Demography and Federal Elections in Germany, 1953–1990—and Beyond

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In recent years growing differences in voting between older and younger voters have been observed in Germany. Cohort analytic techniques are used here in order to break up such differences into those that reflect either life cycle or generational effects on turnout and the vote. The data base is a unique set of official statistics that has been collected in Germany since 1953 by marking a random sample of ballots according to sex and age of voters. The analysis shows that both life cycle and cohort factors have had a significant and systematic impact on turnout and the probability of a vote for each party. It is also demonstrated that the growing polarization by age of the vote for some parties primarily reflects generational disparities, not an increased importance of the life cycle. Finally, the impact of such demographic factors on the electoral performance of the parties from one Bundestag election to the following one is assessed, and a forecast of these effects up to the year 2006 is presented.

Differences in age among the electorates of German political parties have repeatedly been observed. In the first wave of the 'Wahlstudie (Election Study) 1987',[1] for example, the mean age of eligible voters was found in a representative poll to be 46.4 years. The average age of CDU/CSU (Christian Democratic Union) voters was exactly 50 years, that of SPD (Social Democratic Party) voters 45.6, for the FDP (Free Democratic Party) it was 47.9, and for the Greens 30.5. An exit poll conducted by 'Forschungsgruppe Wahlen' on 2 December 1990, showed that 32.7 per cent of CDU voters were 60 years or older, 23.7 of the SPD and 23.9 per cent of the FDP electorate, but only 3.5 per cent of those who voted for the Greens. On the other hand, voters under 30 years of age made up only 16.6 per cent of the CDU electorate, 23 of SPD and 17.9 per cent of FDP voters, and 42.7 per cent of those who voted for the Greens.[2]

Such observations lead to questions that are relevant not only analytically, but also in practical political terms. Since in the early years of the Federal Republic such dramatic age differences in voting were not reported, the first question is whether age has over the decades become an important cleavage of German electoral politics, and, if so, why. A second key question asks for the consequences that these age differences in voting have had, and will have, on the electoral performance of political parties over time. These questions cannot be answered by methodologically unsophisticated interpretation of a few cross-sectional findings.

They rather call for a cohort analytic approach, which can separate voting differences by age into those that are attributable to the life cycle (i.e. to ageing) and those that are due to generational (or cohort) factors, and which requires the use of data for a longer period of time.

An attempt will be presented here to perform such a long-term cohort analysis of voting for the German case, using the data from representative electoral statistics up to 1990. First, these data will be described. Following that we will report the results concerning the relative importance of these different demographic effects for turnout and the share of votes going to the parties. Only then will it be possible to move from cross-sectional to a dynamic analysis, and to ascertain what bearing these effects have had from one Bundestag election to another. The last step in the analysis will be an attempt to forecast demographic influences on election outcomes up until the year 2006.

The Data

Our data come from representative electoral statistics ('Repräsentative Wahlstatistik') for the Bundestag elections from 1953 to 1990. We are dealing here with a peculiarity of (West) German electoral statistics that exists since 1953. In certain randomly chosen electoral districts, in which between 3.5 and 4 per cent of eligible voters reside, turnout and votes cast are officially registered in terms of age and sex.[3] This is made possible through differentiated imprints on the ballots of the individual sex/age voter groups. Since 1972 turnout and votes have been recorded for ten and five age groups, respectively.[4] The large size of the sample virtually eliminates sampling errors. The data are further strengthened by the fact that they come not from interviews, but from the actual ballots. Therefore, certain problems of reliability and validity, such as the unwillingness of some people to reveal their voting to an interviewer, do not exist.

The data have already been described and summarized several times (Jesse, 1975, 1987). In addition, they have also been used to correct polling results for forecasting purposes (Rattinger and Ohr, 1989). Surprisingly enough though, a more intensive study has not yet been performed on the data, in spite of the fact that they are also extremely well suited for other types of analysis, for example, of split-ticket voting. No attempt at a systematic separation of cohort and age effects (such as is our intention here) has ever been undertaken with these data.

From the official representative electoral statistics a data set was created as follows: for each of the eleven Bundestag elections 1953-90, turnout and voting results were assigned to every age-level, year by year, starting with voting eligibility up until and including 90 years of age. This was done both for grand totals as well as separately for men and women. The reason for this upper age limit is that population statistics in Germany end with a category '90 years and older'. These data for the individual Bundestag elections were joined together, yielding a total number of 788 cases: 70 for each election 1953 through 1969, when the voting age was 21, and 73 for each election 1972 through 1990, when it was 18. In order to capture generational or cohort affiliation, age plus 0.5 was subtracted from the date of the respective election, thus approximating mean year of birth for each age at each election. This assumes, naturally, that births are uniformly distributed throughout the calendar year. Because this estimated mean year of birth is a linear function of age, it does not provide any additional information, and cannot be directly entered

into cohort analytical models. Therefore, ten of these mean birth years were collapsed into one birth decade. Such birth decades were defined for those persons born in the 1860s (1860-69), 1870s, etc., up until the 1970s.

Besides age and cohort effects the basic cohort analytical model posits period effects, that is, effects which influence all people equally during a certain time period, regardless of age or cohort affiliation.[5] Such period effects could simply be expressed as a function of the election year. This, however, would assume linearity or trends of a higher order. It is much more realistic to assume that certain period effects are at hand, which are specific to a given election, and are not subject to any trends. In order to grasp such effects, a zero/one dummy variable was created for each Bundestag election.

For cohort analyses with this data base the cases have to be weighted, since age levels are unevenly filled, in accordance with the population pyramid. Analyses of turnout have to be weighted by the number of eligible voters of each given age, and analyses of vote distributions by the number of those of a given age who actually cast their vote. In order to achieve such weighting, end-of-year data on the age distribution of the German population (both total and separately for male and female) closest to each election were integrated into the data set. The population data cannot, however, be directly applied for weighting, since the total number of eligible voters has changed considerably over the period of this study. If raw population data were used, elections with a higher number of eligible voters would go into the calculations with greater weight than elections with fewer eligible voters. Therefore the mean number of persons of each age was calculated for each election, and the population data for the individual ages were divided by this average. The weights which result from these calculations were used for all analyses of turnout; for each election they average one.

The number of voters of each age is needed for weighting analyses of vote distributions. One could calculate this by multiplying the number of people of each age by turnout, as provided by the official representative electoral statistics. This would lead, however, to considerable miscalculations, as the grouping of turnout into ten age categories yields a distorted picture of the differences between different ages. This would not be much of a problem at middle age, where turnout rates barely change. Considering, however, the well-known phenomenon of increasing turnout in the first decade following eligibility, and the marked decrease at higher age, it is clear that the use of the original data would cause some problems. It would be assumed, for example, that 70 year old people have the same turnout as those 90 years and older.

Therefore, in order to estimate the number of voters, turnout for each age was approximated as follows: first the weighted mean age was calculated for each age category used in the official electoral statistics of turnout. It was then assumed that within the age category lying in the middle of the distribution the change of turnout with age could be approximated as the mean of the turnout differences between this class and the adjacent lower and higher age categories. Finally, approximate values of turnout at each individual age in the adjacent higher and lower age classes were determined by an iterative procedure, such that the curve was forced through each respective weighted mean class age, and that turnout rates were identical for two neighbouring ages that belong to different age categories.

This produces a highly plausible distribution of approximate turnout by age (Fig. 1) which satisfies the criterion that mean turnout (weighted by population) in each
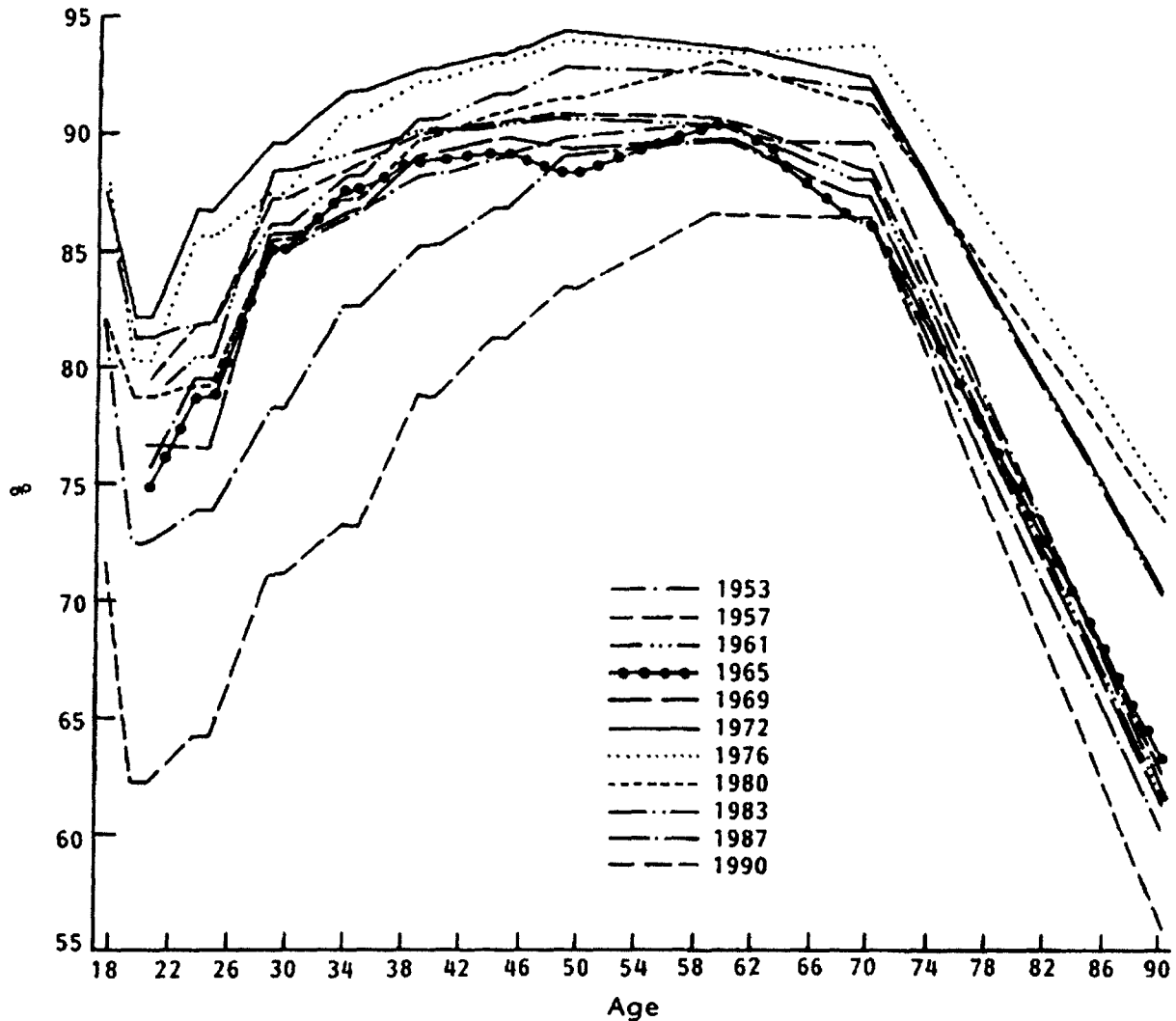
FIG. 1. Approximate turnout by age, 1953-1990

age class must be identical with the official statistics. Multiplying this approximate turnout for each age by the corresponding population figure yields an estimate of the absolute number of voters for that age. Weights for the analyses of vote distributions among the parties can then be calculated (analogous to the procedure described above), so that for each election the turnout patterns according to age will be taken into account through weighting, and each election will enter into the model estimations with the same weight.

This data base is subject to the following problems and limitations:

1. The data base (and therefore the analysis) is restricted to the former Federal Republic, not including West Berlin. Data for all of united Germany are available for the election of 1990, but cohort analysis with only one point of measurement is impossible.

2. Bavaria, Rhineland-Palatinate and Saarland did not take part in the collection of representative electoral statistics in 1953; Saarland did not yet participate in 1957.

3. Since the representative electoral statistics are collected in voting districts, they cannot include absentee ballots. The proportion of such ballots has markedly increased over the years, and the absence of such ballots from the data could lead to errors if there is a difference in voting behaviour (with respect to cohort, age and period effects) between absentee voters and those who cast their ballots in person.

4. Due to the nature of the population statistics persons over 90 years of age are treated in the data as if they were 90 years old. The number of such cases is low, however, and so it is expected that this will have very little bearing on the analyses.

5. The year-end population statistics used here include the residents of West Berlin, who were not eligible to vote in the Bundestag elections prior to 1990. Minor errors could then occur should there be a deviation in the age structure between West Berlin and the rest of the former Federal Republic.

6. These population statistics also include the foreign population of Germany, which is not eligible to vote. Minor errors could come about as a result of differences in age structure between Germans and foreigners living in Germany, especially as the proportion of foreigners in the population has changed considerably throughout the years.

Age, Cohort and Period Effects on Turnout

The approximated turnout rates of individual ages (Fig. 1) were employed for calculating age, cohort and period effects on turnout. Our procedure was as follows: in a first step, turnout rates (total, male and female) were regressed on the dummy variables for Bundestag elections, then on those for birth decades, and then on both sets of dummy variables. In the second stage, age and various arithmetic transformations of age were entered into the regression models in a stepwise routine, such that only statistically significant variables were allowed into the models (these transformations are the second to fifth power of age, the square root, the natural logarithm, the exponential, and the arc tangent of age). The residuals from the final models were saved, and regressed once again on age and all transformations of age just listed, this time with all age variables having been previously multiplied by the distance in time from the Bundestag election of 1953. This procedure allows a determination as to whether age effects change over time. A simultaneous estimation of a possible modification of age effects over time in the first step of the analysis is impossible due to multicollinearity, which is an inevitable complication of cohort analysis. If cohort and time-dependent age effects were to be estimated simultaneously, the latter would absorb much of the explanatory power of cohort membership. It is thus necessary that the cohort effect be fixed when time-dependent age effects are to be estimated.

The results of these computations are reproduced in Tables 1 and 2 and in Fig. 2 and 3. Table 1 shows that all three factors have a very strong influence on turnout.

TABLE 1. Age, cohort, and period effects on turnout (R^2*1000)

	Total	Men	Women
Election dummy variables only	336	337	304
Cohort dummy variables only	473	559	463
Election plus cohort dummy variables only	673	761	659
Election plus cohort dummy variables plus age	926	917	936
Increase R^2 due to age	253	156	277
R^2 residual-regression on time-dependent age variables	014	025	011
Increase R^2 due to time-dependent age variables	001	002	001
Final model	927	919	937

TABLE 2. Net effects of period and cohort on turnout
(deviation from the grand mean in percentage points)

Net effect period Year	Total	Men	Women
1953	0.0	0.3	-0.3
1957	1.2	1.8	0.6
1961	0.7	1.1	0.2
1965	-1.1	-0.4	-1.6
1969	-1.1	-0.6	-1.5
1972	4.1	3.9	4.3
1976	3.9	3.3	4.2
1980	1.4	0.9	1.9
1983	2.4	1.9	2.9
1987	-2.7	-2.9	-2.5
1990	-8.8	-9.3	-8.2

Net effect cohort Birth-decade	Total	Men	Women
1860	-7.2	-3.8	-14.2
1870	-6.3	-3.1	-10.1
1880	-3.5	-1.4	-4.7
1890	-1.6	-1.3	-1.5
1900	-0.7	-1.2	-0.2
1910	0.3	0.2	0.5
1920	1.5	1.4	1.5
1930	1.4	1.0	1.6
1940	0.6	0.1	1.2
1950	-0.9	-0.6	-1.2
1960	-2.8	-1.8	-4.4
1970	-3.0	-2.3	-5.5

Average net effect cohort Year	Total	Men	Women
1953	-0.6	-0.4	-0.8
1957	-0.3	-0.1	-0.4
1961	0.0	0.1	0.0
1965	0.2	0.2	0.3
1969	0.4	0.2	0.5
1972	0.3	0.2	0.5
1976	0.3	0.2	0.5
1980	0.2	0.1	0.2
1983	0.0	0.0	0.1
1987	-0.2	-0.2	-0.3
1990	-0.4	-0.3	-0.6

Period and cohort effects together explain over two-thirds of the variance in total turnout, even more for males. Taking age effects into account leads to an explanation of well over 90 per cent of total variance. On the other hand, the time-dependent age effect does not have any additional explanatory power. Thus it can be concluded that throughout the history of the former Federal Republic the effect of the ageing process on turnout has been fairly uniform.
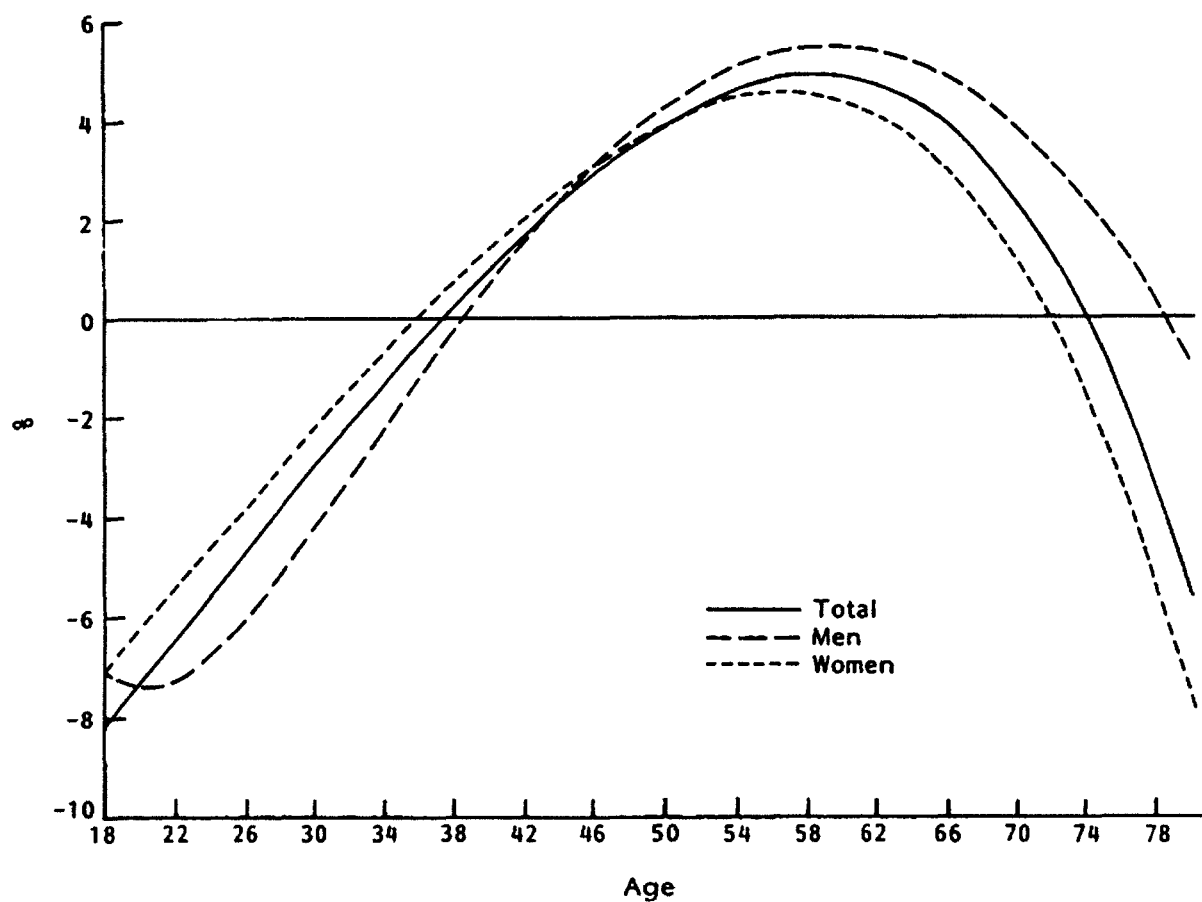
FIG. 2. Net effect of life cycle on turnout

The net effects of periods and of cohort membership are presented in Table 2. They were computed by weighting and averaging the respective elements of the regression models over elections and birth decades, and then subtracting the weighted grand mean. These results show that there is very little difference between males and females with respect to period effects. The Bundestag elections of 1965 and 1969, and again those of 1987 and 1990, were characterized by negative period effects; those elections from 1953 to 1961, and from 1972 to 1983, showed positive period effects, which were especially strong in 1972 and 1976. Examination of turnout of individual cohorts reveals considerable differences between men and women, especially those born before 1890 and after 1959. For these cohorts turnout was markedly lower among women. Persons born between 1910 and 1949 had rates of turnout above average. These age groups are very strongly represented throughout the period of this study; they made up more than half of the eligible voters in the elections from 1957 to 1990, and reached a maximum of 72.3 per cent of the electorate in 1969.[6]

If one computes weighted averages of net cohort effects for each election (that take into account the distribution of voters over birth decades) a clear picture emerges of the effects of changes in the cohort composition of the electorate on turnout (bottom part of Table 2). It increased from 1953 to 1969 because older generations that were less likely to vote disappeared, while at the same time new cohorts with high turnout rates entered the electorate. This trend reversed itself, beginning in 1972, as (now older) cohorts with above average turnout began to suffer attrition, while the young voters coming in (especially those born in 1960 and after) were characterized by below average turnout.
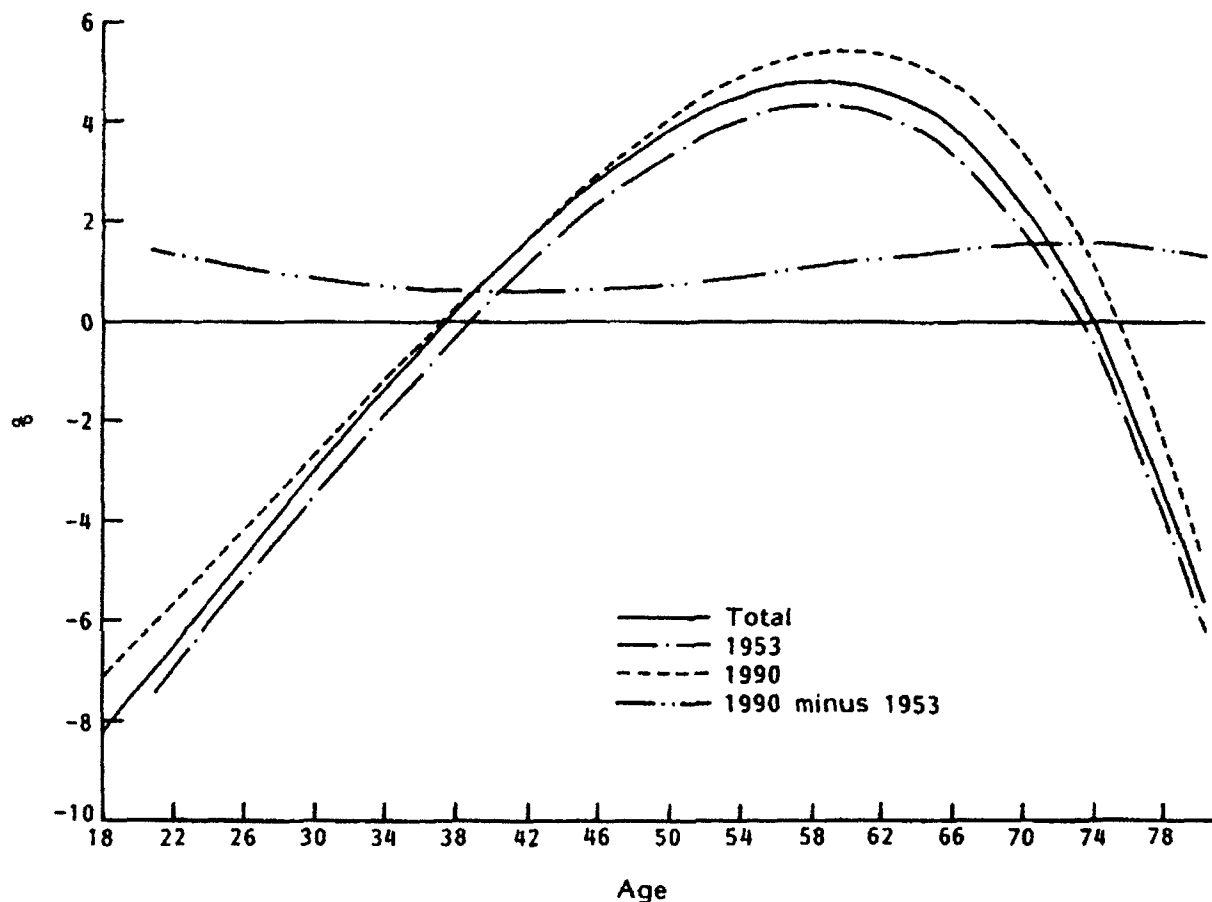
FIG. 3. Time-dependent net effect of life cycle on turnout

Fig. 2 shows the pure life cycle effect, that is, the net effect of age on turnout. The pattern of this relationship, which resembles an upside-down parabola, is well known, not only for Germany. There is, however, a very noticeable difference between men and women. Though both have below average turnout at younger age, that of women is less so than that of men, and women earlier in the life cycle reach above average levels. On the other hand, women also reach their maximum turnout in life earlier than men, and then drop more quickly below average. Women over 72 years old usually turn out below average, whereas for men below average values occur for age 80 or older.

Fig. 3 illustrates just how little the life cycle effect on turnout changed between 1953 and 1990. The displacement of the curves for these two years *vis-à-vis* the aggregate curve is above all a matter of a parallel shift, conditioned by the change in the age structure between the two years: relatively speaking, there were less eligible middle-aged voters in 1990 as compared with 1953, as well as a larger proportion of older voters. The greatest deviation between the curves for 1953 and 1990 is visible for very young voters and those over 60 years of age. In the case of the former, life cycle specific voting abstinence seems to have somewhat decreased from 1953 to 1990, whereas for the latter the retention of higher turnout has shifted in the direction of older age.

Age, Cohort and Period Effects on the Distribution of Votes

All estimations of the various effects on the electoral performance of the parties were conducted analogous to the procedure for turnout. There was one difference.

however. For this analysis of party vote shares, original data from the representative electoral statistics were used as the dependent variable (instead of interpolated values, as for turnout). Before presenting the results it must be pointed out that an analysis for the Green Party is impossible, although it would be extremely interesting in light of its failure to return to the Bundestag in 1990. However, since the Greens have only run in four of the eleven elections dealt with here, no reliable analysis of age and cohort effects is feasible.

Whereas cohort effects on turnout proved to be stronger than period effects, the reverse is true for party performance. In fact, period effects are (with the exception of the CDU/CSU) by far the most important (Table 3). Such effects, specific to the respective elections, are responsible for between 70 and 80 per cent of the variance in the vote shares for the SPD, the FDP, and all other parties combined. Only for the CDU/CSU do period effects play a much smaller role. Cohort effects are weakest for the FDP, but most pronounced for the CDU/CSU, where these effects alone explain a much larger proportion of variance than do period effects. However, a very strong difference between the sexes is apparent here: the performance of the CDU/CSU among males is more dependent upon period effects than on generational factors; among women it is exactly the opposite. All other parties show only minor sex differences in the importance of period and cohort effects.

In the case of turnout the introduction of age led to a substantial increase in the explanatory power of the cohort analytical model. This is not nearly the case for party vote shares. The smallest increase can be seen for the SPD, followed by the combined 'other' parties. On the other hand, for the CDU/CSU and the FDP the

TABLE 3. Age, cohort, and period effects on party vote shares (R^2*1000)

	CDU/CSU			SPD			FDP			Other		
	T	M	W	T	M	W	T	M	W	T	M	W
Election dummy variables only	172	294	265	780	766	817	698	722	674	703	707	707
Cohort dummy variables only	525	215	692	284	199	321	040	021	075	253	265	238
Election plus cohort dummy variables only	795	764	850	887	869	914	803	778	820	893	888	898
Election plus cohort dummy variables plus age	870	851	903	897	875	923	874	855	882	924	917	929
Increase R^2 due to age	075	087	053	010	006	009	071	077	062	031	029	031
R^2 residual-regression on time-dependent age variables	006	007	005	003	003	003	003	003	003	004	004	004
Increase R^2 due to time-dependent age variables	001	001	000	000	000	000	000	000	000	000	000	000
Final model	871	852	903	897	875	923	874	855	882	924	917	929

T: Total
M: Men
W: Women

increment in explained variance is quite visible, and of the same order of magnitude for both parties. The additional introduction of time-dependent age variables yields even less of an increase in explained variance than was the case for turnout. Thus the conclusion can be drawn that throughout the history of the former Federal Republic age effects on voting have remained rather constant.

TABLE 4. Net effects of period and cohort on party vote shares (deviation from the grand mean in percentage points)

Net effect period Year	CDU/CSU	SPD	FDP	Other
1953	-1.1	-8.9	1.9	8.1
1957	4.2	-7.0	-1.0	3.8
1961	-0.6	-2.8	3.9	-0.4
1965	1.1	0.9	0.5	-2.5
1969	-0.7	4.1	-3.4	0.0
1972	-1.8	7.3	-0.8	-4.6
1976	1.7	4.3	-1.2	-4.8
1980	-2.1	4.6	1.6	-4.1
1983	2.7	-0.2	-2.3	-0.2
1987	-1.8	-0.8	-0.3	2.9
1990	-1.4	-2.0	1.3	2.2

Net effect cohort Birth-decade	CDU/CSU	SPD	FDP	Other
1860	-5.9	-1.8	1.1	6.6
1870	-5.7	-1.2	1.3	5.7
1880	-4.1	-1.1	0.9	4.5
1890	-2.7	-0.6	0.3	3.0
1900	-1.6	0.4	-0.1	1.4
1910	0.1	0.4	-0.4	0.0
1920	1.9	0.4	-0.6	-1.7
1930	3.1	-0.1	-0.1	-2.9
1940	2.1	-0.8	1.1	-2.4
1950	-3.6	1.0	0.4	2.1
1960	-5.2	-1.2	-0.5	6.9
1970	-5.2	-3.4	0.0	8.9

Average net effect cohort Year	CDU/CSU	SPD	FDP	Other
1953	-0.9	0.0	0.0	1.0
1957	-0.4	0.0	-0.1	0.5
1961	0.1	0.0	-0.1	0.0
1965	0.5	0.0	-0.1	-0.4
1969	0.8	0.0	0.0	-0.8
1972	0.6	0.0	0.1	-0.7
1976	0.4	0.1	0.1	-0.6
1980	0.1	0.1	0.1	-0.3
1983	-0.1	0.0	0.0	0.0
1987	-0.4	-0.1	0.0	0.4
1990	-0.7	-0.2	0.0	0.8

The election specific period effects[7] on party vote shares do not show a common pattern (Table 4). No clear trends are recognizable for the CDU/CSU and the FDP. A permanent up and down is the rule, although gains of one of these parties are often accompanied by losses of the other. This is a reflection of exchange processes between the two bourgeois parties from one election to another. For the SPD the period effects mirror the 'comrade trend' from 1953 up until the culmination in 1972, after which a downward trend began. For all 'other' parties combined the opposite is true. The period effects show at first a downward trend during the time of the 'electoral miracle' which followed the economic miracle, as such parties vanished from the political scene. The period effects between 1965 and 1980 give a good picture of the heyday of the 'two-and-a-half party system'; a slight deviation being caused here by the success of the National Democratic Party (NPD) in the Bundestag election of 1969. The favourable performance of the Green Party in the elections of 1983 and 1987 is recorded by the reversal of this downward trend during the 1980s.

An examination of the cohort effects reveals an above average attraction to the FDP and 'other' parties on the part of those voters born before 1900 (to the detriment of the two major parties). The three birth decades of those born between 1910 and 1939 exhibit an opposite effect—an above average tendency towards the two main parties (especially the CDU/CSU), and below average inclination towards the FDP and other parties. The positive cohort effect for the CDU/CSU is most pronounced among those voters born in the 1930s. Of all birth decades this group made up the largest proportion of voters in the Bundestag elections between 1961 and 1987 (between 18 and 21 per cent). A stable pattern is not ascertainable for the younger generations of voters. For those born in the 1940s, the aversion against the other parties still is almost as strong as for those born in the 1930s. Here, however, support for the SPD is below average, whereas the CDU/CSU and especially the FDP enjoy above average success. The 'fall' of the CDU/CSU and the 'rise' of the combined 'other' parties begin to set in with those voters born in the 1950s. The SPD and FDP maintain their above average shares in this most 'social-liberal' of all cohorts. Finally, the two major parties receive below average votes from the most recent cohorts (born in the 1960s and 1970s); this is especially true for the CDU/CSU. On the other hand, among these youngest generations the highest of all positive cohort effects are obtained for the combined 'other' parties.

For this author the most remarkable finding of this survey of cohort effects is the clearly above average preference for the CDU/CSU of those born between 1920 and 1949, coupled with their aversion against the fourth parties. These three birth-decades also distinguish themselves by the highest levels of turnout (Table 2). From 1965 to 1983 more than half of those who voted in Federal elections belonged to this group, and for 1987 and 1990 these figures still were 49.9 and 49.4 per cent, respectively. Both higher turnout and preference for the CDU/CSU can be explained by the socialization experiences of these cohorts. All of them grew up either during the Third Reich, the Second World War, the post-war period, or during the years of the economic miracle, and after 1945 had their first opportunity to vote in free elections. All of them either experienced the darkest years of German history or the immediate aftermath first hand, or else were during their years of socialization in the early period of the Federal Republic still strongly affected by it through their parent generation.

This clearly acted as an important prerequisite for internalizing the democratic norm to turn out ('Wahlrecht=Wahlpflicht' is the German shorthand). As far as party preference is concerned, the CDU/CSU became known to these cohorts as the party of the economic miracle, the first two-denominational Christian people's party in Germany, but also the only really *new* political party in the new republic. All of the other parties carried on traditions from the Weimar Republic and earlier, in many cases even in their names. By contrast, these traumatic historical experiences did not play as much of a role in the socialization of those Germans born later, and as a result the CDU/CSU came to be seen by such voters no longer as a 'new' party, but rather as an established party which had been continually in power. In this regard a parallel can be seen between the above average affinity for the CDU/CSU on the part of those born between 1920 and 1949, and that of those born 1960 and later for the 'other' parties (mostly the Greens, of course): 'new' parties (with new issues, that are relevant for the respective generations) seem especially to attract younger and first-time voters, and this attraction can prove to be resistant against changes during the life cycle, as these exceptionally CDU/CSU-friendly age groups illustrate.

If we calculate the weighted average of cohort effects for individual elections, we see that the age composition of the voters had virtually no impact on the performance of the FDP and SPD. Such is not the case for the Christian Democrats: 1953 and 1957 the age composition of voters was still disadvantageous for them, from 1960 to 1980 the age structure of the electorate led to above average shares of the votes. The pinnacle of this process was reached in 1969. Since 1983 the cohort composition of the electorate has been turning increasingly against the CDU/CSU, as 'friendly' age groups exit and are replaced by voters less well disposed towards this party. For the combined 'other' parties the cohort effects over time run in exactly the opposite direction. They experienced above average electoral success in the 1950s not only as a result of election specific effects, but also because older cohorts still in the electorate at that time were especially attracted to them. The composition of the electorate in the 1960s and 1970s led to hard times for these parties, and in the 1980s they benefited from a reversal of this trend.

Due to the large numbers of categories, graphic presentation of life cycle effects on the distribution of votes among the parties again is appropriate. Fig. 4 shows this effect on the electoral prospects for the CDU/CSU. For each age, the deviation of the CDU/CSU share of the vote from the grand mean (controlling for period effects and generational affiliation) is reproduced, analogous to Fig. 2 and 3 for turnout. To put it another way: Fig. 4 shows how strongly below or above average the probability of a vote for the CDU/CSU lies at each age, where the average of these deviations (weighted by the number of voters at each age level) equals zero.

Below average support for the CDU/CSU is found among voters up until 50 years of age; above average support is found among those 50 years and older. Among younger voters the probability of casting a vote for the CDU/CSU first decreases with increasing age, reaching a minimum between the ages of 30 and 35. Thereafter a vote being cast for the CDU/CSU becomes more likely with growing age. This age effect is noticeably weaker among men than among women: younger men reject the CDU/CSU less strongly than younger women do, and with age the tendency of women to vote for this party gets even more above average than that of men. As has already been mentioned, the calculation of a time-dependent age effect did not contribute any great additional explanatory power to the model.
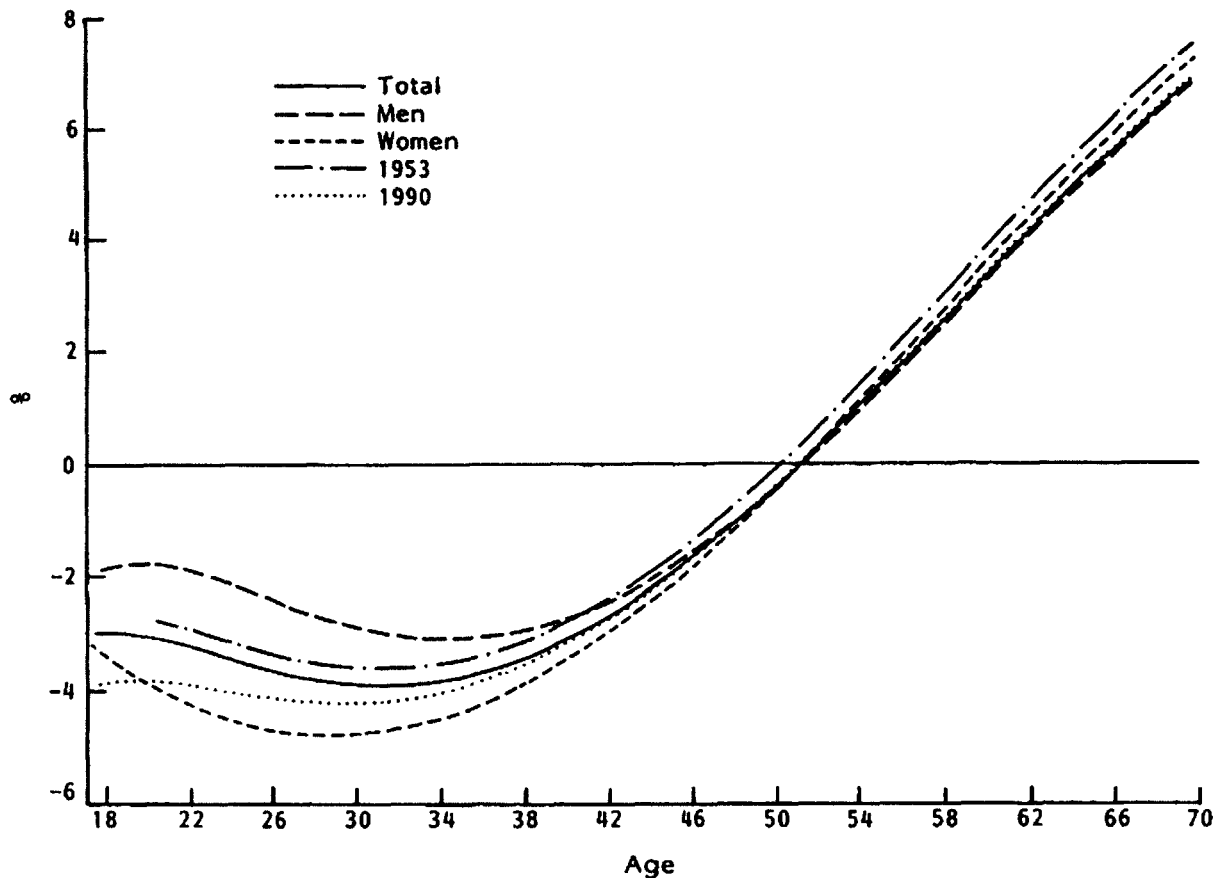
FIG. 4. Net effect of life cycle on CDU/CSU vote share

However, it appears that the tendency of younger voters towards below average support for the CDU/CSU has somewhat increased from 1953 to 1990.

The age effect on SPD voting runs in exactly the opposite direction (Fig. 5). The probability of such a vote decreases monotonously with growing age. This decrease occurs very quickly at the beginning, reaching average probability at around 44 years of age, thereafter the probability of a vote for the SPD is below average. The loss of votes due to increasing age is considerably more pronounced among women. Younger women turn out for the SPD more above average than men of the same age, and older women vote SPD more strongly below average than older men. The age at which above average support for the SPD turns into below average support shifted downward between 1953 and 1990, that is, the curve for 1990 slopes downward steeper at the beginning, and is flatter at the end, than the curve for 1953. In other words: the probability of a vote being cast for the SPD decreased especially among voters of middle age (35 to 55) between these two elections.

The age effect for the FDP shows a totally different pattern (Fig. 6). Average to slightly below average votes for the FDP characterize the youngest voters. Above average shares of the vote begin at just below 30 years of age, and the maximum is reached at a little over 40. Thereafter the FDP percentage decreases monotonously with growing age, moving below average at around 60 years of age. While at each given time the CDU/CSU is more the party of older people, and the SPD the party of younger voters, the FDP is the party of middle age. Men and women differ here systematically as well. Younger women vote above average for the FDP more strongly than men of the same age, and at greater age the
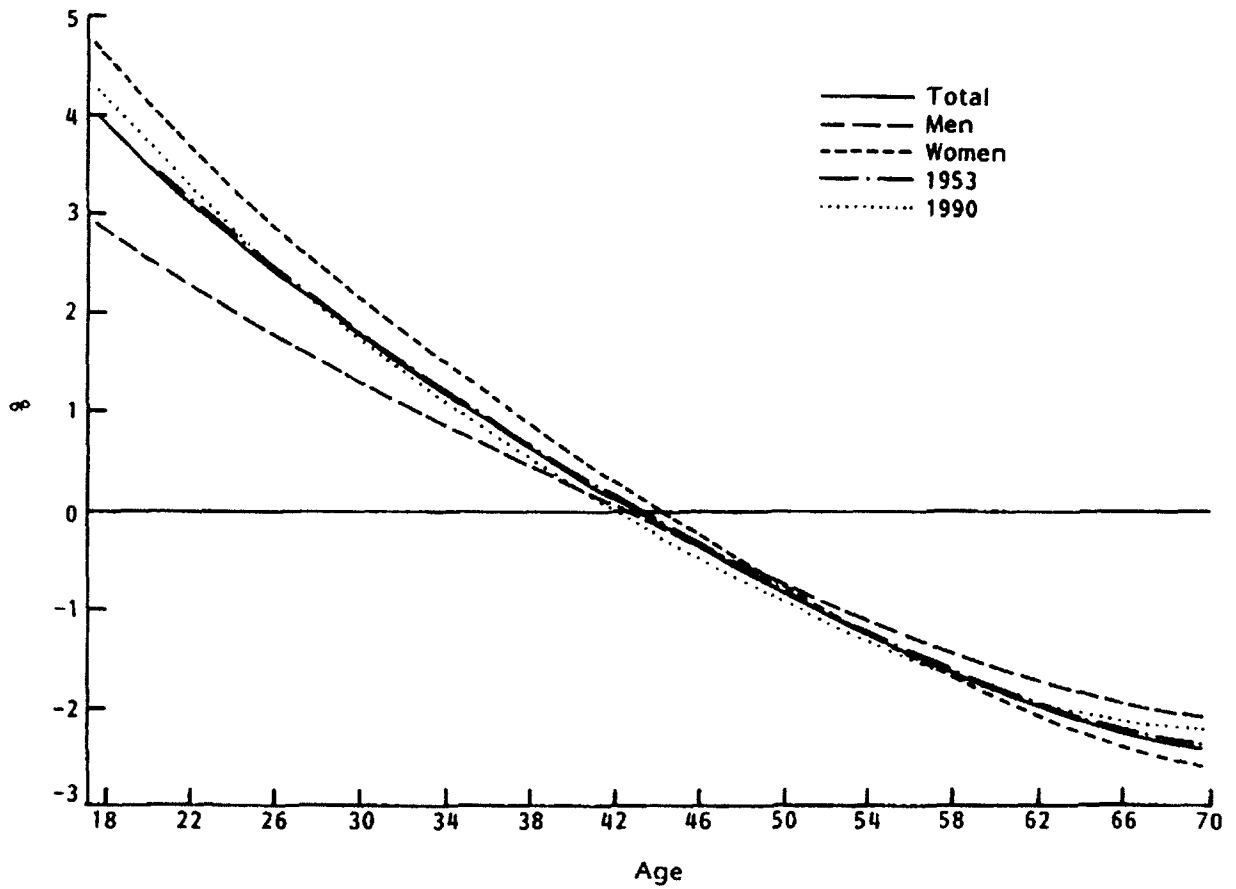
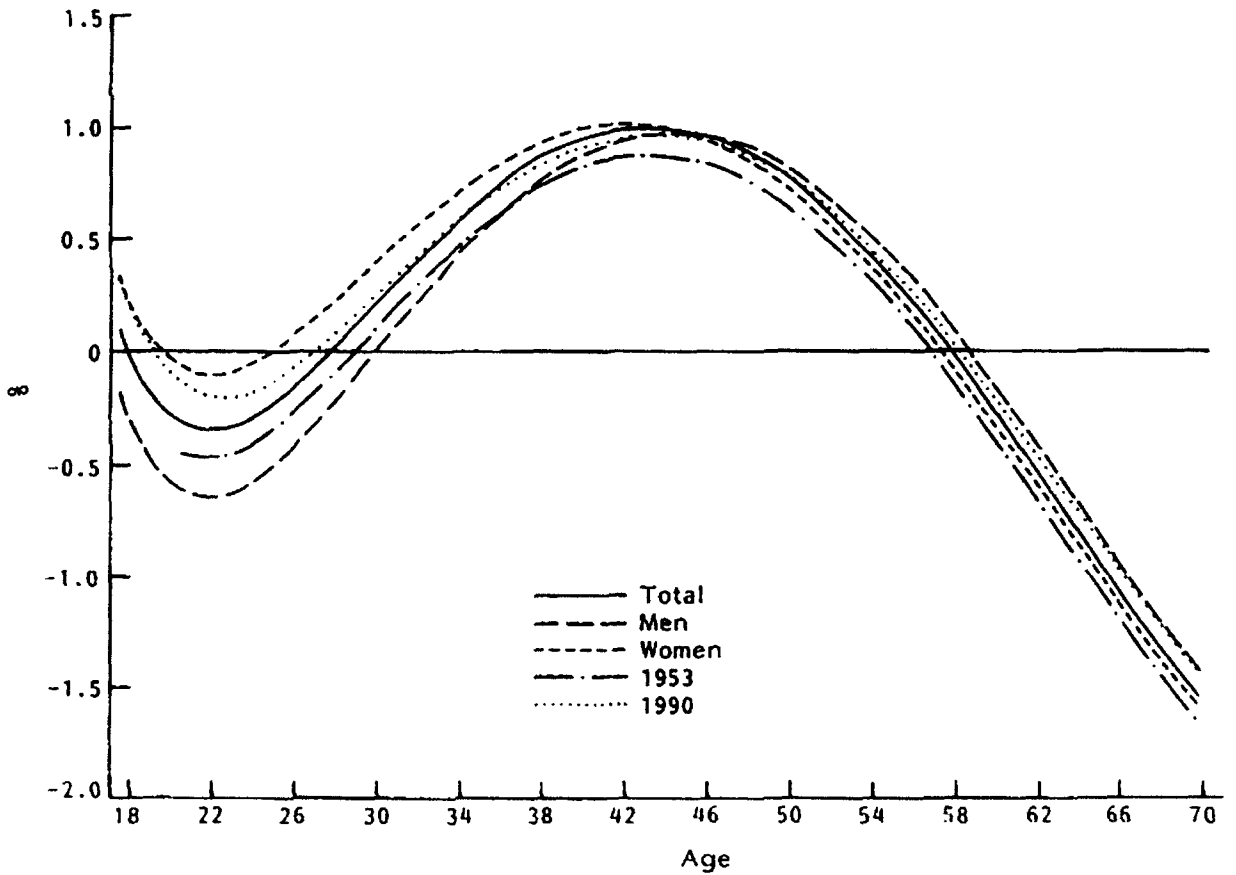Fig. 5. Net effect of life cycle on SPD vote share

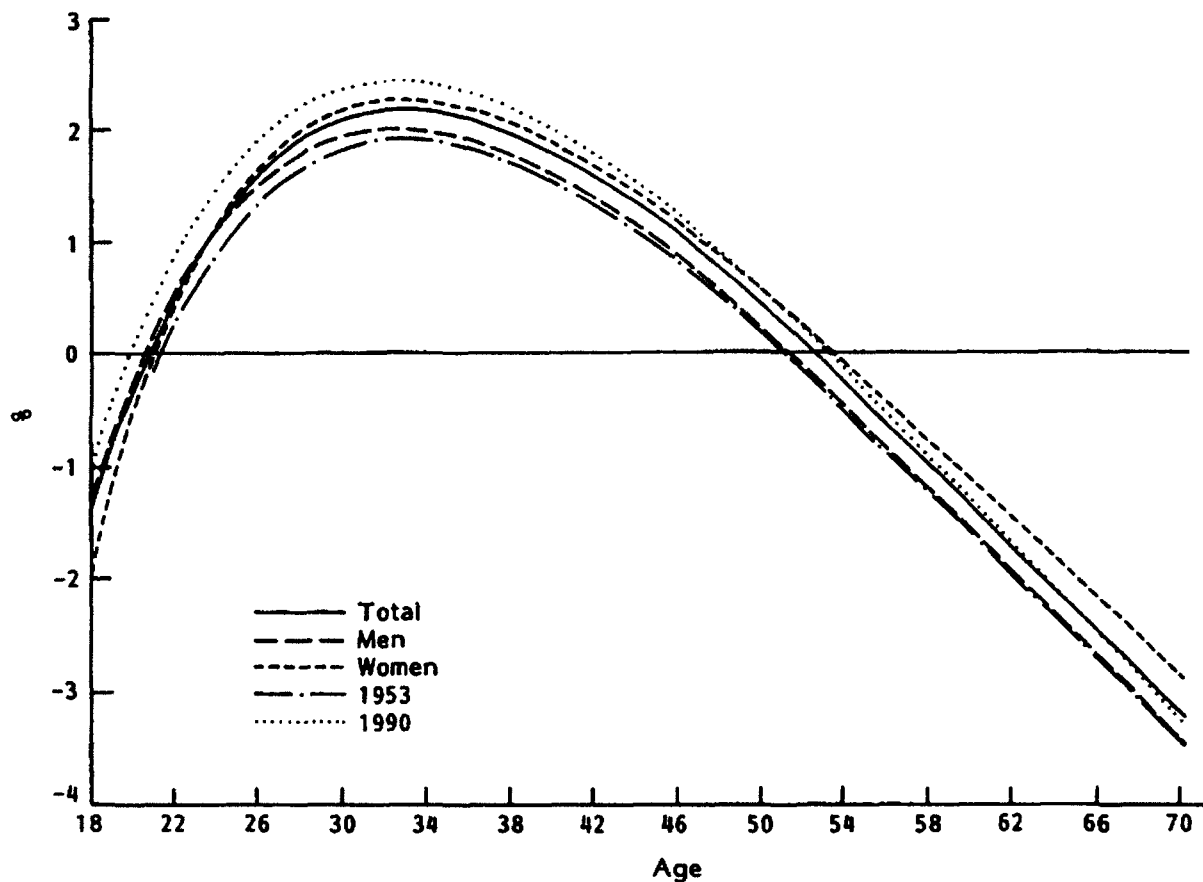Fig. 6. Net effect of life cycle on FDP vote share

FIG. 7. Net effect of life cycle on vote share of 'other' parties

relationship is exactly the other way around. The calculation of a time-dependent age effect, finally, leads to the conclusion that the aversion of the youngest voters against the FDP has disappeared to such an extent between 1953 and 1990 that the early phase of the life cycle now is no longer characterized by below average FDP voting.

The age curve for all 'other' parties combined is similar to that for the FDP (Fig. 7). The major differences are that the vote for these parties is below average among very young voters, and that the maximum above average percentages are reached considerably earlier in the life cycle (between around 30 to 35 years of age). Below average values are then reached again earlier in the ageing process. There are barely any differences here between men and women. Only at a greater age can it be seen that men vote for these parties more strongly below average than women. The most notable change between the beginning and end point of our period of analysis is an increased tendency of middle-aged persons to vote for these 'other' parties.

Polarization of Voting Behaviour by Age

These results allow us to see age differences in voting behaviour in a new light. Such differences are often reported and commented upon. However, without the analysis conducted here it is impossible to separate them into those elements which can be attributed either to age or to membership in particular generations. Lacking such an analysis there is the very real danger that increasing differences
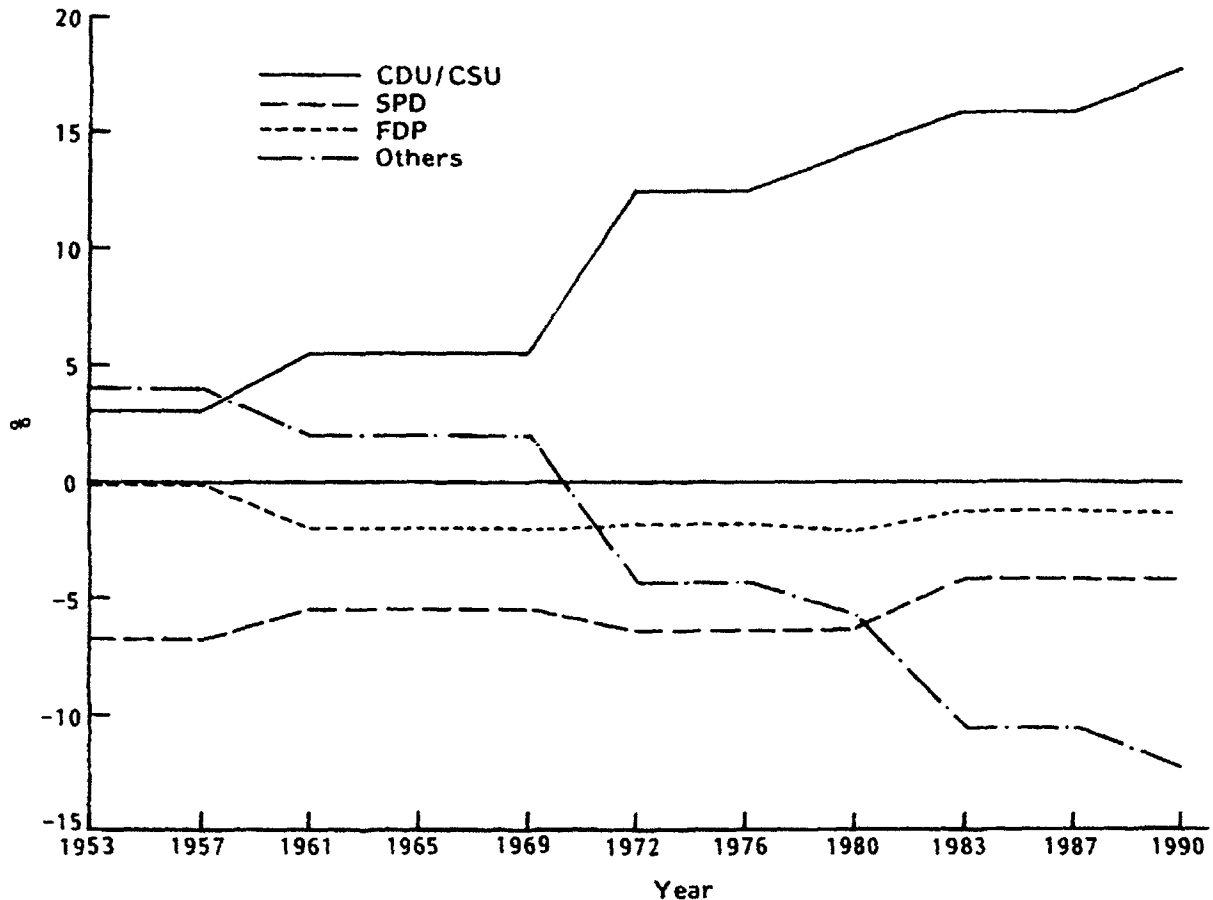
FIG. 8. Party vote shares for 70-year-old minus for 21-year-old voters

in voting patterns among different age groups get misinterpreted as growing polarization of voting behaviour within the life cycle, even though this development might have in reality been caused more by polarization between different generations of voters.

Based upon the analysis pursued here we can avoid this danger. From the estimated cohort analytic models we can derive predictions for the distribution of votes among parties for each election and age level. In addition, partial predicted values can be computed from either the age or the cohort portion of the model. Thus it can be determined for any two age levels for any election to what extent their deviation in the vote can be attributed either to differences in age or to membership in different birth cohorts. The results of such calculations are presented in Fig. 8 and 9.

Fig. 8 depicts the total differences in voting behaviour between 21 and 70-year-old voters. Keeping in mind our earlier findings concerning the net effects of age and cohort membership on the proportion of the vote for the FDP, it is not surprising that a clear polarization of voting by age cannot be detected for this party. Up until 1957 there was no difference between 21 and 70 year olds in the FDP vote, whereas after 1957 the proportion of the vote going to the FDP was one to two percentage points lower among the latter. This can be attributed mainly to the negative age effect. Until 1957 this effect was compensated for among older voters by a positive cohort effect, but in later elections this was no longer the case (Fig. 9).
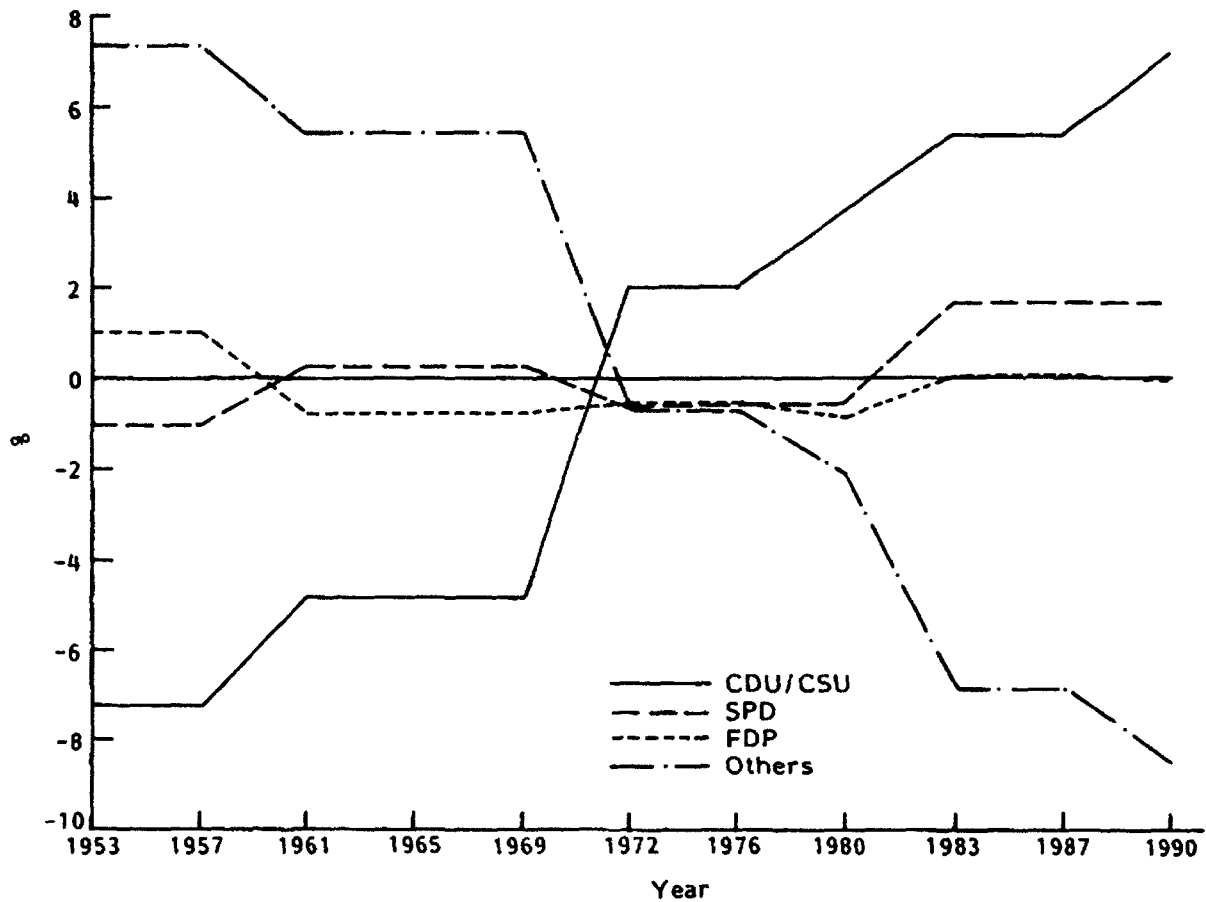
Fig. 9. Difference in party vote shares between 70 and 21-year-old voters accounted for by cohort affiliation

The polarization of the SPD vote between old and young voters decreased somewhat over the history of the Federal Republic. In 1953 and 1957 the SPD vote among 70-year-old people was still seven percentage points lower than among those 21 years old. From 1961 to 1980 there was a difference of between 5.4 and 6.3 percentage points; since 1983 it has been about four percentage points. This decline in polarization must be a result of cohort affiliations, since the age effect barely changed over this period. Until 1957 the proportion of SPD voters among 70 year olds was, as a result of cohort membership, one percentage point lower than among 21 year olds, so that the negative age effect was boosted. In the elections that followed up to 1980, the different cohort affiliations of the two age groups played practically no role for the SPD vote. Since 1983, however, differences in cohort membership have made for a one-and-a-half percentage points higher proportion of SPD votes among 70 year olds than among 21 years old voters, which implies a partial compensation of the negative age effect. In comparison, the SPD share of the vote was only little polarized by age in the last three Bundestag elections, whereas up until 1961 such polarization was found to be stronger for the SPD than for any other party.

The historical pattern for the CDU/CSU and the smaller parties combined presents a mirror image. The difference in the CDU/CSU share of the vote between the 70 and 21 year olds remained under six percentage points from 1953 up to and including 1969. Beginning in 1972 this difference began to increase strongly in the case of the CDU/CSU, followed later (due to the appearance of the Green Party on

the political scene) by these 'other' parties (Fig. 8). As Fig. 9 shows, this was primarily caused by differences in cohort membership. Up until 1969 70 year olds voted CDU considerably less often than did 21 year olds, which can be attributed to different generational affiliation. Their cohort-specific difference was over seven percentage points in 1953 and 1957, and slightly less than five percentage points from 1961 to 1969. This compensated for the positive age effect to a large extent. Since 1972 this has no longer been the case. Due to generational affiliation the probability of 70 year olds voting for the CDU/CSU has been higher than that of 21 year olds, with a steadily increasing trend. Age and cohort effects have mutually reinforced each other, leading to a difference in the CDU/CSU share of the vote between 70 and 21 year olds of over 15 percentage points ever since 1983, in 1990 this figure even reached almost 18 percentage points.

At the same time, an inverse development is apparent for the combined 'other' parties. The age effect results in older voters tending less towards such parties than young ones. However, in the elections up until 1969 older voters belonged to birth cohorts which were especially attracted to these parties, and for this reason higher proportions of older than of younger voters were supporting them. The difference between 70 and 21 year olds was around four percentage points in 1953 and 1957, and two percentage points from 1961 to 1969. Beginning in 1972 the mutual reinforcement of age and generational effects detected for the CDU/CSU in more recent years also comes into play, this time, however, in reverse direction. The difference caused by cohort affiliation in the proportion of the votes of 21 and 70 year olds going to these 'other' parties increased to over 8.5 percentage points by 1990, together with the age effect resulting in a total difference of more than 12 percentage points.

Three conclusions can be drawn with respect to the polarization of voting behaviour by age in the 'old' Federal Republic. First, this polarization in total has increased. This occurred in two distinct 'thrusts': one in 1972, when voting eligibility was lowered to 18 years, and the second in 1983, when the Green Party entered the Bundestag for the first time. Secondly, the individual parties have been subject very unevenly to this development. In the 1950s it was the SPD which was most affected by age group differences. Since 1972 this has been the CDU/CSU, with an increasing trend, and beginning in 1983 the same can be observed for the combined 'other' parties in a comparable order of magnitude.

Finally, it would be a mistake to interpret the increase in polarization by age for the CDU/CSU and the 'other' parties as evidence of a growing influence of the life cycle on voting behaviour. Such an interpretation would ignore that in each election differences in voting between two age groups are a result not only of age differences, but also of different cohort affiliations. Our findings prove that the growing differentiation of vote shares for the CDU/CSU and the 'other' parties among voters of different age has very little to do with an amplification of the ageing effect and very much with an intensification and reversal of the differences in voting behaviour between different generations. During the first 20 years of the existence of the Federal Republic, life cycle differences in voting were mitigated by the cohort affiliations of the respective young and old voters of that time. In the 20 years that followed, life cycle differences were increasingly amplified by generational factors. Therefore it would be incorrect to describe 'age' as an emerging cleavage in voting behaviour in Germany. Those differences in voting that can be traced exclusively to age have barely changed over the past 40 years. In the case

of those parties for which polarization by age now is highest these differences were for a long time 'hidden' by opposite effects of generational membership, only to be intensified in later years by parallel effects of generational disparity.

From Cohort Analysis to a Dynamic Perspective

Our analysis so far was focused on the individual voter. It has demonstrated to what extent the probability of turning out to vote or of a certain vote in a given election depends on factors specific to that election, on cohort membership, and on the age of the voter at the time of the election. This analysis does not, however, give us any information about changes compared with the previous election, that is, those caused by the ageing of the electorate as well as the entrance into and withdrawal from the electorate of young and older voters, respectively. Therefore, our goal now is to determine the effects of demographic changes on the performance of the parties over time.

Drawing on the results of our cohort analysis we can exactly ascertain the effect between two subsequent elections which ageing had on repeat voters, and which effects arose from new voters entering and older ones exiting from the electorate. The results of such calculations are reproduced in Table 5. The consequences for repeat voters of advancing in the life cycle were determined in each election by computing the mean age effect (weighted by the number of voters of each age) only for those who had already been eligible to vote in the previous election. If, for example, the distance in time between two elections was 3.6 years, then the lowest 3.6 age levels were excluded from the computation of the mean life cycle effect.

The net effect of entry and exit of voters into and from the electorate can be determined by subtracting both this aggregate life cycle effect and the difference in period effects for two subsequent elections from the total inter-election change in the vote share for a given party. The total net effect of exit and entry and of the ageing of repeat voters is obtained by summing these two partial demographic effects. These effects are presented in Table 5 for each election, as well as for the two sub-periods 1953-69, and 1969-90, and for the total period from 1953 to 1990. From these statistics one can conclude that ageing of repeat voters was never of much importance for the FDP or the combined 'other' parties. This is not surprising when one recalls that for both parties the life cycle is first associated with an increase and later a decrease in the probability of a vote (Fig. 6 and 7). A different pattern emerges, however, for the two large parties, with the CDU/CSU benefiting from one election to the next as a result of voters advancing in the life cycle, and the SPD continually losing ground due to this process. Between 1953 and 1990 both these gains for the CDU/CSU and the corresponding losses for the SPD amounted to about 2.8 percentage points.

In order to judge the *total* effect of demographic turnover, however, one must also consider the net effects of voters entering and leaving the electorate. Once again these effects were of minor importance for the FDP, but not so for all other parties. For the SPD they led to gains from one election to another. However, as Table 5 shows, these gains were compensated for with splendid regularity by the negative life cycle effect among the repeat voters. The only substantial exceptions are the elections of 1972, 1987 and 1990. In 1972 so many new voters entered the electorate as a result of the extension of voting eligibility that their above average affinity for the SPD clearly compensated for losses brought about by the ageing of the repeat

TABLE 5. Dynamic analysis of net effects

Net effect of ageing of repeat voters

Year	CDU/CSU	SPD	FDP	Other
1953	0.2	-0.3	0.0	0.0
1957	0.3	-0.3	0.0	0.0
1961	0.3	-0.3	0.0	-0.1
1965	0.3	-0.3	0.0	-0.1
1969	0.2	-0.2	0.0	0.0
1972	0.4	-0.4	0.0	0.0
1976	0.3	-0.3	0.0	0.0
1980	0.3	-0.3	0.0	0.0
1983	0.2	-0.2	0.0	0.0
1987	0.3	-0.3	0.0	0.0
1990	0.2	-0.2	0.0	0.0
1953-1969	1.1	-1.1	0.1	-0.2
1969-1990	1.7	-1.7	0.0	0.2
1953-1990	2.8	-2.8	0.1	0.0

Net effect of entry and exit of voters

Year	CDU/CSU	SPD	FDP	Other
1957	0.4	0.3	-0.1	-0.6
1961	0.5	0.4	0.0	-0.9
1965	0.0	0.2	-0.1	-0.1
1969	0.2	0.1	0.0	-0.3
1972	-0.6	0.7	0.0	-0.1
1976	-0.4	0.3	0.0	0.1
1980	-0.5	0.2	0.0	0.3
1983	-0.4	0.3	0.0	0.1
1987	-0.5	0.1	0.0	0.4
1990	-0.5	-0.1	0.0	0.5
1953-1969	1.1	1.0	-0.3	-1.9
1969-1990	-3.0	1.6	0.0	1.2
1953-1990	-1.9	2.6	-0.2	-0.7

Combined net effect of ageing, entry and exit

Year	CDU/CSU	SPD	FDP	Other
1957	0.7	0.1	-0.1	-0.7
1961	0.8	0.1	0.0	-0.9
1965	0.3	-0.1	-0.1	-0.1
1969	0.4	-0.1	0.0	-0.4
1972	-0.2	0.3	0.1	-0.1
1976	-0.2	0.0	0.0	0.2
1980	-0.2	-0.1	0.0	0.3
1983	-0.2	0.1	0.0	0.1
1987	-0.2	-0.2	0.0	0.4
1990	-0.2	-0.3	0.0	0.5
1953-1969	2.2	-0.1	-0.1	-2.1
1969-1990	-1.3	-0.1	0.0	1.3
1953-1990	0.9	-0.2	-0.1	-0.7

voters. In 1987 and 1990 the reverse was true. The SPD could profit only very little from the influx of new voters, because they voted in great numbers for the Greens. Thus the losses resulting from the ageing of repeat voters could not be compensated for. The net balance of all demographic factors on the SPD vote share for the two periods 1953-69, and 1969-90, is, however, on the whole almost even.

This is totally different with respect to the CDU/CSU and the combined 'other' parties, and there was a clear break here between the 1960s and 1970s. 'Other' parties suffered considerable losses in the first period (1953-69), due to the influx of new voters and the withdrawal of older ones from the electorate. The same demographic changes then led to gains in the second period (1969-90). The slightly negative balance for the entire period (1953-90) conceals the fact that between 1953 and 1969 the 'other' parties lost over 2 per cent of the electorate solely through such demographic shifts, whereas between 1969 and 1990 they produced gains of 1.3 percentage points.

The net effect of the movement of voters in and out of the electorate was exactly the opposite for the CDU/CSU. In the elections up until 1969 it experienced an increase in its vote share as a result of such movements. During these years new groups of voters born in the 1930s and 1940s were entering the electorate, who had an above average attraction towards the CDU/CSU. At the same time, older voters less fond of the CDU/CSU were leaving the electorate. Age effects on the one hand, and the movement of voters in and out of the electorate on the other hand, reinforced each other in such a manner that the CDU/CSU was able to make gains of 2.2 per cent between 1953 and 1969 solely through these demographic shifts. Since 1972 the effect of entry and exit of voters on the CDU/CSU has reversed itself, and has continually overcompensated for the constantly favourable life cycle effect. Accordingly, although there is a slightly positive total balance for the entire period, the CDU/CSU still lost 1.3 per cent of the vote through demographic turnover between 1969 and 1990.

From Dynamic Analysis to Prediction

From the results obtained so far it is possible to forecast the impact of demographic turnover on future Bundestag elections. A 'naïve' prediction would simply project the demographic net effects from previous elections into the future. The resulting forecast would be that, ceteris paribus, the CDU/CSU will further lose votes in future elections (in the former West German states), while the combined 'other' parties would stand to gain, and the SPD and FDP would not be affected in any significant way.

However, such a 'naïve' prediction ignores that we can already reasonably estimate the future age composition of the electorate for coming Bundestag elections. If we assume legislative periods of normal (four year) length, then the eligible voters for the Bundestag elections up to and including 2006 had already been born at the time of the 1990 election. If we further assume that the mortality of individual age groups will in the next four legislative periods remain as it was in 1986-90, we can project the number of eligible voters at each age level until 2006. If we further assume that turnout rates at each age level will remain the same as they were in the Bundestag election of 1990, then we can also forecast the age structure of those who will vote over the next 15 years. This requires, of course, that this age structure will not be changed by any larger influx of eligible voters into the former West German states (e.g., from the former GDR or from Eastern Europe).
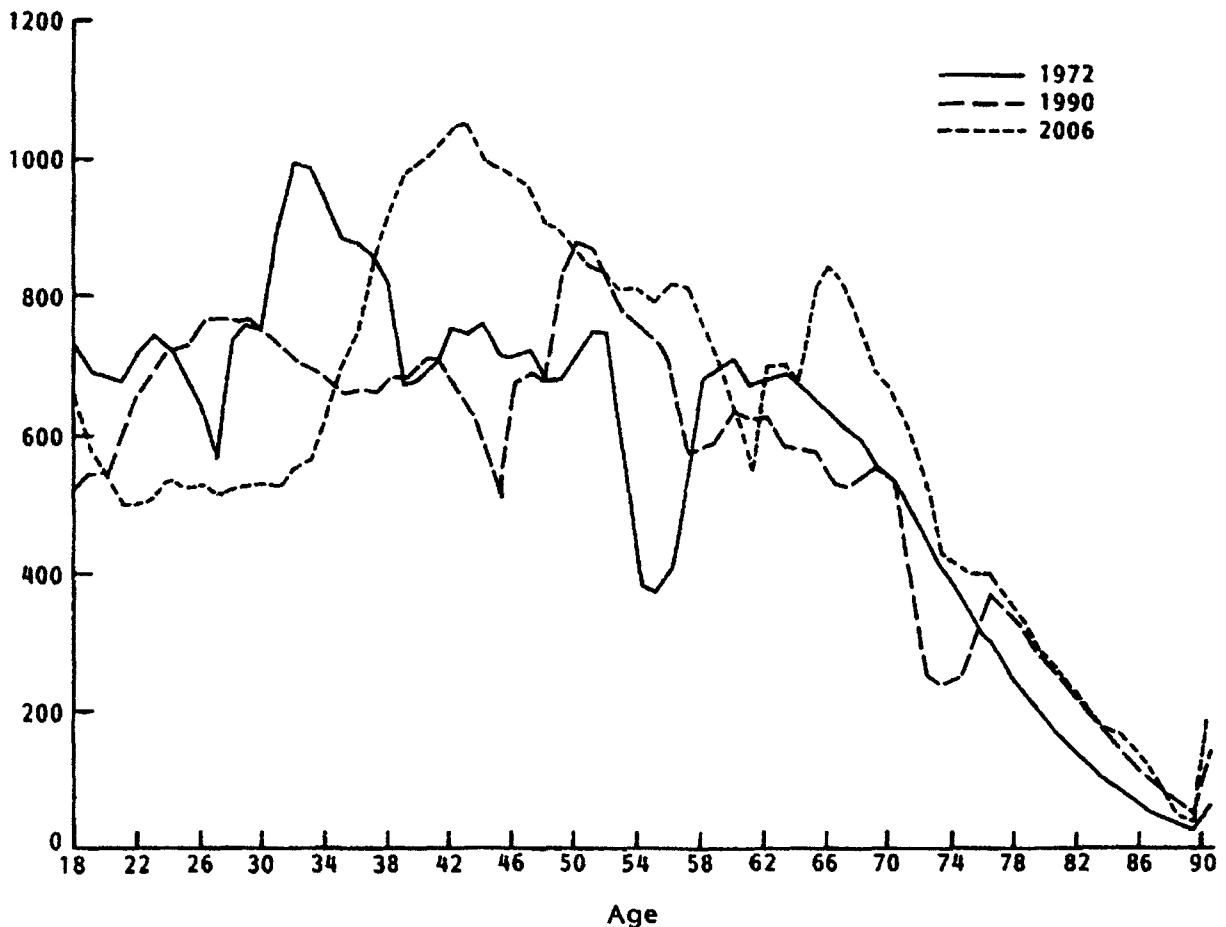
Fig. 10. Voters 1972, 1990, and 2006 by age (in thousands)

The result of this projection of the number of voters into the year 2006 is reproduced in Fig. 10, where it is contrasted against the distributions from 1972 and 1990. One can clearly see that early in the next millennium there will be significantly fewer new voters and considerably more older voters compared with earlier elections. This development is summarized further in Table 6. Whereas the mean age of eligible voters changed only insignificantly between 1972 and 1987, it will continually increase throughout the elections until 2006. The same goes for the average age of those who will actually cast their ballots. On the other hand, the proportion of new voters will significantly decrease as we move up to the election of 1998, hovering afterwards at around 5 per cent of those eligible to vote.

In order to assess the effects of demographic turnover on the individual parties, one needs, of course, to have an idea of what form the age effect and the effects of movements of voters in and out of the electorate will take in future Bundestag elections. For forecasting purposes it was assumed that life cycle effects in 1994 through 2006 would remain unchanged from 1990. This is not an unrealistic assumption, if one considers the fact that time-dependent age effects have proved to be fairly minor in our previous analyses. As to new voters entering and older ones leaving the electorate, the average of this effect for the elections from 1972 through 1990 was used for forecasting, but it was weighted by the percentage of new voters for each predicted election as compared with the mean share of first-time voters between 1972 and 1990, since declining proportions of such voters naturally lead to a moderation of this effect.

TABLE 6. Average age of voters and percentage of new voters 1990-2006

Year	Average age of:		Percentage of:
	Electorate	Voters	New voters
1990	46.2	47.3	5.6
1994	46.9	47.9	4.3
1998	47.6	48.5	4.4
2002	48.2	49.0	4.7
2006	48.6	49.4	5.1

Our prediction (Table 7) was, except for the assumptions just explained, computed completely analogous to the determination of the net effects presented in Table 5, and it does in fact differ quite considerably from the 'naïve' projection. Once again demographic turnover will have no effect on the FDP. For the CDU/CSU the ageing of the electorate will act to bring the trend of the past two decades to a halt and then reverse it. The aggregated life cycle effect to the advantage of the CDU/CSU will get stronger and stronger, and will increasingly over compensate for the negative effect of the entry of new voters into the electorate. Demographic turnover will result in no changes for the CDU/CSU between 1990 and 1994, which

TABLE 7. Forecast of net effects until 2006

Net effect of ageing of repeat voters				
Year	CDU/CSU	SPD	FDP	Other
1990	0.2	-0.2	0.0	0.0
1994	0.3	-0.3	0.0	0.0
1998	0.4	-0.4	0.0	0.0
2002	0.5	-0.4	0.0	-0.1
2006	0.7	-0.5	0.0	-0.2
1990-2006	1.8	-1.6	0.0	-0.3

Net effect of entry and exit of voters				
Year	CDU/CSU	SPD	FDP	Other
1990	-0.5	-0.1	0.0	0.5
1994	-0.3	0.2	0.0	0.1
1998	-0.3	0.2	0.0	0.1
2002	-0.3	0.2	0.0	0.1
2006	-0.4	0.2	0.0	0.1
1990-2006	-1.3	0.8	0.0	0.4

Combined net effect of ageing, entry and exit				
Year	CDU/CSU	SPD	FDP	Other
1990	-0.2	-0.3	0.0	0.5
1994	0.0	-0.1	0.0	0.1
1998	0.1	-0.2	0.0	0.1
2002	0.2	-0.2	0.0	0.0
2006	0.3	-0.3	0.0	-0.1
1990-2006	0.7	-1.0	0.0	0.2

means that it will not suffer from demographic factors for the first time since 1972. Later it will benefit from a strong life cycle effect and from the small number of young voters, so that, *ceteris paribus*, it stands to gain by 0.7 percentage points from 1994 to 2006 exclusively due to demographic factors. If life expectancy would increase further, so that older voters would remain longer in the electorate (which is not improbable), then the prospects for the CDU/CSU will be even better.

Contrary to the 'naïve' projection, the losers from demographic turnover will be the Social Democrats, and not the CDU/CSU. The aggregated life cycle effect will get stronger for them as well, however, as it is negative this will be to their disadvantage. Due to increased ageing of the electorate and shrinking numbers of new voters the SPD can expect to lose 1 per cent of the vote between 1990 and 2006 solely as the result of demographic developments. Increasing life expectancy would darken the prospects of the SPD even further. The combined 'other' parties will also profit to a certain extent from these SPD losses.

This prediction cannot, of course, extend to whether a party will present the 'right' issues or the 'right' candidate in a future election. What it shows, however, is that the fact that younger and new voters vote for a party above average does not necessarily allow the conclusion that this party will perform well in future elections. That the Social Democrats have found a relatively better echo among younger voters for a long time now is not something which needs to be debated. However, due to a negative life cycle effect, the increased ageing of the electorate, and the declining proportion of young voters, the SPD will lose most from the demographic turnover which will be occurring in the next one-and-a-half decades, and the biggest winner will be the CDU/CSU.

Conclusion

The unique tool of the German representative electoral statistics makes it possible to calculate precisely the long term consequences of demographic changes on the electoral performance of political parties. Since poll data are not being used (hence no sample errors), the analysis of these data leads to highly accurate results. The study presented here can be continued and expanded upon in many different respects. One could, for example, conduct this analysis separately for individual German states (Länder), in order to track regional differences of the patterns laid out here. The analysis can and should also be updated, of course, following each future Bundestag election, because the more observation points we have, the more reliably we can calculate the breakdown of period, age and cohort effects.

Concerning this last point, however, a problem is posed by the unification of Germany. It is obvious that for including the first all-German election of 1990 into this analysis only the ten former West German states could be used; our prediction also deals only with this part of Germany. It appears that things will have to remain that way at least until seven or eight all-German elections have been held. Only then will it become possible to comparatively evaluate the all-German representative electoral statistics from 1990 onward with a sufficient number of observations available. That the cohort analytical approach employed here requires a longer series of elections for obtaining meaningful results also is the reason why no attempt was made here to evaluate the relative impact of age and cohort effects on the electoral performance of the Green Party. In the case of the Greens, too, it will be necessary to wait for a longer time before any such calculations can be

made. Should the Greens, however, gradually wither away in the aftermath of their debacle of 2 December 1990, the cohort analytical question would be answered sooner and without quantitative analysis, as then it would be evident that they would have predominantly owed their two trips to the German Bundestag to period effects.

Notes

1. Zentralarchiv für empirische Sozialforschung, University of Cologne, Study No. 1537 N=1954, own calculations.
2. Report of 'Forschungsgruppe Wahlen', Mannheim, No. 61. The figures are for the western electoral region, i.e. eleven 'former' West German states, including West Berlin.
3. For a detailed description of procedures and results see Statistisches Bundesamt (1991).
4. The interval limits for turnout are 21, 25, 30, 35, 40, 45, 50, 60 and 70 years (each interval starting at ... years, and older); for votes cast the interval boundaries are 25, 35, 45 and 60 years.
5. For the methodology and problems of cohort analysis, see Converse (1976), Glenn (1977), Mason and Fienberg (1985).
6. The proportion of eligible voters born between 1910 and 1949 was 46.1 per cent in 1953; 52.8 in 1957; 60.8 in 1961; 66.6 in 1965; 72.3 in 1969; 68.7 in 1972; 66.1 in 1976; 62.2 in 1980; 56.2 in 1987; and 52.4 per cent in 1990.
7. From Table 4 onward, separate results for men and women are no longer reported, in order to avoid excessively complex tables, even though the text will occasionally refer to gender-specific differences. A complete set of tables in which all results are broken down by sex is available from the author upon request.

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