

Demographic Changes and their Implications on Some Aspects of Social Security in the Unified Germany

German Case Study

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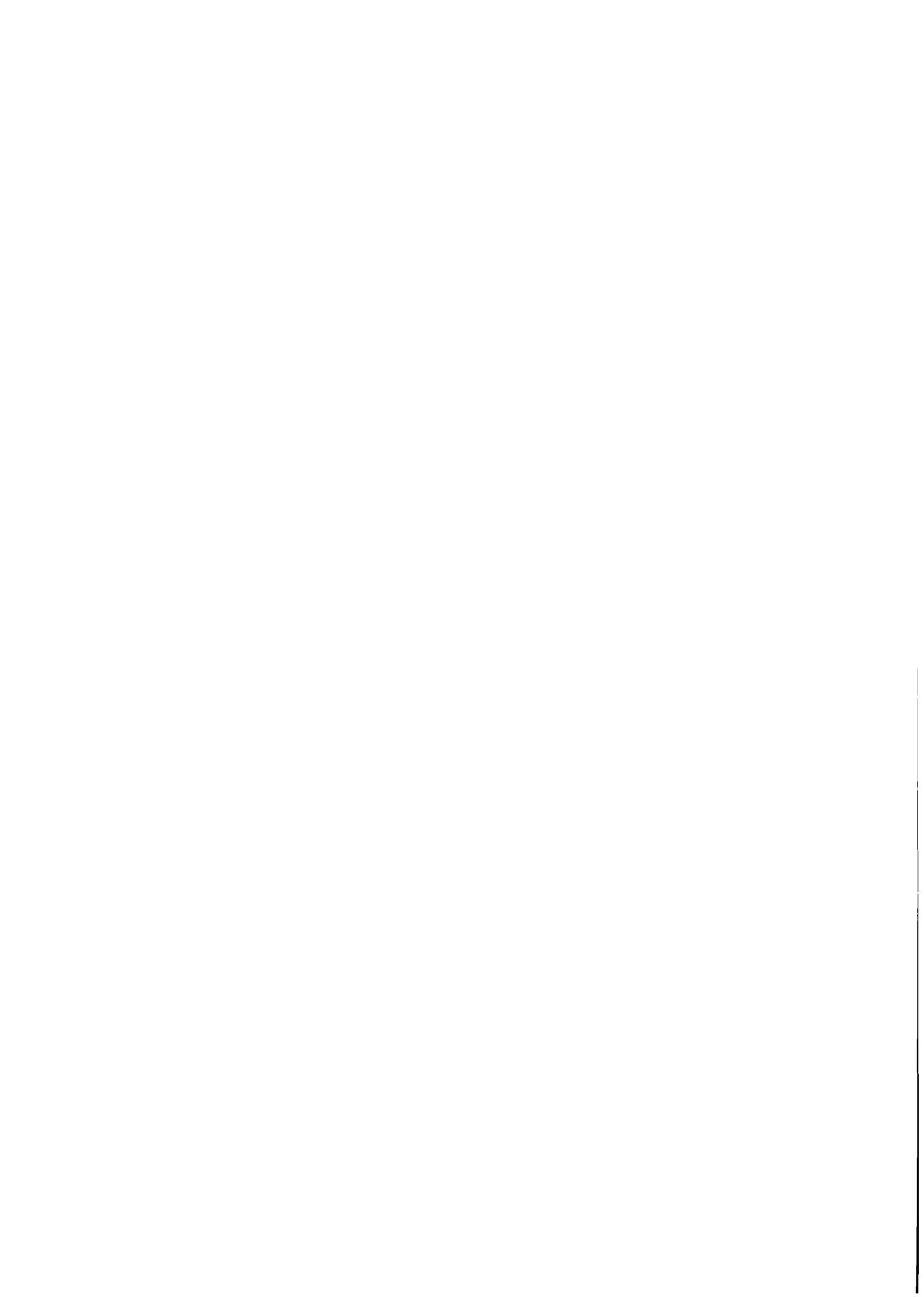
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PREFACE

The German 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). Initially two country case studies were planned for Germany, one for each German state. Because of German unification in October 1990, it was decided to produce a common study, taking into account that the West German pension system as well as the economic system have been applied to East Germany.

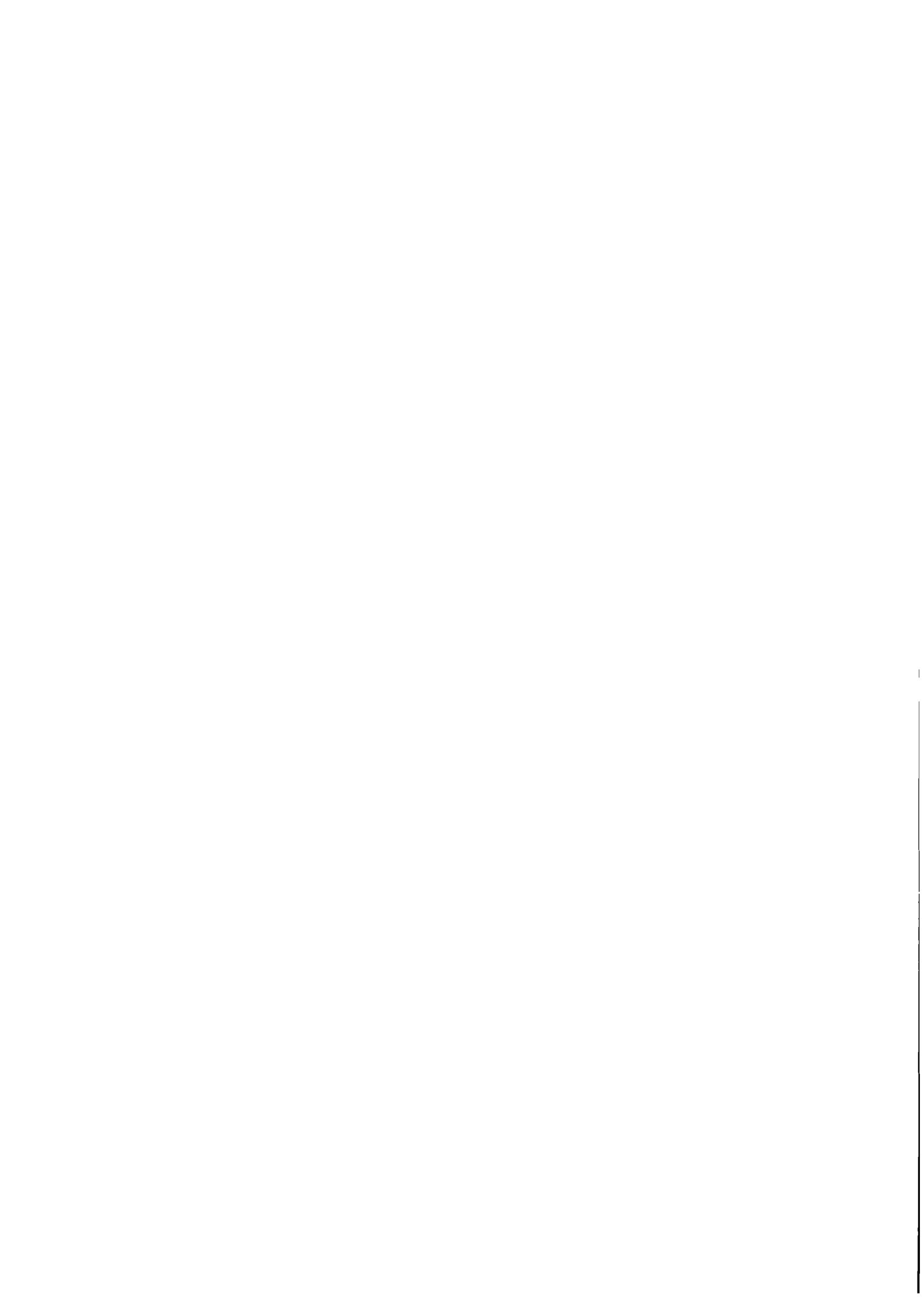
Working Papers related to the IIASA project are listed below:

- 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

A comparison of the demographic past of the two German states shows that, although some important similarities remained, some demographic patterns have had a diverging tendency. With respect to aging, this has resulted in a somewhat younger age structure and a slightly more favorable demographic reproduction for East Germany. The demographic aging of the German population will continue, which at the same time will challenge the pension system. Testing different possible solutions to the pension problem, including strong immigration, showed that there is no sole demographic answer to the problem. Instead, a combination of different measures will perform best.

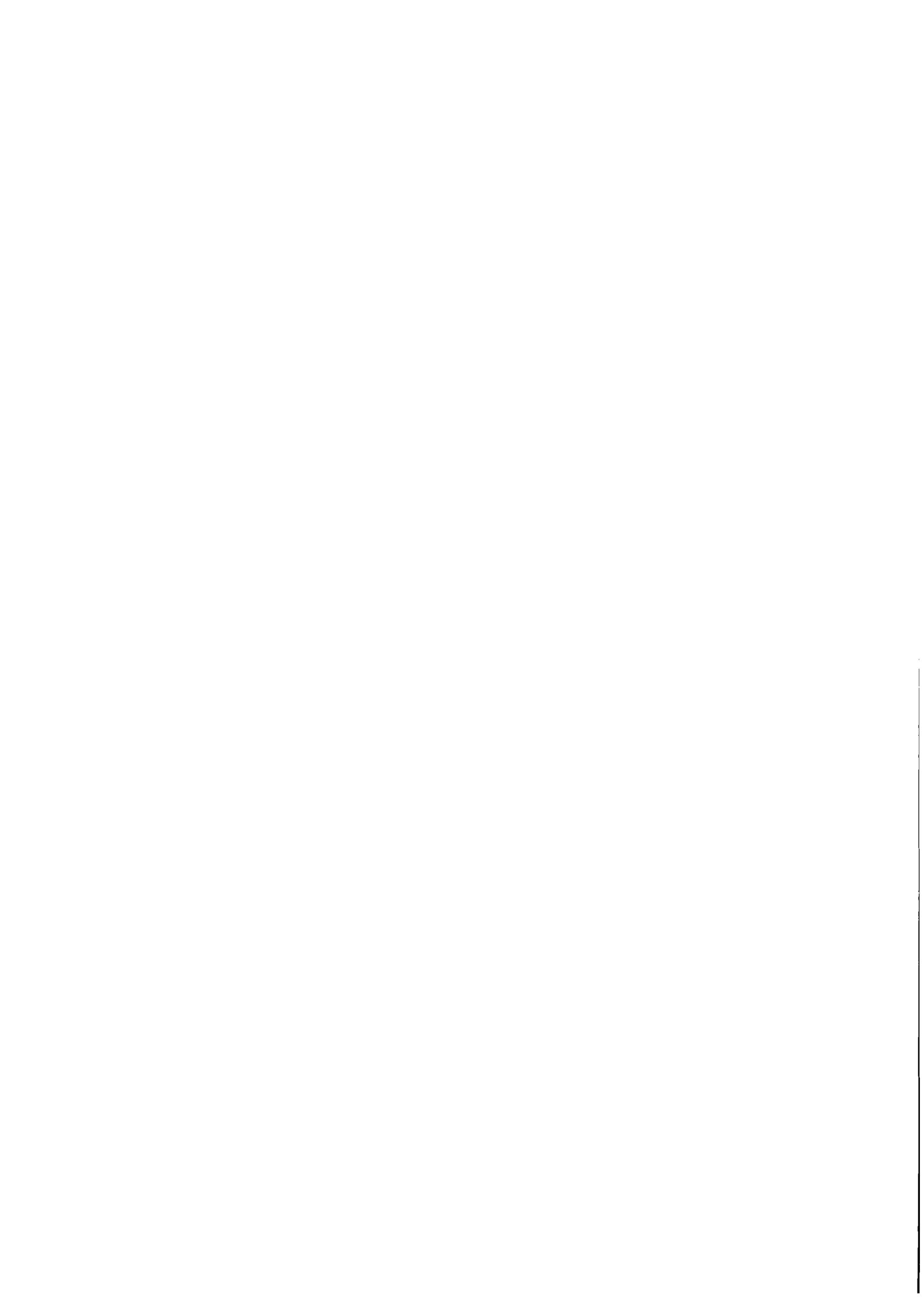


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DEMOGRAPHIC CHANGES AND THEIR IMPLICATIONS ON SOME ASPECTS OF SOCIAL SECURITY IN THE UNIFIED GERMANY

German Case Study

Notburga Ott,¹ Thomas Büttner² and Heinz P. Galler³

0. INTRODUCTION

The study on "Demographic Changes and their Implications on Some Aspects of Social Security in the Unified Germany" is the German case study of the international project "Social Security, Family and Households in Aging Societies." It tries to keep a common framework for the comparative part of the project, such as a common set of data tables, scenario settings for (demographic) projections, etc. However, the German case study deviates to some extent because of the exceptional event of German unification which suddenly became a reality in 1990. Consequently, the former concept of two separate country case studies, one for each German state, had to be withdrawn. Instead, a common German case study has been prepared, giving a comparative nature to some of the chapters (demographic trends in the past, description of the former pension systems).

For reasons of simplicity, the term 'Germany' is used to represent the united Germany although the correct name now is Federal Republic of Germany (FRG). West Germany or FRG is used to describe the former West German state, while East Germany or German Democratic Republic (GDR) refers to the second German state which ceased to exist in October 1990.

1. DEMOGRAPHIC TRENDS IN POSTWAR GERMANY--COMPARATIVE ANALYSIS OF EAST AND WEST GERMANY

1.1. Demographic Trends

The demographic trends in the two German states are similar to most of the developed countries. In the GDR, however, they show some specific features, especially for fertility and nuptiality which often have been attributed to a specific combination of an East German lifestyle and GDR population policy.

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Fertility

As far as fertility is concerned, one might distinguish between three periods (see Figure 1):

- The post-war baby boom period peaked in the mid-1960s, when Total Fertility Rates (TFR) increased up to about 2.5 in both East and West Germany.
- Subsequently, fertility dropped below replacement level within a few years (between 1966 and 1974 a decrease of about 40%). Surprisingly, until the mid-1970s the TFR in the GDR as well as the FRG showed quite a similar picture.
- In 1976, different trends for the two countries emerged. In the GDR fertility rose temporarily, to a certain extent due to a package of social political measures implemented in 1976, and then declined smoothly in the early 1980s. In the FRG, the TFR continued to decrease until 1985, reaching a minimum of 1.28 children per woman. In the second half of the 1980s East and West German fertility showed quite different trends, but resulted in a similar fertility level. At the end of the 1980s, the TFR of the two German states were more similar to each other than in the preceding 15 years.

The two German states differ not only with respect to the level, but also to the age pattern of fertility. East German women have their children earlier than in the FRG. Although the mean age of childbearing in both countries has increased (FRG since the mid-1970s, GDR since 1980), the difference has been growing from 2.1 years in 1975 to about 3 years in 1985, respectively.

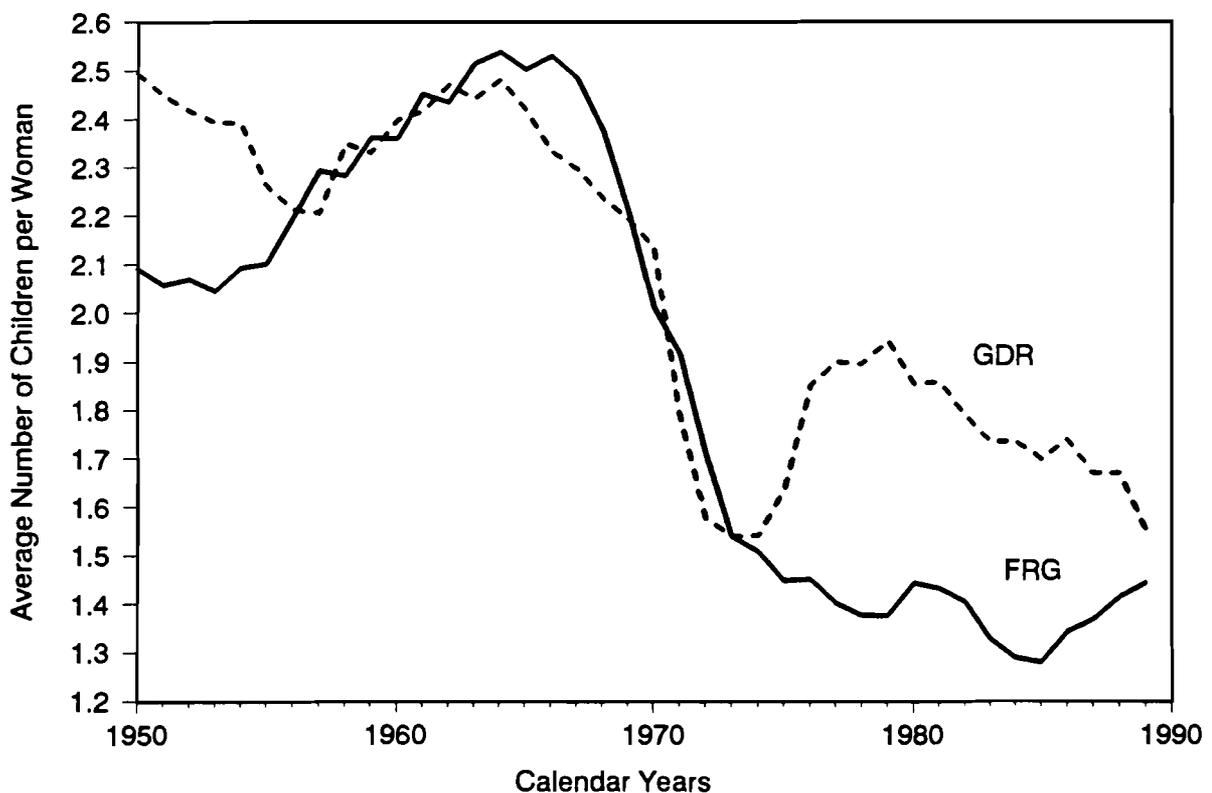


Figure 1: Total Fertility Rates, GDR and FRG, 1950 - 1989.

In general, differences in level and age patterns of basic demographic processes between East and West Germany might be explained by social conditions and individual orientation specific to each country. In the GDR, the provision of a basic social security for all citizens, combined with an overall low income and limited opportunities for individual careers especially in young ages, as well as specific benefits and incentives for both young couples and lone-parent families, might have resulted in both early childbearing, including a high amount of children born out of wedlock, and early marriages. However, the extremely high illegitimacy ratio in East Germany does not seem to be the result of the policy measures of the 1970s and 1980s. In the 1950s a higher proportion of children born out of wedlock had already been observed in the GDR (see Figure 2). In the FRG, a trend towards higher illegitimacy in childbearing had also been observed, starting at the peak of the baby boom in the mid-1960s, but the trend was more modest than in the GDR. In the late 1980s in the FRG, about 10% of all births had been born out of wedlock, while about one-third of all children born in the GDR had been born to unmarried mothers.

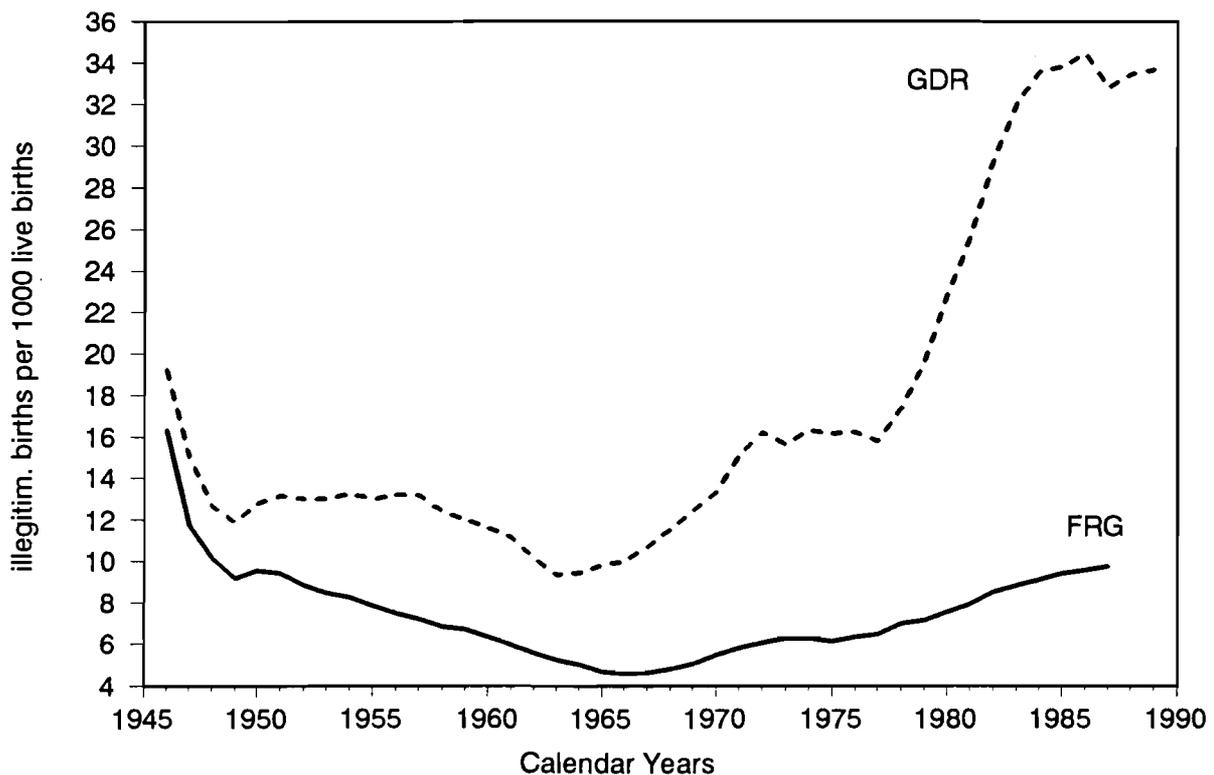


Figure 2: Illegitimacy ratio, 1946 - 1989.

Summarizing the facts on the rather different trends with respect to fertility, some assumptions about future trends can be made. It should be assumed that a fast trend towards West German age patterns of fertility will occur in the GDR. Delaying fertility to older age groups might also result in a tendency to a lower fertility level. In the FRG the process of postponing fertility to older age groups seems unfinished, which means both a further increase of the age specific fertility rates for older women, and a decrease for younger women. But, as a result, a slight increase in the West German TFR might be expected, which assumes that an increase in the older age groups overcompensates the fertility decline in younger age groups. As for Germany as a whole, it seems rather likely that it will remain a low fertility country for the next decade(s). (For more detailed assumptions about future trends, see Section 2.)

Nuptiality

Nuptiality also shows a very different picture for the former two German states, as well as some common features. While in the 1950s and early 1960s more similarities can be found, in the 1970s a diverging trend emerged.

The trend of the mean age of first marriage corresponds to a certain extent to the trends in overall nuptiality common to the two countries (see Figure 3): one can find a 'golden age' of marriage in the 1950s and 1960s, with a decreasing mean age of (first) marriage; growing numbers of marriages in absolute and relative terms; and a period of stagnation and reversion. In the mid-1970s, a trend towards later marriages, shorter marriage durations, and increasing divorces can be observed (see Table 1). In the 1980s, growing fractions of people remained unmarried, and new living arrangements like cohabitation emerged.

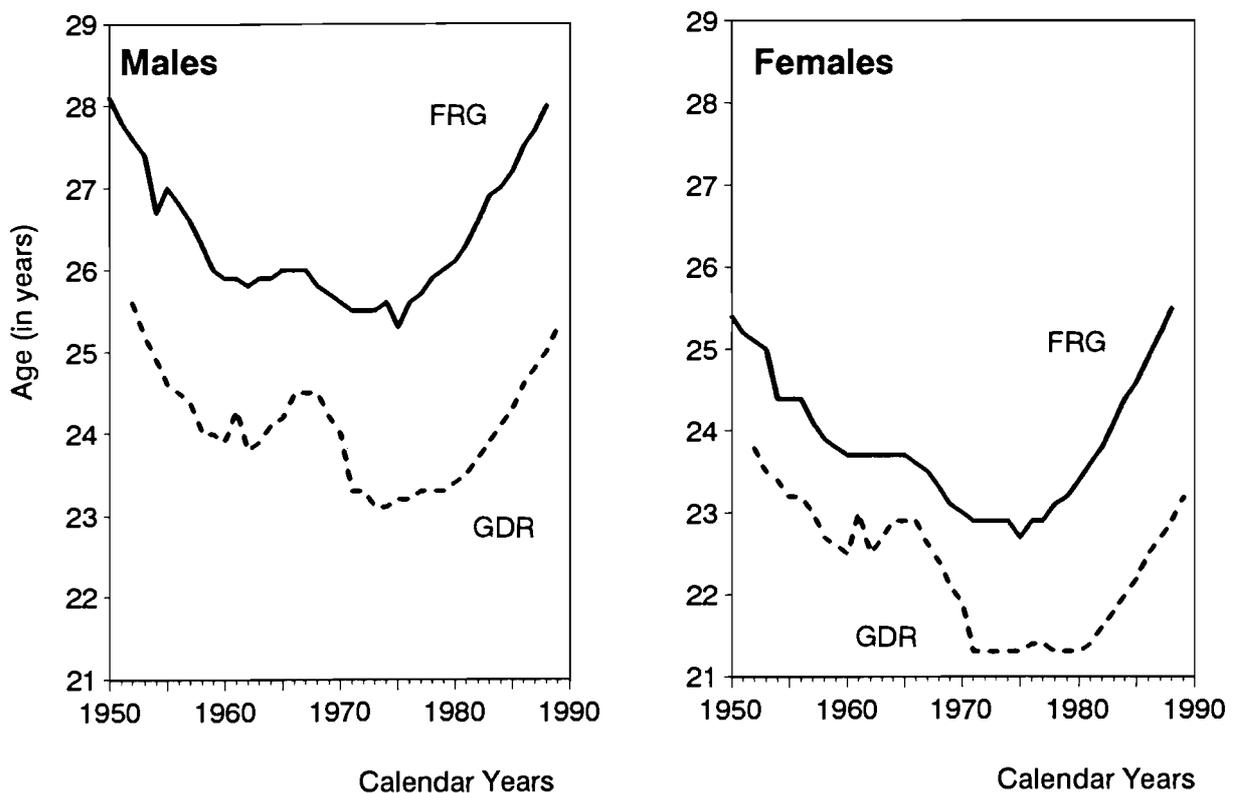


Figure 3: Mean age at first marriage.

Table 1: Nuptiality statistics.

Year	Proportion Ever Marrying			
	GDR		FRG	
	Males	Females	Males	Females
1971	92%	95%	86%	93%
1980	87%	90%	76%	83%
1987	82%	87%	72%	79%

While the general trend in the mean age of (first) marriage has been surprisingly similar, the level and the age patterns are different when comparing East and West Germany.

The very young age pattern of fertility in the GDR corresponds with similar young age patterns for marriage and divorce, and vice versa for the FRG. The age patterns of nuptiality are significantly different in young age groups (before age 30), but surprisingly similar for older age groups (see Figures 4 and 5).

Future trends for nuptiality are not easy to estimate. Two main tendencies seem to be probable: a change in East German age specific nuptiality patterns similar to those of West Germany, and a moderate tendency of further shifting the first marriages to older age groups (see Section 2).

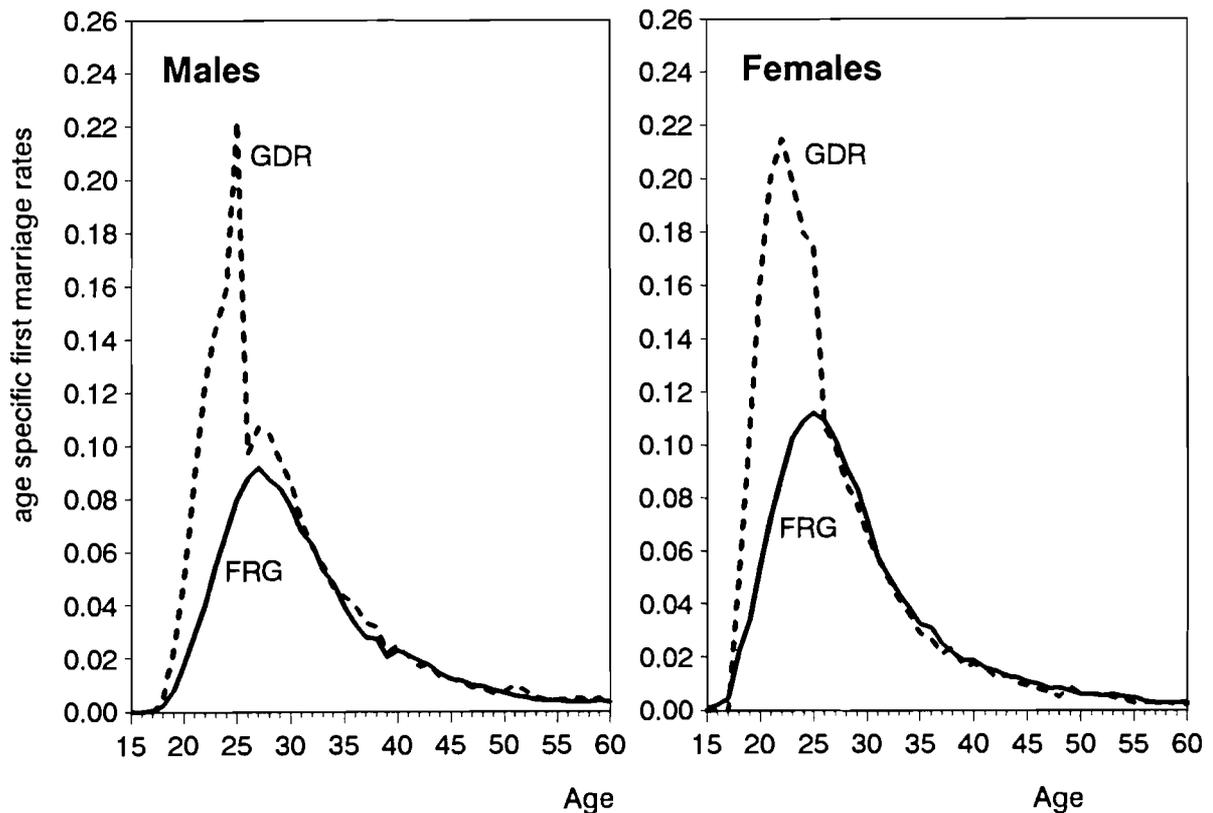


Figure 4: First marriage 1985, age patterns.

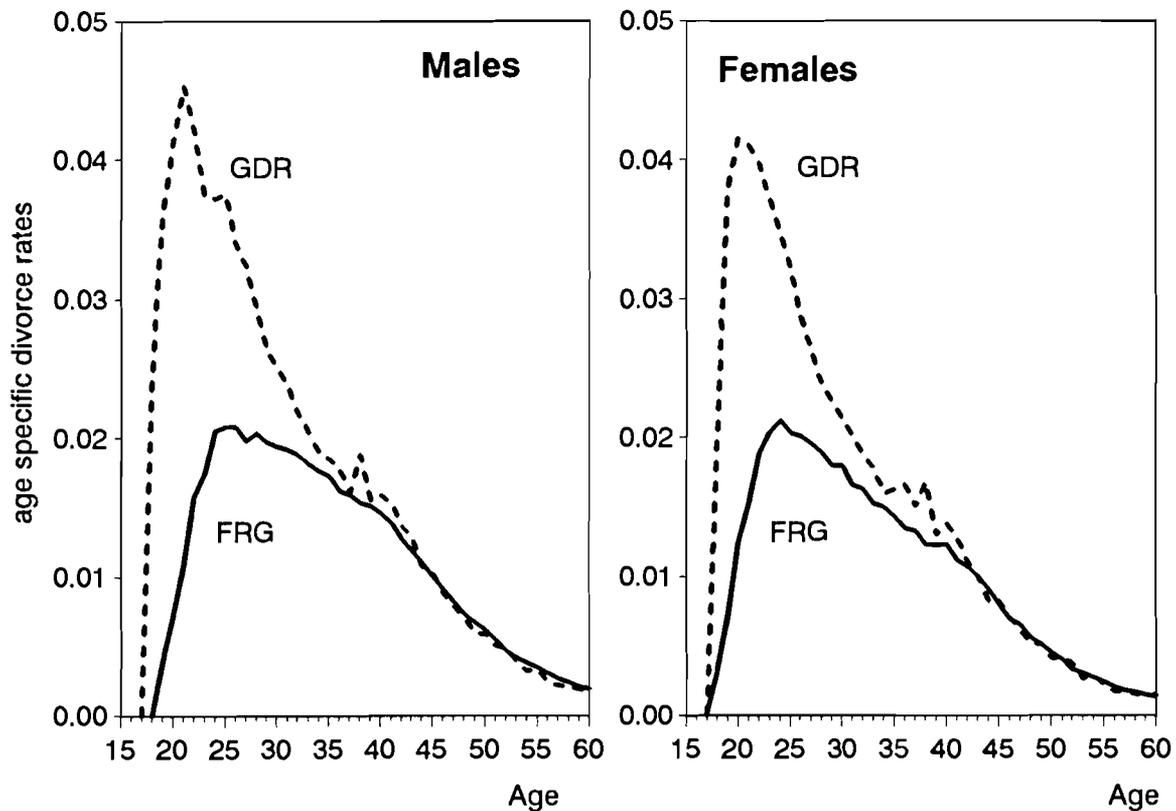


Figure 5: Divorce 1985, age patterns.

Mortality

As in most European countries, life expectancy has increased remarkably in both East and West Germany, and the increase has been greater for women. Between 1950 and 1985 life expectancy of a newborn rose in West Germany by 7.3 years for males and by 9.9 years for females.

The increase in life expectancy in East Germany was more moderate: 4.6 years for males and 6 years for females. As a result, the FRG life expectancy for males in 1985 was 2.2 years, and for females 2.9 years higher, when compared with the GDR figures. Note that the differences between East and West Germany tend to decrease for higher ages (Tables 2 and 3).

Table 2: FRG mortality 1950 - 1985.

Age	Life Expectancy (in years)				
	1949/51	1960/62	1970/72	1980/82	1985/87
Males					
at birth	64.56	66.86	67.41	70.18	71.81
at age 60	16.20	15.49	15.31	16.51	17.26
at age 80	5.24	5.24	5.36	5.73	5.99
Females					
at birth	68.48	72.39	73.83	76.85	78.37
at age 60	17.46	18.48	19.12	20.82	21.72
at age 80	5.57	5.85	6.16	7.46	6.98
Survivors (per 1000 born)					
Males					
at age 60	729	767	777	810	833
at age 80	251	242	232	284	325
Females					
at age 60	802	855	869	899	914
at age 80	318	385	420	557	509

Table 3: GDR mortality 1950 - 1985.

Age	Life Expectancy (in years)				
	1952/53	1960/61	1971/72	1980/81	1985/86
Males					
at birth	65.06	67.31	68.46	68.96	69.64
at age 60	15.99	15.95	15.35	15.58	15.87
at age 80	5.03	5.21	5.14	4.99	5.09
Females					
at birth	69.53	72.18	73.73	74.85	75.48
at age 60	17.68	18.51	18.43	18.95	19.23
at age 80	5.35	5.73	5.69	5.89	6.02
Survivors (per 1000 born)					
Males					
at age 60	742	777	797	795	803
at age 80	247	263	236	244	260
Females					
at age 60	808	852	874	887	895
at age 80	332	384	392	425	443

The post-active phase of a life cycle is--in terms of mortality--characterized by three major facts:

- A large and still growing fraction of individuals survives to the last phase in the life cycle. More than 80% of a male cohort, but about 90% of a female cohort will survive to age 60.
- The post-active period of the life cycle itself is of considerable duration and therefore importance. Sixty year-old males can expect to live another 16 (GDR) to 17 (FRG) years, whereas females will have another 19 (GDR) to 22 (FRG) years to live at that age.
- As a result of the significant sex differentials of mortality over the whole life cycle, the sex ratio of the elderly is very much imbalanced.

1.2. Internal and External Migration

The origin and history of both East and West Germany were remarkably affected by significant migration flows, resulting in gains for West Germany and losses for East Germany:

- tremendous outmigration from East Germany to West Germany (about 3.158 million),
- continuous immigration to West Germany by people of German nationality coming from eastern and southeastern Europe (about 2.0 million between 1950 and 1989),
- immigration of foreign workers and their families to West Germany, and, to a smaller amount, to East Germany,
- immigration of people seeking asylum for political reasons.

Outmigration from East Germany to West Germany falls into two different periods (see Table 4). Between 1950 and 1960/1961, more than 200,000 people left the GDR annually to re-settle in the FRG. This migration was 'clandestine,' that is, without permission from the GDR authorities, but because of the open borders, especially between East and West Berlin, movement was easy. The significant migration losses and their economic implications threatened the economic as well as political stability of the GDR. Until August 1961, about 2.56 million people migrated from the GDR to the FRG, which is a tremendous number when compared with the 17.08 million inhabitants of the GDR at the end of 1961. The response was the construction of the Berlin Wall in 1961.

Subsequently, the number of people migrating illegally from East to West Germany decreased drastically. Another consequence was that some legal emigration became possible: so-called family reunification on a legal basis. From 1962 to 1988 the majority of migrants from the GDR to the FRG left with permission. In total, from 1962 to 1988 about 560,000 people left the GDR for the FRG, 68% legally. In 1989, a dramatically increased outmigration of 344,000 GDR citizens finally destabilized East Germany as a separate state. Unification of Germany became possible and was urgently demanded by a majority of East Germans.

Table 4: Total immigration to West Germany, 1950 -1989.

Year	Immigration into West Germany (in 1000)				
	Total	Germans			Foreigners
		Total	from East Germany	from Eastern Europe	
1950-59	1 960	2 643	2 203	440	- 683
1960-69	2 493	840	618	222	+ 1 653
1970-79	1 828	504	149	355	+ 1 324
1980-88	1 371	811	204	607	+ 561
1989	-	721	344	377	-
1950-88	7 652	4 798	3174	1 624	+ 2 885

Source: Bundesausgleichsamt

After unification of Germany on 3 October 1990, however, immigration does not seem not to be finished at all. After having received 2.0 million people with German nationality or of German origin during the last four decades, the united Germany is likely to be entered by approximately another 2 million Germans still living in Eastern Europe until the turn of the century.

In addition, the organized immigration of foreigners into Germany was a decisive means to deal with the lack of labor force for both East and West Germany. Whereas in West Germany foreign workers were already employed in the 1950s, in East Germany the temporary inflow of foreign workers did not start before the 1970s. At the end of the 1980s, 1.624 million foreign workers were registered in West Germany (1988), but only 94,600 in East Germany (end of 1989). The proportion of all foreigners to the resident population differs between East and West Germany from 1.2% (GDR 1989) to 6.8% (FRG 1987). Quite similar to the expected inflow of ethnic Germans, an end to immigration of foreigners cannot be seen yet. Within the context of the East European political changes, as well as their economic difficulties during the transition to a market economy, an enormous migration potential can be identified in East Europe.

1.3. Size and Age Structure of the Two Populations

Between 1950 and 1985, the GDR population decreased from 18.4 million to 16.7 million, i.e. by 1.7 million (see Table 5). This might be regarded as a substantial amount in absolute terms, but it is surprisingly little when the migration loss of about 3.089 million at that time is taken into account. Between 1950 and 1985 the FRG population increased by 11.2 million people, i.e. by 12% (see Table 6).

Despite its declining number of total population, East Germany shows a younger population in the late 1980s than the population of West Germany. This was the result of different population trends and their implications on the age composition of the population.

Table 5: GDR population by broad age groups.

Year	Total				Percentage of total		
	0-14	15-59	60+	Total	0-14	15-59	60+
1950	4 202	11 214	2 972	18 388	22.8	61.0	16.2
1960	3 678	10 013	3 497	17 188	21.4	58.3	20.3
1970	3 970	9 334	3 764	17 068	23.3	54.7	22.0
1980	3 271	10 261	3 208	16 740	19.5	61.3	19.2
1985	3 202	10 390	3 058	16 650	19.2	62.4	18.4
1990	3 253	10 020	2 939	16 212	20.1	61.8	18.1

1990 estimated

Table 6: FRG population by broad age groups.

Year	Total				Percentage of total		
	0-14	15-59	60+	Total	0-14	15-59	60+
1950	11 855	31 952	7 151	50 958	23.3	62.7	14.0
1960	12 066	34 657	9 235	55 958	21.6	61.9	16.5
1970	14 103	35 094	11 804	61 001	23.1	57.5	19.4
1980	11 003	38 689	11 966	61 658	17.8	62.7	19.4
1985	9 128	39 414	12 482	61 024	15.0	64.6	20.5
1990	9 336	39 745	13 111	62 192	15.0	63.9	21.1

1990 estimated

In the period under consideration, the proportions of broad age groups for both East and West Germany change, but do not show a linear trend at all. The percentage of people of working age (15 to 59) declined until the 1970s, but again increased until the mid-1980s in both countries.

Until the 1970s, the proportion of old age people was higher in East Germany, against a background of an increase for both East and West Germany. In the 1980s the proportion of old age people continued to increase for the FRG, but decreased for the GDR. The same can be seen for the proportion of people below age 15. Until the 1970s, the proportion of children remained on a comparably high level, fluctuating around 22% of the total population. The proportion of people below age 15 later decreased significantly for the FRG (to 15% in 1990), and fell only slightly for the GDR (about 20% in 1990).

2. DEMOGRAPHIC SCENARIOS FOR GERMANY

2.1. Estimating the Future: Transition Towards a Unified Germany

In the project "Social Security, Family and Households in Aging Societies" a set of four standard scenarios have been defined for comparative reasons. These scenarios are:

- **Benchmark Scenario (BM)**
Keeps the observed average rates from 1980-85 constant for the whole projection period (e.g. 1985/90 - 2050);
- **Western Scenario (WEST)**
Combines the most extreme demographic rates in western European countries observed in the period 1980 to 1985: West German low fertility (1.28 children per woman), Swedish nuptiality (one-third never married, mean age at first marriage of 28 for women and 30 for men, one-third of all marriages ending in divorce);
- **Fertility Scenario (FER)**
Assumes fertility increase to replacement level, other rates are the same as the benchmark scenario;
- **Mortality Scenario (MOR)**
Assumes further and significant progress against mortality; all age specific mortality rates have been reduced by 30% for women and by 45% for men, all other rates are the same as benchmark scenario.

All changes are assumed to take place within the period 1985 to 2005. For the specific case of Germany, additional assumptions were made. Because of the comparative nature of the whole project, it seemed useful to calculate the set of four common scenarios for the two German states separately, and then to sum them up as one for Germany. This can be easily accepted in all cases except for the benchmark scenario. The latter is somehow artificial, presenting the plain mixture of significant different demographic features of two different states.

National Scenarios

Two National Scenarios try to anticipate the most likely demographic trends for the future. In general, a strong tendency towards common demographic patterns for all Germany has been assumed, with a transition period for East Germany until 2005.⁴ The most striking element of change seems to be the expected changes of age patterns of fertility and nuptiality for the East German population, rather than changes in their level. This implies deviation from the habits spread uniformly among the East German population, and adaptation to new or changed life cycles.⁵ Both National 1 (NAT 1) and National 2 (NAT 2) scenarios are identical with respect to the basic demographic assumptions, but the latter additionally considers a large and long-lasting external immigration to Germany (for the demographic

⁴ The duration of the transition period has been chosen according to the transition periods for some of the standard scenarios.

⁵ The transition period necessary to develop common demographic patterns in Germany was the main reason to technically process the forecasts for East Germany and West Germany separately.

parameters see Table 7). Additionally, the 1990 population for the two countries was estimated using observed rates in order to get a realistic initial population for the unified Germany.

- **National 1 Scenario (NAT 1)**

A shift of fertility age patterns towards older mean age of childbearing, nuptiality age patterns towards later first marriage, and later divorce have been assumed. The levels of the main demographic processes of the former GDR were closely adapted to FRG levels observed in the late 1980s.

- **National 2 Scenario (NAT 2)**

Keeping all other settings as in National 1, an annual immigration of 200,000 people has been assumed, resulting in an inflow of 12 million people in total between 1990 and 2050. This seems to be extreme at first glance, but plausible when compared to the amount of immigration to (West) Germany during the last four decades.

Table 7: The parameter for the German national scenarios.

Scenario/ country	Parameter			
	Fertility (TFR)	Mortality (life exp.)	Nuptiality	Migration
<u>NATIONAL 1</u>				
East Germany	1985: 1.856 1990: 1.600 change to FRG age pattern 2005: 1.500 const.	1985: 69.1 (m) 75.1 (f) 2005: 73.0 (m) 79.0 (m) const.	<u>first marriage:</u> 1985: as observed 1990: change to FRG age pattern level: 80% of GDR (1985) const. <u>remarriage:</u> 1985: as observed (1985) const. <u>divorce:</u> 1985: as observed 1990: change to FRG age pattern level: 120% of FRG (1985) const. <u>widowhood</u> 1985: as observed const.	1985/90: 500000 outmigration to FRG 1990/95: 400000 re-distribution to West Germany
West Germany	1985: 1.28 2005: 1.43 const.	1985: 75.1 (m) 79.0 (f)	<u>first marriage:</u> 1985: as observed 2005: slight increase in older, but decrease in younger age groups <u>remarriage, divorce, widowhood:</u> const. on 1985 level	1985/90: 500000 immigration from GDR 1990/95: 400000 re-distribution from East Germany 1985/2000: 2.1 million immigration of Germans from Eastern Europe 1985/90: 520000 immigration of foreigners
<u>NATIONAL 2</u>				
	as NAT 1	as NAT 1	as NAT 1	as NAT 1 1990/2050: 12.0 million immigration of foreigners (200,000 annually)

2.2. Changes in the Size and Age Structure of the Population

The population of Germany in all scenarios--in the long run--will decrease (see Figure 6 and Table 8). This is true even with fertility assumed to be at replacement level (FER) or with massive immigration (NAT 2). The decrease varies between 91.8% and 75.4% in 2030, and 82.6% and 57.1% in 2050, respectively, as compared with the population size of 1990. Both the Western and the Benchmark Scenarios imply the largest decrease in the size of population: from 78.4 million in 1990 to about 60 million in 2030 (WEST), and to around 45 million in 2050 (BM). On the other hand, with the Fertility Scenario and/or the immigration assumption (NAT 2), the population decrease is the smallest. Note that in the long run, a population inflow of 12 million foreigners in the period between 1990 and 2050 (NAT 2) could not compensate for missing replacement level of fertility; in 2050 the total population of Germany is estimated to be 64.7 million under replacement assumption, but only 62.0 million resident population has been estimated under the immigration assumption. The possible range of change is rather wide: 13 million between the Benchmark and National 2 Scenarios in 2030, and 17.3 million between Western and Fertility Scenarios in 2050. Even if one takes only the two National Scenarios into account, the estimated difference in population size is rather large, 8.4 million inhabitants in 2030 or 12.2 million in 2050, respectively.

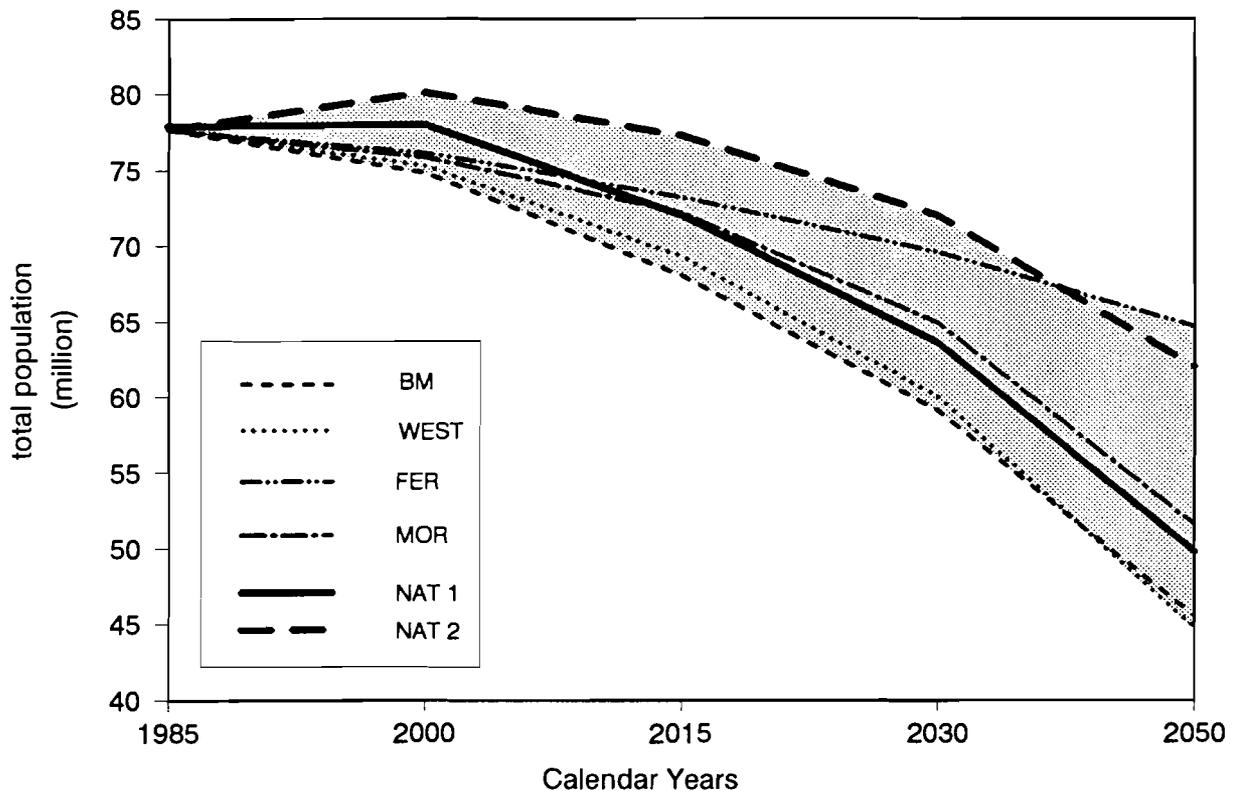


Figure 6: Total population of Germany, 1985 - 2050.

Table 8: German population by broad age groups and scenarios, total and relative.

Year	Total (in 1000s)				Relative (in %)			
	0-14	15-59	60+	Total	0-14	15-59	60+	Total
1990	12589	49765	16050	78404	16.1	63.5	20.5	100.0
Benchmark Scenario								
2000	11587	45529	17676	74791	15.5	60.9	23.6	100.0
2015	8827	41096	18124	68047	13.0	60.4	26.6	100.0
2030	7575	31453	20087	59115	12.8	53.2	34.0	100.0
2050	5796	24954	14789	45539	12.7	54.8	32.5	100.0
Western Scenario								
2000	11365	45620	18271	75256	15.1	60.6	24.3	100.0
2015	7995	41169	20197	69361	11.5	59.4	29.1	100.0
2030	6490	30683	22878	60052	10.8	51.1	38.1	100.0
2050	4442	22692	17599	44733	9.9	50.7	39.3	100.0
Fertility Scenario								
2000	12952	45529	17676	76156	17.0	59.8	23.2	100.0
2015	12659	42450	18124	73233	17.3	58.0	24.7	100.0
2030	12866	36593	20087	69547	18.5	52.6	28.9	100.0
2050	12700	37241	14789	64729	19.6	57.5	22.8	100.0
Mortality Scenario								
2000	11603	45674	18535	75812	15.3	60.2	24.4	100.0
2015	8873	41619	21725	72217	12.3	57.6	30.1	100.0
2030	7637	31981	25287	64906	11.8	49.3	39.0	100.0
2050	5868	25525	20162	51555	11.4	49.5	39.1	100.0
National 1 Scenario								
2000	12453	47389	18185	78027	16.0	60.7	23.3	100.0
2015	9489	43429	19100	72018	13.2	60.3	26.5	100.0
2030	8375	33664	21527	63567	13.2	53.0	33.9	100.0
2050	6323	27208	16316	49846	12.7	54.6	32.7	100.0
National 2 Scenario								
2000	12996	48653	18448	80096	16.2	60.7	23.0	100.0
2015	10522	46860	19882	77264	13.6	60.6	25.7	100.0
2030	9915	39029	23037	71981	13.8	54.2	32.0	100.0
2050	8338	34773	18927	62038	13.4	56.1	30.5	100.0

Not only the size, but also the age composition of the population is subject to changes under the different scenarios. For all but the replacement assumption (FER), a decline in the percentage as well as the absolute number of population under age 15 has been estimated (see Table 8). For the year 2030, the possible ratio of people below age 15 on total population varies between 10.8% (Western Scenario) and 18.5% (Fertility Scenario).

For the older age groups, a further increase in number as well as in percentage is calculated to happen by the year 2030 (see Figure 7). With 16.0 million older people in 1990, it is expected that there will be between 25.3 million (Mortality Scenario) and 20.1 million (Benchmark and Fertility Scenarios) in 2030. After the year 2030, the absolute number of people 60 years and older is estimated to significantly decline for all scenarios. However, at the same time, the percentage of old age people does not decrease for all scenarios; the Western and Mortality Scenarios show a levelling off or even a further increase.

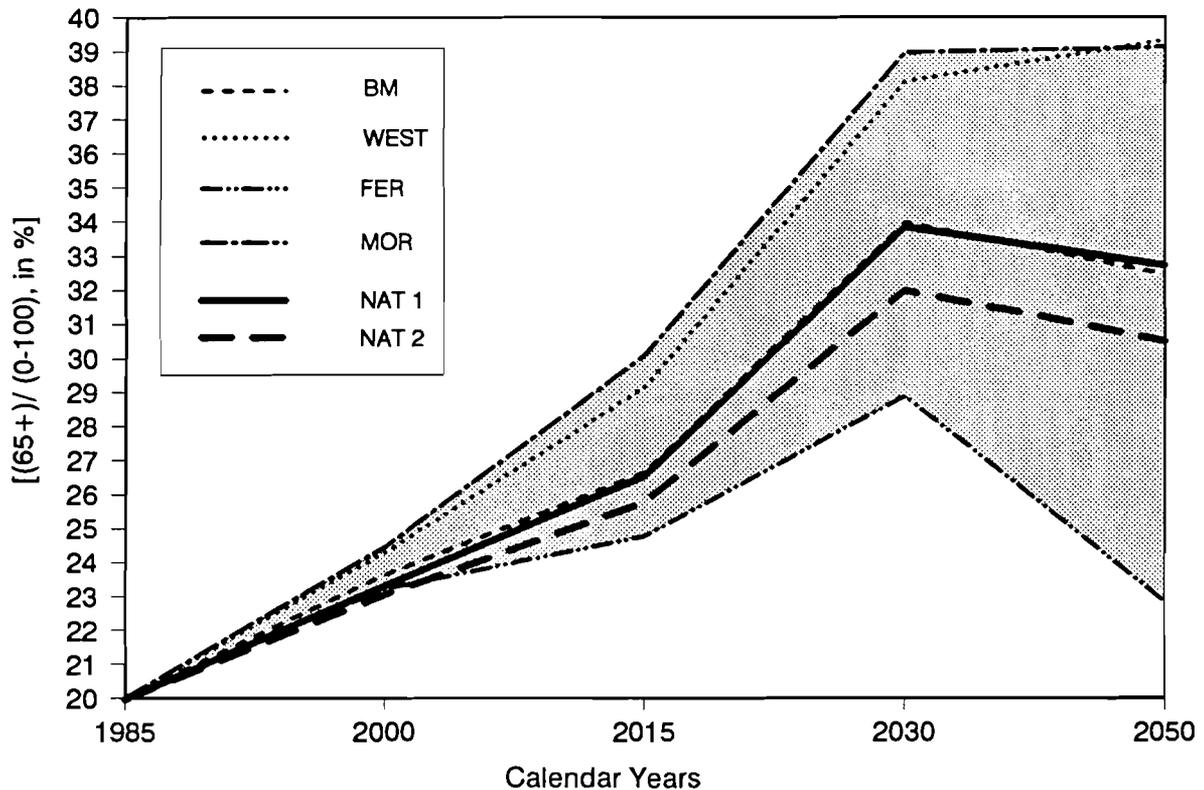


Figure 7: Percentage of the elderly, Germany 1985 - 2050.

For the Benchmark and Fertility Scenarios the absolute number of people aged 60 and over in 2050 will be below those figures estimated for 1990. As far as the two National Scenarios are concerned, the number of old age people is higher for the National 2 Scenario, whereas the percentage is higher for the National 1 Scenario. Furthermore, the number of old people in 2050 does not differ very much from the number estimated for 1990 (2050: 16.3 million for National 1, 18.9 million for National 2; 1990: 16.0 million).

Changes in age composition can also be seen in terms of dependency ratios (see Table 9). The Total Dependency Ratio (TDR), expressing the proportion of non-active to active population,⁶ increases for all scenarios until the year 2020 (see Figure 8). The 'burden' per active person, however, is expected to differ widely between the different scenario assumptions. Starting with 45 non-active per 100 active in 1990, the TDR can be expected to be between 60 and 74 in 2030. In some scenarios, the TDR is expected to increase even further (Western Scenario, Mortality Scenario), while for the others a slight decrease can be seen. The general tendency towards an increase in TDR is mostly due to significant increases in the Old Age Dependency Ratio (OADR), taking into account the ratio of persons aged 65 and older per 100 persons in age group 15 to 65 (see Figure 9).

⁶ Active population has been identified as those persons of legal working age (15 - 64), and non-active population as those below 15 and over 65.

Table 9: Dependency ratios for Germany.

Scenario	1990	2000	2015	2030	2050
Young Age (under 15)					
Benchmark		22.8	19.3	20.7	20.4
Western		22.3	17.4	18.1	16.9
Fertility		25.4	26.8	30.9	31.2
Mortality		22.7	19.0	20.4	20.1
National 1	23.3	23.5	19.6	21.5	20.4
National 2	23.3	23.9	20.2	22.1	21.2
Old Age (65 and over)					
Benchmark		24.1	29.2	41.1	39.9
Western		25.1	33.3	49.0	53.3
Fertility		24.1	28.4	36.0	27.9
Mortality		25.5	35.9	53.2	56.3
National 1	21.7	23.9	29.3	41.5	40.6
National 2	21.7	23.6	28.4	38.4	36.8
Total					
Benchmark		46.9	48.5	61.8	60.3
Western		47.4	50.6	67.1	70.1
Fertility		49.6	55.2	66.9	59.1
Mortality		48.2	54.9	73.6	76.4
National 1	45.0	47.4	49.0	63.0	61.0
National 2	45.0	47.6	48.6	60.5	58.1

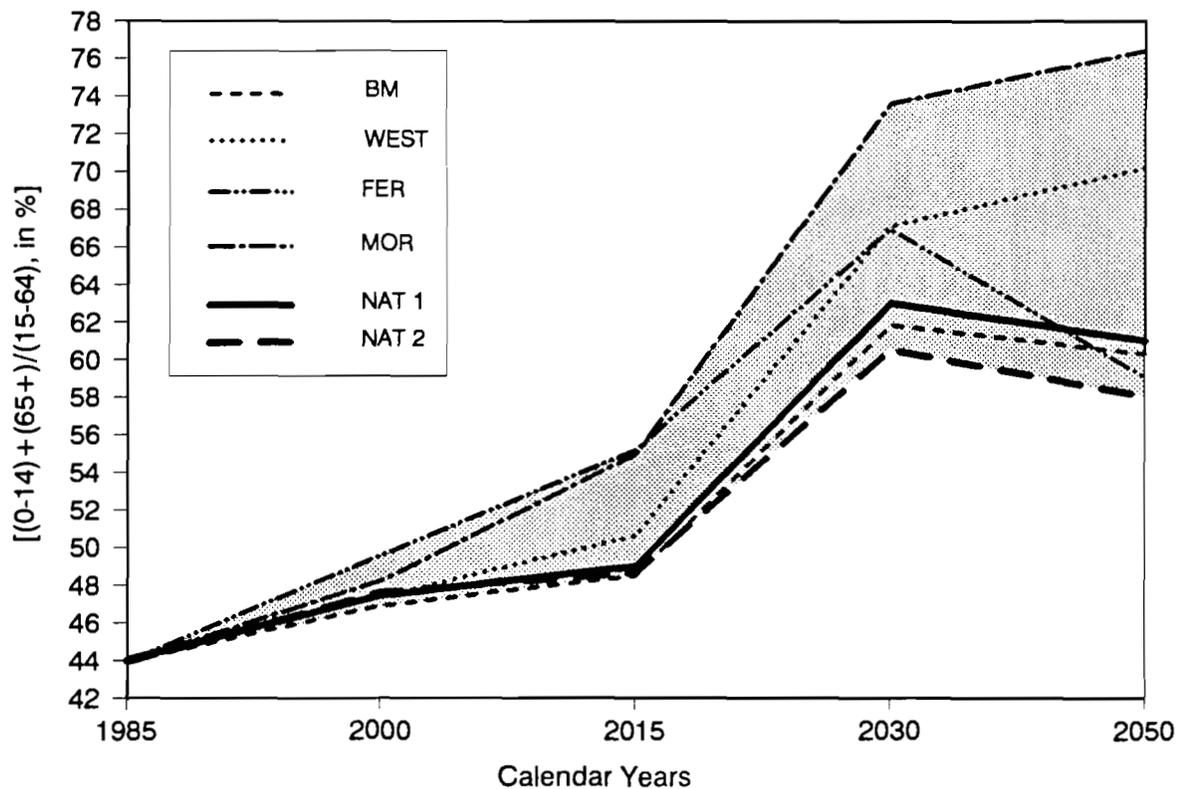


Figure 8: Total Dependency Ratio, Germany 1985 - 2050.

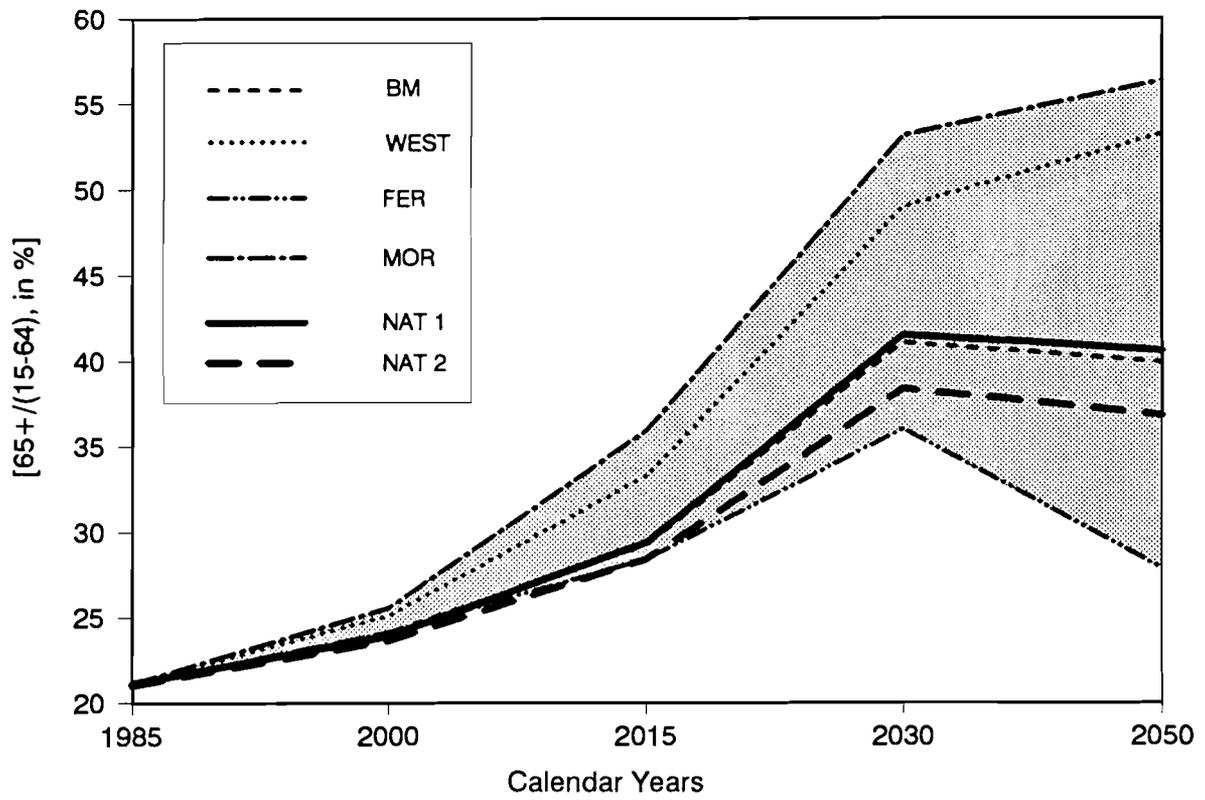


Figure 9: Old Age Dependency Ratio, Germany, 1985 - 2050.

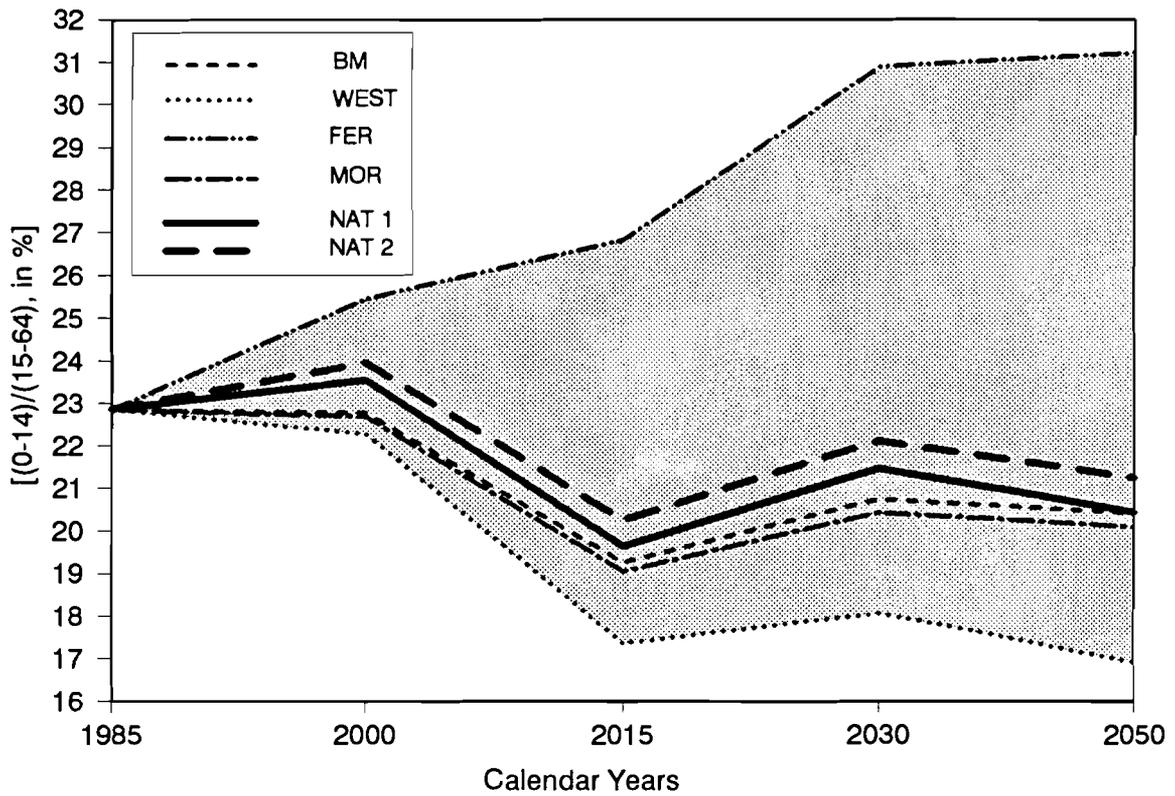


Figure 10: Young Age Dependency Ratio, Germany, 1985 - 2050.

The increase in the number of elderly compensates for the fall in the Young Age Dependency Ratio for all but the Fertility Scenario (see Figure 10). As for the two National Scenarios the differences are rather minor, which implies that immigration does not change the ratios active to non-active population substantially. The process of aging remains the main trend under all assumptions.

2.3. Changes in the Marital Composition of the Elderly

In the context of social security, and especially with respect to the pension problem, the marital composition of the elderly is of considerable interest, not only because of different pension types, such as survivor pension, but also because of different living arrangements connected with marital status. In 1990, the marital composition of the elderly differs only slightly between East and West Germany. The percentage of married old age females is higher for West Germany, whereas the percentage of married males is almost the same (see Table 10). Both East and West Germany show that a majority of old age males is still married (more than three-quarters), while there is a minority of women married in old age groups (35 - 39%).

Table 10: Marital composition of the population aged 60 and over, East and West Germany, 1990 (estimated) (%).

Country	Single	Married	Divorced	Widowed	Total
	Females				
East Germany	7.3	35.2	7.4	50.1	100.0
West Germany	8.6	38.5	4.7	48.3	100.0
	Males				
East Germany	1.6	78.0	3.0	17.4	100.0
West Germany	4.1	78.2	3.2	14.5	100.0

The future trends for the number as well as the marital composition of the elderly are rather certain due to the fact that nuptiality dynamics are concentrated in young adulthood and mortality changes affect population numbers smoothly. In the long run, the marital composition of both males and females is subject to change towards less people being married (see Table 11). Consequently, the proportion of old age people living outside their own nucleus family is likely to grow remarkably, but to a different amount with respect to gender.

As for males aged 60 and over, it is expected that a majority of them will be married, with the exception of the Western Scenario after the year 2030. Although almost 80% of the males are currently married, this percentage will drop between 60% and 50% until 2030 for the different scenarios (see Figure 11).

Table 11: Marital composition of the elderly in Germany (people aged 60 and over, in percentages).

Year	Females					Males				
	Single	Married	Divorced	Widowed	Total	Single	Married	Divorced	Widowed	Total
1990	8.3	37.8	5.2	48.6	100.0	3.7	78.2	3.1	15.0	100.0
	Benchmark Scenario									
2000	6.9	41.6	6.5	45.0	100.0	5.8	75.0	5.3	14.0	100.0
2015	6.6	39.0	9.3	45.1	100.0	11.4	66.4	7.4	14.9	100.0
2030	13.1	35.9	9.8	41.2	100.0	21.3	59.0	7.2	12.5	100.0
2050	16.3	30.6	9.4	43.8	100.0	24.5	55.4	6.9	13.2	100.0
	Western Scenario									
2000	7.0	41.8	6.6	44.6	100.0	5.7	75.0	5.6	13.6	100.0
2015	6.7	39.1	11.4	42.9	100.0	11.2	64.2	10.2	14.3	100.0
2030	13.0	33.7	15.9	37.4	100.0	22.5	52.5	12.8	12.1	100.0
2050	22.3	25.1	16.5	36.1	100.0	35.1	41.4	11.6	11.9	100.0
	Fertility Scenario									
2000	6.9	41.6	6.5	45.0	100.0	5.8	75.0	5.3	14.0	100.0
2015	6.6	39.0	9.3	45.1	100.0	11.4	66.4	7.4	14.9	100.0
2030	13.2	35.8	9.8	41.2	100.0	21.3	59.1	7.1	12.5	100.0
2050	16.5	30.2	9.5	43.8	100.0	24.2	56.0	6.7	13.1	100.0
	Mortality Scenario									
2000	7.0	43.4	6.5	43.2	100.0	5.7	75.3	5.2	13.9	100.0
2015	6.6	46.1	9.1	38.1	100.0	10.6	66.9	7.0	15.4	100.0
2030	12.4	43.8	9.8	34.0	100.0	19.5	58.6	7.0	14.9	100.0
2050	15.7	37.4	9.6	37.3	100.0	23.7	52.4	6.8	17.1	100.0
	National 1 Scenario									
2000	6.8	41.9	6.9	44.4	100.0	5.7	74.8	5.5	14.1	100.0
2015	6.2	39.9	9.7	44.1	100.0	10.9	66.2	7.8	15.0	100.0
2030	10.4	38.6	10.4	40.6	100.0	19.4	59.9	7.9	12.8	100.0
2050	14.9	32.7	9.8	42.6	100.0	25.9	53.4	7.1	13.6	100.0
	National 2 Scenario									
2000	6.8	42.1	7.1	44.0	100.0	5.6	74.8	5.6	14.0	100.0
2015	6.2	40.2	10.0	43.7	100.0	10.6	66.3	7.9	15.2	100.0
2030	9.9	39.2	10.6	40.3	100.0	18.4	60.5	8.0	13.1	100.0
2050	13.3	34.3	10.1	42.2	100.0	23.6	54.9	7.4	14.0	100.0

For the growing group of unmarried elderly males, the never married are expected to become the majority. The percentage of never married males will increase from 3.7% in 1990 to about 20% in 2030 (varying between 18.4% and 22.5%). In the year 2050, this percentage will be about 25%, with the exception of the Western Scenario, resulting in 35% never married males (see Figure 12).

Although the general trend against formal marital unions is also found for old age females, some specific features are likely to happen. For the next 10 to 20 years, there is a temporal trend towards increasing married women among the age group under consideration. This is because the age, sex, and marital status composition of the elderly will successively rectify its disturbances and imbalances brought about by World War II (see Table 12). The general trend, however, will clearly appear for the years after 2000/2015. Until the end of the projection period, the percentage of married women is estimated to vary between 25% (Western Scenario) and 37.4% (Mortality Scenario).

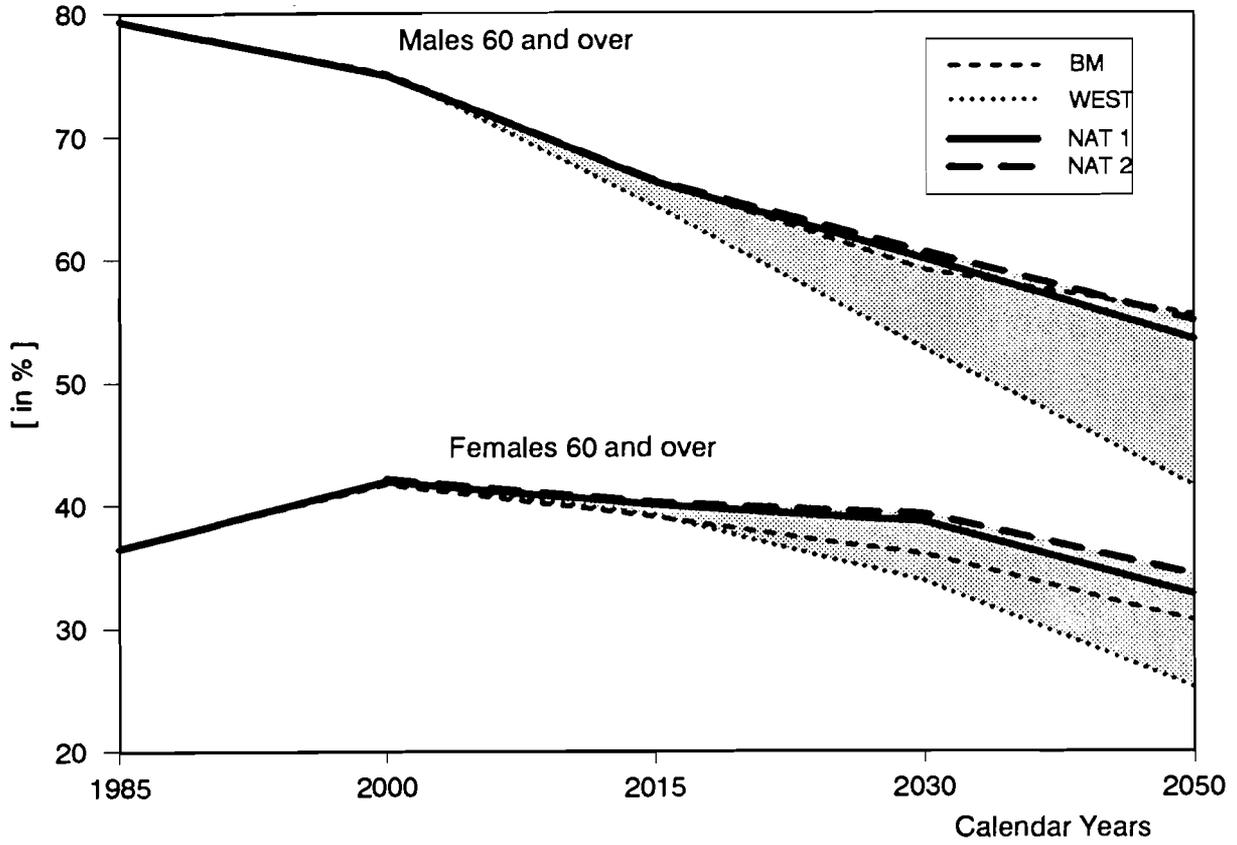


Figure 11: Percentage married among the elderly, Germany, 1985 - 2050.

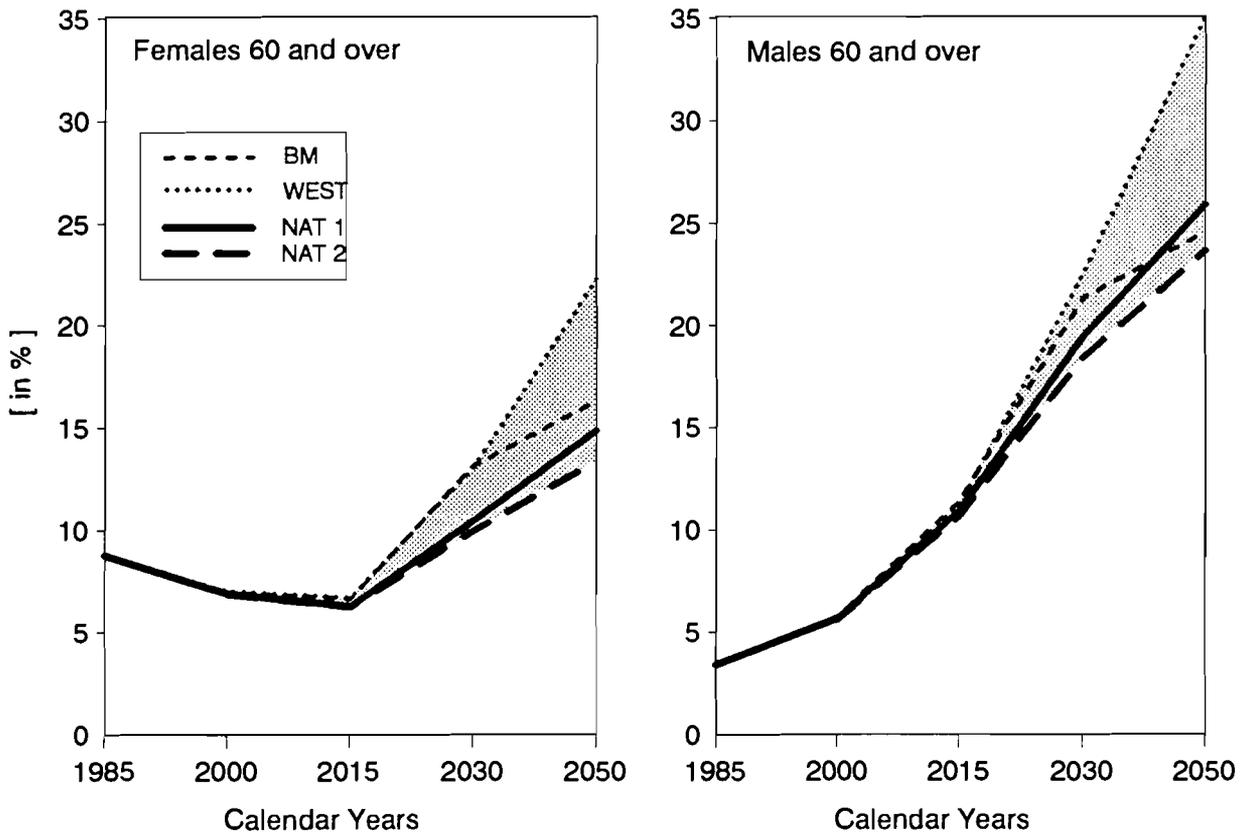


Figure 12: Percentage single among the elderly, Germany, 1985 - 2050.

Table 12: Sex ratio of the elderly (males aged 60+ per 100 females aged 60+).

Scenario	1990	2000	2015	2030	2050
Benchmark		70.7	76.2	78.4	74.3
Western		70.3	76.0	78.6	74.3
Fertility		70.7	76.2	78.4	74.3
Mortality		72.5	85.7	92.1	92.4
National 1	58.9	70.3	76.3	79.8	75.8
National 2	58.9	70.4	76.0	79.7	77.0

3. WORK PATTERNS AND RETIREMENT--PAST AND FUTURE

3.1. Similarities and Dissimilarities--Comparison of East and West Germany

In both East and West Germany the work patterns of males and non-married females were almost similar to other developed countries. The labor force participation rates were, and still are, considerably high, more or less for all but the very young and the older age groups. In the last decade only minor changes have been observed with respect to the younger age groups as a result of longer duration of education. For divorced and widowed women, a slight trend of increasing participation in the older age groups occurred.

Strong differences with respect to employment have been observed between the GDR and the FRG for married women. In the FRG a 3-phase sequence can be observed: a high labor force participation for very young females; a drop between the ages of 25 and 35 because of interrupting economic activities due to the birth of children; and subsequently a rise of labor force participation, followed by a steady decrease until pension age. Although in the past the labor force participation of married women increased, especially in the older age groups, the typical pattern remains more or less unchanged.

In the GDR, rather different patterns have evolved. Since the 1950s, where the employment behavior of married women was similar to the FRG, the participation rates increased to a pattern similar to that of non-married women. For the mid-1980s, the age specific participation rates were close to 90% for age groups between 25 and 50, and no substantial influence of childbearing activities on the nominal labor force participation exists. There are two main reasons for this. First, as already stated, reproductive activities were positioned in very young age groups, just before or at the beginning of intense economic activities, when the combination of parenthood and continued labor force participation seemed to be easier.⁷ Second, the comprehensive child-care network helped most of the mothers combine, to a certain extent, motherhood/parenthood and economic activities.

Further differences between the two German states can be observed for people older than 60. In the FRG the labor force participation rates have dropped substantially since the 1970s for men as well as for women, which implies a corresponding earlier retirement. In the GDR the decrease was much slower for women while for men a little increase of the participation rates was seen. Therefore the retirement age was higher in the GDR than in the FRG.

⁷ For example, it was quite common for female students to combine pregnancy with studying.

3.2. Labor Activity Scenarios for Germany

The unification of Germany already has and will continue to have strong impacts on the labor force, especially for East Germany. The expected dramatic changes in economic and social conditions might result in changes in both the level and age pattern of labor force participation rates. One should assume that the patterns assimilate, after a transition period, to those of the FRG. But also in West Germany changes in activity rates, especially for women, are likely. First, there is some evidence that the trend of increasing female labor force participation is continuing, but may be slower than in the past. Second, very low mean age at retirement in the 1980s was, to some extent, the outcome of policy measures to reduce unemployment. We might assume, therefore, slightly increasing activity rates in the older age groups for the future.

For the pension calculation (see Section 5) three different assumptions have been chosen with respect to employment/labor force participation for the time period under consideration.

- **Activity Benchmark Scenario**

For the transition period assumed to last until 2005, region-specific but converging assumptions have been made. After 2005, the labor force participation rates will be the same for all of Germany and will be kept constant until 2050. The assumptions are as follows:

Never Married Women: The 1985 rates are held constant for East and West Germany throughout the whole projection period.

Married Women: For West Germany a slight increase in participation rates is assumed until 2005, except for the youngest age group. For East Germany the 1990 activity rates have been set only to 90% of the GDR 1985 level. Until the year 2005, there will be a further decline to the West German level in 2005.

Divorced and Widowed Women: For West Germany an increase in activity rates is assumed in the older age groups (35 and older) until 2005. For East Germany the 1985 rates are assumed to be still valid for 1990, but a transition is expected to the 2005 West German level.

Males, all marital statuses: For West Germany the activity rates are held constant for all but the last age group (60-64), for which the rate increases to 55% in 2005. For East Germany a change between 1990 and 2005 to the FRG level is assumed.

- **Low Activity Scenario**

Sets the labor activity of women for both East and West Germany to the level observed in the FRG in 1985. For East Germany, an immediate adaptation to this level has been assumed.

- **Late Retirement Scenario**

Assumes a rise of the mean age of retirement to 65 years with all other settings as in the activity benchmark.

4. SOCIAL SECURITY IN A UNITED GERMANY

4.1. Historical Background

Social security has a long tradition in Germany. As early as 1883 a compulsory health insurance for blue collar workers was established by law on the 'Reich' level. An insurance covering work accidents and a pension system providing disability and old age benefits followed in 1884 and 1889, respectively. In 1911 the system was extended to white collar, salaried workers. Since then, the system has been extended gradually to cover additional groups like craftsmen and portions of the self-employed. But in principle it always remained an insurance system related to those employed. Basically, it covers the loss of earnings caused by unemployment, sickness, disability or old age, and is financed by contributions that are defined as a percentage of individual earnings.

From the beginning, the system was split up into different institutions covering different risks for different groups in different regions. This is especially true for the health insurance system that was organized primarily at the local level. Different bodies for the pension insurance were also created for different groups of workers mostly at the federal state level. Major institutional changes took place both after 1934 and 1945, and after 1949 different developments took place in the FRG and GDR, respectively.

In the GDR, a large number of about 1300 different insurance bodies was merged into five institutions in 1947, one for each of the federal states that belonged to the zone occupied by the Soviet Union. But even then, about 150 institutions for specific professions remained in addition to the state bodies. In 1952 the system was centralized further when the federal states were disbanded. The most significant change occurred in 1956, when the centralized trade unions took over to govern the Social Insurance for Workers and Employees⁸ (SIWE) and it was in principle integrated into the state budget. In order to stress the 'socialist' character of the system, contributions from workers and employers were frozen and an increasing part of the expenditure was covered from the general budget (cf. Winkler, 1989, p. 98).

The social security system in the FRG was related more closely to the traditional German system than the system in the GDR. Most institutions remained almost unchanged and most of the basic regulations were kept. However, a major reform of the pension system took place in 1957 when a dynamic, wage-related pension was introduced. Pensions were to be paid proportionally to individual contributions that were defined as a percentage of earned income. The tax rate for contributions to the pension system was set by federal regulations to cover current expenditure. In addition, a subsidy from the general budget was granted to cover those expenses that are not part of the insurance, but rather a consequence of general redistribution policy.

Presently a single system for all of Germany has been created by merging the system of the GDR into the system of the FRG. The basic principles of the West German system have already been implemented in East Germany. But, for a period of transition, some differences remain due mainly to economic and administrative reasons. However, after several years the pension system of East Germany will be merged into the system of the Federal Republic, with the same regulations applying to both regions. This is not only true for present regulations but also for future changes in the system that are to occur according to legislation

⁸ In German: "Sozialversicherung der Arbeiter und Angestellten."

on the pension reform in 1992. Basically, an attempt will be made to strengthen the pension system against demographic trends that are expected to result in rising pension expenditures in the future.

4.2. The Pension System of the GDR

In the GDR old age pensions were provided by a state pension system as part of a comprehensive, obligatory public social insurance system which provided both monetary and benefits in kind in cases of sickness, accidents, retirement (see Table 13), and motherhood. It consisted of two different parts, differing with respect to the clientele:

- (1) The Social Insurance of Workers and Employees (SIWE), covering about 85% of all GDR working people (e.g. workers and employees, but also physicians, dentists, or veterinarians).
- (2) The Social Insurance of the State Insurance Company⁹ (SISIC) in which members of cooperatives, private craftsmen, private trade persons, and free-lancers were insured.

In the following we will concentrate on SIWE (see Table 14) which served the majority of the people. Under this scheme the insured person had to contribute 10% of his or her taxable income up to a limit of 600 GDR Mark. In addition, the employer had to contribute another 12.5% of taxable income. Income over 600 Mark was not insured in the compulsory social insurance scheme. It should be stressed that these were the total contributions for coverage of all types of benefits (illness, accident, motherhood, retirement).

In order to cover income over 600 Mark, a Voluntary Additional Pension Scheme (VAPS) was introduced in 1971. In general, the contribution to VAPS amounted to 20% of the income over 600 Mark, split equally by the employee and the employer. This scheme provided additional benefits for old age, disability, and survivor pensions. However, the VAPS did not gain importance before the mid-1980s. In 1985, the total expenditure for VAPS benefits amounted to about 4% of all spending for pensions.

In the GDR, pensions were not indexed according to increases in income. However, pensions were increased by discretionary political decisions. The ratio between pensions and average income was at about 30%, but the absolute gap between income and pensions widened (see Table 15).

It was because of the specific centralized nature of SIWE and the inherent ideology of the former bureaucratic GDR society that the state subsidy to the insurance budget rose from the very beginning, and was close to 50% of the total budget of SIWE by the late 1980s (see Table 16). From a technical point of view, this was a redistribution of monetary funds stemming from the tremendous taxation on enterprise. It must be noted that not only SIWE but also SISIC received a significant state subsidy.

⁹ In German: "Sozialversicherung bei der Staatlichen Versicherung."

Table 13: Types of pensions in the state pension system.

Type of pension	Preconditions		
	minimum age	duration of contribution	other
	<u>obligatory insured pensions</u>		
old age	males 65 females 60	at least 15 years	
disability	none	at least 5 years	
accident	none	none	physical injury of at least 20%
survivor	none	at least 5 years	
war-disabled	none		physical injury of at least 2/3
	<u>voluntary additional pensions</u>		
voluntary additional	males 65 females 60		income higher than 600.- GDR Mark

Table 14: Basic traits of the GDR pension system, as of 1988.

Type of scheme	Contributions (as percentage of income liable to subscription)	Type of pension	claimants (in 1000)	average pension (in GDR Mark per month)
Social Insurance for Workers and Employees	insurant : 10% obligatory 10% voluntary employer: 12.5% obligatory 10% voluntary	obligatory	1 830.0	380.94
		oblig. & voluntary	690.0	481.56
		survivor (unabridged)	70.0	347.08
		surv. & voluntary	16.5	406.95
Social Insurance of the State Insurance	insurant: 20% obligatory 20% voluntary	obligatory	330.0	363.00
		oblig. & voluntary	100.0	446.52
		survivor (unabridged)	10.0	301.07
		surv. & voluntary	0.5	357.70
		old age disability disab. & voluntary	80.0 14.0	355.20 458.49

Source: Social Report 1990, p. 225

Table 15: Comparison of average income and average pension.

Years	average income	average pension	difference
	(in GDR Mark)		
1950	311	90.7	220.3
1960	555	152.7	402.3
1970	755	199.2	555.8
1980	1 021	342.5	678.5
1985	1 130	377.0	753.0
1989	1 300	446.6	853.4

Source: Statistical Yearbook of the GDR, various issues

Table 16: Income and expenditures of the Social Insurance of Workers and Employees (SIWE) (in million GDR Mark).

Years	Income		Expenditure	State subsidy (percentage of total expenditures)
	total	from obliga- tory contri- butions	total	
1955	5846	5726	5993	2.45
1960	6737	6635	8034	16.14
1965	7015	6949	9547	26.52
1970	7950	7902	12187	34.77
1975	10147	9178	17617	42.40
1980	13299	11254	24785	46.34
1985	15164	12092	27733	45.32
1989	16795	12347	32437	48.22

Source: Statistical Yearbook of the GDR, various issues, author's calculations

4.3. The System in the FRG: Past and Future

Basically, the pension system of the FRG, which will be maintained in the unified Germany, is related to employed work with two different principal schemes. The majority of the employed are insured in the compulsory old age insurance system. Formally, this system was split up into different institutions at the state level for workers, a federal insurance for salaried workers, and special institutions for some industries and professions. However, for all these institutions, basically the same regulations apply and funds are transferred between the institutions in order to balance the system as a whole. Thus, in most aspects, the old age insurance system can be regarded as a single system. It is designed as a pay-as-you-go system with current contributions used to pay for current pension expenditures. Only a comparatively small fund is maintained to compensate for short term fluctuations in expenditure and revenue. However, from the perspective of the insured, the system appears as an insurance with claims depending on the contributions paid during the individual's life cycle.

A different approach is used for civil servants acting as state functionaries ('Beamte'). Traditionally, this group does not pay contributions to an insurance system on an individual basis, but is entitled to receive pensions that are provided from the general budget. Basically, these pensions depend on the last income and on the duration of the service. Presently, only functionaries of the former FRG are covered by this system while civil servants of the former GDR are insured in the general old age insurance. However, in the future, the system will also be applied to East Germany. Formally, the system is not designed as an insurance

system, but it can be interpreted as an insurance scheme where the government pays contributions for the civil servants directly into a (fictitious) fund that is used to provide pensions.¹⁰ Since it covers only a comparatively small part of the population, and there is a tendency to make the system more compatible with the compulsory insurance system, only the compulsory insurance system will be considered in this analysis.

Historically, self-employed persons and helping family members have not been covered by the pension system. However, in the course of time, some groups of the self-employed have been forced into the insurance system in order to guarantee appropriate old age income. For others, the system has been opened on a voluntary basis. As a consequence, a substantial number of self-employed persons and of helping family members is today insured in the old age insurance system.

Some basic figures on the coverage of the public pension system are presented in Table 17. The table is based on survey data of 1981 since in the official insurance system data, individuals count twice if they have pension claims at different institutions. In the age bracket of 40 to 60 years, only 1% of all men have no claims in a public pension scheme. Almost all of the male population is covered by the system because practically all men are employed at some time. The same is not true for women. About 30% of the women over age 40 had no pension claims of their own in 1981. However, most of these women are married and are entitled to receive dependents' benefits if they survive their husbands.

Table 17: Coverage of the public pension system in the FRG, 1981.

	Males	Females
Individuals 40-60 years old	100%	100%
Insured	99	71
Employed	87	66
Pension insurance	77	64
State functionary	10	2
Self employed	12	5
Not insured	1	29
Individuals 65-80 old	100%	100%
With public pension		
Pension insurance	81	71
Own claims	81	50
Only Dep. benefits	0	21
State functionary	10	7
Own claims	10	1
Only Dep. benefits	0	5
Other public pensions	1	1
No public pension	8	24

Source: P. Hirvonen, 1990

A similar picture is obtained for the population in the age bracket 65 to 80 years. About 90% of the men and 80% of the women receive a public pension. Roughly one out of ten

¹⁰ This is the way the system is dealt with in the national accounts.

pensioners is covered by the system of the state functionaries while the rest belong to the old age insurance system. While practically all men receive a pension of their own, 26% of the women receive only dependents' benefits that are derived from the pension claim of the deceased husband. A substantial portion of women do not receive a pension at all. Since most pensions can be claimed by those over 65 even when working, this implies that about 8% of the men and 24% of the women are not covered by a public pension system. However, a large portion of these women are entitled to receive dependents' benefits when widowed. In the future, the number of elderly persons without a pension claim of their own will be reduced substantially since the coverage of the public pension schemes has been extended in the younger cohorts, and the requirements for a pension entitlement have been lowered.¹¹

Currently, the pension system covers almost the entire active population. In 1985, about 32 million people were insured in the pension system (see Table 18). Compulsory contributions are defined as a fixed proportion of gross earnings up to an upper limit of (approximately) twice the average income of the insured. Income above this limit remains untaxed. In general, half of the contributions is paid by the employer and half by the employee. The tax rate was 18.7% in 1985 and has changed slightly since then. It is set by the federal parliament in a discretionary way in order to cover current expenditures of the system.

Table 18: Basic traits of the (West) German pension system.

Characteristics	Pension System Type	
	Insurance system (1986)	State functionaries (1986)
Persons insured (in 1000)		
Total	31406	2010
Compulsory	22583	
Voluntary	700	
Latent	8123	
Average taxable income (DM)	31131	47096
Tax rate (%)	18.7	0
Number of Pensions (1000)		
Total	14015	1271
Old age benefits	6969	657
Handicapped	2371	/
Dependents	4674	614
Average Benefit (DM/year)		29802
Standard pension*	16496	
Average old-age benefit		
All pensioners	13015	
Men	18455	
Women	7962	
Revenue/expenditure (in million DM)		
Contributions	148688	
Pensions	169838	37867
Subsidy	34405	37867

* Based on 40 years insured with average income (DM/year)

Sources: Statuary system--Verband Deutscher Rentenversicherungsträger, Ed., 1989;
State Functionaries--Governmental Reply to the Interpellation of the Social Democrats, 1988

¹¹ Starting from 1992, an insured period of at least 5 years is required for a pension entitlement. Women are granted three years insured for each child born. Cf. Bundesminister für Arbeit und Sozialordnung, 1990.

Formally, the standard retirement age in Germany is set at 65 years for both men and women. However, early retirement plans have allowed people to retire earlier. Presently, early retirement is available to men at age 63 and for women at age 60, if some additional requirements are met. Early retirement before age 60 is also available to persons who have been unemployed for a long time. This, and the provision of early retirement for the handicapped, has resulted in a lowering of the average age of retirement during the last years. However, the age of retirement will gradually be raised again to 65 years in the years 2001 to 2005, as a consequence of the 1992 pension reform. From then, early retirement will be possible only with pensions reduced actuarially (i.e. by 0.3% for each month before age 65). This is meant as a measure to cope with rising pension expenditures in the next decades.

Pension entitlement on the other hand depends on the individual contributions and on general economic growth. In principle they are computed as a product of a standard pension and a factor that represents individual contributions. This factor is computed as the sum of the ratios of the taxed income of the individual to the average income for all years insured. As a consequence, individual entitlement is proportional to the relative (taxed) income of the individual, as compared to the average contributor, and is proportional to the time during which contributions have been paid. Since in the past, the base standard pension has been defined as a given percentage of the average income of the insured, pensions are directly linked to the general economic development: increases in average income lead to proportional changes in pension payments.

Up to now, pensions have been linked to average gross income. Since pensions remain almost untaxed but tax rates are constantly rising, this implies that pensions have grown faster than net income. Presently, the standard pension claim that is obtained after 40 years of contributions, corresponding to the average income of the insured, amounts to about 60% of the general computation base that equals the average gross income in the last three years. Since tax rates will have to be raised in the future due to demographic changes, starting in 1992 the pensions will be linked to net income. This is achieved by dynamically adjusting the standard pension in accordance with changes in average net income of the active population. Individual pension claims are then computed as a proportion of the standard pension. As a consequence, the ratio of pensions to net wage income will be held constant in the future. This implies that the recipients of old age pensions will share a part of the additional burden.

Up to 1986, dependents' benefits were defined as 60% of the pension claim of the deceased, and were granted to widows independent of other income. Due to a ruling by the constitutional court, widowers are now eligible for dependents' benefits. Other pensions are deducted from the dependents' benefits using a linear scheme: 40% of other income over a limit of 40% of the general computation base is deducted from the dependents' benefits. The most important effects are lower dependents' benefits for persons with large pension claims of their own, and substantial reductions in benefits for widowers. In the future, this deduction may become more important when women receive higher pensions because of higher female earnings and longer working histories.

4.4. A Simplified Model of the Future German System

The institutional setting of the pension system in the united Germany will be more or less the same as in the former FRG. The centralized East German insurance system will be transformed into a decentralized system with several institutions at the federal state level. After a transition period, the same regulations as in the former FRG will be applied,

including the changes planned for the future. Thus, essentially, the system of the former Federal Republic has been maintained.

In principle, the German pension system can be modelled easily if some simplifying assumptions are made. If, besides some other non-linearities, the upper limit on taxable income (and as a consequence on pensions) is ignored, the system will be linear in average income: contributions are paid approximately as a fixed proportion of income, and pensions are also defined approximately as proportional to average income. As a consequence, general economic growth can be neglected if all terms are expressed as multiples of average income.¹² Since the pensions of the state functionaries are also computed proportional to current average income, in a simplified model, both systems can be merged into one general old age pension scheme. Additionally, it is assumed that persons presently not covered by the compulsory insurance system are insured in a similar way. Thus, in the model, all individuals are assumed to be insured according to the regulations of the public pension system.

Disregarding the differences remaining in a transition period, in the model the regulations of the present West German pension system have been applied to both Germanies from the very beginning. This implies some errors for the years to come, but after about five years this should give an adequate description of the entire system. All calculations are conducted as of 1990. Since for the transition period until 2005 different behavioral assumptions are applied for both East and West Germany, the model is run for both regions separately and then the results are aggregated into one.¹³

As for the Pension Benchmark Scenario, the computations have been based on the institutional setting of the pension system as of 1985. Parameters like average income, the standard pension, and the tax rate have been fixed at the values that have been observed in the FRG in that year.¹⁴ Institutional changes, like the deductions from dependents' benefits introduced in 1986, or the measures of the pension reform bill planned for the future, have been considered in separate scenarios as well as in a combined scenario.

No provision was made for unemployment since in the German pension system, contributions to old age insurance are paid for the unemployed by the unemployment insurance.

¹² In reality, the growth rate of income affects the system to some extent, since contributions depend on current income, while the computation of pensions is based on the average income of previous periods. Thus, in the short run, the level of pensions and the financial situation of the system depend on changes in the growth rate of income. For the scenarios, a constant growth rate has implicitly been assumed with the standard pension being defined as a constant percentage of average income.

¹³ The only exception is the formula for deducting other income from dependents' benefits, which is applied to the combined results. The reason is that due to structural differences the average pensions differ for the two regions. Applying the deduction separately then would imply different deduction formulas. Thus deductions are computed on the basis of the overall averages for the united Germany.

¹⁴ Since the system is approximately linear and homogeneous to the first degree, all variables can be standardized so that the average income remains constant. However, the assumption contains a small inconsistency, since at the same time the standard pension and average income are held constant for both men and women, but the structure of the labor force changes over time. Given different average incomes for the two sexes, a change in the composition of the labor force by gender implies a change in the average income of the employed that would induce a change in the standard pension. This effect is neglected in the model.

5. THE FUTURE OF THE PENSION SYSTEM IN GERMANY

5.1. The Impact of Demographic Aging

It is a difficult task to specify a reference scenario for the future pension system in Germany as a whole since a common status-quo cannot easily be found. Also, it makes no sense to assume that no behavioral change will occur in the two former states during the process of unification. At least for East Germany adaptation to the changes in the institutional setting should be taken into account. Thus, for the Pension Benchmark Scenario some assumptions on future trends are implemented. This is especially true for labor force participation, transitions into retirement, and average income since the pension system strongly depends on these variables. In order to assess the impact of demographic aging (and other behavioral factors, such as labor activity), a pension benchmark scenario has to be defined. Different settings and assumptions will be made later to discuss possible measures and policies to tackle the pension problem.

- Pension Benchmark Scenario

Used as a basis for comparison, this scenario is a combination of the National 1 demographic assumptions, the Activity Benchmark settings, and the institutional settings of the West German pension system of 1985. A fast transition process is assumed for income, and the average values that have been observed in the FRG in 1985 are used for both West and East Germany from the very beginning.

The basic trends in the number of contributors and retirees are substantially linked to demographic aging as described above. For Germany as a whole as well as for both West and East Germany, the number of people in retirement age, and consequently retirees, increases substantially until the year 2030. This number later declines since smaller cohorts enter the retirement age. The number of people in working age, or contributors, on the other hand, remains more or less constant until the year 2000, and then declines constantly. As a consequence, the ratio of contributors to retirees is likely to decrease, putting a higher burden on the first.

While the basic trends are the same for both East and West Germany, some differences remain. In general, the effects of demographic aging are less pronounced for East Germany with a smaller rise in the number of retirees especially between 2015 and 2030 as compared to the FRG. The number of contributors starts to decline earlier in East Germany due to the reduction in female labor force participation assumed as a consequence of unification. The decline is later slower than for the FRG. Thus, in terms of the old age burden, West Germany is gaining from the unification process while East Germany is losing: Without unification the problems would be larger in the FRG with even a less favorable ratio of contributors to retirees in the year 2030. East Germany on the other hand would be better off than the united Germany. However, it should be stressed that these calculations are purely demographic and do not account for economic gains and losses.

Given the economic and institutional setting of the FRG in 1985, total expenditure will increase in the Pension Benchmark Scenario by about 30% from 1990 to 2030 (see Table 19). At the same time, the revenue of the system will be reduced by about 25% due to a smaller number of contributors if the tax rate remains unchanged. With average income and pension claims held constant, the contributions cover only 50% of the expenditure in 2030, as compared to 90% in 1990. If only the contribution rate would be used to balance the system with the pensions remaining unchanged, a tax hike from about 20% in 1990 to

a contribution rate of about 37% would be required in 2030.¹⁵ If, as an alternative, only the pensions would be adjusted to cover the deficit, cuts of 50% would be necessary, reducing the pensions to one-half.¹⁶

Basically these results remain unchanged if further assumptions are considered with regard to female labor force participation (Low Activity Scenario), or immigration (Immigration Scenario) which have been defined as follows:

- **Immigration Scenario**

It assumes a permanent immigration of 200,000 foreigners per year according to the National 2 (demographic) Scenario. At least from today's perspective this scenario may be regarded as an upper limit of future immigration, although a comparable number of immigrants has been observed in the FRG in the last years. There are strong political sentiments that a permanent immigration of such a size is unbearable in the long run and measures are being presently discussed to reduce immigration.¹⁷

- **Low Activity Scenario**

The labor force participation level for women in both East and West Germany is set constant at the level observed in the FRG in 1985.

The additional immigration results in a substantially larger labor force and larger contributions to the pension system. Total revenue still decreases in the long run, but at a lower rate than in the Benchmark Scenario. There are also additional expenditures since the number of retirees increases when the additional contributors retire. However, the overall financial situation of the system improves. An additional 3% to 4% expenditure is covered by contributions as compared to the Benchmark Scenario. The main reason is that by a constant inflow of immigrants, the active population becomes larger as compared to the elderly. Given that the additional labor force is gainfully employed, immigration implies additional income and tax revenue that can be used to cover pension expenditures.

In principle, changes in labor force participation have a similar effect. This can be seen by considering the results of the Low Activity Scenario. For this scenario the overall financial situation of the system is not changed significantly in the long run since both revenue and expenditure of the pension system decrease. For a transitional period, the deficit becomes slightly larger, because in the short run a lower labor force participation implies lower contributions to the system, but expenditures do not change since the number of retirees remains the same. But in the long run, pension expenditures also decline since individual pension entitlements are smaller if women work less.

This relationship also holds in the opposite direction. Given the institutional setting of 1985, an increase in female labor force participation improves the situation of the pension system only transitorily since revenue is raised immediately, but in the long run additional

¹⁵ Similar results have been obtained by other authors (cf. *On the Long-Term Development of the Obligatory Pension Insurance*, 1987).

¹⁶ The pension level required to balance the system given the present contribution rate equals the ratio of contributions to benefits at constant values.

¹⁷ Total net immigration to the FRG amounted to 481,945 people in 1988, including about 289,461 foreigners in addition to German nationals. This substantially exceeds the number of immigrants to traditional immigration countries like Canada or Australia.

contributions result in additional pension claims by women and, therefore, higher expenditures.¹⁸

Table 19: The financial situation of the pension system, 1990 - 2050, three scenarios.

Pension Scenario	Year				
	1990	2000	2015	2030	2050
Total contributions					
	Mio.DM	Index (1990=100)			
Benchmark	219704	100	92	74	59
Immigration	219704	102	99	85	75
Low activity	214365	98	90	73	58
Total benefits					
	Mio.DM	Index (1990=100)			
Benchmark	242847	109	121	132	102
Immigration	242847	110	125	141	118
Low activity	245242	107	116	125	96
Contributions/benefits (in %)					
Benchmark	90	83	69	50	52
Immigration	90	84	71	54	57
Low activity	87	80	68	51	53
Balancing contribution rate (in %)					
Benchmark	20.7	22.5	27.2	37.0	35.9
Immigration	20.7	22.3	26.2	34.3	32.7
Low activity	21.4	23.2	27.5	36.8	35.5

In all three scenarios considered so far, the financial situation of the pension system deteriorates substantially as a consequence of demographic aging. Even if constant immigration at a comparatively high rate is considered, the contribution rate required to balance the pension system rises to about 37% in 2030.¹⁹ This would imply a total average tax rate of about 80% if, in addition, 15% of the contributions to the health and unemployment insurance and an average income tax rate of about 30% are assumed. A tax burden of that size poses severe economic and political problems. It implies strong incentives for tax evasion and activities in the shadow economy. This would add to the problems of the social security system. Substantial political unrest might be expected as a consequence of distributional conflicts.

¹⁸ This result changes if other income is deducted from dependents' benefits as has been the rule in the FRG since 1986. The cumulation of old age pensions and dependents' benefits is then reduced and total expenditure increases less. A rise in female labor force participation has a lasting, but modest positive effect on the financial situation of the pension system (see next section, Table 21).

¹⁹ The figures for the required tax rate exaggerate the problem to some extent since in 1990 the system is not financially balanced, but a subsidy of 9% of the total expenditure is required from the general budget. As an alternative measure, a tax rate can be computed that is required to maintain a constant relative deficit of the system. Even in this case the tax rate rises to 33.5% in the benchmark scenario and 31% in the immigration scenario.

5.2. Compensating Policy Measures

In this section, the effects of changes in the pension system that have been implemented in the FRG by the pension reform bill as a means to cope with the problems posed by demographic aging are discussed.²⁰ The most important approaches to the problem are deductions of other income from dependents' benefits, a rise of the mean age of retirement to 65 years, and a schedule to distribute the additional burden more equally. The first two approaches aim at reducing pension expenditures and obtaining additional revenue in the case of later retirement. The third proposal on the other hand aims at a 'just' distribution of the additional burden. In Table 20 the effects of these policies are given.

Income Deduction Scenario

Other income of survivors is deducted here from their dependents' benefits. Such a measure was implemented in the FRG in 1986 in order to comply with rulings on equal rights of men and women by the constitutional court. Under this scheme, 40% of the pension income exceeding a limit of 40% of the general computation base is deducted from the individual dependents' benefit.²¹ Besides its distributional effect, this measure also has a positive impact on the financial situation of the pension system since the cumulation of old age pensions and dependents' benefits is reduced.

The deduction schedule results in lower pension expenditures in Table 20. But the reduction is small compared to the large rise in expenditure due to changes in the age structure. The contribution rate required to balance the system drops by about half a percent point in 2030. Obviously, the present deduction scheme is not sufficient to achieve a strong effect. The main reason is that a large portion of the old age pensions of widows is smaller than the income limit. This would change to some extent if the wage gap between men and women would be reduced. In the model the average income is held constant for men and women respectively, with women earning about 55% of the average income of men. The lower income is then reflected by lower pension claims of women. As a consequence, given the assumptions of the scenario, only a comparatively small percentage of women have income deducted from the dependents. The effect of the deduction scheme will be larger if the distribution of earnings by gender becomes more equal.

²⁰ Different policies are discussed in *On the Long-Term Development of the Obligatory Pension Insurance* (1987) and Eckerle et al. (1987).

²¹ To estimate the effects of such a scheme, additional assumptions concerning the distribution of pension benefits are required since only average income and pensions are considered in the basic version of the model. For this purpose, the distribution of old age benefits that was observed in the FRG in 1981 has been adapted to the average pension benefits that are computed in the model. The amount of deductions is then estimated on this basis. First the empirical distribution is approximated by a Weibull-distribution. Next, this distribution is adapted to the average pension computed in the model by changing the scale parameter in such a way that the mean of the distribution is equal to the value given. In a third step the average deductions are estimated as 40% of the conditional expected value of pensions above the limit that equals 40% of the current average income. Since this expected value could not be computed analytically, an approximation to the distribution has been used.

Table 20: The effects of compensating policy measures.

Items/Scenarios		1990	2000	2015	2030	2050
Total contributions						
Pension Benchmark	Index	100	100	92	74	59
Income Deduction	Index	100	100	92	74	59
Late Retirement	Index	100	101	94	77	61
Burden Sharing, with Subsidy	Index	100	106	111	109	85
Burden Sharing, no Deficit	Index	100	107	113	114	89
Total Expenditure						
Pension Benchmark	Index	100	109	121	132	102
Income Deduction	Index	100	108	120	131	101
Late Retirement	Index	100	112	130	143	111
Burden Sharing, with Subsidy	Index	100	107	115	117	91
Burden Sharing, no Deficit	Index	100	107	113	114	89
Contributions/Expenditure						
Pension Benchmark	%	90	83	69	51	52
Income Deduction	%	92	84	70	51	53
Late Retirement	%	113	101	81	61	62
Burden Sharing, with Subsidy	%	90	90	88	84	85
Burden Sharing, no Deficit	%	100	100	100	100	100
Relative Deficit (as percentage of total expenditures)						
Pension Benchmark	%	9.5	17.0	31.2	49.5	48.0
Income Deduction	%	8.4	15.8	30.0	48.6	46.9
Late Retirement	%	-12.6	-1.1	18.7	39.0	38.0
Burden Sharing, with Subsidy	%	9.5	10.3	12.2	15.9	15.5
Burden Sharing, no Deficit	%	0.0	0.0	0.0	0.0	0.0
Balancing Contribution Rate						
Pension Benchmark	constant %	20.7	22.5	27.2	37.0	35.9
Income Deduction	pension %	20.4	22.2	26.7	36.3	35.2
Late Retirement	level %	16.6	18.5	23.0	30.7	30.2
Burden Sharing, with Subsidy	%	18.7	19.9	22.7	27.7	27.2
Burden Sharing, no Deficit	%	20.3	21.7	25.1	31.3	30.7
Balancing Pension Level						
Pension Benchmark	constant %	90	83	69	51	52
Income Deduction	contribution %	92	84	70	51	53
Late Retirement	level %	113	101	81	61	62
Burden Sharing, with Subsidy	%	100	99	95	89	90
Burden Sharing, no Deficit	%	98	96	92	85	85

Late Retirement Scenario

Another policy measure that has been adopted in the 1992 pension reform bill to cope with an increasing old age burden is to raise the retirement age. In the past, the average retirement age has declined in the FRG to below 59 years. This was mainly a consequence of early retirement schemes that were introduced as a response to rising unemployment. Since a declining labor force is expected in the future, provisions have been adopted in the pension reform bill to shift the standard retirement age back to 65 years.²² To estimate the effects

²² Starting in the year 2001, the retirement age will be raised gradually to 65 years by the year 2005. Early retirement still will be possible, but only with reduced pensions. Thus, early retirement will not affect pension expenditures. Cf. Bundesminister für Arbeit und Sozialordnung, 1990.

of such a policy, a retirement pattern has been applied in the model using a scenario that has been observed for men in the FRG in 1970. Before 1970, most individuals retired close to age 65. Since in the long run reductions of the labor force should also reduce unemployment, the assumption that retirement patterns will change back to those observed before 1970 has some plausibility. The same retirement pattern has also been applied to the GDR from the very beginning.²³

Since an immediate shift in the retirement age is assumed in the model for 1985, the financial situation of the pension system improves dramatically in the short run. For 1990 a surplus of about 14% is estimated. This demonstrates the large impact of employment on a pay-as-you-go pension system. If unemployment is reduced and people work longer, additional contributions are obtained, and at the same time less pensions are paid since workers retire later. In the long run, this effect is reduced to some extent since in the German system a longer working life results in higher pension claims. But even then the net effect remains substantial: the deficit of the system is reduced in the most critical year 2030 by about 10%. The contribution rate required to balance the system drops to 31% as compared to 37% in the benchmark scenario. However, even such a contribution rate implies a high overall tax burden. Thus a rise in the retirement age alone is not a sufficient measure to balance the system.

Burden Sharing Scenario

The third measure that has been adopted for the pension reform is a 'burden-sharing' approach. It aims at distributing the old age burden on a broad base. The basic idea is to adjust the tax rate, the pension level, and the subsidy from the federal budget to demographic changes in such a way that the ratio of the average disposable income of the active population and of the pensioners remains unchanged. This is achieved by linking the pension level to net income instead of to gross income as in the past. The subsidy from the federal budget is also increased at the same rate as the tax rate.²⁴ In this way the increasing old age burden is distributed at least approximately on all members of the society and the individual burden of the insured is reduced.²⁵

²³ In the model, labor force participation rates in the age brackets between 50 and 65 years have been computed for men and women respectively as proportional to the participation rate in the age bracket 45-50 years, using the factors observed for men in 1970. In this way the retirement pattern of men observed in 1970 is applied in each year.

²⁴ The additional subsidy also must be covered by taxes. However, since all income is taxed for the general budget and also indirect taxation is used, all groups of the population are levied in this way. The distributional effects of this taxation depend on the structure of the general tax schedule.

²⁵ Given the starting values t_0 , p_0 and s_0 for 1990, the contribution rate t_i , the pension level p_i and the subsidy s_i for the burden sharing scheme in year i are computed in the following way using the total contributions C_i and total benefits B_i for year i corresponding to the contribution rate t_0 and pension level p_0 :

$$t_i = t_0 * f$$

$$p_i = p_0 * g$$

$$s_i = s_0 * f$$

$$\text{with } f = R_i / (t_0 B_i + (1 - t_0)(R_i + s_0 B_i))$$

$$\text{and } g = (1 - t_0 f) / (1 - t_0)$$

Since an increase of the subsidy from the general budget also implies an additional tax burden if it is not compensated by cuts in public expenditure, two variants of the burden-sharing policy have been considered.

- **Burden Sharing, with Subsidy**

In a burden sharing scenario which implies a state subsidy, the regulations of the pension reform bill have been modelled with the percentage of the pension expenditures covered by the subsidy, rising by the same factor as the contribution rate.

- **Burden Sharing, no Deficit**

As an alternative, a scenario has been designed in which the contribution rate and the pension level are adjusted in such a way that all pension expenditures are covered by contributions, and no deficit occurs that must be covered by a subsidy. The latter describes the total effect of the burden sharing policy, including the incidence of the federal subsidy if one assumes that the additional taxes required to cover the subsidy are distributed to the contributors and pensioners of the pension system proportionally. Since no compensation by decreasing public expenditure, for instance for the school system, is assumed, this scenario gives a worst case solution.

For the two versions, a rise of the contribution rate and a reduction of the pension level are still required. But the changes are substantially smaller than those required in the other policy scenarios. In the burden sharing solution with a federal subsidy, the maximum contribution rate in 2030 is reduced to 28% as compared to 37% in the pension benchmark if only the contribution rate is adapted. The pension level is reduced by 11%. This is moderate when compared to a reduction of almost 50% that would be necessary if only the pension would be adapted. However, the subsidy from the federal budget is raised from about 10% of the pension expenditure in 1990 to 16% in 2030.

Given the growth of total pension expenditure, a rise of the relative deficit by 6% implies a substantial growth of the required subsidy in nominal terms. To some extent this additional burden is compensated by a reduction in other expenditure, for instance, related to children. But even then the tax burden will increase. If, in the worst case, the deficit is distributed proportionally to contributors and retirees (burden sharing, no deficit), the contribution rate would rise to 31% and the pension level would be reduced to 85% of its 1985 value.

While the income deduction schedule has only a small positive effect on the financial situation of the pension system, both the rise of the retirement age and the burden sharing approach provide means to substantially reduce the impact of demographic aging. Thus, the combined effects of all three measures have been computed. Income deduction, late retirement, and burden sharing have been applied to three different scenarios, namely the Pension Benchmark, Immigration, and Low Activity Scenarios.²⁶

Again the two versions of the burden-sharing approach are presented in order to provide an upper and lower limit. As a point of reference, the values of the contribution rate, the pension level, and the deficit are given if just one parameter is used to balance the whole system (see Table 21). For instance, in order to balance the system in 2030, a contribution rate of 37% is required if no other measure is applied, or the pension level must be reduced

²⁶ As far as the effects of the combined policy are concerned, the three scenarios mentioned differ from those introduced earlier, because all three policy options have been taken into account simultaneously. For more detailed information about the scenario settings, see Tables 22 and 23.

to 56% of the 1990 pension. Alternatively, the deficit would amount to 49.5% of the total expenditure.

Table 21: The effects of combined policy measures (income deduction, late retirement and burden sharing) on the pension system.

Policies/ Effects	1990	2000	2015	2030	2050
Benchmark, no measures					
balancing contribution rate %	20.7	22.5	27.2	37.0	35.9
balancing pension level Index	100	92	76	56	58
relative deficit %	9.5	17.0	31.2	49.5	48.0
Pension Benchmark					
Burden Sharing Policy, subsidy					
contribution rate %	15.7	17.0	19.9	24.2	23.9
pension level Index	104	102	99	93	94
relative deficit %	7.7	8.5	10.3	13.2	13.0
Burden Sharing Policy, no Deficit					
contribution rate %	16.7	18.3	21.7	26.9	26.5
pension level Index	102	101	96	90	90
Immigration					
Burden Sharing Policy, subsidy					
contribution rate %	15.7	16.8	19.4	23.0	22.5
pension level Index	104	102	99	95	95
relative deficit %	7.7	8.4	10.0	12.4	12.0
Burden Sharing Policy, no Deficit					
contribution rate %	16.7	18.1	21.1	25.5	24.8
pension level Index	102	101	97	92	93
Low Activity					
Burden Sharing Policy, subsidy					
contribution rate %	16.5	18.0	20.8	25.0	24.6
pension level Index	103	101	97	92	93
relative deficit %	8.2	9.1	10.9	13.8	13.5
Burden Sharing Policy, no Deficit					
contribution rate %	17.7	19.4	22.8	27.8	27.4
pension level Index	101	99	95	89	89

Starting values: Contribution rate 18.7%
Federal subsidy 9.5%

Table 22: Scenario settings for pension calculations.

Settings/ Domain	Pension Scenarios						
	Bench- mark	In migration	Low Activity	Income Deduction	Late Retirement	Burden Sharing	
						subsidy	no deficit
Demography National 1 (Standard) National 2 (Immigration)	■	■	■	■	■	■	■
Labor Activity Activity Benchmark Low Activity Late Retirement	■	■	■	■	■	■	■
Pension System Pension Benchmark Income Deduction Burden Sharing - with subsidy - no deficit	■	■	■	■	■	■	■

Table 23: Combinations of scenario settings for pension calculations.

Settings/ Domain	Combined Policy Pension Scenarios (Burden Sharing)					
	Burden Sharing with Subsidy			No Deficit Burden Sharing		
	Bench- mark	In- Migration	Low Activity	Bench- mark	In- Migration	Low Activity
Demography National 1 (Standard) National 2 (Immigration)	■	■	■	■	■	■
Labor Activity Activity Benchmark Low Activity Late Retirement	■	■	■	■	■	■
Pension System Pension Benchmark Income Deduction Burden Sharing - with subsidy - no deficit	■	■	■	■	■	■

If all three measures are applied simultaneously, the impact of demographic aging on the pension system is reduced substantially. In the version with subsidy, the maximum of the contribution rate in 2030 is reduced to 23-25%, and the pension level amounts to 92-95% of its 1985 value. The deficit of the system is raised to about 13% of total expenditure, as compared to 10% in 1990. If the deficit is also covered by the contributors and retirees, contributions will increase by another 2.5% in the no deficit scenario, and the pension level is reduced by another 3%. However, since the present system runs a deficit of about 10%, these figures overstate the burden to some extent.

A comparison for different demographic and behavioral assumptions shows some differences. The Low Activity Scenario results in the largest burden, while the Immigration Scenario gives the lowest values. The difference between these two scenarios for the year 2030 is about 2.3% in the contribution rate and 2% in the pension level. This is still a substantial difference. The results for the Pension Benchmark Scenario with a low immigration and an increase in female labor force participation are in between. The most important reason for the differences is the different size of the labor force as compared to the number of retirees. If a steady and substantial immigration is assumed, the ratio of contributors to retirees becomes more favorable than in a scenario with no immigration, except persons of German origin, and a low female labor force participation.

In general, the effects of demographic aging can be offset to some extent by a higher labor force participation and additional immigration. However, a condition for such a policy is that the additional labor force is gainfully employed. Thus problems on the labor market and also general political problems created by a constant inflow of a large number of immigrants may set a limit to such a simple straightforward policy.

But even if less favorable assumptions are made for the labor force, the negative impact of demographic aging on the pension system is still reduced substantially by suitable policy measures. In the Low Activity Scenario, the contribution rate must be raised by about one half, and pensions must be reduced by about 10% in the long run to balance the system. Such adaptation appears to be feasible, especially if future economic growth is considered: even if a moderate growth rate of real income is assumed, such a solution would only imply smaller increases of pensions and net earnings, as compared to the growth rate of gross earnings, but no reductions in real income.

6. CONCLUSION

The study gives some additional proof that, for a rather wide range of possible assumptions, further aging of the German population is certain. The German unification, which adds the somehow younger but smaller East German population to the older but larger West German population, will not change the general trend of aging.

Aging implies--in a rough definition--significant changes towards the higher proportion of older people on total population. Consideration of marital statuses show that aging comes together with important changes in the marital composition of the elderly. The calculations made give some evidence that in the next decades the proportion of non-married will increase, especially for males.

The aging process as described in the study will result in some serious challenges to the pension system. Extrapolating the current settings, the contribution rate will rise, or the benefits will fall, or both. It is one of the striking results of the study that there is no demographic solution to the pension problem. Even with strong immigration or replacement level fertility, the general problem of maintaining the pension system is not solved. It should be mentioned, however, that in the mid-term, the strong immigration or replacement fertility can help to relax the problems of the pension system.

On the other hand, there is a bundle of different policy measures to counteract the implications of population aging. Our scenario based calculations point out that a combination of different measures will perform best: higher female labor force participation, income

deduction, and burden sharing can reduce the expected deficit of the pension fund. However, almost all of the proposed measures need a consensus across the society.

While aging is certain, the extent of aging may vary in a somewhat narrow range. One of the most important implications of population aging will be the change in the ratio contributors/beneficiaries of the pension systems, demanding changes in the institutional settings (pension systems, general tax system), and/or behavioral components and expectations (economic activity, income level).

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