

# Working Paper

## Demographic Trends and the Pension Problem in Poland

*Ewa Fraczak and Janina Józwiak*

WP-92-23  
February 1992



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## PREFACE

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

Other papers related to the project are listed below:

- CP-91-15      The Effects of Changing Marital Status Patterns on Social Security Expenditures in the Netherlands, 1985-2050, by N. Keilman
- CP-91-002     Demographic Changes and their Implications on Some Aspects of Social Security in the Unified Germany, by N. Ott, T. Büttner, and H.P. Galler
- WP-90-22      Socio-Demographic Changes and the Pension Problem in Austria, by J.-P. Gonnot
- WP-90-15      Demographic, Social and Economic Aspects of the Pension Problem: Evidence from Twelve Countries, by J.-P. Gonnot
- WP-89-107     Pension Systems and Social Security Trends and National Characteristics, by J.-P. Gonnot and C. Prinz
- WP-89-34      Recent Trends in Living Arrangements in Fourteen Industrialized Countries, by J.-P. Gonnot and B. Vukovich

## ABSTRACT

Projections of expenditures for old age pensions, survivor pensions, and disability pensions were made for the period 1985-2050 on the basis of future developments in population structure by age, sex, and marital status. Five demographic scenarios were formulated: (i) a Benchmark scenario, with demographic rates kept constant at their 1980-84 level; (ii) a Fertility scenario, with a decline of the Total Fertility Rate (TFR) towards replacement level; (iii) a Mortality scenario, with reductions in mortality rates of 30 percent for females, and 45 percent for males; (iv) a Western scenario, which combines extreme demographic conditions of several West European countries: a TFR of 1.28, proportions never-marrying of one-third, one-third of all marriages ending in divorce, and male and female life expectancies of 74 and 81 years, respectively; and (v) a National scenario, with a TFR declining to 1.6. Under all scenarios, the share of the elderly will rise, and that of children will diminish, with the most significant developments under the Western and the National scenarios.

Due to uncertain economic conditions in Poland, results of the pension model should be interpreted with great care. Yet, assuming no changes in the current pension system, the calculations point to a considerable growth in expenditures, ranging from some 65 percent (Benchmark and National scenario) to about 120 percent (Mortality scenario and Western scenario) for the period 1985-2050. The increase is particularly steep during the years 2000-2015. The ratio between contributions and benefits deteriorates from its current level of 1.13 to a ratio between 0.90 (Benchmark scenario) and 0.44 (Western scenario) in the year 2050.

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## DEMOGRAPHIC TRENDS AND THE PENSION PROBLEM IN POLAND

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### 1. DEMOGRAPHIC TRENDS, 1950-1989

Irregular fertility trends are a characteristic feature of demographic changes in the post-war period in Poland. Two peaks of baby-booms took place in this period: in 1955 and 1983. The lowest number of births was observed in Poland in 1967. The total fertility rate (TFR) dropped from 3.7 in 1950 to 2.2 in 1969 and 1970. Then, it rose to 2.4 in 1983 (Figure 1). After that year, a steady decline has been observed; 1989 was the sixth year of falling fertility with a TFR of 2.1. Therefore, Polish fertility reached replacement level only in recent years.

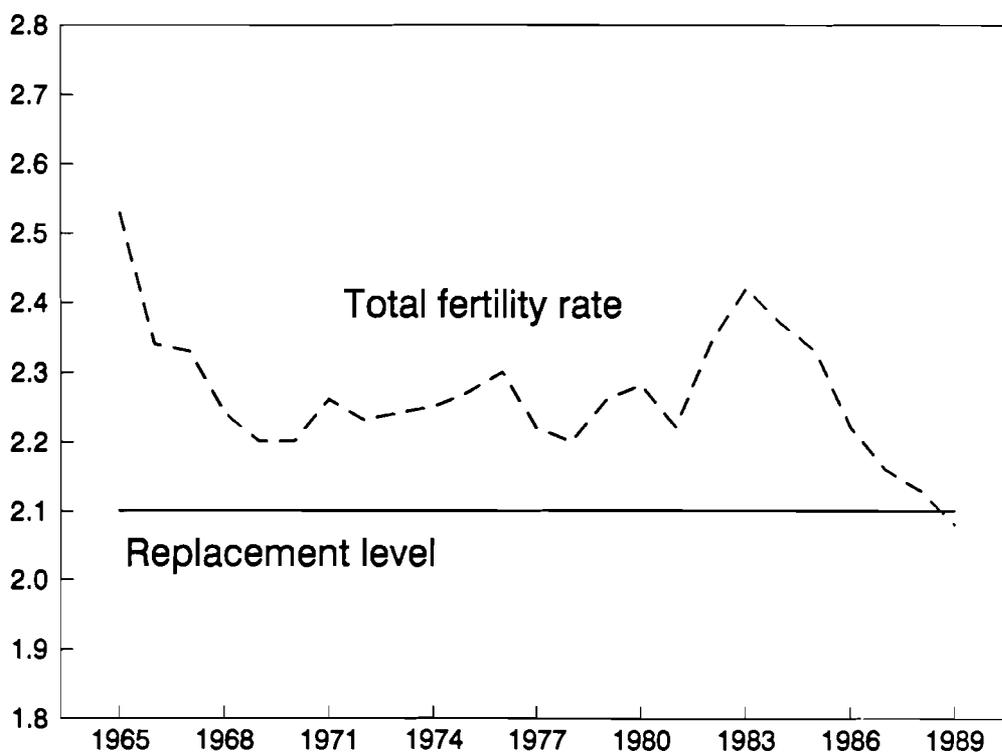


Figure 1. Total fertility rate, 1965-1989.

In Poland fertility differs according to the place of residence of women (urban-rural areas). The rural TFR was higher than the urban (in 1988: 2.6 and 1.9, respectively) though the difference has been steadily declining. For instance, in 1975 the TFR for rural areas equaled 3.2 while the urban TFR amounted to 1.8. Actually, the fertility level in towns has been below replacement level since the mid-1960s, and the relatively high national rate results from the high fertility of females in the rural areas.

The changes in fertility level are strongly connected with shifts in the composition of births by order. For example, in 1950, the proportions of births of orders 1, 2, and 5 or higher were 31, 28 and 10 percent, respectively, while in 1988 the proportions were 37, 34 and 5 percent. About 95 percent of these births occur within marriages. In the period 1965-1985 the proportion of extramarital births ranged from 4.5% to 5.8%, and until 1986 it was not higher than 5% (Figure 2).

Not only fertility, but also mortality displayed irregular behavior after World War II. In the period 1952-1989 the life expectancy at birth increased both for males and females from 58.6 to 66.8 years and from 64.2 to 75.5 years, respectively (Table 1). However, this general increase slowed down during the 1970s, and at the beginning of the 1980s a slight decrease in life expectancy at birth set in, which continued until 1989. In 1989, life expectancies rose again, though they were still lower than at the end of the 1970s.

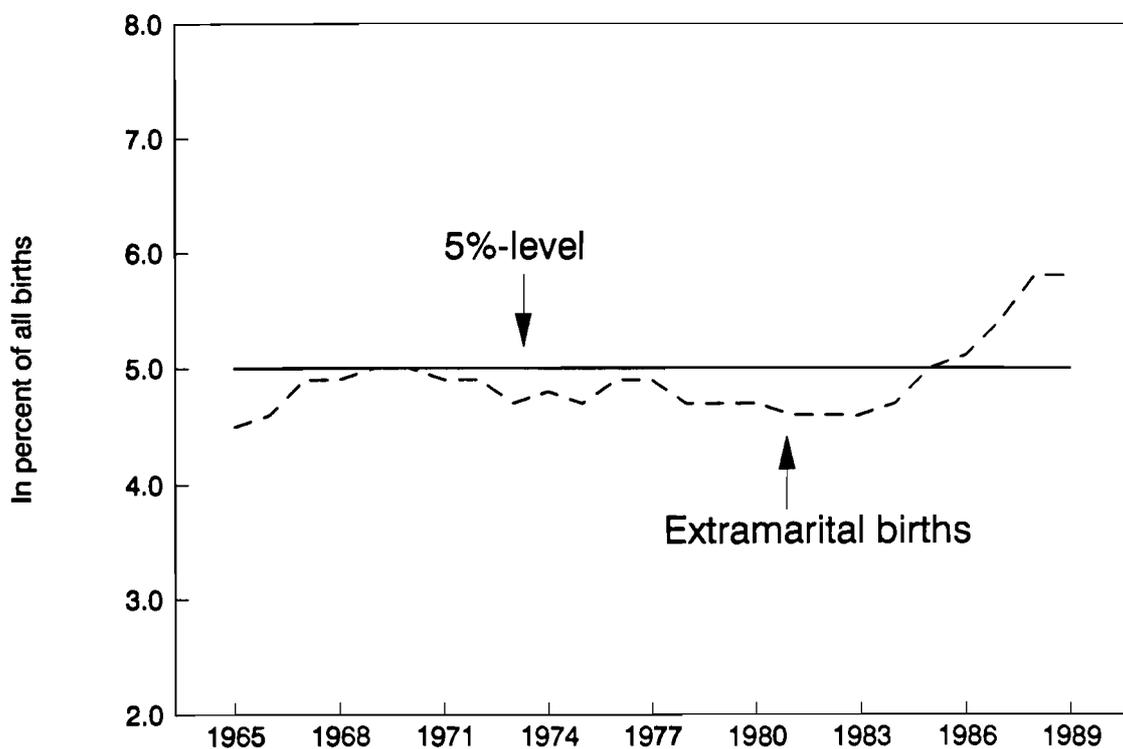


Figure 2. Proportion of extramarital births, 1965-1989.

Table 1. Life expectancy and survivors at age 80 per 1000 born, 1952-1989.

Years	Males			Females		
	Life Expectancy (yrs)		Survivors at age 80 per 1000 born	Life Expectancy (yrs)		Survivors at age 80 per 1000 born
	0	60		0	60	
1952-53	58.6	14.7	164	64.2	17.3	266
1960-61	64.8	15.8	236	70.5	18.6	371
1970-72	66.8	15.5	214	73.8	19.3	396
1980-81	66.9	15.7	221	75.4	20.3	449
1985-86	66.9	15.3	215	75.3	19.9	445
1989	66.8	15.4	228	75.5	19.9	462

The trends are similar for life expectancies in other age groups. After the period of increasing values in 1950-1970, the favorable changes stopped. In 1989 especially males in higher age groups had lower values for their life expectancy than in the period 1955-1970. Indeed, the decrease in life expectancy was the most significant for persons aged 60 and over. Maintaining life expectancy at birth at an almost unchanging level was possible through the improvement of infant mortality. In the post-war period a steady rise in male excess mortality was observed. Differences between life expectancy at birth of females and males grew from 5.6 years in 1952-53 to 8.7 years in 1989. Similar tendencies in sex differentials in mortality are valid for the remaining age groups. For instance, for persons aged 60 this difference increased from 2.6 years in 1952-53 to 4.5 years in 1989, which means an increase from 17.7% of the male life expectancy to 30.1% of the value of this parameter. In the 1980s, as a result of the increasing sex gap in mortality, the number of women surviving until age 80 was twice as much as the number of male survivors.

The course of nuptiality during the period 1950-1989 was irregular although the general tendency was downwards. In particular, in the last decade the number of marriages dropped due to lower numbers of persons reaching matrimonial age and, at the same time, due to a reduction in the propensity to marry (Table 2).

In the period 1960-1989, nuptiality rates fell by 28% for males and 30% for females. The decrease was especially sharp in the 1980s: by 23% both for men and women. At the end of the 1980s this downward trend stopped in the age groups of 20-24 years for both sexes.

No clear tendency can be observed in the median age at first marriage. In the period 1960-1989, this indicator for males ranged from a maximum value of 25.7 years in 1965 to a minimum of 24.1 years in 1970 (see Table 2). For females the respective values were a maximum of 22.8 years in 1980 and a minimum of 22.0 years in 1965. Consequently, in

1965 the maximum difference between sexes in median age at marriage was observed (3.7 years). The minimum difference equaled 1.6 years in 1980, while it was 2.5 years on average.

Table 2. Marriages and divorces, 1950-1989.

Year	Marriages		Divorces		Mean age at first marriage	
	per 1000 aged 15+		per 1000 married women	Marriages dissolved by divorced (%)	Males	Females
	Males	Females				
1960	26.4	23.5	2.3	13.7	25.4	22.3
1970	24.5	22.3	4.6	21.1	24.1	21.6
1980	23.8	21.9	4.6	19.0	24.4	22.8
1985	20.1	18.5	5.4	25.2	25.0	22.6
1989	18.8	17.3	5.1	24.7	24.9	22.4

During the post-war period first marriages constituted the most numerous group among all marriages, although the proportion of first marriages decreased from 88.1% in 1960 to 84.7% in 1988. Remarriages were more frequent for males than for females, and still more divorced than widowed persons remarried.

The gap between intensities of remarrying widowed and divorced persons increased. In 1960, the proportions (among all marriages contracted) of remarriages of females amounted to 1.3% and 1.7% for widows and divorced respectively, while in 1989 the respective proportions were 0.9% and 3.1%. For males the proportions of remarriages of widowers and divorced were 2.7% and 2.5% in 1960 and 0.5% and 3.9% in 1989.

According to the marital status life tables of 1981, the average duration of marriage is about 40 years for both sexes. From 1950 a significant increase in the percentage of marriages dissolved by divorce has been observed. This percentage increased from 10 in 1950 to 25 in 1989. The intensity of divorces was higher in urban than in rural areas. However, the divorce rates changed more in the rural than in the urban sub-population. In the 1980s the annual growth rate of divorce rates amounted to about 1% and 4% for the urban and rural populations, respectively. It should be emphasized that the upward trend in divorces stopped in the early 1980s and stabilized at the level of 1985.

In the post-war period, Poland was an outmigration country. During the years 1952-1988 net outmigration amounted to about 713,000 persons which denotes on average 20,000 outmigrating persons yearly or an average annual outmigration rate of 0.7 per thousand of the population.

In order to trace the consequences for social security of future population trends in Poland, five demographic scenarios were set up for the period 1985-2050. The first four scenarios are common to all countries participating in the project. In summary:

1. The *Benchmark scenario*, with age-specific rates for fertility, mortality, marriage and marriage dissolution constant at the levels observed during 1980-1984 in Poland.
2. The *Fertility scenario* in which it is assumed that fertility in Poland will gradually decrease from its 1980-1984 level of 2.32 children per woman to replacement level (TFR = 2.1) in the period 2000-2004.
3. The *Mortality scenario*, with a gradual decrease by 30 percent of female mortality rates, and one by 45 percent of the rates for males. It is equivalent to an increase of 8.6 years in the life expectancy of males, and about 4.6 years for females. Thus the existing eight-year gap between male and female life expectancy would be reduced to approximately 4.3 years.
4. The *Western low scenario*, which combines the most extreme demographic conditions presently observed in Western Europe: a TFR of 1.28 (cf. the FRG), proportions never-marrying of one-third (cf. Sweden), one-third of all marriages ending in divorce (Sweden), and life expectancies of 74 and 81 years for men and women, respectively (Switzerland).

Based on observations of recent trends in demographic phenomena, the following assumptions have been adopted in the National scenario:

- declining fertility to the level of TFR = 1.6 in 2005;
- constant mortality;
- no external migration;
- unchanging divorce and nuptiality.

The latter assumptions require comment since a marked decrease in marriages has been observed recently. However, legal marriage is still the prevailing type of union in Poland. On the other hand, the recent drop in nuptiality may be considered temporary, since in some subgroups the decrease stopped in the late 1980s. Therefore, one may expect a stabilization in marriages in the future. Due to the new economic, social and political situation in Poland it is very difficult to predict the future size of migration. Hence, (external) migration has been omitted in the Polish National scenario. Under the above assumptions, differences between the Benchmark and the National scenarios express the effect of changing fertility only.

## 2. CHANGES IN THE SIZE AND AGE STRUCTURE OF THE POPULATION

A relatively high amount of population growth has been the characteristic feature of the demographic development of Poland since 1950. The rate of natural increase amounted to about 20 per thousand in the mid-1950s and afterwards fell to about 9 in the late 1960s and early 1970s. After a slight rise in the 1970s, the rate of natural increase has been steadily declining during the last decade and reached a level of 4.8 per thousand in 1989. However, in the period 1950-1989 the average annual growth rate of the Polish population was equal to about 10 per thousand. Under conditions of three scenarios (Benchmark, Fertility and Mortality) one may expect an increase in the size of the population in Poland in the future (Table 3). The slowest increase may be observed under the Fertility scenario since the replacement level in 2005 implies decreasing fertility as compared with 1985. The most rapid increase in the size of Poland's population might be expected under the Low Mortality scenario--to almost 54 million in 2050. This result expresses the extremely bad situation in mortality in Poland. A decrease in the size of the population would occur under two scenarios: Western and National.

In both cases, one can observe a slight increase in the population size until the year 2015 and a steep fall afterwards. The latter is more extreme in the Western scenario due to the effect of lower fertility and nuptiality, while the rise in 2000 and 2015, which is more significant under the Western than the National scenario, reflects the effect of reducing mortality. In 2050, the highest difference in the size of the population occurs between the Mortality and Western scenarios (22 million). In 2000 this difference is the highest for the Mortality and National scenarios (1.2 million). The differences in the size of the population under the Benchmark and the Low Mortality scenarios reflect the loss of population caused by the high mortality level in Poland (0.5 million persons in 2000 and 4.2 million persons in 2050).

Changes in the age structure of the population of Poland may be characterized by some general trends:

- Under all scenarios, the share of the young population will decrease. The magnitude of this decrease depends on the assumptions adopted. The most significant drop in the share of the young population is observed under the Western and National scenarios. This rapid drop is due to the assumptions on the declining fertility in both scenarios.
- Together with a declining proportion of young people, the share of the elderly will increase. Again, the most significant rise occurs in the Western and the National scenarios. The highest share of the elderly population in the Western scenario expresses the combined effect of decreasing fertility and mortality levels.
- The working-age population will grow until the year 2000 under the Benchmark, Fertility and Mortality scenarios, until 2015 under the Western scenario, and until 2030 under the National scenario--compared with 1985. In 2050 the share of this sub-population will be lower than in 1985, irrespective of the assumptions.
- Regardless of the assumptions, the population of Poland will witness an essential process of aging.

Table 3. Population by broad age-groups, 1950-2050.

Year	Absolute total (1,000) = 100%	(%)		
		0-14	15-59	60+
1950	25035	29.4	62.3	8.3
1960	29795	33.5	56.9	9.6
1970	32658	26.5	60.5	13.0
1980	35735	24.4	62.4	13.2
1985	37176	25.3	60.7	14.0
<b>Benchmark Scenario</b>				
2000	40680	23.2	61.4	15.4
2015	43991	23.5	59.1	17.4
2030	46581	22.8	59.4	17.7
2050	49804	23.0	59.0	18.0
<b>Fertility Scenario</b>				
2000	40457	22.8	61.7	15.5
2015	42894	21.9	60.2	17.9
2030	44031	20.9	60.3	18.8
2050	44441	20.7	59.2	20.1
<b>Mortality Scenario</b>				
2000	41157	23.0	60.9	16.1
2015	46070	22.6	57.4	20.0
2030	49863	22.6	56.8	21.6
2050	53965	22.6	56.2	22.2
<b>Western Scenario</b>				
2000	40197	20.9	62.4	16.7
2015	40792	14.9	62.2	22.9
2030	38567	12.3	59.6	28.1
2050	31967	10.2	52.1	37.7
<b>National Scenario</b>				
2000	39945	21.8	62.5	15.7
2015	40260	18.2	62.8	19.1
2030	38555	16.3	62.3	21.4
2050	33813	15.0	58.5	26.5

The dependency ratios (Table 4) show that the most intensive aging process may be expected under the Western scenario, in which the old age dependency ratio (OADR) will reach 48.1 in 2050, compared to only 15 in 1985. Except for the Western and National scenarios the OADR will grow significantly until 2030, and the aging process will slow down thereafter. The maximum aging is observed in the period 2015-2030. Under the Western and National scenarios, this high intensity continues in the period 2030-2050.

Table 4. Dependency ratios, 1985-2050.

Scenario	1985	2000	2015	2030	2050
<b>Young age dependency ratio</b>					
Benchmark	38.7	35.4	36.0	35.9	36.0
Fertility		34.6	33.1	32.3	32.0
Mortality		35.3	35.5	35.3	35.4
Western		32.4	21.5	18.9	16.8
National		32.7	26.2	24.2	22.8
<b>Old age dependency ratio</b>					
Benchmark	14.5	17.1	17.5	21.2	20.3
Fertility		17.1	17.7	22.1	22.5
Mortality		18.2	21.8	28.2	28.0
Western		18.5	23.0	34.6	48.1
National		17.1	18.0	24.2	29.1
<b>Total dependency ratio</b>					
Benchmark	53.3	52.6	53.5	57.1	56.3
Fertility		51.7	50.7	54.3	54.5
Mortality		53.5	57.3	63.5	63.3
Western		49.8	44.5	53.5	64.9
National		49.8	44.2	48.4	52.0

The Mortality scenario indicates a slow but steady growth of the total dependency ratio (TDR). Under the Fertility, Western and National scenarios, a decrease of TDR is observed until 2015, i.e., in the period of declining fertility. Afterwards, a rise of TDR starts. In the Benchmark scenario this rise occurs in the period 2000-2030. In 2050 the highest value of TDR is reached in the Western and Mortality scenarios. In the first case this is the outcome of extremely high OADR. In the latter case this is the result of the relatively high young age dependency ratio (YADR) (the effect of preserving high fertility and reducing mortality) and increasing OADR.

For the Benchmark and Fertility scenarios, TDRs are slightly higher in 2050 than in 1985 due to aging. Under the National scenario the value of TDR which will be reached in 2050 is lower than in 1985. This results from the extremely low value of the YADR under this scenario in 2050--the effect of the steep decrease in fertility. Under two scenarios (Western and National) OADR exceeds YADR: from 2015 and from 2030 in the Western and National, respectively. Again, this expresses the influence of changes in fertility.

### 3. MARITAL COMPOSITION OF THE ELDERLY POPULATION

The marital status structure of the population aged 60 and over is influenced first of all by assumptions on mortality, nuptiality and divorce adopted in different scenarios. In this respect fertility does not play a significant role.

The masculinity ratio, which increases in each of the scenarios in the period 2000-2050, takes the same values for the Benchmark, Fertility and National scenarios (Table 5). These scenarios differ only in fertility assumptions in which the sex ratio at birth is kept constant. The most rapid growth of the masculinity ratio is observed under the Mortality scenario due to the narrowing sex gap in mortality. Obviously, the sex structure of the elderly influences the marital structure of this population.

Table 5. Masculinity ratio for the population aged 60 and over, 1985-2050.

Year	Scenario				
	Benchmark	Fertility	Mortality	Western	National
1985	64.7				
2000	66.7	66.7	69.4	68.5	66.7
2015	69.7	69.7	80.4	75.7	69.7
2030	68.2	68.2	85.0	77.6	68.2
2050	69.2	69.2	88.1	79.1	69.2

According to the Benchmark scenario, the proportions single and married among elderly females have a general tendency to decline, while the proportions divorced and widowed women should increase. For males, increasing proportions single and divorced are observed (Table 6). The proportion married males will drop and changes in the proportion widowed men are irregular. The majority of elderly women are and will be widowed, while the majority of those men are and will be married. Results of the Fertility and National scenarios do not differ from those of the Benchmark scenario as far as the marital composition of the elderly population is concerned.

The most significant differences between the results of the Benchmark and the Mortality scenarios are as follows: an irregular increase in the proportion married and exactly the reverse in the proportion widowed among elderly women; a steady decrease in the proportion married males and an increase in the proportion widowed men. Changes in the proportions widowed both for males and females are the obvious result of the narrowing sex gap in mortality together with improving mortality.

Table 6. Marital composition of the population aged 60 and over, 1985-2050.

Year	Females				Males			
	Single	Married	Divorced	Widowed	Single	Married	Divorced	Widowed
1985	6.9	39.8	2.7	50.6	2.7	82.0	2.1	13.2
Benchmark Scenario								
2000	5.1	37.1	5.6	52.2	4.1	76.5	3.5	15.9
2015	4.7	37.2	7.4	50.6	6.8	74.3	4.0	15.0
2030	4.9	32.7	7.9	54.5	9.1	71.3	3.8	15.8
2050	5.4	32.4	7.9	54.2	9.7	72.0	3.8	14.5
Mortality Scenario								
2000	5.2	39.6	5.6	49.7	4.1	77.1	3.5	15.4
2015	4.8	45.5	7.4	42.3	6.5	74.8	3.9	14.9
2030	4.8	43.7	8.2	43.3	8.7	70.8	3.7	16.8
2050	5.3	42.2	8.2	44.2	9.7	69.4	3.8	17.2
Western Scenario								
2000	5.2	39.3	5.6	49.9	4.1	76.4	3.9	15.5
2015	4.9	41.3	10.0	43.8	7.0	68.7	3.0	15.2
2030	5.8	35.5	16.1	42.6	11.3	58.3	14.0	16.4
2050	18.8	27.0	18.5	35.7	28.9	42.9	14.1	14.1

The most visible changes compared to the Benchmark scenario occur in the Western scenario in which all demographic processes that determine the marital composition of the elderly population were assumed at levels different from those observed. Let us repeat that in the Western scenario, low nuptiality, high divorce and low mortality have been adopted. These assumptions result in a very high percentage of singles both for females and males (18.8% and 28.9% in 2050, respectively, while corresponding figures for 1985 were 6.9% and 2.7%); a steep drop in the proportion married for both sexes (in 2050 27% for females and 42.9% for males versus 39.8% and 82% in 1985); a fast growth in the percentage of divorced persons (in 2050 18.5% females and 14.1% males while in 1985 the proportions equaled 2.7% and 2.1%, respectively); a sharp decrease in the proportion widowed women (35.7% in 2050 versus 50.6% in 1985).

#### 4. PENSION SYSTEM AND SOCIAL SECURITY TRENDS IN POLAND-- POST-WAR DEVELOPMENTS

After World War II the organization of a social security system was originated in the territory of Poland, according to new conditions that had developed in Poland. The situation demanded unification of regulations concerning social security which was achieved by extending the Polish pre-war regulations concerning social security and simultaneous annulment of previous German laws in this respect.<sup>1</sup> New groups of the population were included and new regulations introduced. At present the following social security systems exist:<sup>2</sup>

1. workers of collectivized economy and their families,
2. members of (agricultural) co-operatives (since 1962),
3. persons working for the units of collectivized economy, employed on the basis of individual contracts or commissions (since 1966),
4. craftsmen and other private firm owners (since 1965),
5. individual farmers (since 1978),
6. artists (since 1974),
7. voluntary system of social security for priests (and "CARITAS," since 1976).

Each of the above-mentioned systems defines type, amount and conditions of gaining the insurance, as well as the groups of persons included. It also appoints the institutions obliged to bear the costs in the form of regular contributions of a fixed value. Types of social insurance can be distinguished on the grounds of subject criterion, i.e. sorts of safeguarded services, as:

- safeguard against sickness and maternity,
- safeguard against injury and occupational disease,
- old age and disability pensions,
- family insurance.

The range of services varies, depending on the social insurance system. This variability means that some of the systems safeguard all kinds of services, while others provide only selected types of services. The system of old age and disability pensions is of special weight in the total system. Services provided under this system include:

- old age pension,
- disability pension,
- family pension,
- disease pension, changed in 1983 into rehabilitation services,
- other services and allowances.

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<sup>1</sup>Uscinska, G. 1990. *Basis for Measurement of Contributions and Allowances of Social Security, in Studies and Materials*. Warsaw: IPiSS, p.1 (in Polish).

<sup>2</sup>*Yearbook of Social Security 1846-1985*. Warsaw, p. XII.

1954 should be considered the opening date of the organization of the system. Subsequent reforms were connected with the imposition of new legal solutions, and were introduced in 1968, 1974, 1977, and 1982, the latter being in force since 1 January 1983.<sup>3</sup> In addition to the common system (see below) several systems of services for selected socio-occupational groups of the population exist. Railway workers, miners and individual farmers should be mentioned.

About 64% of the total pensions in 1985 were paid under the so-called "common system" based on the Bill of 1982. Pensions are basic services within this system and can be divided into old age, disability, and family (survivor) pensions. The Bill defined the conditions of acquisition, the basis for counting the amount of a pension, additional services, and the conditions of combining and interrupting services. General characterizations of the system are presented in Appendix 1.

The Bill of 1982 introduced new regulations such as indexation of pensions. The base for calculating the amount of an old age or disability pension was increased annually by the same percentage as the increase in average monthly wages in collectivized economy, based on the preceding year. However, the maximum increase should not exceed 150% of the wage increase. The main idea of indexation was to raise pensions and diminish the discrepancy between the levels of earlier and most recently granted pensions, and applied only to pensions granted before 1982.

The run-away inflation proved disadvantageous for the old age and disability pensions, and the system of indexation, intended to be enforced once a year, became insufficient. As it was shown by the studies of A. Wiktorow<sup>4</sup>

...between the years 1984-1989 pensions were additionally raised nine times and the principles of indexation were changed once in order to arrest the continuous lowering of the living standards of the retired and disabled, when compared with active persons.

The existing situation created the grounds for introducing new amendments to the Bill of 1982 (in 1990). Among the many corrections to the text, the following should be treated as the most intrinsic:

1. The basis for calculating an old age or disability pension is identical to the average indexed wage of a worker for:
  - the most recent quarters of a year, or

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<sup>3</sup>Law regulations (Bill of 14 December 1982, Retirement Insurances for Workers and Their Families). *Dziennik Ustaw PRL No. 40*.

<sup>4</sup>Wiktorow, A. 1989. *Functioning of Workers' System of Old Age and Disability Pensions*. Partial report on Subject CPBP 09.09-19/04. Warsaw: Institute of Work and Social Affairs, p. 18 (in Polish).

- the subsequent 3 calendar years (selected by the pensioner) among the most recent 12 calendar years, counting the pension year (quarter of a year) in which an application for pension was submitted.
2. The indexed average wage of a worker equals the average wage of the indexation that preceded the quarter in which the application for pension was submitted. An amount for indexation is fixed for each individual pension, according to the scheme included in the regulation.
  3. Old age and disability pensions undergo periodical indexations. The regulation defines the method of fixing index rates. If the index rate is lower than 105%, the procedure is not used. The President of the Central Statistical Office, with the consent of other central offices (which are mentioned in the Bill), projects an average wage for a quarter of a year, which is taken into account while fixing the index rate.
  4. Amounts of the lowest old age and disability pensions are: 35% of the projected average wage (which is the base for calculating indexation in the case of old age, survivor and disability groups 1 and 2 (defining the degree of disability)) and 21% for disability group 3, for retirees over age 55 (females) and 60 (males).

## **5. FINANCING THE SOCIAL SECURITY SYSTEM--RECEIPTS AND EXPENDITURES**

Changes in the social security system have been accompanied by shifts in the principles of financing it. In the early 1950s, the separate pension funds based on the pre-war system were liquidated, and the regulation of 1951 introduced a system<sup>5</sup> whereby all security contributions were transmitted to the State Budget, which covered insurance expenditures. This financial system was not clearly defined, and it was difficult to correlate the expenditures and receipts. In the mid-1970s the principle of "exclusive right" of the State Budget to finance the social security system was rejected. Transformations in the method of financing consisted of the creation of separate funds for particular branches of social security as the system expanded.

Funds serving different purposes have undergone various changes and transformations, but their concept remained untouched.<sup>6</sup> Among others, the funds include:

- Social Security Fund for some groups of population (since 1966),
- Old Age Pension Fund (since 1968),
- Social Security Fund for craftsmen (since 1966),

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<sup>5</sup>Regulation of the Cabinet concerning amounts of contributions for Social Security. *Dz. U. IX/1951, item 60.*

<sup>6</sup>Data from the *Yearbook of Social Security, 1946-1985*. Warsaw: Social Security Office, 1987, p. XIX.

- Old Age Pension Fund for individual farmers (since 1978), replaced by Social Security Fund for individual farmers in 1982.

The Bill of 1986<sup>7</sup> which brought about separation of all insurance funds from the State Budget, was a significant turning-point in the principles of financing the social security system. The pension system was abandoned with the simultaneous creation of the Social Security Fund, which was based on contributions, and the expenditures consist of payments for workers and their families, with the exception of farmers who have a separate fund.

Insurance contributions and allocations are the main sources of financing social security. The amount of a contribution to individual pension systems is fixed by regulations. The fund of personal wages is the base for measuring contributions within the common security system, which serves the employees of units of collectivized economy. Insurance contributions are paid by enterprises and, for example, in 1988 amounted to 38% of the measurement base. Also non-collectivized firms pay contributions for their workers. Contribution collecting within the social security system for individual farmers is different--the scale of charges is fixed--and has two components:

- charge for every person insured in a farm, and
- charge for every hectare (countable).

It is worth stressing that the Social Security Fund for individual farmers is composed of farmers' contributions (one-third) and State Budget allocations (two-thirds). Detailed analysis and evaluation of the system of financing social security in Poland, carried out by G. Uscinska,<sup>8</sup> showed that

...the regulations in force differentiate types of services rendered to individual groups, as well as the way they participate in financing the system. Considerable differentiation of regulations determining the insurance status of individual groups of people is also a characteristic feature.

Table 7 shows the structure of incomes and expenditures according to types of services. In each of the selected years of the 1950-1985 period, total incomes of social security slightly exceeded total expenditures. It should be mentioned that those benefitting from the social security system in Poland comprise approximately 99.7% of the total population. The main source of income is insurance contributions, their shares oscillating between 98.2% in 1950 and 89.6% in 1985.

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<sup>7</sup>Bill of 25 December 1986 on organizing and financing Social Security, *Dz. U. No. 42 and No. 25/1989*.

<sup>8</sup>Uscinska, G. *Op. cit.*, p. 36.

Table 7. Structure of receipts and expenditures of social security in Poland, according to type of receipt and direction of expenditure (percentage).

Types of receipts and expenditures	Years				
	1950	1960	1970	1980	1985
<b>RECEIPT - TOTAL</b>	100.0	100.0	100.0	100.0	100.0
1. Insurance contributions	98.2	98.9	94.1	86.9	89.6
2. Allocations of the State Budget	-	-	3.4	7.0	6.8
3. Other income	1.8	1.1	2.5	6.1	3.6
<b>EXPENDITURE - TOTAL</b>	100.0	100.0	100.0	100.0	100.0
1. Old age and disability pensions	23.4	49.7	69.3	80.8	74.5
2. Family and care allowances	47.4	34.9	17.1	7.6	17.0
3. Disease allowances	5.6	9.7	9.4	0.9	0.8
4. Other services	2.0	2.3	2.0	8.7	6.5
5. Expenditures for sanatoriums	18.5	0.9	1.2	1.1	0.0
6. Operating costs of Social Security Office	2.2	0.7	0.8	0.8	1.1
7. Other expenditures	0.9	1.8	0.2	0.1	0.1

Source: *Statistical Yearbook of Social Security 1946-1985*, Warsaw, 1987, Table 3(16), p. 16.

The diminishing share of receipts from contributions is compensated by the increase in state allocations and other income sources. Looking at expenditure groups, pensions and family and care allowances are the most common services. The two categories together constituted 91.5% of the total expenditures in 1985. Tables 8 and 9 present the structure of receipts and expenditures of two selected funds, i.e., the Pension Fund (after 1986 called the Social Security Fund) and the Social Security Fund for Individual Farmers. Sources of income for the two funds are differentiated. The main sources of income of the Pension Fund in the years 1970-1985 were contributions collected from insured persons, whereas in the case of the Social Security Fund for Individual Farmers (with the exception of 1978, when the fund was organized, and the scale of the system was not common) the sources were allocations of the State Budget, covering 69-74% of the expenditures. The main expenditures of both funds are old age and disability pensions.

Before concluding the description of the system of financing social security in Poland, it should be mentioned that expenditures for social security in relation to the national product increased from around 5% in 1955 to around 7% in 1975 and more than 12% in 1985. The growing value of this percentage is reflected in the changes in the social security system in Poland. These changes were brought about by the expansion of the functioning range of the system and the inclusion of new groups of population.

Table 8. Structure of incomes and expenditures of the Pension Fund according to sources of contribution and direction of expenditure (percentage).

Year	Income				Expenditure		
	Total	Contribution	State participation	Other expenditures	Total	Pension and disability pensions	Other expenditures
1970	100.0	91.3	5.3	3.4	100.0	98.5	1.5
1975	100.0	89.6	7.5	2.9	100.0	98.5	1.5
1980	100.0	90.7	5.3	4.0	100.0	98.9	1.1
1985	100.0	93.7	3.9	2.4	100.0	99.0	1.0

Source: *Statistical Yearbook of Social Security, 1946-1985*, Warsaw, 1987, Table 5(18), p. 18, and own calculations.

Table 9. Structure of incomes and expenditures of the Social Security Farmer Fund according to sources of income and direction of expenditure (percentage).

Year	Income				Expenditure		
	Total	Contribution	State participation	Other expenditures	Total	Pension and disability pensions	Other expenditures
1978	100.0	70.7	29.2	0.1	100.0	94.7	5.3
1980	100.0	31.3	68.7	-	100.0	85.0	15.0
1985	100.0	24.5	74.2	1.3	100.0	94.5	5.5

Source: Data of *Statistical Yearbooks, 1979-1986*, Central Statistical Office, Warsaw, and own calculations.

## 6. WORK AND RETIREMENT PATTERNS

Meeting all conditions concerning the period of service and age (see Appendix 1) is the basic criterion for claiming a pension, as established by the Bill of 1982. The regulation created the possibility to retire five years earlier for females with 30 years of service, or 20 years if a member of disability groups 1 or 2, and for males with 25 years of service if a member of disability groups 1 or 2. Figure 3 presents labor force participation rates for women and men. The level of working activity is lower for females, although it should be considered as relatively high. The discrepancy between male and female activity levels stays the same from the age of 20, and decreases after age 45. A decrease in activity levels at ages 45 and over is characteristic of the recent past. Maximum activity levels for males (exceeding 96%) are characteristic for age groups 25 to 39, for females (exceeding 80%) for ages 35 to 44. It should be expected that restructuring the economy will cause the activity levels to sink even further, especially for persons aged 55 and over.

In the 1980s, the cases of early retirement, together with the continuation of occupational activity in the form of part-time jobs, were very frequent. The possibility to continue work in the form of part-time jobs in the light of the reforms is only limited.

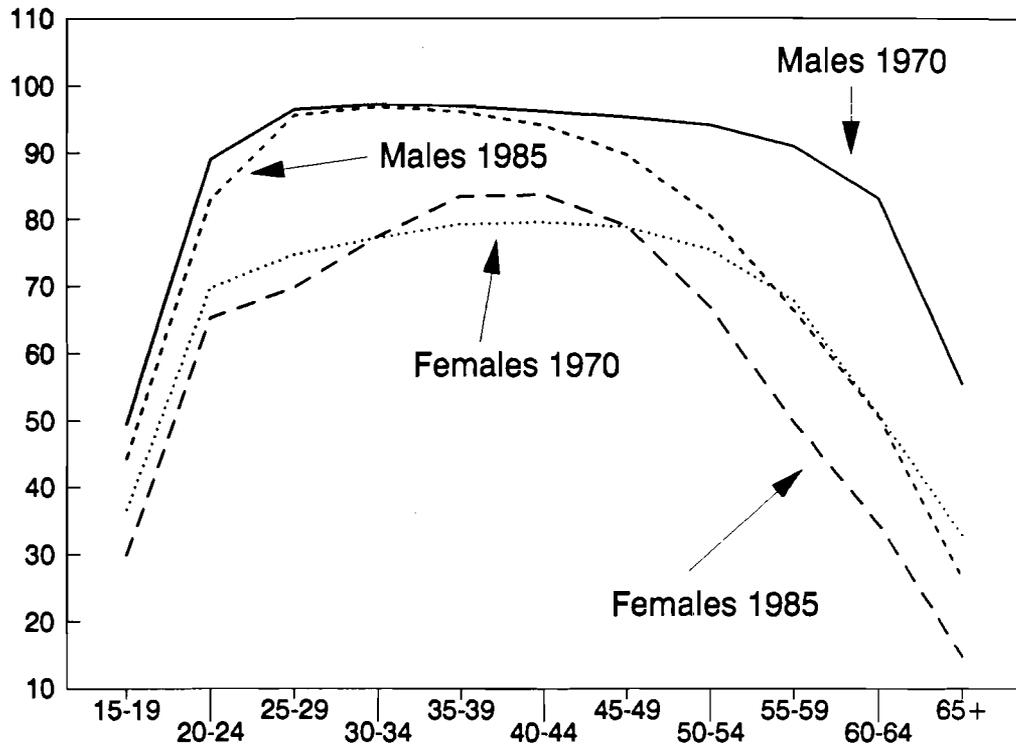


Figure 3. Labor force participation rates, 1970 and 1985.

Polish current statistical reports do not provide information on pension distributions according to age and sex with respect to both persons receiving old age or disability pensions and persons claiming old age or disability pensions. Such data usually come from single representative surveys of the Social Security Office, and exemplary data are included in Table 10.

By assuming the lowest retirement age as 50, we can define mean values for 1984: age 59.2 for males and 57.0 for females. Comparison with the retirement age included in the regulation (60 for females and 65 for males) shows that real average retirement age was lower by 5.8 years for males and 3.0 years for females. From the viewpoint of the society as a whole, the information on the number of persons receiving old age and disability pensions, and the expenditures connected with these services are most interesting, whereas a pensioner is interested in the level of the received allowance. The relation of the average pension to the average wage can be the index of this level (see Table 11). In the years 1980-1989 the rate oscillated between 48% and 58%, and remained at around 50%. The numbers in Table 11 show that the level of farmers' pensions is significantly lower than that of workers'.

Table 10. Retired persons, old age and disability pensions by age and sex.

Age	Old Age Pensions				Disability Pensions			
	Males		Females		Males		Females	
	A	B	A	B	A	B	A	B
below 50 years	2.7	1.1	5.4	2.8	53.3	29.9	47.0	20.6
50-54	9.9	6.1	11.0	8.1	16.8	16.8	19.2	18.5
55-59	21.3	15.3	35.5	19.7	13.8	17.6	14.4	18.9
60-64	32.4	21.9	42.8	24.3	7.4	15.2	12.1	13.1
65-69	30.8	15.7	3.6	14.2	6.0	6.3	4.4	8.0
70-74	1.8	18.4	1.0	15.5	1.8	6.8	2.0	9.2
75 and over	1.1	21.5	0.7	15.4	0.9	7.4	0.9	11.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

A - age at receiving first old age, disability pension

B - age at the time of inquiry

Source: Data of sample survey of Social Security Office, 1984.

Table 11. Average monthly benefits in zloties (zl), and relation between average pension and average salary for Poland, selected years 1970-1989.

Items	Benefits in zloties											
	1970	1975	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Total	1144	1545	2681	3314	5629	6953	7824	9209	11737	15494	26099	95575
Without farmers	1149	1558	2751	3433	5755	6873	8363	9779	12268	16366	27698	101214
Individual farmers	683	1118	1999	2392	4622	4798	5095	6448	9235	11598	19320	72673
Pension/Wage (%)			48.0	47.4	57.7	54.0	54.7	51.7	53.0	58.2	52.2	49.0

Source: Data of Social Security Office and Central Statistical Office.

## 7. THE FUTURE OF STATE PENSIONS

### 7.1. Assumptions for the Calculations

The general idea and algorithm of the pension model was presented in Gonnot.<sup>9</sup> The basic assumptions (mostly due to limited data availability) are:

1. Marital status projections calculated using data for the period 1984-1985
2. Identical age at retirement for all marital statuses, male = 59.2, female = 57.0
3. Constant mean age at marriage and divorce
4. Identical average salary for males and females
5. No difference in labor force participation by marital status
6. Pension benefits formula:  
old age and disability:  $z1\ 3000 + (0.55 * \text{average income})$   
survivors:  $0.8 * \text{average old age pension benefits}$
7. Average salary estimated on the base of reported average pension in 1985
8. 20 years of contribution for full pension
9. Yearly benefits rate of 2.75%.

### 7.2. Pension Expenditures

The pension model presented below includes five scenarios: Benchmark, Fertility, Mortality, Western and National. Results in absolute terms should be interpreted cautiously. Changes observed in the Polish economy and the phenomenon of intensive inflation accompanying these changes show that the results of the model in absolute terms are not adequate and do not reflect present and future realities. It is worth mentioning that calculations of the four common and the national demographic scenarios assumed constant work and retirement patterns.

Basic information of changes in pension expenditures are included in Table 12. Old age pensions constitute the predominating share among the two categories of services (old age and survivor pensions) independent of the adopted scenario. Range and rate of changes in total pension expenditures for the period under analysis (1985-2050) are differentiated, depending on scenario, although some similarities can be observed. Similar results are obtained by the Benchmark, Fertility and National scenarios on the one hand, and the Mortality and Western scenarios on the other (see Table 12).

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<sup>9</sup>Gonnot, J.P. 1990. Demographic, Social and Economic Aspects of the Pension Problem: Evidence from Twelve Countries. *WP-90-15*. Laxenburg, Austria: International Institute for Applied Systems Analysis, pp. 13-16 and Appendices 1, 2, 3, pp. 42-47.

Table 12. Pension expenditures, 1985-2050.

Scenario		Absolute (in million zloties)	Index (1985 = 100)			
			1985	2000	2015	2030
Benchmark	old age	917,930	115	145	155	166
	survivors	489	136	166	181	181
	total	918,419	115	145	155	166
Mortality	old age		121	172	198	218
	survivors		142	207	273	315
	total		121	172	198	218
Western	old age		122	174	199	217
	survivors		143	207	254	244
	total		122	174	199	217
National	old age		115	145	155	164
	survivors		109	131	146	150
	total		115	145	155	164

During the first period (1985-2000) pension expenditures will grow by 15% according to the Benchmark, Fertility and National scenarios, and by 21% or 22% according to the Mortality and Western scenarios. Greater variability can be observed in the case of survivor pensions, which is confirmed by the increase in expenditure until 2000, as compared to 1985, by 9% (National scenario), by 36% (Benchmark and Fertility scenarios), and 42% and 43% (Mortality and Western scenarios, respectively). From 2000 on, the tendency of pension expenditures to increase will still be significant. Average annual growth rate for the years 2000-2015 will even be higher than that in the preceding period. The average annual growth rates for old age expenditures amount to 2.4% in the Mortality and Western scenarios, and 1.6% in the Benchmark, Fertility and National scenarios. For the subsequent sub-period under analysis (2015-2030) average annual growth rates of old age expenditures are almost three times lower for the Benchmark, Fertility and National scenarios, and over two times lower for the Mortality and Western scenarios, when compared with the 2000-2015 sub-period. In 2030, the expenditures on old age pensions will equal 155% of the expenditure level of 1985 for the Benchmark, Fertility and National scenarios, and around 200% for the Mortality and Western scenarios. Changes in survivor expenditures for the respective period vary strongly by scenario, but due to their low share among total pension benefits (0.1%), survivor pensions are negligible. As survivor pensions are not paid in addition to old age pensions, but rather instead of, and since the average old age pension of women is usually higher than the average survivor pension, the model underestimates the number of widows claiming survivor benefits. On an aggregate level, however, it does not matter whether a woman received old age or survivor benefits, as long as the average benefit is calculated correctly.

After evaluation of the projected changes in expenditures on pensions for the period 1985-2050, we can conclude that:

- as a whole, changes in pension expenditures are determined by changes in old age expenditures; share of expenditures on survivor pensions are of minor significance.
- within the period 1985-2050, the highest growth rate of pension expenditures will take place in the years 2000-2015. This is the retirement period for the age groups of the post-war baby-boom.
- for the whole period 1985-2050 the indices of average annual growth rate for expenditures on old age pensions are identical for the Mortality and Western scenarios, and identical but at a lower level (by 50%) for the Benchmark, Fertility and National scenarios.

### 7.3. Number of Retired

Analysis of pension expenditures shows that a significant growth in expenditures will occur between 2000-2030, and in particular in the sub-period 2000-2015, when the age groups of the post-war baby-boom will retire. One of the assumptions adopted in the social security model states that

...in the absence of information on the number of persons insured, the model used data on labor force participation. This provides correct information of total and per capita pension expenditures, but does not allow calculation of the number of beneficiaries.<sup>10</sup>

Between 1985 and 2000 the increase in the total number of old age retirees, estimated out of labor force participation rates, will oscillate between 18% and 25% depending on scenario, causing an increase from about 900,000 to 1.28 million retirees. Females will constitute the majority of the growth, which is a consequence of changes in the retired population structure by sex. Changes including the criterion of marital status show large increases in single and divorced males and in divorced and widowed females, especially for the Western scenario.

The growth in old age retirees during the years 2000-2015 will be three times as large as that in the preceding period, oscillating from 1.57 million persons in the Benchmark scenario to 2.69 million in the Western scenario. Females will constitute a decisive majority of the increase. Analysis shows that independent of the scenario, the divorced can be ascribed the highest dynamics among the total of population. After 2015 less numerous birth cohorts will reach retirement age, and absolute increases in the retired numbers will be at a considerably lower level. Generally, the differences by scenario are parallel to those discussed in the context of total pension expenditures.

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<sup>10</sup>Gonnot, J.P. 1990. Socio-Demographic Changes and the Pension Problem in Austria. *WP-90-22*. Laxenburg, Austria: International Institute for Applied Systems Analysis, p. 24.

#### 7.4. Labor Force

Developments in pension expenditures are closely related to the changes in the size of the labor force. Assuming constant activity rates, the size of the labor force will increase in the period 1985-2000 for both males and females by about 10-12% for all five scenarios (see Table 13). Between 2000 and 2015 the labor force will increase by 790,000 (National scenario) to 1.7 million (Mortality scenario), which gives an increase of 4-8%. According to the Benchmark, Fertility and Mortality scenarios, the increase in labor force will continue until 2050, whereas in the Western scenario the level of 1985 will be reached in 2030, declining constantly thereafter. The National scenario provides a tendency parallel to that of the Western scenario. Different tendencies in sizes of the labor force for the Western and National scenarios, when compared with the remaining three scenarios, are mainly a consequence of the assumptions concerning fertility. Decreases in labor force (for the Western and National scenarios) take place after 2015 when less numerous cohorts, resulting from the fertility levels adopted in the scenarios (see basic scenario assumptions), will enter the age of occupational activity.

Table 13. Size of the labor force, 1985-2050.

Scenario	Absolute (1000)		Index (1985 = 100)		
	1985	2000	2015	2030	2050
<b>Benchmark</b>					
males	10190	110	117	124	133
females	8288	110	116	123	131
total	18479	110	117	123	132
<b>Fertility</b>					
males		110	116	120	120
females		110	115	119	119
total		110	116	119	120
<b>Mortality</b>					
males		112	123	132	144
females		111	118	126	135
total		111	120	129	140
<b>Western</b>					
males		112	119	111	86
females		111	116	108	83
total		111	118	110	85
<b>National</b>					
males		110	115	110	93
females		110	114	110	93
total		110	115	110	93

It is worth stressing that there are differences in average numbers of years in the labor market from the viewpoint of cohort and period perspective, assuming constant labor force participation rates. For the period perspective, the average number of years worked corresponds to 43.4 years for males and 34.5 years for females, resulting in a difference of 8.9 years. For the cohort perspective, the indicators relevant for calculating individual benefit entitlements are 40.4 years for males and 27.5 years for females. This corresponds to the number of years worked by the cohort having reached pensionable age in 1985.

The average number of years worked both for males and females is higher for the period perspective than for the cohort perspective, which is due to past decreases in labor force participation rates.

### **7.5. Ratio Contribution/Benefits**

Financial equilibrium of the pension system is reflected by the ratio total contribution/total benefits (Table 14). Estimates obtained from the model in 1985 give a value of 1.13 for this ratio, which corresponds to an overfunded scheme, although considerable discrepancies by sex can be observed (1.70 for males and 0.80 for females). The results should be interpreted cautiously and the causes should be sought among the assumptions to the model, especially those concerning occupational activity. Therefore, we limited the interpretation to changes in total structure, without division by sex.

For all adopted scenarios, the ratio total contribution/total benefits decreases. The range of changes differs strongly by scenario. In the Benchmark scenario the ratio decreases from 1.13 to around 0.9 in 2015, remaining constant at that level until 2050. The direction of the changes calculated by the Mortality scenario is similar to the Benchmark scenario, although the decrease in values of the ratio is more pronounced, reaching a level of 0.8. The largest decrease in the ratio can be observed in the Western scenario, from 1.13 in 1985 to only 0.62 in 2030 and 0.44 in 2050.

In the period 1985-2000 the pension model gives values of the ratio exceeding one (irrespective of scenario), which confirms the existence of an overfunded scheme. The scheme will be underfunded after 2015, signaling the advancing aging process of the Polish population, which will intensify after 2015.

Finally, we should like to add some remarks on the numbers in Table 15, which presents the relative cuts in benefits (assuming a constant contribution rate at the 1985 level) which would be necessary under all scenarios to keep the balance between receipts and expenses. For all scenarios, cuts between 1985 and 2000 are relatively small--from 4% for the Benchmark scenario to 9% in the Western scenario. After 2000 the cuts in benefits are stable at the level of around 20% for subsequent years (2015, 2030, 2050) for the Benchmark scenario. Cuts grow for the remaining scenarios. The sharpest cuts, two or even three times higher in comparison to the Benchmark scenario, occur in subsequent points of the period under study for the Western scenario.

Table 14. Ratio contribution/benefits, 1985-2050.

Scenario		1985	2000	2015	2030	2050
Benchmark	males	0.80	0.78	0.65	0.65	0.65
	females	1.70	1.59	1.32	1.30	1.29
	total	1.13	1.08	0.91	0.90	0.90
Fertility	males		0.76	0.59	0.57	0.56
	females		1.49	1.07	0.95	0.92
	total		1.04	0.79	0.74	0.72
Mortality	males		0.78	0.65	0.63	0.59
	females		1.59	1.31	1.26	1.18
	total		1.08	0.90	0.87	0.81
Western	males		0.74	0.56	0.47	0.33
	females		1.48	1.06	0.83	0.59
	total		1.03	0.76	0.62	0.44
National	males		0.78	0.64	0.58	0.47
	females		1.59	1.30	1.15	0.92
	total		1.08	0.89	0.80	0.64

Table 15. Cuts in benefits as compared to 1985 (in %).

Scenario	2000	2015	2030	2050
Benchmark	-4	-19	-20	-20
Fertility	-8	-30	-35	-36
Mortality	-4	-20	-23	-28
Western	-9	-33	-45	-61
National	-4	-21	-29	-43

## 8. CONCLUSION

The analysis presented for Poland was based on results from two models: a dynamic population projection model by marital status, and a pension model. Interpretation of the results consisted of an attempt to evaluate demographically and economically the forecasted changes in number and structure of the Polish population. The results of the population projections according to marital status can be of both practical and scientific relevance, allowing an evaluation of consequences of different demographic evolutions. However, due to the adopted and simplified assumptions, results of the pension model are merely of scientific nature in the aspect of economic consequences.

One might ask which of the adopted scenarios is closest to Polish reality. We can mention three of them: National, Benchmark and Western. The latter can be considered mainly a point of reference to the possible changes in the future, if Eastern European countries, including Poland, follow the way of demographic development close to that of Western European countries.

Future changes in population age structures in Poland can be characterized as follows:

- Under all scenarios, the share of children will decrease, with the most significant drop observed under the Western and National scenarios;
- In the case of working age population, comparison with the situation in 1985 shows relative growth in this group until the year 2000 under the Benchmark, Fertility and Mortality scenarios, and even until 2015 under the Western and National scenarios;
- The share of the elderly population will increase, with the most significant rises under the Western and National scenarios.

Independent of the scenario, the dominant share of females aged 60 and over is and will be widowed--from 54.2% under the Benchmark scenario to 35.7% under the Western scenario in 2050. Among males, the dominant share is and will be married--from 73.6% under the National scenario to 42.9% under the Western scenario in 2050.

Two of the many consequences in the field of economics should be stressed. Independent of the scenario, changes in the total number of retirees are defined by the changes of old age retirees, numbers of survivors being relatively unimportant. Decisively higher dynamics of changes in the total number of retirees under the Mortality and Western scenarios, when compared with the three remaining ones, are the main consequence of the assumptions concerning mortality. Changes in labor force are a sensitive indicator of the assumptions concerning fertility levels in the respective scenarios. Differentiated tendencies of changes in the size of labor force, depending on scenario, can be observed after the year 2015. According to the Mortality and Benchmark scenarios there will be an increase in labor force until 2050; under the Fertility scenario a stabilization at a level close to that of 2015 can be observed. The Western and National scenarios show a decrease in labor force resources for the respective sub-periods 2015-2050.

Finally, the intrinsic changes which have taken place in recent years in Poland should be mentioned: the high level of inflation and the transition from a centrally planned economy to a free-market economy have as a consequence that part of the assumptions for application of the pension model are of a purely hypothetical nature. This refers both to the evaluations of benefits and contributions.

Appendix 1. Scheme of principles of granting old age and disability pensions under the common system in Poland.<sup>11</sup>

Conditions of receiving pension and allowance	Old Age Pension
Basic criterion	<p>Fulfillment of all conditions concerning age and employment period</p> <p>retirement age            65 - males    60 - females</p> <p>employment period        25 years - males    20 years - females</p> <p>Earlier pensions by 5 years for very hard or hazardous-to-health professions; women employed for 30 years, or 20 years when members of disability groups 1 or 2; men employed for 25 years and members of disability groups 1 or 2; veterans; different regulations for teachers.</p>
Basis for measurement	Average monthly salary for last 12 months of employment or subsequent 24 months of the last 12 years of employment, as chosen by the pensioner-to-be.
Measure of payment	<p>100% of the basis for measurement (3,000 zł) plus 55% of the surplus over the amount plus 1% of the basis of measurement for each full year of employment in Poland exceeding 20 years.</p> <p>Partial pensions amount to 90% of the measurement base up to 3,000 zł and 50% of the remaining sum.</p>

<sup>11</sup>Source: Law regulations: Bill of 14 December 1982 of Pension System for Workers and Their Families (*Dziennik Ustaw PRL no. 40*).

<b>Conditions of receiving pension and allowance</b>	<b>Disability Pension</b>
<b>Basic criterion</b>	<p>Fulfillment of all criteria concerning age and employment:</p> <ul style="list-style-type: none"> <li>- employee belongs to disability groups 1, 2 or 3</li> <li>- has the required period of employment</li> <li>- disability caused by work.</li> </ul> <p>The required period of employment depends on the age at which disability started.</p>
<b>Basis for measurement</b>	Average monthly salary for last 12 months of employment or subsequent 24 months of the last 12 years of employment, as chosen by the pensioner-to-be.
<b>Measure of payment</b>	Disability groups 1 and 2 as pensions 3 group, 85% of the basis for measurement (3,000 zł) plus 50% of surpluses exceeding the amount plus 1% of the basis for measurement for each full year of employment in Poland exceeding 20 years.

<b>Conditions of receiving pension and allowance</b>	<b>Family Pension</b>
<b>Basic criterion</b>	<p>For family members in the case of employee's death:</p> <ul style="list-style-type: none"> <li>- children under 16 (25 if still studying) or without restrictions if disability occurred before the age of 16 (25);</li> <li>- widow (or widowed) if over 50 (widow) or 65 (widower) or if person takes care of child under 16 (18 if still studying, without restriction if the child is disabled) or when disabled himself;</li> <li>- parents, when supported previously by the deceased and meet same requirements as for widow or widower.</li> </ul>
<b>Basis for measurement</b>	Average monthly salary for last 12 months of employment or subsequent 24 months of the last 12 years of employment, as chosen by the pensioner-to-be.
<b>Measure of payment</b>	85% of the basis for measurement (3,000 zł) plus 50% of surpluses exceeding the amount (for every person entitled it grows by 5% of the measurement basis).
<b>Additional payments</b>	A pension is complemented by family, care, state distinction benefits; a family pension can include allowance for orphans. Care allowance is granted to a member of disability group 1, or to a pensioner over 75.