prognoses to be compared with those produced at the National Swedish Insurance Board. The simplification of the model facilitates comparisons between the countries, but above all it isolates the influence of demographic changes on the pension system.

The initial values for the calculations are those which applied in 1985. In the model, sex- and age-specific labor force figures are used for projections of the labor force. Also, the number of hours worked is assumed to be unchanged in the various sex and age groups. The labor-force participation rates give an average retirement age of 63 years. New regulations, including transitional rules, are in force for the survivors pensions from 1990 onwards. Calculations have been made for both the old and the new system.

8. PROJECTIONS OF CONTRIBUTIONS AND BENEFITS UNDER THE PENSION SYSTEM

The demographic model and the pension model are linked together and used for making projections of the pension system based on different population trends. The trend of the pensioner ratio (L/R) is of great significance in a PAYG system, as is shown clearly by the equation for such a pension system. Table 7 shows the trend of the pensioner ratio for the various demographic scenarios. The number of pensioners per person in the labor force will decline somewhat over the next 10-15 years. After that there will be a very pronounced rise in the pensioner ratio. This development, when coupled with the way a PAYG system works, makes it apparent that the pension system will be subjected to very strong pressure by virtue of demographic trends.

Table 7. Pensioner ratio, estimated as number of pensioners/number of persons in labor force (labor-force participation rates, 1985).

	1985	2000	2015	2030	2050
Benchmark	0.38	0.37	0.46	0.53	0.54
High fertility		0.37	0.46	0.50	0.44
Low mortality		0.39	0.55	0.67	0.72
Western Europe		0.37	0.48	0.58	0.70
National 1		0.37	0.45	0.50	0.48
National 2		0.37	0.46	0.54	0.56

Expenditure on pensions will rise very markedly, as is shown by Figure 14, where the pension benefits for six demographic scenarios are shown. The rise is greatest up to 2015-2030 and is followed by a levelling-off and in some cases a fall (see also Appendix Tables A7 and A8).

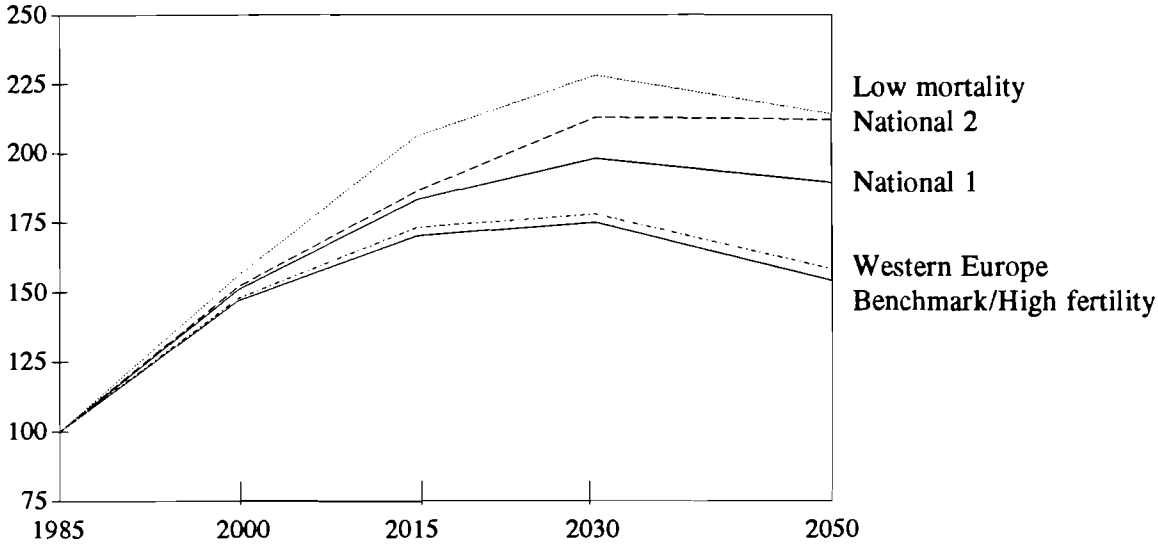

Figure 14. Expenditure on old age pension for different demographic scenarios. Index, 1985 = 100.

Expenditure on pension benefits rises during the period from 1985 onwards until just after the turn of the century despite the fact that in most cases the pensioner ratio falls somewhat. One of the reasons for this is that those who were pensioners in 1985 had lower average pension points and a lower number of pension-accruable years, i.e. a lower t/N, than those who will become pensioners later. This effect will probably have vanished almost completely around 2005, when the maturing period of the system will be ended. The increases to be seen after that result largely from demographic changes. Another factor underlying the rises in benefit expenditure is that more and more women will have qualified for ever- higher pension benefits. Increases in expenditure such as are shown in Figure 14 cannot be covered by prevailing contribution rates at constant incomes. If neither contribution rate nor pension benefits are changed a heavy deficit will make its appearance in the pension system. Revenue from contributions will defray only a limited portion of pension benefits (see Table 8; Appendix Table A9 shows this ratio for all scenarios), which means that the rest, amounting in certain cases to half the expenditure, must be met from other taxes or by borrowing.

If there is a resentment against increasing other taxes or raising the level of borrowing, what remains is to reduce pension benefits and/or to increase contributions. It is worth pointing out that the funds built up during the initial phase of the ATP system are far from sufficient if it should be considered to utilize them so as to avoid raising contributions or reducing pension benefits. Calculations show that using the funds for pension payments while keeping contributions and benefits

at today's level would exhaust the funds shortly after the turn of the century. Table 9 therefore shows by how much benefits would need to be cut for a given contribution rate.

Table 8. Proportion of pension benefits covered by revenue from contributions at 1985 contribution rate (= 19.5%).

	1985	2000	2015	2030	2050
National 1	1.00	0.70	0.59	0.54	0.56
National 2	1.00	0.70	0.58	0.50	0.49

Table 9. Cuts in benefits (compared with 1985).

	2000	2015	2030	2050
Old survivors regulations				
Benchmark	-31	-44	-51	-52
High fertility	-31	-44	-48	-41
Low mortality	-35	-53	-61	-64
Western Europe	-32	-46	-55	-63
New survivors regulations				
Benchmark	-31	-42	-49	-49
National 1	-30	-41	-46	-44
National 2	-30	-42	-50	-51

As pointed out earlier, the Swedish pension system is so designed that pension benefits are determined by means of the system of regulations. It therefore falls to the contributions side to make the adaptation to changed demographic and/or economic conditions. From here on, therefore, the exposition will concentrate on comparisons of so-called balanced contribution rates, i.e. the contributions necessary to defray the promised pension benefits. Concerning pension expenditures (see Appendix Tables A7 and A8) the only operative factors are the number of pensioners and their civil status, while the labor force and its distribution between age groups also have significance for the trend of balanced contribution rates. The effect which different demographic trends have on the pension system is indicated by Table 10, which shows what contributions are required in order to defray pension expenditures.

Table 10. Balanced contribution rates (actual rate in 1985 = 19.5%).

	1985	2000	2015	2030	2050
Old survivors regulations					
Benchmark	19.5	28.2	34.7	39.7	40.5
High fertility		28.2	34.7	37.4	33.0
Low mortality		29.9	41.4	49.9	54.0
Western Europe		28.6	30.5	43.2	52.6
New survivors regulations					
Benchmark		28.2	33.5	38.1	38.1
National 1		27.8	33.0	36.0	34.7
National 2		27.8	33.5	38.9	39.7

It is worth reiterating that none of the scenarios are implausible or inconceivable. The range covered by the various scenarios also means that all conceivable population trends are accounted for. Regardless of which of these population trends actually comes about, it is obvious that it will be difficult to convince those who are of working age in 2015 and thereafter that the pension contributions they are paying are reasonable.

In the calculations we do not take into account the fact that persons in the labor market have the possibility to adapt their behavior in the labor market to changes in the contribution rate. As is evident from the description of the Swedish pension system, to an individual the link between the contribution side and the benefit side is very weak. This means that a large part of the contribution is a pure tax which may result in a decrease in labor supply in response to increases in the contribution rate shown in Table 10 (see i.e. Hansson and Stuart (1985) for estimations of tax efforts on labor supply). Such a reaction diminishes the contribution base leading to the need for even higher contribution rates. We did not find it worthwhile to include a scenario with these labor market reactions since the calculations are not to be perceived as prognoses of an expected development. The intention is only to give some examples of the effects of the present rules of the pension system. Even without an elastic labor supply we expect the pension system to be changed.

A comparison between the benchmark scenario and that in which high fertility is assumed shows that it is not until after 2015 that high fertility has a reducing effect on the necessary contribution level. The reason, of course, is that there is a delay of about 20 years before the rise in the number of children has any effect on the size of the labor force, thus helping to increase the contribution base. Nor does high fertility then lead to any dramatic reduction of contributions: in 2030 a reduction by 2.3 percentage points and in 2050 by 7.5 percentage points from a level of over 40% of wages in 2050. It is plain that high fertility offers no solution to the pension problem even in the long term.

The scenario in which mortality is assumed to continue falling is the one which is most devastating for the pension system. Even at the turn of the century contributions need to be 50% higher than today. By 2015 they ought to be more than twice as high, and by 2050 they would need to amount to more than half of wages.

The scenarios which we consider the most interesting are National 1 and 2. National 1 is the main alternative in SCB's population prognosis of 1989, and National 2 is based on this but with the hypothesis of lower fertility and lower mortality than in the main prognosis. The new regulations for survivors' pensions are applied in both cases. Table 11 shows changes in number of pensioners and number of persons in the labor force for these two scenarios and what change in the contribution rate follows from these changes.

Table 11. Change in number of pensioners (R), number of persons in the labor force (L), pension expenditures, contribution revenues and balanced contribution rate (bcr).

	1985/2000	2000/15	2015/30	2030/50
National 1				
R(1000s)	36	322	157	-98
%	2.3	19.9	8.0	-4.7
L(1000s)	267	-114	-132	-47
%	6.0	-2.6	-3.1	-1.0
expenditure, billions	38.4	17.3	7.8	-6.8
revenue, billions	4.9	-2.1	-2.3	-0.8
bcr (percentage points)	8.3	5.2	3.0	-1.3
National 2				
R(1000s)	38	360	269	-11
%	2.0	22.0	13.0	-0.5
L(1000s)	267	-78	-190	-154
%	6.0	-2.0	-4.0	-4.0
expenditure, billions	38.5	20.0	15.0	-1.0
revenue, billions	5.0	-1.4	-3.3	-2.8
bcr (percentage points)	8.3	5.7	5.4	0.8

Until the turn of the century, the labor force increases more than the number of pensioners. Despite this there is an increase of contributions by 8.3 percentage points. The reason, as already noted, is that the ATP system is still in its maturing phase and that those who were pensioners in 1985 have lower average pensions than those retiring later. Moreover, the transitional regulations for the changed survivors' pension mean that expenditure on this pension element will rise during the period.

The pension system will be under pressure from two directions during the first three decades of the next century. The number of pensioners will increase by about 20% in the first 15 years and by 8% and 13% respectively in the second 15 years, simultaneously with a decrease in the number of persons in the labor force. In both scenarios it is the rise in the number of pensioners which constitutes the prime cause of the estimated increases in contribution rates. The contraction of the labor force is responsible for only about 10% of the rise in contribution rates during the first 15-year period and for about 25% during the period 2015-2030.

The number of pensioners will fall between 2030 and 2050. The small birth cohorts born during the 1970s will be retiring on pension during this period. The lower mortality assumed in National 2 implies a considerably lower fall in the number of pensioners than in the National 1 case--a mere 0.5% compared with almost 5%. In the National 1 case the decrease in the number of pensioners is greater than the decrease in the labor force, which makes it possible for the contribution rate to be lowered. In the National 2 case we have a continued sharp reduction of the labor force coinciding with a fall in the number of pensioners that is only marginal, and this causes a continued raising of the contribution rate.

Up to the year 2015 the balanced contribution rate is almost the same in the two cases. Not until later do lower fertility and mortality produce effects on the pension system.

The behavior of males and females on the labor market differs, and one of the results of this is that women have lower average wages than men (see Appendix Table A6). Since the pension system is based for the most part on the loss-of-income principle, the lower wages paid to women also lead to their having lower old age pensions than men, as is shown by Table 12.

Table 12. Average old age pension of men and women, 1000s SEK.

	1985	2000	2015
Men	57	76	77
Women	34	56	56

The average woman's pension in 1985 was just under 60% of the average man's. It will rise to about 74% around the turn of the century and remain at that figure. This does not mean of course that women are treated unfairly by the pension system itself. From Table 13, which shows the ratio between contributions and benefits distributed by sex, it can be seen that on average women pay a considerably smaller proportion of their pension benefits than men.

Table 13. Ratio between total contributions and total benefits distributed by sex at the 1985 contribution rate (= 19.5%); National 2 scenario.

	1985	2000	2015	2030	2050
Men	1.21	0.96	0.74	0.63	0.61
Women	0.77	0.48	0.43	0.37	0.36
Total	1.00	0.70	0.58	0.50	0.49

There are several properties of the pension system which bring this about. Women are prone to more frequent and lengthy interruptions associated with childbirth than are men, and parental leave is accruable for pensions but not for contributions. The contribution is not differentiated according to sex. Differences in mortality between the sexes cause women to receive their pensions for more years than men and also to receive survivors' pensions more often than men.

9. IMPACT OF SELECTED POLICY MEASURES

The development of the pension system generated by the demographic projections and the design of the system will enforce changes in one way or another. Here effects on the economy of the pension system are shown for three kinds of changes. Two of them are changes in labor supply, the third is a change in the rules for calculating pension-points (the 15-year rule) and the period of service for full pension (the 30-year rule).

One change which is studied is a raising of the retirement age by two years. As a result of early retirement pensions, partial pensions and so on, the average retirement age in 1985 was de facto 63 years. The effect on balanced contribution rates of a raising of the average retirement age to 65 years is shown in Table 14 for the benchmark scenario. Compared with the actual retirement age in 1985, such a change would signify that the level of contribution rate required in order to finance pension benefits could be almost 5 percentage points lower in 2015 and over 7 percentage points lower in 2030.

In all scenarios, the labor-force participation rates have been assumed to be constant at the 1985 values. In Section 6 above, it is shown that the vast majority of changes in the labor force are caused by changes in labor-force participation rates, not by population changes. Even though by international standards Sweden already has a high level of female participation in the labor market, this is expected to rise further for females in the age range 25-64 years, while for young women and for males of all ages it is expected to fall (see SCB, 1990, Table 10). The effect of such changes on the pension system is shown in Tables 15 and 16.

Table 14. Balanced contribution rates if mean age at retirement is 65 compared with actual retirement age at 63.

	2000	2015	2030	2050
Benchmark				
Retirement age				
65 years	24.9	29.9	32.4	31.4
63 years	28.2	34.7	39.7	40.5
Difference	-3.3	-4.8	-7.3	-9.1

Table 15. Balanced contribution rates based on different assumptions regarding labor supply; National 2 scenario.

	1985	2000	2015	2030	2050
LPR for 1985	19.5	27.8	33.5	38.9	39.7
LPR according to Trender och prognoser*	19.5	25.9	31.4	36.7	37.4
Difference	-	-1.9	-2.1	-2.2	-2.3

* SCB, 1990.

Table 16. Ratio between total contributions and total benefits at labor force participation rates according to SCB, 1990.

	1985	2000	2015	2030	2050
Females	0.77	0.57	0.51	0.45	0.43
Males	1.21	0.94	0.73	0.61	0.60
Total	1.00	0.75	0.62	0.53	0.52
Difference compared with LPR for 1985	-	+0.05	+0.04	+0.03	+0.03

A comparison of the ratio between contributions and benefits at the labor force participation rates for 1985 (see Table 13) and those according to Trender och prognoser (SCB, 1990) shows firstly that changed labor-force participation rates affect the system's "finances" favorably and secondly that first and foremost they affect the distribution between males and females. With such labor market behavior, women will pay for a considerably larger proportion of their pensions, while the men's proportion will diminish.

As mentioned before the link between the contribution side and the benefit side in the ATP-system is very weak. Both the 15-year rule and the 30-year rule contribute to this weakness. Discussions about changing these rules have been brought up on several occasions, most recently in the report of the Parliamentary Committee on Pensions (SOU 1990:76), without any results, however, in the form of proposals. In Table 17 the effect of an extension of the number of years on which benefits are based is shown. In Table 18 this change is combined with an extension of the period of service for full pension from 30 to 40 years. The calculations have been carried out for the National 1 case. The effects are the same for the rest of the scenarios.

Table 17. Ratio between contributions and benefits with a change in the 15-year rule.

	1985	2000	2015	2030	2050
Benefits based on number of years with highest income					
15 years	1.0	0.70	0.59	0.54	0.56
20 years	-	0.70	0.60	0.55	0.57
30 years	-	0.72	0.61	0.56	0.58
entire working life	-	0.77	0.65	0.59	0.62

Table 18. Ratio between contributions and benefits with a change in the 15-year rule combined with a change in the 30-year rule from 30 to 40 years.

	1985	2000	2015	2030	2050
Benefits based on number of years with highest income					
15 years	1.0	0.79	0.63	0.57	0.59
20 years	-	0.80	0.64	0.57	0.60
30 years	-	0.81	0.65	0.58	0.61
entire working life	-	0.87	0.69	0.62	0.65

A change in the 15-year rule to a 20- or 30-year rule gives only minor improvements in the economy of the pension system. The ratio between contributions and benefits rises a couple of percentage points. A change in the 30-year rule has a greater effect. A comparison of the first row in the two tables shows the effect of changing this rule to a 40-year rule. The ratio between contributions and benefits increases from 70% to 79% by 2000 and remains about 3 percentage points higher thereafter. If this change is combined with a change in the 15-year rule, some additional improvement is gained.

The improvement in the economy of the pension system to which these changes of rules give rise is almost exclusively due to a deterioration of women's pension benefits compared to the benefits of today. As shown in Table 13, women are subsidized by the present rules. Some of these subsidies will disappear with the changes studied. Men's pension benefits will hardly be influenced at all by these changes.

10. THE FUTURE OF PUBLIC PENSIONS

The pension system involves very long-term commitments. Throughout their working lives, individuals are building up by means of their contribution payments an asset which comes to fruition in the form of pension benefits during their retirement years. From the standpoint of the individual the pension system establishes a distribution of consumption over the life cycle via levels of contributions and pension benefits. In a PAYG system the assets which individuals build up are not funded but take the form of charges on the result of future production whereby the working generations of the future, through their contributions, relinquish part of their incomes. In this way the pension system, via the regulations governing it and the levels of contributions and benefits, establishes the distribution between persons belonging to the labor force and pensioners. For the pension system to work this distribution must be perceived as reasonable. Figure 1 measures how this distribution evolved between 1970 and the mid-1980s. Table 19 presents calculations of the corresponding trend assuming that the contribution is raised in order to cover the pension benefits established according to the regulations.

Table 19. Pension per old age pensioner in proportion to net wage per employed after deduction of balanced contribution.

	1985	2000	2015	2030	2050
National 1	0.65	0.97	1.06	1.11	1.09
National 2	0.65	0.97	1.06	1.16	1.18

On the assumptions applied in the IIASA model and provided the pension system is not changed, persons in the labor force and pensioners will have about the same scale of consumption by the turn of the century. After the turn of the century the pensioner will have a larger scale of consumption than the employed even before taking into account that such a person often has children to maintain. It is difficult not to believe that the development of such a situation will lead to reappraisal of the system.

The projections in this report are made on the assumption that there will be no growth. As remarked above, the Swedish pension system is sensitive to growth, so

that with an annual growth rate of 2% or more contributions do not need to be raised to anything like the extent shown in this report (see Table 2 and RFV, 1987). Three comments can be made on this. Firstly, the Swedish economy with its structural problems offers little hope of high growth in the future. Secondly, growth leads to an implicit reappraisal of the system. The reason why rises in contributions remain at a low level when there is growth is that more and more people reach incomes above the ceiling. These incomes are reckonable for contributions but not for pensions. For an increasing number of people, therefore, the loss-of-income principle will no longer apply, and this can be regarded as an implicit change of the pension system. Thirdly, there are negotiated insurance schemes, primarily to cover loss of income for incomes above the ceiling. This means that the apportionment of scales of consumption between employed and pensioners shown in Table 19 will still apply, broadly speaking, even if there is growth.

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APPENDIX A. Tables.

Table A1. Population in age groups 0-14, 15-59 and 60 years and above, 1950-2050.

	Absolute numbers				Percent			
	0-14	15-59	60+	total	0-14	15-59	60+	total
1950	1651	4340	1051	7042	23.4	61.6	14.9	100.0
1960	1664	4552	1284	7500	22.2	60.7	17.1	100.0
1970	1682	4807	1592	8081	20.8	59.5	19.7	100.0
1980	1615	4862	1841	8318	19.4	58.5	22.1	100.0
1985	1512	4917	1930	8359	18.1	58.8	23.1	100.0
Benchmark Scenario								
2000	1404	4982	1872	8258	17.0	60.3	22.7	100.0
2015	1226	4514	2175	7915	15.5	57.0	27.5	100.0
2030	1117	4017	2217	7351	15.2	54.6	30.2	100.0
2050	952	3503	1934	6389	14.9	54.8	30.3	100.0
High Fertility Scenario								
2000	1486	4982	1872	8340	17.8	59.7	22.4	100.0
2015	1496	4596	2175	8267	18.1	55.6	26.3	100.0
2030	1498	4367	2217	8082	18.5	54.0	27.4	100.0
2050	1494	4381	1934	7809	19.1	56.1	24.8	100.0
Low Mortality Scenario								
2000	1405	4995	1968	8368	16.8	59.7	23.5	100.0
2015	1230	4555	2556	8341	14.7	54.6	30.6	100.0
2030	1123	4068	2778	7969	14.1	51.0	34.9	100.0
2050	961	3560	2548	7069	13.6	50.4	36.0	100.0
Western European (low fertility) Scenario								
2000	1320	4983	1880	8183	16.1	60.9	23.0	100.0
2015	951	4434	2207	7592	12.5	58.4	29.1	100.0
2030	774	3665	2261	6700	11.6	54.7	33.7	100.0
2050	535	2688	1981	5204	10.3	51.7	38.1	100.0
National 1 - Scenario								
2000	1609	5208	1918	8735	18.4	59.6	22.0	100.0
2015	1528	5044	2323	8895	17.2	56.7	26.1	100.0
2030	1555	4847	2507	8909	17.5	54.4	28.1	100.0
2050	1502	4848	2343	8693	17.3	55.8	27.0	100.0
National 2 - Scenario								
2000	1630	5209	1920	8759	18.6	59.5	21.9	100.0
2015	1446	5069	2364	8879	16.3	57.1	26.6	100.0
2030	1467	4799	2663	8929	16.4	53.7	29.8	100.0
2050	1356	4668	2583	8608	15.8	54.2	30.0	100.0

Table A2. Number of persons below 15 years, 65 years and above and the two groups together in relation to the population aged 15-64 years, 1985-2050; percent.

Scenario	1985	2000	2015	2030	2050
			Under 15		
Benchmark	18.0	16.7	15.8	15.6	14.6
Fertility		17.5	18.5	19.0	18.9
Mortality		16.7	15.8	15.6	14.6
Western		15.9	2.9	12.0	10.1
National 1		18.2	17.8	18.4	17.9
National 2		18.4	17.0	17.7	16.8
			65 and Over		
Benchmark	22.9	22.3	28.0	30.9	29.7
Fertility		22.1	26.8	28.1	24.4
Mortality		23.4	32.8	38.5	38.8
Western		22.6	29.8	35.0	37.6
National 1		21.8	27.1	29.7	27.9
National 2		21.7	27.7	32.1	32.0
			Total		
Benchmark	40.9	39.1	43.9	46.5	44.4
Fertility		39.7	45.3	47.1	43.3
Mortality		40.2	48.5	54.0	53.4
Western		8.5	42.7	46.9	47.7
National 1		40.0	44.8	48.2	45.8
National 2		40.2	44.7	49.8	48.8

Table A3. Marital composition of the population aged 60 years and over, 1985-2050.

	Women					Men				
	Single	Married	Divorced	Widowed	Total	Single	Married	Divorced	Widowed	Total
1985	10.4	45.0	7.4	37.3	100.0	11.8	69.1	6.8	12.3	100.0
Benchmark scenario										
2000	7.7	37.2	13.5	41.6	100.0	12.1	59.4	14.1	14.5	100.0
2015	13.0	33.2	19.0	34.8	100.0	21.3	49.9	17.1	11.6	100.0
2030	24.4	27.0	17.6	30.9	100.0	33.2	41.5	14.7	10.6	100.0
2050	30.1	24.9	16.3	28.7	100.0	36.8	39.4	13.8	9.9	100.0
High Fertility scenario										
2000	7.7	37.2	13.5	41.6	100.0	12.1	59.4	14.1	14.5	100.0
2015	13.0	33.2	19.0	34.8	100.0	21.3	49.9	17.1	11.6	100.0
2030	24.4	27.0	17.6	30.9	100.0	33.2	41.5	14.7	10.6	100.0
2050	30.2	24.8	16.3	28.7	100.0	36.7	39.6	13.8	9.9	100.0
Low Mortality scenario										
2000	7.7	39.0	13.4	39.9	100.0	12.1	59.6	13.8	14.5	100.0
2015	12.5	38.4	18.6	30.5	100.0	20.2	50.5	16.7	12.6	100.0
2030	22.9	32.5	17.8	26.8	100.0	30.8	41.5	15.0	12.7	100.0
2050	29.0	29.1	16.6	25.3	100.0	35.8	37.5	13.9	12.8	100.0
Western European (low fertility) scenario										
2000	7.7	37.1	13.4	41.8	100.0	12.1	59.6	13.9	14.3	100.0
2015	12.9	33.2	18.7	35.1	100.0	21.2	50.1	17.2	11.5	100.0
2030	24.3	27.0	17.4	31.2	100.0	32.7	41.3	15.5	10.5	100.0
2050	31.2	24.5	15.9	28.4	100.0	36.8	38.5	14.8	9.9	100.0
National 1 - scenario										
2000	7.6	38.1	13.4	40.9	100.0	12.0	59.6	14.0	14.4	100.0
2015	12.7	34.9	18.7	33.8	100.0	20.8	50.5	17.0	11.6	100.0
2030	23.0	29.5	17.6	29.8	100.0	32.0	42.5	15.0	10.6	100.0
2050	28.3	27.5	16.5	27.8	100.0	35.8	39.8	14.1	10.3	100.0
National 2 - scenario										
2000	7.7	38.0	13.4	40.9	100.0	12.0	59.6	14.0	14.4	100.0
2015	12.6	35.3	18.6	33.5	100.0	20.7	50.8	17.0	11.5	100.0
2030	22.5	30.4	17.7	29.4	100.0	31.5	43.0	15.0	10.4	100.0
2050	27.8	28.0	16.6	27.5	100.0	35.5	40.0	14.2	10.3	100.0

Table A4. Labor force in age range 16-64 years at 1985 relative labor force participation rates (1000s).

	1985	2000	2015	2030	2050
Benchmark	4157	4239	3895	3496	3035
National 1	4157	4424	4310	4178	4131
National 2	4157	4424	4346	4156	4002

Number of pensioners in age range 65 and older at 1985 relative labor force participation rates (1000s).

	1985	2000	2015	2030	2050
Benchmark	1585	1579	1807	1852	1636
National 1	1585	1621	1943	2100	2002
National 2	1585	1623	1983	2252	2241

Table A5. Proportion of labor force in different age groups distributed by sex (1985 relative labor force participation rates).

	Females				Males			
	2000	2015	2030	2050	2000	2015	2030	2050
National 1								
15-24	13.8	15.9	15.0	15.4	12.6	14.5	13.5	14.0
25-34	22.7	20.0	22.2	21.9	23.7	20.9	22.9	22.7
35-54	49.3	49.1	46.7	47.3	47.1	47.1	44.5	45.3
55-64	14.2	15.0	16.2	15.4	16.6	17.5	19.1	18.0
National 2								
15-24	13.8	16.5	14.3	14.6	12.6	15.1	12.9	13.2
25-34	22.7	19.9	20.9	21.8	23.7	20.7	21.6	22.4
35-54	49.3	48.8	48.3	46.5	47.1	46.7	46.1	44.4
55-64	14.2	14.9	16.4	17.1	16.6	17.4	19.4	19.9

Table A6. Average pension points, 1985, used as input in the pension model. t/N is estimated on actual figures for new entrants to disability for those under 65 years of age and on actual figures for those over 65.

		Average pension points		Proportion of full pension (t/N)	
		Males	Females	Males	Females
	16-19	1.31	1.04	1.0	1.0
	20-24	2.49	2.10	1.0	1.0
	25-29	3.43	2.39	1.0	1.0
	30-34	3.90	2.47	1.0	0.97
	35-39	4.26	2.66	1.0	0.92
	40-44	4.49	2.85	1.0	0.90
	45-49	4.41	2.83	1.0	0.90
	50-54	4.30	2.76	1.0	0.88
	55-59	4.14	2.59	0.98	0.82
	60-64	3.64	2.26	0.95	0.78
All	16-64	3.80	2.50		
	65-69	4.31	2.21	0.93	0.72
	70-74	3.73	1.82	0.85	0.69
	75-79	3.09	1.59	0.65	0.52
	80-84	2.61	1.56	0.40	0.32
	85-89	2.33	1.42	0.18	0.15

Table A7. Pension expenditures 1985-2050. In billions SEK.

	1985	2000	2015	2030	2050
		Old survivors regulations			
Benchmark					
old age	69.3	102.2	117.7	121.0	106.9
survivors	5.4	8.4	7.8	7.1	5.9
total	74.7	110.5	125.5	128.2	112.7
High fertility					
old age		102.2	117.7	121.0	107.0
survivors		8.4	7.8	7.1	5.9
total		110.5	125.5	128.2	112.9
Low mortality					
old age		108.3	142.6	158.2	1480
survivors		8.2	7.2	6.8	5.8
total		116.5	149.8	165.0	153.8
Western Europe					
old age		102.6	119.6	123.6	109.5
survivors		8.5	8.0	7.3	5.9
total		111.0	127.6	131.0	115.4
		New survivors regulations			
Benchmark					
old age		102.2	117.7	121.0	106.9
survivors		8.3	3.4	0.9	0.4
total		110.4	121.2	121.9	107.3
National 1					
old age		104.9	126.6	137.4	131.0
survivors		8.2	3.8	0.9	0.4
total		113.1	130.4	138.2	131.4
National 2					
old age		105.0	129.2	147.3	146.7
survivors		8.2	3.9	0.8	0.4
total		113.2	133.1	148.1	147.0

Table A8. Pension expenditures 1985-2050. Index 1985 = 100.

	1985	2000	2015	2030	2050
		Old survivors regulations			
Benchmark					
old age	100	147	170	175	154
survivors	100	154	143	132	108
total	100	148	168	172	151
High fertility					
old age					
survivor		same as Benchmark scenario			
total					
Low mortality					
old age		156	206	228	214
survivor		150	133	125	108
total		156	201	221	206
Western Europe					
old age		148	173	178	158
survivor		156	147	135	109
total		149	171	175	154
		New survivors regulations			
Benchmark					
old age		147	170	175	154
survivor		152	63	16	7
total		148	162	163	144
National 1					
old age		151	183	198	189
survivor		152	70	16	8
total		151	175	185	176
National 2					
old age		152	186	213	212
survivor		152	72	15	7
total		152	178	198	197

Table A9. Ratio between contributions and benefits (with 1985 contribution rate).

	1985	2000	2015	2030	2050
		Old survivors regulations			
Benchmark	1	0.69	0.56	0.49	0.48
High fertility		0.69	0.56	0.52	0.59
Low mortality		0.65	0.47	0.39	0.36
Western Europe		0.68	0.54	0.45	0.37
		New survivors regulations			
Benchmark		0.69	0.58	0.51	0.51
National 1		0.70	0.59	0.54	0.56
National 2		0.70	0.58	0.50	0.49