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Changes in the distribution of pre- government and post-government income in Germany 1973 - 1993

Arbeitspapier Nr. 20

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1. Introduction

During the two decades from 1973 to 1993, Germany underwent far-reaching economic and political changes. 1973 was the last year with full employment, with an unemployment rate of just 1.2%, while in 1993 unemployment in the western part of Germany had risen to 8.2%. In 1989 the Berlin wall was torn down and in mid-1990 the Federal Republic of Germany and the German Democratic Republic founded a monetary union. In October 1990, with German reunification, the West German legal system, including the regulations for the labor market as well as the entire tax and transfer system, was implemented in East Germany¹, and federalism was introduced in the former German Democratic Republic by forming several new Länder. West Germany paid high transfers to East Germany amounting to up to 5% of West German GDP per year²; these transfers will continue for many years to come.

From 1973 to 1993, National Income per capita increased by 178.5% in nominal terms and by 40.8% in real terms in West Germany; this amounts to an average real increase of 1.7% per year (cf. Table 1). During the first decade, the share of gross wages in National Income rose slightly, and then decreased again. A change in the opposite direction occurred in terms of the share of gross income from self-employment and capital. The labor force participation rate first decreased by 1.2 percentage points, but then increased by almost 5 percentage points. While the share of taxes in Gross National Product diminished slightly, the share of social security contributions increased continuously. The share of taxes and social security contributions in GDP had to be raised considerably from 1988 to 1993 in order to finance the transfers to East Germany.

In 1993, the East German National Income per capita was about 45% lower in nominal terms than that in West Germany. The share of wages in National Income amounting to 93.7% was extremely high compared to West Germany and other typical western industrialized states, while, on the other hand, the share of income from self-employment and capital was very low. The labor force participation rate was 5 percentage points and the unemployment rate 7.6 percentage points higher than in West Germany. Transfers received in 1993 totaled to 28.2% of the household sector's gross income (including the non-profit sector) in West Germany, while this share was 48.6% in East Germany³. Average household size was

¹ An overview of these changes is given in Hauser/Glatzer/Hradil/Kleinhenz/Olk/Pankoke (1996).

² Compare Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (1996).

³ Calculated from Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (1995), Table 33*.

still a little higher in the new Länder than in the old Länder where it had decreased from 2.61 to 2.24 since 1973.

Table 1: Macroeconomic indicators for Germany 1973 to 1993

	West-					East-	Germany
	Germany						1993
	1973	1978	1983	1988	1993	1993	
National Income (NI) per capita (current prices) (DM p.a.)	11 624	16 423	20 808	26 616	32 377	17 816	29 570
Consumer price index (1991=100)	54,0	68,0	86,3	91,4	107,7	125,4	109,8
Share of income from wages in NI (%)	71,4	72,9	74,6	71,5	71,8	93,7	74,2
Share of income from self-employment and property in NI (%)	28,6	27,1	25,4	28,5	28,2	6,3	25,8
Labour force participation rate of the population aged 15 to 65 years (%)	67,4	66,4	66,2	68,8	71,0	76,0	71,9
Unemployment rate (%) ¹	1,2	4,3	9,1	8,7	8,2	15,8	9,8
Share of social benefits in GDP (%) ²	28,2	32,1	32,0	31,2			33,5
Share of taxes in GNP (%) ³	24,5	24,7	23,7	23,2			23,6
Share of social insurance contributions in GDP (%) ⁴	13,8	15,7	16,4	16,6			18,1
Mean household size ⁵	2,61	2,46	2,34	2,22	2,25	2,33	2,27

Sources: Bundesministerium für Arbeit und Sozialordnung (Federal Ministry) (1998): Statistisches Taschenbuch '98. Arbeits- und Sozialstatistik, Bonn, Tabellen 1.9, 2.10, 7.2, 7.6.
Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (Council of Economic Advisors) (1997): Jahresgutachten 1997/98, Bundestagsdrucksache 13/9090, S. 259, 317, 330, 397.
Bundesanstalt für Arbeit (1994): Arbeitsmarkt 1993. Amtliche Nachrichten der Bundesanstalt für Arbeit, 42. Jg., Sondernummer, Nürnberg, S. 12 f.

¹ Officially registered unemployed in % of the sum of employees and unemployed (without soldiers).

² Social benefits (as defined in the Social Budget) in % of Gross Domestic Product.

³ Tax revenue in % of Gross National Product.

⁴ Social insurance contributions (as defined in the National Accounts) in % of Gross Domestic Product.

⁵ 1973 to 1988: resident foreigners excluded. Source: EVS-Databank (Income and Consumption Surveys); own calculations.

One would expect that these far-reaching changes at the macro level had a strong effect on the personal distribution of income. In particular the loss of income from earnings due to the enormous increase in the unemployment rate is supposed to have had the effect of increasing inequality. Income from earnings, however, is the main income only during working life, not for an entire lifetime. The period of childhood is dominated by intra-family transfers. Income during the period of young adulthood usually is a mixture of intra-family transfers, income

from work, from fellowships and other educational benefits. Income in old age is dominated by pension income and income from capital. While unemployment was the most obvious new factor in the period from 1973 to 1988 with an influence on the personal distribution of income, and was especially problematic for those in the working phase of life, it also had an effect on the availability of intra-family transfers, especially to children and non-working spouses. This effect becomes the more pronounced the lower is the level of compensation for this loss of earnings by unemployment benefits or other transfers.

These considerations raise the question of whether the changes in the personal distribution of income differed among persons in households headed by a young adult, persons in households headed by a person in prime working age, and members of households headed by an elderly person. Additionally, one can distinguish within the two non-elderly groups by differentiating those households with no unemployed members from those with at least one unemployed member receiving unemployment benefits. The overall personal distribution of income, however, may have been influenced not only by the increase in unemployment and by changes in the share of gross labor income in National Income, but also by changes in average household size and by changes in the population share of each age group. Therefore, we must look at a variety of factors if we want to formulate hypotheses to explain changes in the personal distribution of income.

The remainder of this paper is arranged as follows: In section 2 we discuss data and methods of our analysis. Section 3 presents an overview of the trend of inequality in the personal distribution of income from 1973 to 1993 in West Germany, and a comparison of the personal distribution of income in West and East Germany in the year 1993. In section 4 we extend the analysis by breaking down overall inequality into inequality within and between three age groups and two sub-divisions according to the employment status of the household members. Finally, in section 5 changes in income inequality are analyzed by a decomposition into changes in within-group inequalities, changes in sub-group mean incomes and changes in population shares. A summary concludes the paper.

2. Methods and Data

If one thinks of the personal distribution of income as an indicator of inequality in individual welfare, one has to assign an income to each person even if he or she does not receive any monetary income of his or her own but is supported within a household by intra-

household monetary or in-kind transfers. This assigned income is called equivalent income. It is a function of the income of all members of the household in which an individual lives and in which he or she shares in the household consumption, and, additionally, of the number and age of household members. The assignment of a share of household income to each member is based on several assumptions:

- a) Household income is shared such that each member enjoys the same level of well-being, taking the differing needs of the various members into account.
- b) The needs of children are fewer than those of adults.
- c) There exist economies of scale if household members live and consume together.

To derive the equivalent income of a household member which may be considered a weighted per capita income, it is necessary to apply an equivalence scale weighting the various members of the household. Although the literature offers several equivalence scales⁴ based on empirical analyses of consumption behavior of households of different size, a value judgement is implicit in any decision for a specific equivalence scale or inequality measure, as the level of individual welfare, strictly speaking, cannot be measured and compared objectively. It is therefore advisable to use an equivalence scale based on the institutional regulations of a country as determined by parliament. As we have shown elsewhere for Germany, the equivalence scale originally used by the OECD offers the closest reflection of its institutions, giving the first adult in a household a weight of 1.0, additional persons over age 14 weights of 0.7, and younger children weights of 0.5⁵. Thus this equivalence scale was applied in our analysis. Please note, however, that some results may be sensitive to the use of this specific scale⁶.

Equivalent income can be defined at the level of pre-government income (also referred to as "market income" in the following) and at the level of post-government income (also referred to below as "net income"). Factors influencing the distribution of equivalent pre-government income include the distribution of wealth, the distribution of human capital, labor force participation of the population at working age, the extent and distribution of the risk of becoming unemployed, the percentage of self-employed individuals in the population, the structure of hourly wages, interest rates and income from self-employment, and, finally, the composition of households. In our explanation of the distribution of equivalent market income

⁴ Compare Buhmann et al. (1988), Burkhauser/Smeeding/Merz (1994).

⁵ Hauser/Faik (1997) and Faik (1997).

and its changes, we can look at only a few of these factors, and only at an intermediate level. We will explain changes in overall inequality of equivalent market income, first, by changes in the within-group inequalities of five groups, distinguished by age of the head of household and the employment status of its members; second, by changes in the between-groups inequality; and, third, by changes in the population shares of each group. Implicitly, changes in average household size also play a role.

The distribution of equivalent post-government income results from the application of the currently valid tax and transfer system to the distribution of equivalent pre-government income. While it would be possible to separate the effects of the various tax and transfer regulations and their changes by calculating an intermediate stage of the equivalent net income considering all but one type of transfer or tax, this is beyond the scope of this paper⁷. Comparing the personal distribution of equivalent market income and equivalent net income gives us an indication of the equalizing effect of the whole tax and transfer system as well as the effect of changes to this system during the period under review. However, we must admit that such a comparison exaggerates the effect of this system since the contra-factual situation is not modeled completely. It is assumed that there were no private provisions and no other individual reactions if they had to live in a kind of minimalist state without personal taxes, contributions and transfers. While this is obviously a gross oversimplification, comparisons of changes over time should be less biased in this respect than the absolute effects, calculated as the difference between the distributions of equivalent pre-government and post-government income at a given point in time.

Inequality will be measured by the Gini coefficient and the Theil coefficient that is bottom sensitive⁸. The Theil coefficient can be decomposed into within-group inequality – as measured by the group-specific Theil coefficients – and differences in the group means, which characterize between-groups inequality⁹. We will also use kernel density estimates to visualize differences and changes in the distributions¹⁰. In 1993, the wage levels differed considerably between West and East Germany, as did pension levels (which are tied to the wage levels),

⁶ For a comparison of the values of the Gini coefficient based on the same data set we are using but on an equivalence scale of the form $E_i = S_i^\theta$ with E_i is the sum of the weights of household i and with S_i is the number of members of household i and θ varying from 0 to 1 see Faik (1995), p. 53.

⁷ It also must be emphasized that it was not possible to perform a cohort analysis following the same group of persons over time, as only cross-section data are available. Therefore, the groups among which we distinguish are abstract, defined by certain characteristics, but with varying membership over time.

⁸ The Gini coefficient is calculated by the formula (1) in the appendix. The Theil coefficient used here is calculated by the formula (2) in the appendix.

⁹ The formula for this decomposition is found in the appendix as (3). See in this context Jenkins (1995).

¹⁰ We used the STATA program with a kernel function given in the appendix as (5).

and many other discrepancies existed between the old and the new Länder. It thus seems appropriate to treat the population in both parts of Germany as separate sub-populations among which income inequality is measured relative to the sub-population mean income. To achieve this, all measures are calculated separately for West Germany and East Germany.

We will use several waves of the German Income and Consumption Survey (Einkommens- und Verbrauchsstichprobe, EVS)¹¹. This is an official cross-section survey conducted every five years by the Statistische Bundesamt, comprising between 45.000 and 50.000 households. Participation is voluntary, but participation rates that do not correspond to the respective population shares are corrected according to weights based on the "Mikrozensus" an annual obligatory 1 percent-sample of all residents of Germany. Several limitations of the Income and Consumption Surveys due to the survey methods or to the anonymization process used must be mentioned:

- Top coding is used¹².
- From 1973 to 1988 no resident households headed by a foreigner were included.
- The institutionalized population is not included.
- The homeless are not included.
- Incomes of farmers and of the self-employed as well as income from capital are considerably underreported (as in most other surveys)¹³.
- Only sub-samples of between 80 and 95 percent of the original sample are available to us.
- For the period from 1973 to 1988, households with more than 6 persons are not included in our sub-samples due to data-protection regulations.

We are fairly certain that the extent of income inequality is underestimated each year as a result of these survey limitations. However, our assumption is that comparisons over time and conclusions about trends in inequality are much less biased by these data restrictions.

Several other features of the surveys deserve mentioning:

- Households of students who live apart from their families are treated as separate households if most of their income is from sources other than private transfers from their parents.
- The rental value of owner occupied housing is estimated by the Statistische Bundesamt and added to net income.

¹¹ For basic information about the Income and Consumption surveys see Statistisches Bundesamt (1994).

¹² The cut-off points were: 1973 DM 15,000, 1978 DM 20,000, 1983 and 1988 DM 25,000 and 1993 DM 35,000 net household income per month.

¹³ Compare Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (1998), p. 143.

- The survey reports annual income that is recorded for each member of a household. However, there is no information about the length of the period during which a certain kind of income is received. Therefore, we cannot distinguish between a low income received continuously during the entire year and a high income received only during a few months of the respective year. This lack of information results in a certain ambiguity of measured inequality.
- The identification of unemployed persons poses problems. Data of the older surveys allow us only to distinguish households in which one or several members received unemployment benefits for some time from those households whose members never received unemployment benefits during the year under consideration. Therefore, households with unemployed members who do not receive unemployment benefits are not counted as belonging to the group of households hit by unemployment. This situation arises both for new entrants into the labor market who have not yet accumulated claims to unemployment insurance transfers, and second earners whose claim to unemployment insurance transfers has expired and who do not receive unemployment assistance because they do not pass an obligatory means-test. Thus a portion of the effects of unemployment is hidden in the group of employed.

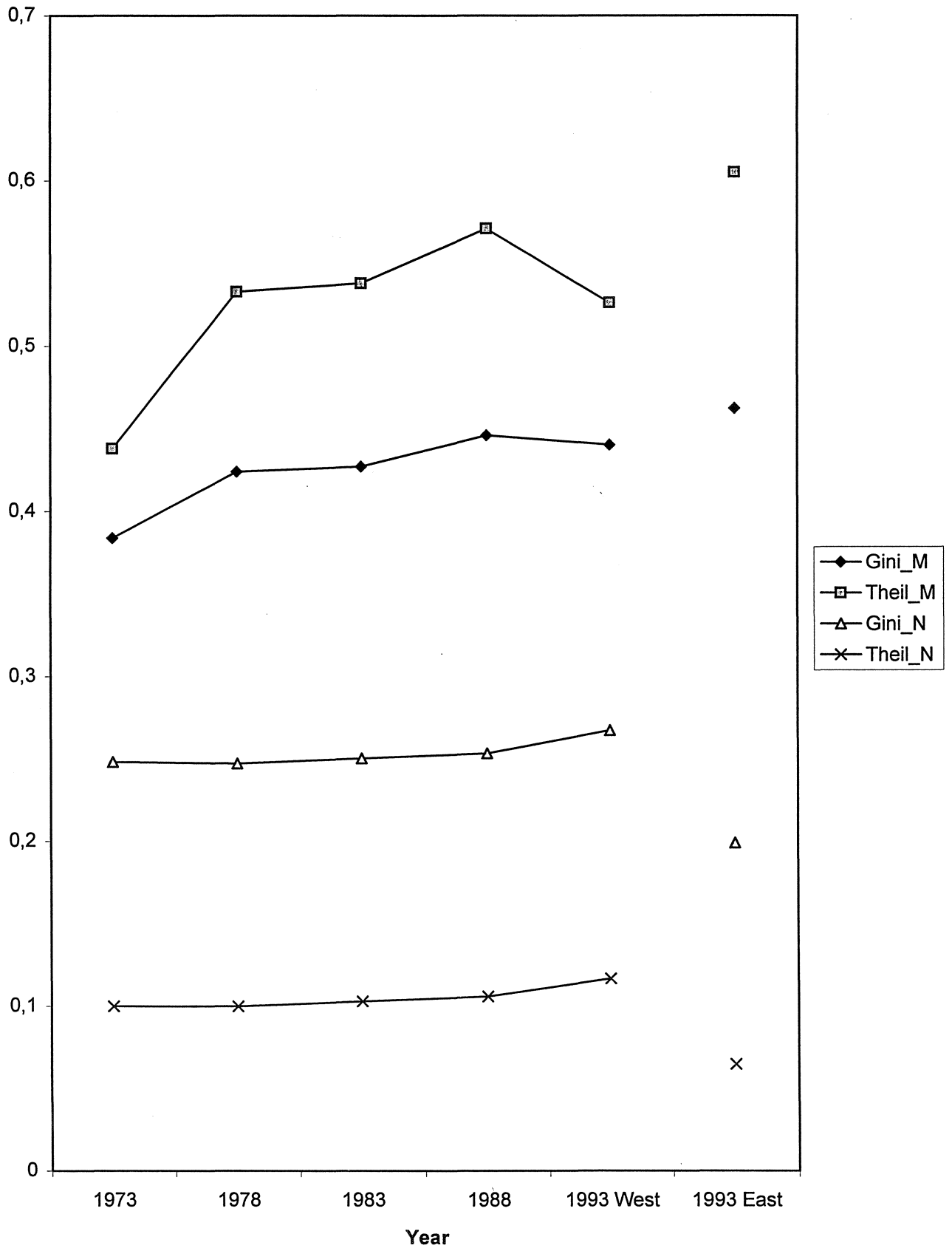
The following results must be considered with these limitations in mind.

3. Trends in Overall Inequality of the Personal Distribution of Equivalent Market Income and Equivalent Net Income

3.1 West Germany 1973 to 1993

We begin with an overview of the trends in inequality during the period from 1973 to 1993. Three questions have to be dealt with: First, has the personal distribution of equivalent market income changed during this period? Second, has the personal distribution of equivalent net income changed in line with the personal distribution of market income during this period, or was the German tax and transfer system able to cushion changes in equivalent market income to such an extent that the personal distribution of equivalent net income remained unchanged? Third, were there in 1993 differences in the personal distribution of equivalent market income and equivalent net income between East and West Germany (see below, 3.2)?

Figure 1: Gini and Theil coefficients of the inequality of equivalent market and equivalent net income, 1973 to 1993



Source: EVS-Databank (Income and Consumption Surveys); own calculations.

M = Distribution of equivalent market income.

N = Distribution of equivalent net income.

Table 2: Trends in the inequality of equivalent market income (pre government income)¹ and equivalent net income (post government income)^{2,3}, 1973 to 1993

Inequality Indicator	West Germany						East Germany
	resident foreigners						
	excluded					included	
	1973	1978	1983	1988	1993		
	Equivalent market income						
Gini coefficient	0,384	0,424	0,427	0,446	0,440	0,440	0,462
Theil-Index	0,438	0,533	0,538	0,571	0,526	0,526	0,605
	Equivalent net income						
Gini coefficient	0,248	0,247	0,250	0,253	0,267	0,269	0,199
Theil-Index ⁴	0,100	0,100	0,103	0,106	0,117	0,118	0,065

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

- 1 Wage earnings, income from self-employment and property income (including imputed rent for owner-occupied housing) of the household, divided by the household's sum of equivalent weights; for the equivalence scale see footnote 3.
- 2 Market income plus transfer income (from government, from social insurance and from other private households) minus personal taxes and payroll taxes, divided by the household's sum of equivalent weights; for the equivalence scale see footnote 3.
- 3 The head of the household is weighted by 1,0; further household members older than 14 years are weighted by 0,7, children up to the age of 14 by 0,5.
- 4 Bottom-sensitive version of the Theil-Index (mean logarithmic deviation); see formula (2) in the appendix.

Figure 1 presents the Gini and Theil coefficients for equivalent market income and equivalent net income. Exact values of the coefficients are listed in Table 2. From 1973 to 1993, the inequality of equivalent pre-government income increased in West Germany¹⁴. The Gini coefficient rose by 14.6%, the Theil coefficient by 20%. Most of the increase occurred between 1973 to 1978, as the unemployment rate rose from 1.2% to 4.3%. Interestingly, in the following period from 1978 to 1983, when the unemployment rate doubled again, the inequality of equivalent market income did not increase any further. Inequality increased again slightly between 1983 and 1988, although the unemployment rate did not rise; during the last period inequality of equivalent market income diminished slightly in line with a small reduction in the unemployment rate.

As could be expected, the inequality of equivalent post-government income was much lower than inequality of equivalent pre-government income. In 1973, the Gini coefficient was 35% and the Theil coefficient 77% lower. The pattern revealed by the time paths of the

¹⁴ When we compare West German inequality measures over time in a diagram, coefficients referring to 1993 are always calculated neglecting households with a foreign head for sake of consistency. But it has to be noted that the measures for overall inequality in 1993 are only slightly influenced by this omission. When inequality measures for West and East

inequality measures for equivalent net income, however, differs from the pattern exhibited by the measures for equivalent market income. Both coefficients show stability from 1973 to 1988, and then display a moderate increase from 1988 to 1993. Over the entire period the Gini coefficient when calculated from equivalent net income increased a little less than when calculated from equivalent market income. In 1993 the former was 39 % lower than the latter, indicating a slight increase of the equalizing effect of the tax and transfer system. But if the equalizing effect is measured by the differences of the Theil coefficients, constancy is indicated. On the other hand, when the differences of the Gini coefficients and the Theil coefficients are compared during the most recent sub-period from 1988 and 1993 (in 1988 the Gini coefficient was reduced by 43%, the Theil coefficient by 81%, while in 1993 the corresponding differences were 39% and 77%, respectively), both measures indicate that the equalizing effect of the tax and transfer system weakened.

Thus, we can conclude that the German tax and transfer system exerted a strong influence toward compensating for income losses due to unemployment or to other social risks as well as to family burdens. Comparing the first and the last year of the period under review, one can say that the equalizing effect of the tax and transfer system has remained fairly constant. But it seems to have increased from 1973 to 1988, and then decreased again. Only for the last period is this result in line with the public perception that the retrenchment policy of the 80s and the 90s hit the low income groups more than the middle and high income groups.

One-parameter inequality measures like the Gini and Theil coefficients condense the available information into a single figure, and, therefore, hide details that might also be of interest to students of inequality. More information can be visualized by showing income distributions in the form of density functions based on kernel density estimates as is shown in Figures 2a and 2b. The first fact to note is that the distribution of equivalent market incomes is bimodal in both years (Figure 2a). In 1973 this can be explained in part by pensioners with no market income, by widespread but small incomes from interest on savings, and from minor jobs (*geringfügige Beschäftigung*)¹⁵, i.e., part-time jobs with very low monthly wages. The changes in the distribution of equivalent market incomes between 1973 and 1993, however, are quite remarkable. In 1993 a much greater share of the population received, relatively

Germany referring to the year 1993 are compared the whole resident population is included in the calculations. The accompanying Tables mostly show the coefficients for 1993 with and without foreigners.

¹⁵ Holders of a single minor job are not obliged to pay social security contributions nor is their employer. They need not declare income from the minor job with the tax authority if the employer pays a standard tax of around 20 %. Holders of minor jobs must not work more than 15 hours a week and the monthly wage must not exceed a rather low limit of about one fourth of average wage.

Figure 2a: Relative equivalent market income 1973 and 1993, West Germany (resident foreigners excluded)

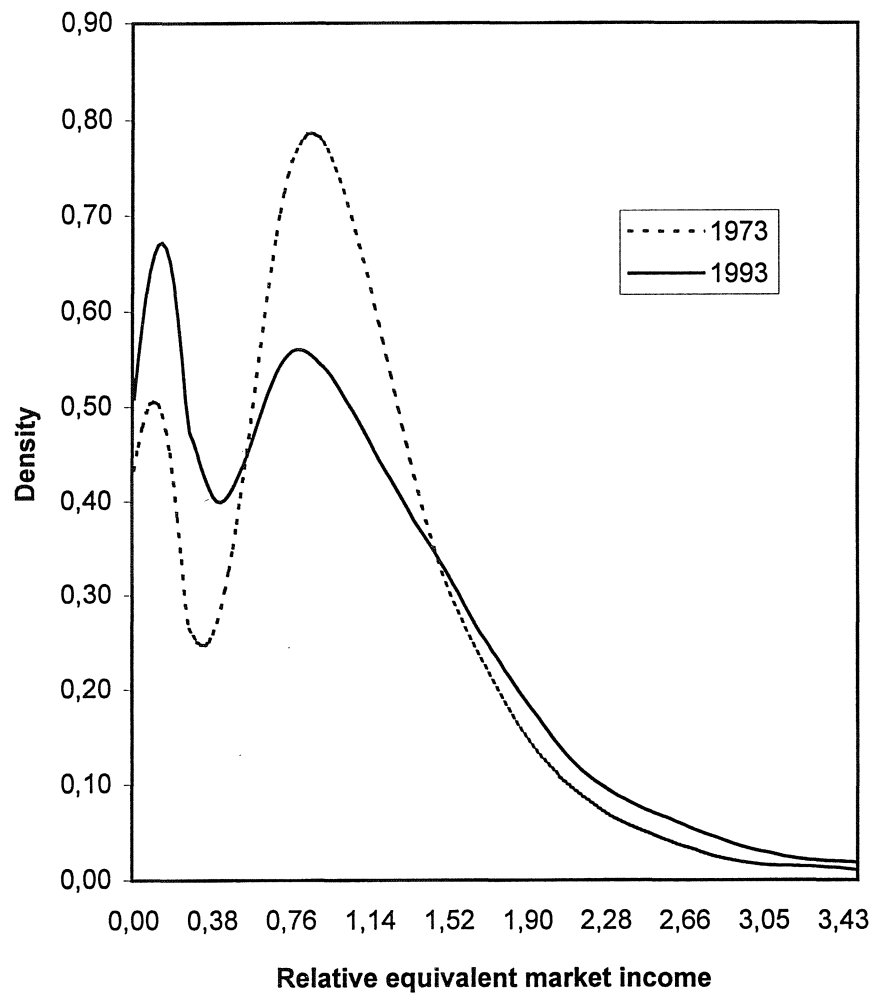
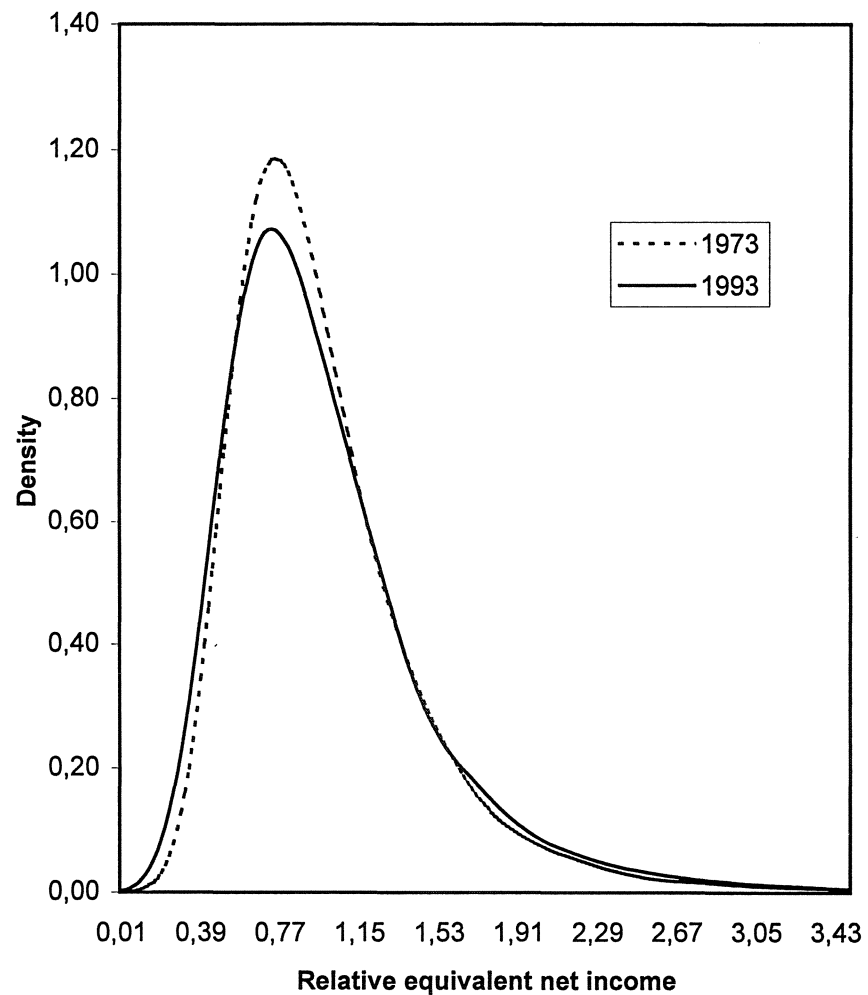


Figure 2b: Relative equivalent net income 1973 and 1993, West Germany (resident foreigners excluded)



speaking, very low equivalent market incomes, and a greater share of the population received incomes far above the mean, while the population share of the middle group diminished. A well-known increase in the number of minor jobs as well as the increase in unemployment that resulted in unemployment spells and, therefore, in earnings from employment of less than twelve months per year for a large number of workers, are the major factors behind this change at the lower end of the distribution. Changes in the wage structure seem to have played only a minor role. Changes at the higher end of the distribution may result from an increase in the income from capital relevant mainly for upper-income groups.

The tax and transfer system changes the bimodal distribution of equivalent market income into a unimodal distribution of equivalent net income (Figure 2b). The most important monetary benefits involved are pensions for old age, disability, surviving dependents, and occupational accidents, as well as unemployment benefits, social assistance benefits, and various other benefits intended to reduce the financial burden of families. A comparison of the distribution of equivalent net income in 1973 with that in 1993 reveals that the mode has become lower and also has shifted slightly downward. Additionally, a higher share of the population is now located in the income brackets far below and far above the mean income. This means that the tax and transfer system has compensated to a great extent but not fully for the increase in inequality of equivalent market income.

A comparison of the distribution of equivalent market income with the distribution of equivalent net income for the same years in Figures 2a and 2b shows only the net effect of upward and downward movements of persons caused by the tax and transfer system. Using a mobility matrix we can display these upward and downward movements separately. Table 3 shows the distribution of persons over relative income brackets the limits of which are defined as percentages of mean equivalent net income in the years 1973 and 1993. Instead of the full mobility matrix, we display only a column representing the main diagonal that contains the share of those who remained in their income bracket (marked "c") along with two other columns which summarize the shares of those who moved upward or downward from each income bracket (marked "+" and "-" respectively). Additionally, the marginal distributions based on equivalent market income and on equivalent net income are shown. To illustrate upward and downward movements without bias, the limits of the income brackets for both distributions are derived as percentages of the mean equivalent net income. The marginal distributions contain analogous information as is shown in Figures 2a and 2b.

Table 3: From equivalent market income to equivalent net income: ascents and descents of persons between relative income brackets in West Germany (resident foreigners excluded) 1973 and 1993

Relative income position	1973					1993				
	Dis_1	+	c	-	Dis_2	Dis_1	+	c	-	Dis_2
- 0,50	21,2	79,0	21,0	/	6,5	30,5	71,9	28,1	/	10,1
0,50 – 0,75	13,3	18,5	65,9	15,6	27,9	12,5	25,1	63,0	11,8	26,2
0,75 – 1,00	19,3	7,0	35,0	58,0	27,9	14,0	11,2	38,2	50,5	24,8
1,00 – 1,25	16,2	3,9	18,9	77,2	17,0	11,7	5,6	20,1	74,3	16,9
1,25 – 1,50	10,8	2,6	10,5	86,8	9,2	9,3	3,9	9,7	86,4	9,1
1,50 – 2,00	11,1	1,1	17,5	81,4	7,3	11,7	1,5	14,5	84,0	8,1
2,00 – 3,00	6,1	(0,3)	25,5	74,2	3,2	7,7	0,9	21,7	77,4	3,8
3,00 u. m.	2,0	/	43,7	56,3	0,9	2,5	/	34,1	65,9	1,0

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

Dis_1: Distribution by relative equivalent market income (see footnote 1 in table 2) (in % of all persons).

Dis_2: Distribution by relative equivalent net income (see footnote 2 in table 2) (in % of all persons).

c: Share of persons without movement to another relative income bracket by taxes and transfers (in % of the respective equivalent market income class).

+: Share of persons with ascent to a higher relative income bracket by taxes and transfers (in % of the respective equivalent market income class).

-: Share of persons with descent to a lower relative income bracket by taxes and transfers (in % of the respective equivalent market income class).

As was to be expected, there is a general tendency that persons who are in lower income brackets with respect to their equivalent market income are moved upward and persons in higher brackets are moved downward. But it is surprising to find that two-thirds of the group with an equivalent market income of between 50 % and 75 % of mean equivalent net income remain in the same income bracket. In other income brackets there is much more movement (compare column c).

More interesting is a comparison between 1973 and 1993. In 1993, upward movements in the lowest bracket were fewer than in 1973. With the second-to-lowest income bracket, however, more upward movements and fewer downward movements occurred than in 1973. The same is true for all income brackets up to 150% of average income. Assuming a poverty line at 50% of equivalent net income, this means that during this period the poverty-reducing effect of the tax and transfer system diminished and the equalizing effect was more concentrated on the lower middle class and the middle class. We know from further analyses (see appendix) that a decreasing share of ascents out of relative poverty by state measures can be observed especially for households with a very young head (less than 25 years; decrease

from 70% in 1973 to 31% in 1993) but also for households with a head in prime working age (25 to 59 years), namely for those with unemployment benefits (1973: 53%; 1993: 41%) as well as for those without unemployment benefits (1973: 65%; 1993: 45%). Only for the group living in households with an older head (60 years or more) the data indicate a development in the opposite direction; the share of persons with an equivalent market income less than 50% of the mean equivalent net income who moved up by the net effect of taxes and transfers increased from 84% in 1973 to 90% in 1993.

3.2 West and East Germany compared in 1993

For the year 1993, the distributions of equivalent market income and equivalent net income also can be compared between West Germany and East Germany. With respect to equivalent pre-government income, the Gini and Theil coefficients for East Germany are higher than those for West Germany (Figure 1 and Table 2). The density functions in Figure 3a show this picture even more clearly. The mode at the lower end of the distribution is higher in East Germany than in West Germany, and the population share located between 150 % and 250 % of the mean income is also greater. Higher inequality of equivalent pre-government income is presumably due to the higher unemployment rate in East Germany - 15.8% compared to 8.2% - caused by the complete restructuring of industry and public services. Additionally, fewer East German than West German pensioners receive income from other sources than transfers because occupational pensions did not exist in East Germany and ownership of houses as well as large wealth holdings from which an income could be derived in old age was much less widespread than in West Germany.

Despite the higher inequality of equivalent pre-government income in East Germany equivalent post-government income is less unequally distributed, if the East German distribution is considered separately from the West German one. This is evident from the values of the Gini and the Theil coefficients in Figure 1 and Table 2. The East German Gini coefficient is 26% lower and the Theil coefficient is even 45% lower than the respective value in West Germany. The same picture is revealed quite impressively in Figure 3b. The share of the population whose equivalent net income is below 50% of its mean is considerably larger in West Germany than in East Germany. Once again, the mode in the East is relatively higher than in the West. Moreover, in West Germany the upper tail of the distribution is „thicker“ than in East Germany. Obviously, the tax and transfer system has a stronger equalizing effect

Figure 3a: Relative equivalent market income West and East Germany (resident foreigners included) 1993

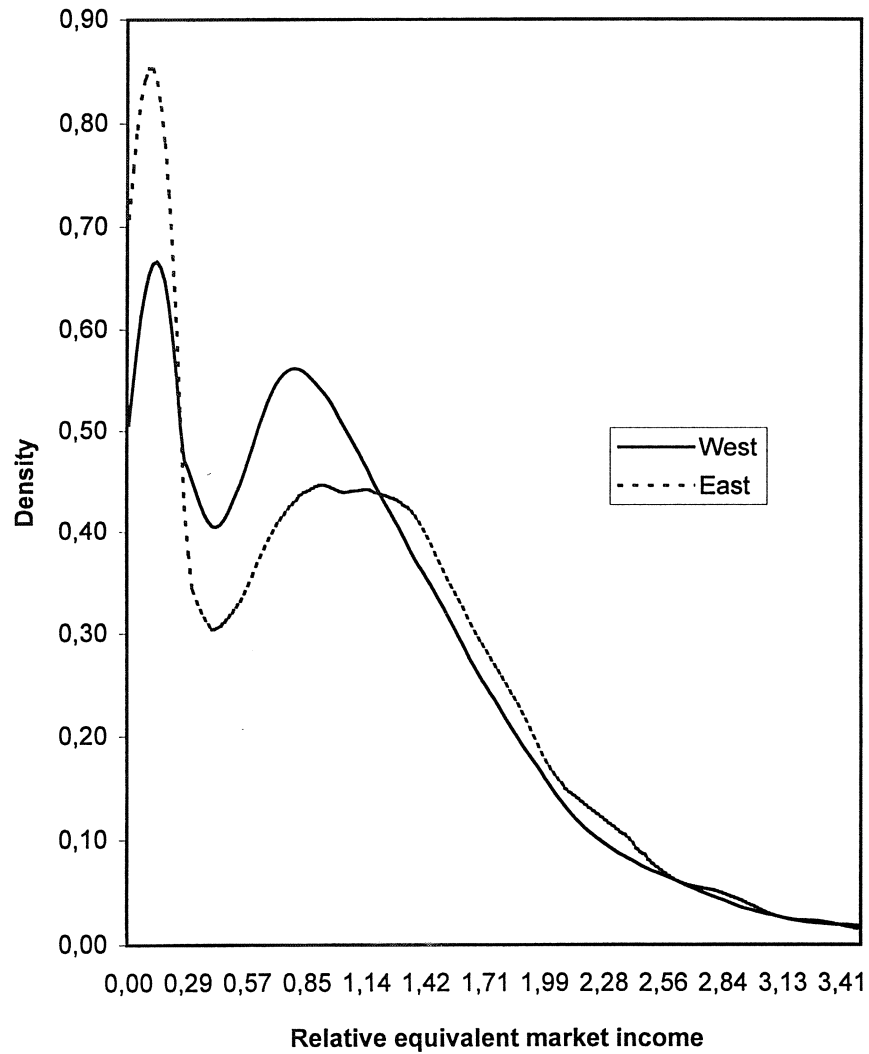
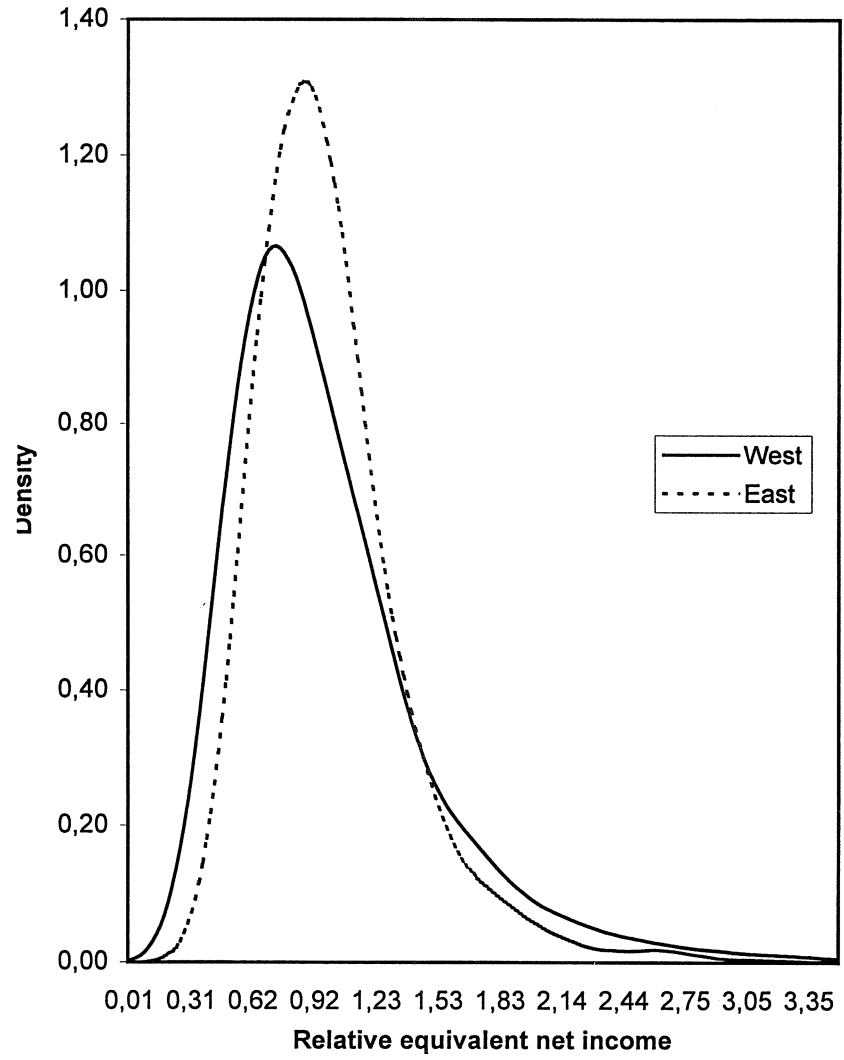


Figure 3b: Relative equivalent net income West and East Germany (resident foreigners included) 1993



in East Germany than in West Germany. This may be due in part to a number of special regulations for the unemployed and pensioners still in effect in 1993, but most of these had been reduced greatly or expired completely by then. Also, the low level of the inequality measures derived for the new Länder in 1993 are somewhat misleading, as we know from other studies based on the German Socio-economic Panel (GSOEP) that inequality increased continuously in East Germany from 1990 to 1995¹⁶.

Table 4: From equivalent market income to equivalent net income: ascents and descents of persons between relative income brackets in West and East Germany (resident foreigners included) 1993

Relative income position from ... to less than ...	West Germany					East Germany				
	Dis_1	+	c	-	Dis_2	Dis_1	+	c	-	Dis_2
- 0,50	31,1	71,6	28,4	/	10,3	36,3	92,0	8,0	/	3,1
0,50 – 0,75	12,9	24,9	63,9	11,2	26,2	11,7	48,7	49,9	*	22,6
0,75 – 1,00	13,8	11,7	41,0	47,3	24,6	12,6	24,0	57,2	18,8	33,3
1,00 – 1,25	11,4	5,9	22,5	71,5	16,9	12,4	9,5	33,5	57,0	23,0
1,25 – 1,50	9,2	4,0	11,4	84,6	9,2	9,3	3,3	11,1	85,5	9,8
1,50 – 2,00	11,6	1,6	16,0	82,4	8,1	10,7	(1,8)	13,7	84,5	5,8
2,00 – 3,00	7,5	0,9	22,9	76,2	3,9	5,7	*	17,3	82,5	2,1
3,00 u. m.	2,5	/	34,6	65,4	1,0	1,2	/	(26,5)	73,5	(0,3)

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

Dis_1: Distribution by relative equivalent market income (see footnote 1 in table 2) (in % of all persons).

Dis_2: Distribution by relative equivalent net income (see footnote 2 in table 2) (in % of all persons).

c: Share of persons without movement to another relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

+: Share of persons with ascent to a higher relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

-: Share of persons with descent to a lower relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

When comparing the upward and downward movements caused by the tax and transfer system between West and East Germany in Table 4 the entire resident population - including households headed by a foreigner - is considered in both parts of the country. Surprisingly, the inclusion of households headed by a foreigner does neither change the marginal distribution of equivalent market income nor the distribution of equivalent net income to any noticeable extent (compare the left-most column of the right section of Table 3 with the left-most column

¹⁶ Hauser/Wagner (1996) and Hauser (1995).

of the left section of Table 4)¹⁷. Looking first at the lowest income bracket, a much stronger upward movement is evident in the eastern part of Germany than in the West. This income pattern is apparent in all the income brackets up to 125% of the mean and supports the view that the German tax and transfer system was - at least in 1993 - much more powerful in reducing inequality, and especially relative income poverty, in the new Länder than in the old. One can conclude, therefore, that the aims of social policy - reducing poverty and compensating for a lack of income and income losses - were better fulfilled in East Germany than in West Germany. But we have to keep in mind that mean income still was much lower than in West Germany: in 1993 mean equivalent net income in the eastern part of Germany amounted to only 68% (21394 DM p.a.) of the respective value in West Germany (31564 DM p.a.). With respect to equivalent market income the difference was even greater: the average value in East Germany was 18622 DM p.a., that means 59% of the respective amount in West Germany (31643 DM p.a.). The resulting income inequality between the two parts of Germany are neglected in our analysis.

4. Decomposition of Income Inequality by Age Groups and Employment Status

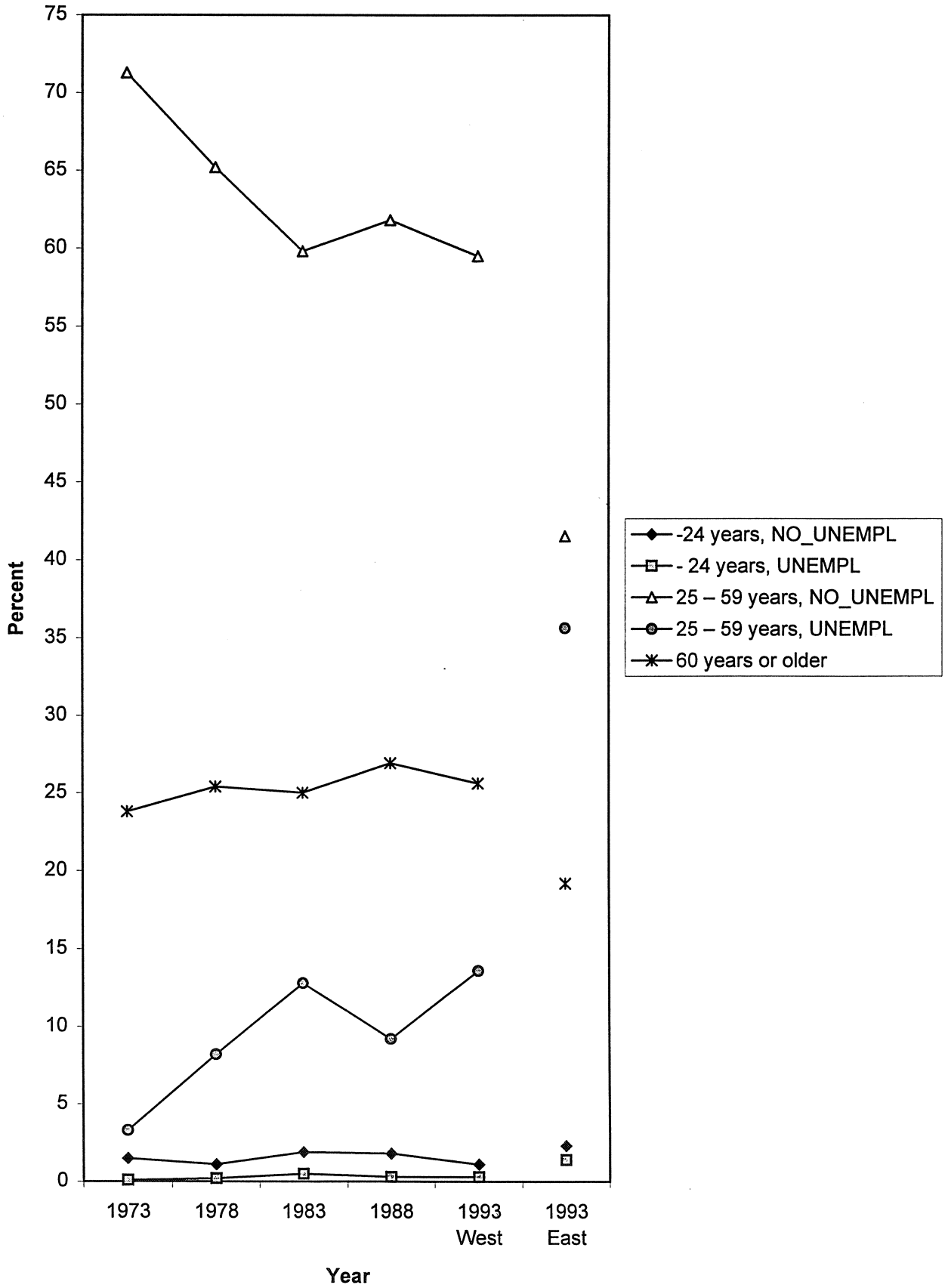
4.1 Changes in population structure

In the following we examine whether the inequality of equivalent market income and inequality of equivalent net income, respectively, is due mainly to within-groups inequality or to between-groups inequality. Within-groups inequality is measured by group-specific Theil coefficients. Between-groups inequality is related to the relative positions of the groups distinguished. A third influence which we look at first is exerted by the population shares of each group as is evident in the formula used to decompose overall inequality (see the formula (3) in the appendix).

Figure 4 and Table 5 show that the population shares of the persons living in households headed by a young individual - both with and without unemployed members - were very small and did not change much. In East Germany these shares were a little higher. Therefore, these groups cannot exert a strong influence on overall inequality. The share of the population living in households headed by an individual aged 60 years or older increased slightly from

¹⁷ This result may depend on the fact that the Statistische Bundesamt did not use special weights for adjusting the participation rates of foreigners in the survey to their share in the population.

Figure 4: Population shares by the age of the head and unemployment status of the household¹ in Germany 1973 to 1993



Source: EVS-Databank (Income and Consumption Surveys); own calculations.

¹ See footnote 1 in table 2.

Table 5: Population shares by the age of the head and unemployment status of the household¹ in Germany 1973 to 1993

Age of the head of household / unemployment status of the household ¹	West Germany						East Germany
	resident foreigners						
	excluded				included		
	1973	1978	1983	1988	1993		
-24 years, NO_UNEMPL	1,5	1,1	1,9	1,8	1,1	1,1	2,3
- 24 years, UNEMPL	0,1	0,2	0,5	0,3	0,3	0,3	1,4
25 – 59 years, NO_UNEMPL	71,3	65,2	59,8	61,8	59,5	59,6	41,5
25 – 59 years, UNEMPL	3,3	8,2	12,8	9,2	13,6	14,0	35,6
60 years or older	23,8	25,4	25,0	26,9	25,6	25,0	19,2
All	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

- 1 NO_UNEMPL=The household did not receive any transfers from unemployment insurance.
UNEMPL=The household received transfers from unemployment insurance.

23.8% (1973) to 25.6% (1993); in West Germany the share was slightly less if foreigners are included. In East Germany the share of this population group is one fifth smaller. From this population group a considerable influence on overall inequality can be exerted.

The dominating groups in both parts of the country are persons living in households headed by a middle-aged individual (prime working age) and with no unemployed members. In West Germany the population share of this group diminished, however, from 71.3% to 61.8% during the two decades under review. Correspondingly, the population share of persons in households headed by an individual at prime working age but with one or more unemployed members in the household increased from 3.3% to 13.6% so that an increasing influence on overall inequality can be expected. In East Germany the share of the population hit directly or indirectly by unemployment was, at 35.6%, nearly as large as the population share of those who escaped unemployment in 1993, namely 41.5 %.

4.2 Decomposition of equivalent market income inequality

As a second step of our analysis we examine within-groups inequality of equivalent market income. In Figure 5a (left section) it is apparent that inequality in 1973 was highest among the

Figure 5a: Group specific Theil coefficients and relative positions with respect to equivalent market income by age of head and unemployment status of the household in Germany 1973 to 1993

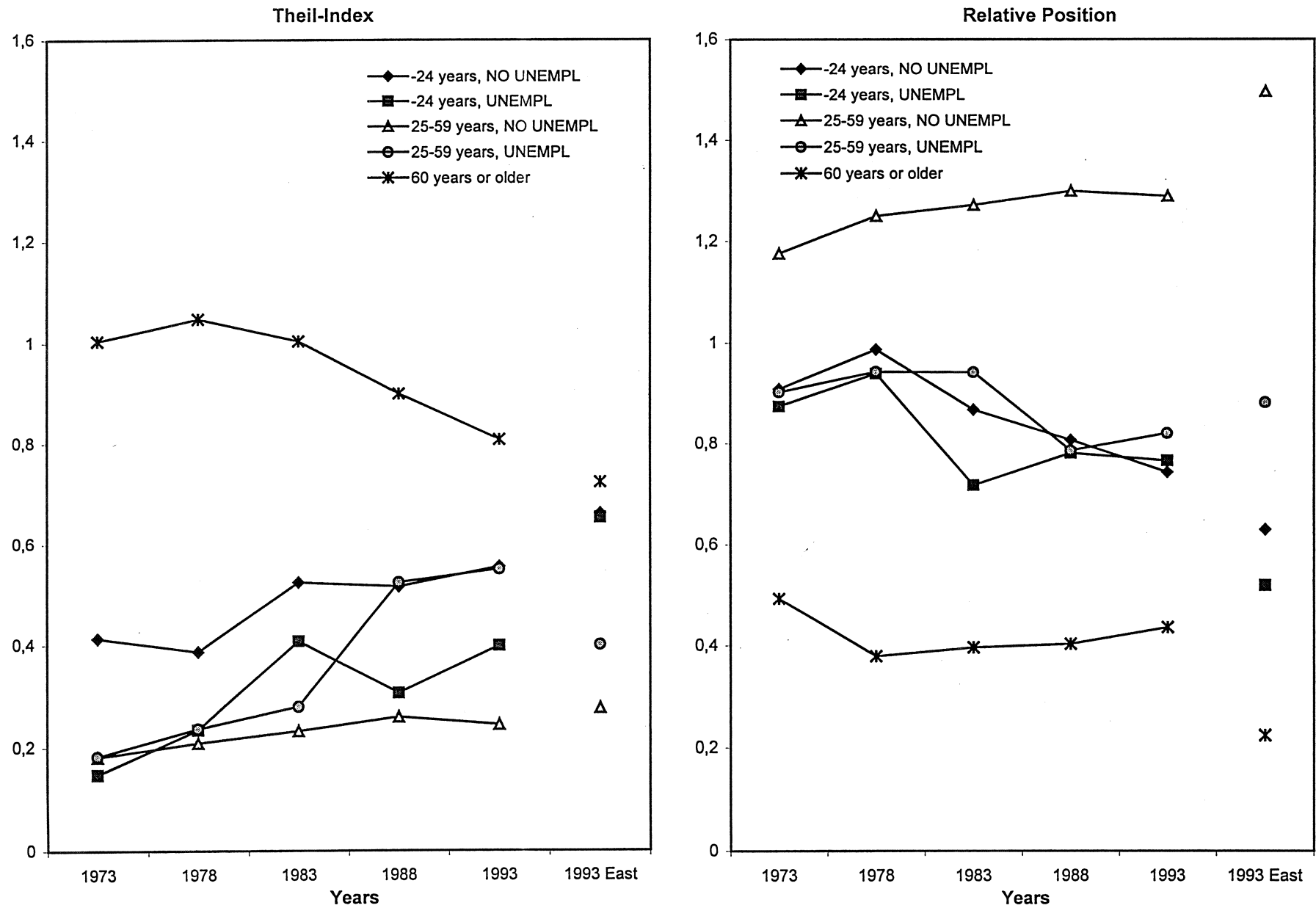


Table 6: Decomposition of inequality of equivalent market income¹ by the age of the head and unemployment status of the household² in Germany 1973 to 1993

	West Germany					East Germany
	resident foreigners					
	excluded					included
	1973	1978	1983	1988	1993	
	Group 1: - 24 years, NO_UNEMPL					
Relative position (%) ³	90,8	98,7	86,7	80,7	74,3	63,0
Gini coefficient	0,375	0,356	0,404	0,433	0,462	0,536
Theil-Index ⁴	0,413	0,387	0,525	0,517	0,556	0,661
Within-group (%) ⁵	1,4	0,8	1,8	1,6	1,2	2,5
	Group 2: - 24 years, UNEMPL					
Relative position (%) ³	87,4	93,9	71,7	78,1	76,6	52,0
Gini coefficient	0,273	0,305	0,390	0,346	0,341	0,525
Theil-Index ⁴	0,148	0,234	0,408	0,305	0,399	0,653
Within-group (%) ⁵	0,0	0,1	0,4	0,2	0,2	1,6
	Group 3: 25 – 59 years, NO_UNEMPL					
Relative position (%) ³	117,6	125,0	127,2	130,0	129,0	149,6
Gini coefficient	0,291	0,309	0,311	0,321	0,327	0,317
Theil-Index ⁴	0,182	0,209	0,232	0,259	0,244	0,276
Within-group (%) ⁵	29,7	25,6	25,8	28,0	27,6	18,9
	Group 4: 25 – 59 years, UNEMPL					
Relative position (%) ³	90,2	94,3	94,2	78,6	82,1	88,2
Gini coefficient	0,279	0,304	0,321	0,416	0,429	0,381
Theil-Index ⁴	0,183	0,236	0,279	0,525	0,551	0,401
Within-group (%) ⁵	1,4	3,6	6,6	8,5	14,3	23,6
	Group 5: 60 years or older					
Relative position (%) ³	49,3	37,9	39,6	40,3	43,6	22,4
Gini coefficient	0,642	0,691	0,681	0,655	0,617	0,633
Theil-Index ⁴	1,004	1,048	1,004	0,899	0,808	0,723
Within-group (%) ⁵	54,5	49,9	46,7	42,3	39,3	22,9
	All groups					
Within-groups (%) ⁶	86,9	80,0	81,4	80,5	82,5	69,5
Between-groups (%) ⁷	13,1	20,0	18,6	19,5	17,5	30,5

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

1 See footnote 1 in table 2.

2 See footnote 1 in table 5.

3 Group-specific mean equivalent market income in % of overall mean equivalent market income.

4 See footnote 4 in table 2.

5 Group-specific Theil-index, weighted with the population share, in % of the overall Theil-index.

6 Sum of weighted group-specific Theil-indices in % of the overall Theil-index.

7 Between-groups inequality (fictitious Theil-index, where each member of a group is given the average income of its particular group) in % of the overall Theil-index.

elderly group, while it was lowest among the young group with unemployed household members. Inequality within the other groups was in the range in-between. By 1993 this rank order had changed somewhat. Inequality of equivalent market income within both groups with unemployed members increased by more than within other groups. One reason may be the increase of long-term unemployment¹⁸ from 15% in 1978 to about one quarter in 1983 to nearly one third of all registered unemployed¹⁹ in 1993 (West Germany) though falling at the beginning of the 90s to 26%. Another cause for the rising within-group inequality can be seen in the tendency of unemployment to spread out to all social groups. In 1993, therefore, inequality among the group headed by an individual at prime working age and without unemployed members was now lowest while inequality among the elderly was still highest although it decreased during this period.

The relative positions of the five groups differed considerably in all years of observation. The elderly group had the lowest position, as public pensions and other transfers are excluded from this calculation. The middle-aged group with no unemployed members occupied the top position, due primarily to its market income from earnings. The relative positions of the other groups were close together between the two extremes and decreasing between 1973 and 1993. In case of the households hit by unemployment the above mentioned rise in long-term unemployment probably is in part causal for this decline. On the other side, the group at prime working age without unemployed members increased its relative position continuously. The relative position of the elderly group decreased strongly at first, but then recovered slightly.

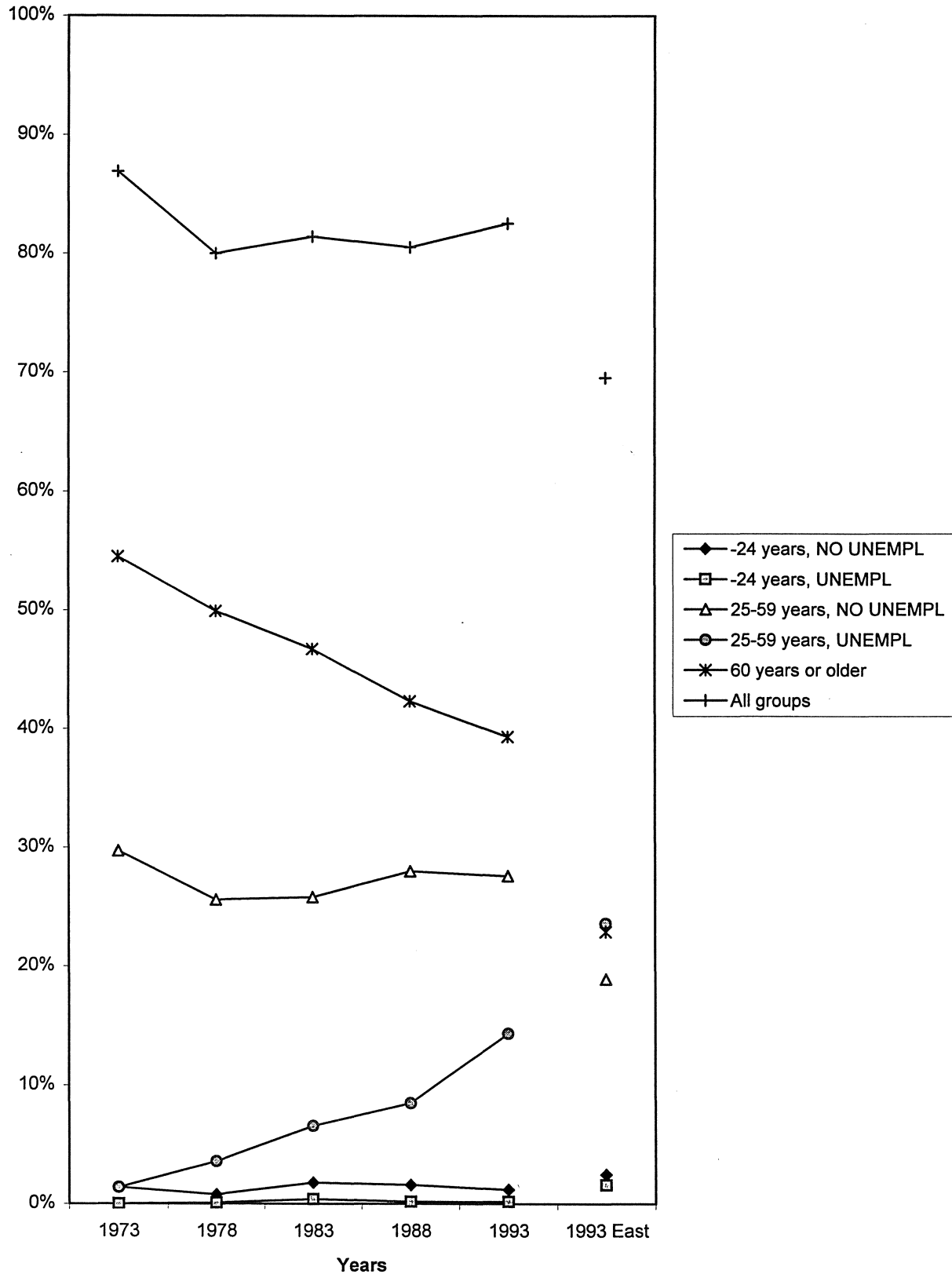
Despite of the range of group-specific relative positions of about 70% in 1973 and 85% in 1993 (West Germany) within-groups inequality always was by far dominating between-groups inequality. Figure 5b shows that in 1973 within-groups inequality of the five groups accounted for about 87 % of overall inequality of equivalent market income. Between-groups inequality explained only 13 % of overall inequality of equivalent market income. The main contributions came from the middle-aged group without unemployed persons and from the elderly group, while the shares of the three other groups were very small. This picture had changed somewhat by 1993. The share of overall inequality explained by within-groups inequality decreased to about 82%. This is the result of countervailing changes: while the share of within-group inequality in the overall inequality of the middle-aged group with unemployed members increased sharply, the contribution of the elderly group fell, while the

¹⁸ Persons being registered as unemployed (without interruption) for twelve months or more.

¹⁹ See Bundesanstalt für Arbeit (1993), p. 34.

Figure 5b: Decomposition of inequality of equivalent market income by the age of the head and unemployment status of the household¹ in Germany 1973 to 1993

- Within group inequalities in % of overall inequality² -



Source: EVS-Databank (Income and Consumption Surveys); own calculations.

¹ See footnote 1 in table 2.

² See footnote 3 in table 3.

shares of the other groups remained fairly constant.

In 1993 the situation in the new Länder was different. Within-group inequalities did not differ between the groups as much as in West Germany, but the relative positions differed even more (see Figure 5a). The elderly and the middle-aged group without unemployed members contributed less to overall inequality of equivalent market income, but the same age group with unemployed members contributed more (see Figure 5b). In East Germany within-groups inequality explained only about 70% of overall inequality compared to 82% in West Germany. Presumably, the greater discrepancies in the relative positions account for the higher overall inequality of equivalent market income in East Germany.

4.3 Decomposition of equivalent net income inequality

In the third step of our analysis we attempt to answer the question which of the five groups most improved its relative position by the effects of the tax and transfer system, and within which group inequality was reduced most.

First, we compare the difference between the inequality of equivalent market income and equivalent net income in 1973. Looking at the right section of Figure 6a, we find that in 1973 the middle-aged group without unemployed members maintained its leading relative position, albeit at a lower level, while the elderly group moved from lowest position to the second highest. This is obviously the effect of the old age protection system. The relative positions of the other three groups remain close together at about the same level as with equivalent market income. The left section of Figure 6a illustrates within-group inequality of equivalent net income for the five groups. In 1973 inequality was greatly reduced within all groups thanks to the tax and transfer system. The reduction was by far greatest for the elderly group, but at that time this group still exhibited the highest within-group inequality of equivalent net income. Inequality within the middle-aged group without unemployed members was reduced least. This group thus displayed the second to highest within-group inequality of equivalent net income.

Second, we compare changes between 1973 and 1993. The relative positions of the five groups with respect to equivalent net income differ much less than in terms of equivalent market income so that in 1973 99.3% of overall inequality of equivalent net income was explained by within-groups inequality. By 1993 this percentage decreased to about 96% (cf.

Figure 6a: Group specific Theil coefficients and relative positions with respect to equivalent net income by age of head and unemployment status of the household in Germany 1973 to 1993

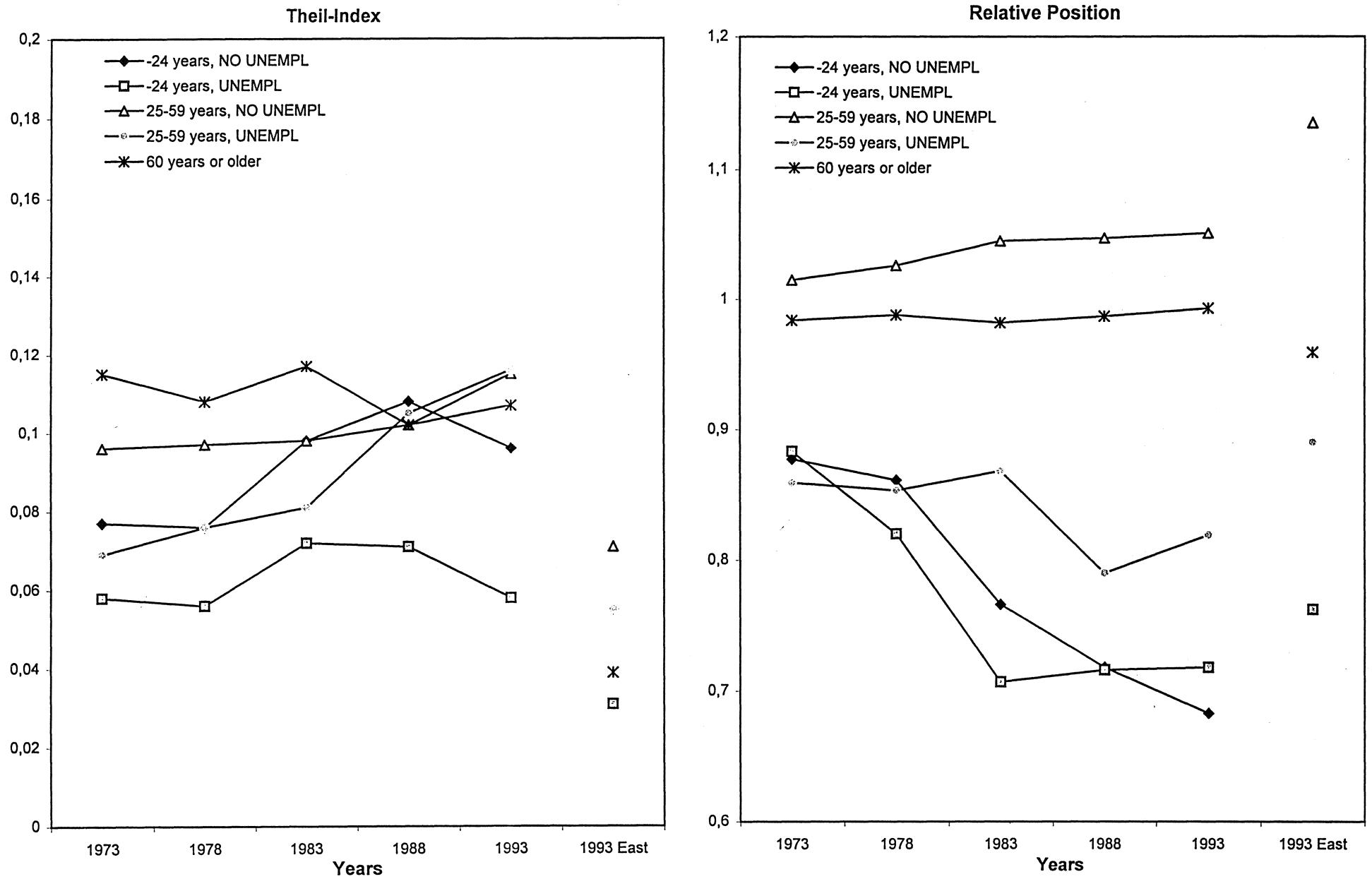


Table 7: Decomposition of inequality of equivalent net income¹ by the age of the head and unemployment status of the household², 1973 to 1993

	West Germany					East Germany
	resident foreigners					
	excluded					included
	1973	1978	1983	1988	1993	
	Group 1: - 24 years, NO_UNEMPL					
Relative position (%) ³	87,7	86,1	76,6	71,8	68,3	76,2
Gini coefficient	0,218	0,214	0,242	0,244	0,242	0,182
Theil-Index ⁴	0,077	0,076	0,098	0,108	0,096	0,055
Within-group (%) ⁵	1,1	0,9	1,8	1,8	0,9	1,9
	Group 2: - 24 years, UNEMPL					
Relative position (%) ³	88,3	82,0	70,7	71,6	71,8	76,2
Gini coefficient	0,190	0,185	0,214	0,195	0,184	0,135
Theil-Index ⁴	0,058	0,056	0,072	0,071	0,058	0,031
Within-group (%) ⁵	0,1	0,1	0,4	0,2	0,1	0,7
	Group 3: 25 – 59 years, NO_UNEMPL					
Relative position (%) ³	101,5	102,6	104,5	104,7	105,1	113,5
Gini coefficient	0,244	0,245	0,245	0,248	0,265	0,207
Theil-Index ⁴	0,096	0,097	0,098	0,102	0,115	0,071
Within-group (%) ⁵	68,5	63,5	56,9	59,5	58,5	45,4
	Group 4: 25 – 59 years, UNEMPL					
Relative position (%) ³	85,9	85,3	86,8	79,0	81,9	89,0
Gini coefficient	0,208	0,217	0,222	0,250	0,265	0,185
Theil-Index ⁴	0,069	0,076	0,081	0,105	0,116	0,055
Within-group (%) ⁵	2,3	6,2	10,1	9,2	13,5	30,1
	Group 5: 60 years or older					
Relative position (%) ³	98,4	98,8	98,2	98,7	99,3	95,9
Gini coefficient	0,265	0,258	0,265	0,250	0,257	0,154
Theil-Index ⁴	0,115	0,108	0,117	0,102	0,107	0,039
Within-group (%) ⁵	27,3	27,6	28,4	25,9	23,4	11,5
	All groups					
Within-groups (%) ⁶	99,3	98,3	97,5	96,5	96,4	89,6
Between-groups (%) ⁷	0,7	1,7	2,5	3,5	3,6	10,4

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

- 1 See footnote 2 in table 2.
- 2 See footnote 1 in table 5.
- 3 Group-specific mean equivalent net income in % of overall mean equivalent net income.
- 4 See footnote 4 in table 2.
- 5 Group-specific Theil-index, weighted with the population share, in % of the overall Theil-index.
- 6 Sum of weighted group-specific Theil-indices in % of the overall Theil-index.
- 7 Between-groups inequality (fictitious Theil-index, where each member of a group is given the average income of its particular group) in % of the overall Theil-index.

Figure 6b). At the level of equivalent net income, the highest share to overall inequality was contributed by the within-group inequality of the middle-aged group without unemployed members, followed by the elderly group. The contribution of the middle-aged group with unemployed members increased sharply from 2% to about 14%; this was in line with the development with respect to equivalent market income.

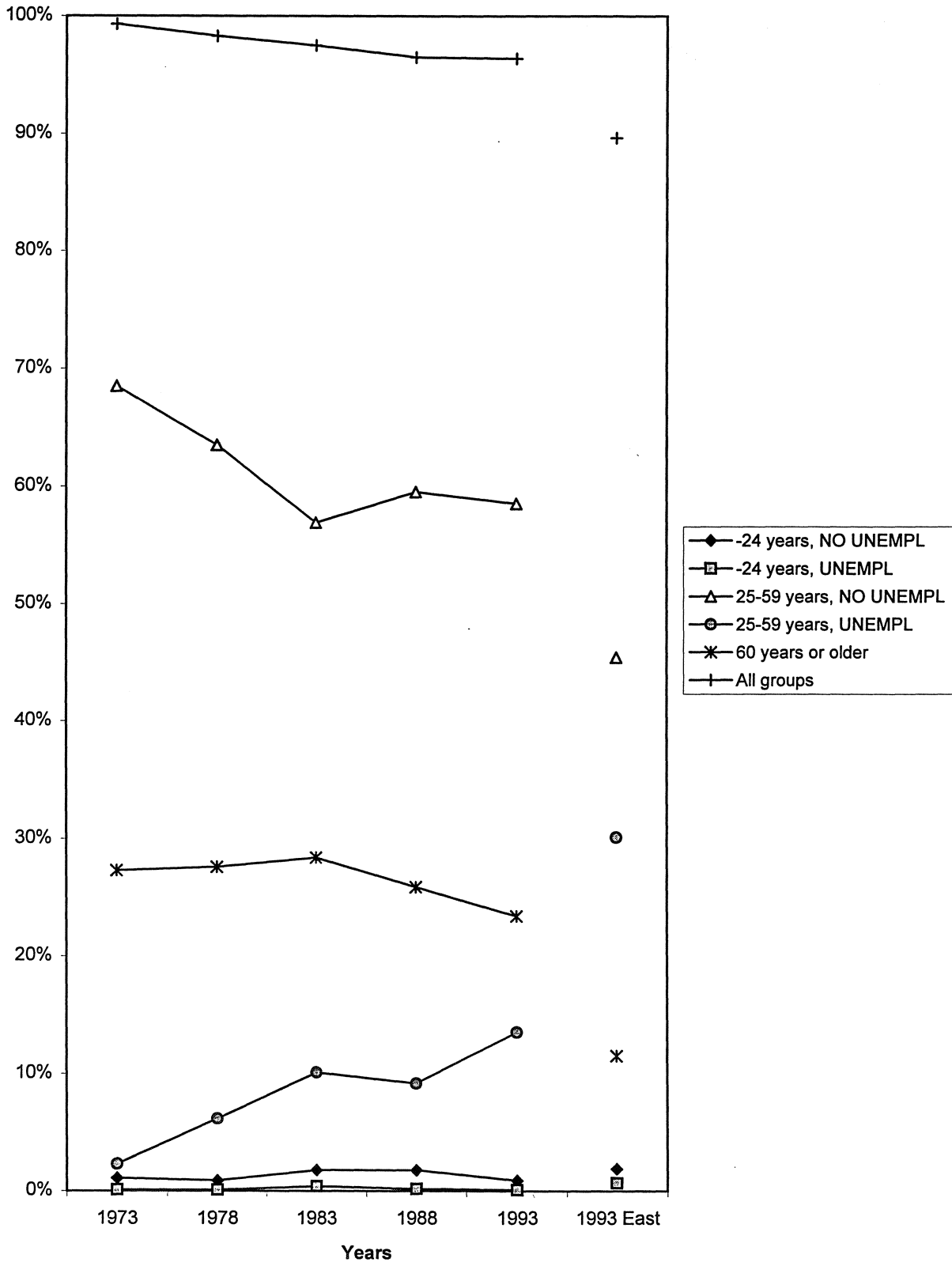
The increase in the share of overall inequality that is not explained by within-groups inequality indicates that the relative positions of the five groups diverged during the period under review (compare the right sections of Figure 6a and Figure 5a). While the middle-aged group and the elderly group slightly increased their relative positions, the two young groups showed a strong drop that was even greater than in their relative position based on equivalent market income. A less pronounced decrease is also evident in the middle-aged group with unemployed members, reflecting the reduction in their relative position based on equivalent market income.

In summary we can conclude that the tax and transfer system did very well in reducing the inequality of equivalent market income within each group and in safeguarding the relative position of the elderly group and of the middle-aged group without unemployed members. It worked adequately in maintaining the relative position of the middle-aged group with unemployed members, but it did rather poorly with respect to the two young groups, irrespective of whether they were employed or unemployed. Surprisingly the decrease of relative equivalent net income is strongest for the young group with no unemployed persons. One reason might be that within this group the share of persons living in a household with a gainfully employed head has decreased from 68% in 1973 to 60% in 1993. In 1993 nearly all of the complementary group lived in students households who on average came to only 48% of mean equivalent net income. Unfortunately we cannot differentiate within the respective group (with a young head not gainfully employed) in 1973 whose relative position, indeed, was much higher reaching 71%. Furthermore, the relative position of the young group has decreased considerably even in the case of gainfully employment of the head: from 91% (98%) for households with a young blue collar (white collar) worker in 1973 to only 75% (84%) in 1993. Perhaps the effect of the "seniority principle" of wage structure and determination has become stronger between 1973 and 1993.

While overall inequality of equivalent pre-government income was higher in the new Länder than in the old Länder in 1993, overall inequality of post-government income was lower. Is this result also true for all of the five groups? In East Germany within-group inequa-

Figure 6b: Decomposition of equivalent net income inequality by age of the head of household and unemployment status of the household¹ in Germany 1973 to 1993

- Within group inequalities in % of overall inequality² -



Source: EVS-Databank (Income and Consumption Surveys); own calculations.

¹ See footnote 1 in table 2.

² See footnote 3 in table 4.

lity of equivalent net income of all groups is much lower than within-group inequality of equivalent market income, as could be expected and as is also true for the old Länder. But surprisingly, within-group inequality of equivalent net income of all groups is also lower than in West Germany, although this is not the case with within-group inequality of equivalent market income. Within-group inequality of equivalent market income was higher in three East German groups than in their Western counterparts (young groups without and with unemployed members, and the middle-aged group without unemployed members). The group-specific equalizing effect of the tax and transfer system, therefore, differs between West and East Germany. As is evident in a comparison of the relative differences between the group-specific Theil coefficients for equivalent market income and equivalent net income, the reduction of inequality by the tax and transfer system is greater in all groups in the East than in the West, but especially strong in the groups mentioned above.

The relative positions of the five groups with respect to equivalent market income were more widespread in the East than in the West (from 22.4% to 149.6% as opposed to from 43.6% to 129.0%). This range calculated from equivalent net income has been reduced in both parts of Germany, but more so in the East than in the West, so that it is now about equal (from 76.2% to 113.5% as opposed to from 68.3% to 105.1%). Nevertheless, between-groups inequality accounts for a comparatively greater part of overall inequality of equivalent net income in East Germany with 10.4% compared to West Germany with 3.6% (see bottom line of Table 7) because of the relatively low group-specific Theil coefficients.

5. Decomposition of the Changes in Income Inequality by Five Year Periods

In analogy to the decomposition of inequality at a certain point of time percentage changes of the overall Theil coefficient can be decomposed into percentage changes of within-group inequalities, changes in population shares that affect within-groups inequality, changes in population shares that affect between-groups inequality, and changes in group mean incomes (between-groups inequality)²⁰. Table 8 presents the results of this decomposition procedure at the level of equivalent market income and equivalent net income for each of the four five year periods studied. During the entire period from 1973 to 1993, the approximately 20% increase in overall inequality of equivalent market income was due primarily to changes of about the same size in within-group inequalities, changes in group mean incomes, and changes in the

Table 8: Decomposition of changes in income inequality by the age of the head and unemployment status of the household¹ 1973 to 1993 (West Germany; resident foreigners excluded)

	1973-1978	1978-1983	1983-1988	1988-1993	1973-1993
	Equivalent market income ³				
%-change in T ²					
- due to - A	7,4	1,9	3,0	-5,1	6,0
- B	3,1	0,2	1,3	0,4	6,3
- C	0,7	-0,4	1,1	-0,7	0,6
- D	10,3	-0,7	0,7	-2,4	7,3
- in sum	21,5	1,0	6,1	-7,7	20,1
	Equivalent net income ⁴				
%-change in T ²					
- due to - A	-0,1	3,5	1,1	9,8	14,9
- B	-0,9	-1,1	0,5	0,2	-1,2
- C	0,3	1,0	-0,7	0,5	1,4
- D	0,2	0,7	2,0	-0,4	2,1
- in sum	-0,4	4,0	2,8	10,1	17,2

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

¹ See footnote 1 in table 5.

² T = Theil-Index; see footnote 4 in table 2.

The components indicate the %-change in T accounted for by:

A = changes in within-group inequalities;

B = changes in population shares (effect on within-groups inequality);

C = changes in population shares (effect on between-groups inequality);

D = changes in sub-group mean incomes.

³ See footnotes 1 and 3 in table 2.

⁴ See footnotes 2 and 3 in table 2.

Differences between (A+B+C+D) and the revealed sum %-change in T are due to rounding (after computation).

population shares that affected within-group inequality (last column of Table 8). These three effects were strongest in the first five year period when unemployment began to rise; in part they were reversed during the last period from 1988 to 1993. In contrast, the effect of changes in the population shares on between-group inequality was negligible.

From 1973 to 1993 overall inequality of equivalent net income increased by about 17 %, i.e. a little less than overall inequality of equivalent market income. At this level the increase was due mainly to changes in within-group inequalities. It is interesting to find that the effect of changes in the group means of equivalent market income during the period 1973 to 1978 was compensated for completely by the tax and transfer system. During the period from 1988 to 1993, however, despite of the inequality reducing effect of the change in within-group inequalities of equivalent market income, the development of within-group inequalities of equivalent net income accounted for nearly all the increase of overall inequality. It seems that

²⁰ The formula for this decomposition is given in the appendix as (4).

during this period the tax and transfer system lost some of its compensating and equalizing influence for the first time. These changes during the period from 1988 to 1993 can be related to a policy of retrenchment in the field of social policy in West Germany. On the other hand, it must be noted that German reunification in 1990 put a heavy burden on the budget that had to be born in part by reductions in social expenditure in West Germany.

6. Summary

To sum up our findings we come to the following statements.

- During the period from 1973 to 1993 inequality of the personal distribution of equivalent pre-government income increased to some extent, as was to be expected given the enormous rise in unemployment.
- Inequality of post-government income also increased slightly, but was much lower than inequality of pre-government income due to the equalizing effect of the German tax and transfer system.
- In 1993 inequality of pre-government income was higher, and inequality of post-government income was considerably lower in East Germany than in West Germany; the West German tax and transfer system that was transferred to East Germany after reunification - with some additional but temporary minimum regulations - seems to have had a stronger equalizing effect in the East than in the West.
- A decomposition into three age groups, the young and the middle-aged group sub-divided further according to whether household members were affected by unemployment, showed that within-groups inequality explained by far more of overall inequality than between-groups inequality.
- The relative positions of the two young groups as well as of the middle-aged group with unemployed members deteriorated with respect to their equivalent pre-government and post-government incomes.
- During the first period with rising unemployment (1973 to 1978), the development of within-groups inequality and of between-groups inequality contributed to about the same extent to the increase of overall inequality of pre-government income. But this was fully compensated by the tax and transfer system as there were only a negligible change in inequality of equivalent net income and very slight effects of the (four) components of change which nearly compensated each other.

- During the last period from 1988 to 1993 the equalizing effect of the German tax and transfer system seems to have weakened, at least in the western part of Germany. The increase in inequality of equivalent net income is mainly due to developments of within-group inequalities.

Appendix:

Formula for inequality indicators

$$(1) \text{ Gini coefficient} = 1 + (1/n) - \left[2 / (n^2 yd) \right] \sum_{i=1}^n iy_i \quad \text{where } y_1 \leq y_2 \leq \dots \leq y_n$$

$$(2) \text{ Theil-Index} = I_0 = 1/n \sum_{i=1}^n \ln(yd / y_i)$$

$$(3) I_0 = \sum_{g=1}^G p_g \cdot I_{0g} + \sum_{g=1}^G p_g \cdot \ln\left(\frac{yd}{yd_g}\right)$$

$$(4) I_0(t+1) - I_0(t) = \sum_{g=1}^G \overline{p_g} \cdot \Delta I_{0g} + \sum_{g=1}^G \overline{I_{0g}} \cdot \Delta p_g + \sum_{g=1}^G \left(\frac{\overline{yd_g}}{yd} - \ln\left(\frac{\overline{yd_g}}{yd}\right) \right) \cdot \Delta p_g \\ + \sum_{g=1}^G \left(\overline{p_g} \cdot \frac{\overline{yd_g}}{yd} - \overline{p_g} \right) \cdot \Delta \ln yd_g$$

$$(5) \text{ Epanechnikov kernel function: } K[z] = \begin{cases} 3/4(1-5z^2)/\sqrt{5} & \text{if } |z| < \sqrt{5} \\ 0 & \text{otherwise} \end{cases}$$

with $z = (ym - y_i) / h$,
 $h =$ half of the window width, here: 10% of the respective mean income,
 $ym =$ mid of the window.

Notation: $n =$ population size
 $yd =$ overall mean income
 $y_i =$ income of individual i
 $I_0 =$ Theil-Index, bottom sensitive (mean logarithmic deviation, MLD)
 $I_{0g} =$ Theil-Index of group g
 $p_g =$ population share of group g
 $yd_g =$ mean income of group g

A bar over variables indicates an average of base and current period values.
 Δ indicates the difference between base and current period values.

Table A1: From equivalent market income to equivalent net income¹: ascents and descents of persons between relative income brackets in Germany 1973 to 1993

- Only persons in households with its head up to the age of 24 years and no transfers from unemployment insurance -

Relative M from... to less than... ²	1973				1978				1983				1988				1993				1993			
	West Germany (resident foreigners excluded)																				East Germany			
	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-
- 0,5	25,7	70,3	29,7	/	23,8	56,3	43,7	/	31,9	32,1	67,9	/	39,8	33,6	66,4	/	45,9	30,9	69,1	/	29,2	83,1*	16,9*	/
0,5 - 0,75	13,4	25,6*	50,5	23,9*	10,2	11,7*	67,4	**	14,5	14,9*	64,2	20,9*	12,9	15,7*	72,1	12,3*	10,5	**	82,3	**	7,1*	**	**	**
0,75 - 1,0	20,0	8,9*	29,5	61,6	20,4	**	24,3*	68,8	10,5	**	24,8*	73,3	10,0	**	25,1*	73,9	9,1	**	40,6*	52,6*	2,6*	**	**	**
1,0 - 1,25	11,5	**	11,2*	85,8	11,3	**	16,7*	82,9	11,9	/	10,6*	89,4	11,5	**	6,1*	93,3	10,5	**	10,2*	87,1	5,2*	/	**	**
1,25 - 1,5	7,8	/	**	90,2	11,4	/	**	96,3	13,9	**	5,4*	93,2	12,0	**	**	98,3	9,6	/	**	99,2	2,3*	/	**	**
1,5 - 2,0	16,1	/	**	93,3	17,9	/	**	93,0	14,9	/	**	98,7	10,7	/	**	97,6	12,0	/	/	100	3,0*	/	**	**
2,0 - 3,0	5,5	/	**	99,2	5,0	/	/	100	2,3*	/	**	97,9*	3,0*	/	**	91,2	**	/	**	**	**	/	/	**
3,0 u. m.	/	/	/	/	/	/	/	/	/	/	/	/	**	/	/	**	/	/	/	/	/	/	/	/

Dis_1 = Distribution by relative equivalent market income (in % of all persons).

c = Share of persons without movement to another relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

+ = Share of persons with ascent to a higher relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

- = Share of persons with descent to a lower relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

M = Equivalent market income.

* = Number of cases in the sample: 10 - 30.

** = Number of cases in the sample: less than 10.

1 See footnotes 1 and 2 in table 2.

2 Individual equivalent market income in relation to average equivalent net income.

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

Table A2: From equivalent market income to equivalent net income¹: ascents and descents of persons between relative income brackets in Germany 1973 to 1993

- Only persons in households with its head up to the age of 24 years and receipt of transfers from unemployment insurance -

Relative M from... to less than... ²	1973				1978				1983				1988				1993				1993			
	West Germany (resident foreigners excluded)																				East Germany			
	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-
- 0,5	21,2*	75,7*	**	/	20,8*	**	58,4*	/	36,1	34,8*	65,2*	/	36,9*	55,5*	44,5*	/	27,1*	**	**	/	61,1*	76,7*	**	/
0,5 - 0,75	**	**	**	**	21,9*	**	75,3*	/	22,6	**	64,6*	**	18,6*	**	**	/	22,8*	**	83,9*	/	8,5*	**	**	/
0,75 - 1,0	23,7*	**	**	**	12,4*	**	**	**	15,6*	/	35,6*	64,4*	22,2*	/	41,3*	**	23,0*	**	**	**	**	/	**	/
1,0 - 1,25	14,6*	**	**	**	16,6*	/	**	**	8,8*	/	**	80,7*	**	/	**	**	11,1*	/	/	100*	**	/	**	**
1,25 - 1,5	**	/	**	**	10,9*	/	/	100*	9,2*	/	/	100*	**	/	**	**	**	/	/	**	**	/	/	**
1,5 - 2,0	**	/	**	**	17,3*	/	/	100*	6,6*	/	**	87,7*	**	/	/	**	**	/	/	**	**	/	/	**
2,0 - 3,0	**	/	/	**	/	/	/	/	**	/	/	**	**	/	/	**	**	/	/	**	**	/	/	**
3,0 u. m.	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/

Dis_1 = Distribution by relative equivalent market income (in % of all persons).

c = Share of persons without movement to another relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

+ = Share of persons with ascent to a higher relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

- = Share of persons with descent to a lower relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

M = Equivalent market income.

* = Number of cases in the sample: 10 - 30.

** = Number of cases in the sample: less than 10.

1 See footnotes 1 and 2 in table 2.

2 Individual equivalent market income in relation to average equivalent net income.

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

Table A3: From equivalent market income to equivalent net income¹: ascents and descents of persons between relative income brackets in Germany 1973 to 1993

- Only persons in households with its head from 25 to 59 years and no transfers from unemployment insurance -

Relative M from... to less than... ²	1973				1978				1983				1988				1993				1993			
	West Germany (resident foreigners excluded)																				East Germany			
	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-
- 0,5	6,3	64,6	35,4	/	7,4	63,1	36,9	/	8,4	56,9	43,1	/	10,2	51,7	48,3	/	10,6	44,9	55,1	/	13,0	87,5	12,5	/
0,5 - 0,75	14,6	9,7	72,3	18,0	14,8	8,5	76,7	14,8	13,2	10,9	75,1	13,9	12,0	12,3	76,0	11,7	13,7	10,3	73,5	16,2	8,5	45,2	51,3	**
0,75 - 1,0	23,1	3,1	34,5	62,4	21,1	3,7	35,9	60,4	19,5	4,6	40,2	55,2	18,4	4,5	43,6	51,9	16,8	3,5	38,9	57,6	12,7	20,8	49,8	29,4
1,0 - 1,25	19,4	1,7	17,6	80,7	18,2	2,0	18,8	79,2	17,5	2,2	21,9	75,9	17,0	2,2	20,2	77,6	15,2	2,3	18,9	78,8	16,3	7,4	25,8	66,8
1,25 - 1,5	13,2	1,2	9,5	89,3	12,7	1,3	9,5	89,3	13,3	1,1	9,8	89,1	13,0	0,9	10,1	89,0	12,5	1,6	8,4	90,0	15,7	3,3*	8,1	88,6
1,5 - 2,0	13,4	0,2*	16,5	83,2	13,9	0,5	14,4	85,0	15,2	0,2*	13,8	86,0	16,0	0,5*	13,2	86,3	16,5	0,4*	13,2	86,4	19,6	1,8*	9,5	88,7
2,0 - 3,0	7,4	**	23,9	76,0	9,0	**	15,7	84,7	9,8	**	16,7	83,3	10,2	**	18,5	81,4	11,1	**	20,6	79,2	11,6	/	15,0	85,0
3,0 u. m.	2,5	/	40,3	59,7	3,0	/	33,3	66,7	3,0	/	25,9	74,1	3,1	/	28,5	71,5	3,5	/	30,2	69,8	2,6	/	23,9*	76,1

Dis_1 = Distribution by relative equivalent market income (in % of all persons).

c = Share of persons without movement to another relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

+ = Share of persons with ascent to a higher relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

- = Share of persons with descent to a lower relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

M = Equivalent market income.

* = Number of cases in the sample: 10 - 30.

** = Number of cases in the sample: less than 10.

1 See footnotes 1 and 2 in table 2.

2 Individual equivalent market income in relation to average equivalent net income.

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

Table A4: From equivalent market income to equivalent net income¹: ascents and descents of persons between relative income brackets in Germany 1973 to 1993

- Only persons in households with its head from 25 to 59 years and receipt of transfers from unemployment insurance -

Relative M from... to less than... ²	1973				1978				1983				1988				1993				1993			
	West Germany (resident foreigners excluded)																				East Germany			
	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-
- 0,5	15,1	52,9	47,1	/	17,3	46,5	53,5	/	20,0	50,8	49,2	/	35,6	38,7	61,3	/	34,6	41,1	58,9	/	32,5	85,9	14,1	/
0,5 - 0,75	22,0	9,5	78,2	12,3*	20,3	13,0	77,5	9,5	18,7	17,1	76,2	6,6	14,8	19,4	72,0	8,6*	14,8	22,8	72,1	5,1*	20,3	46,8	52,9	**
0,75 - 1,0	22,2	7,9*	44,1	48,0	22,7	4,8	45,8	49,4	21,2	6,4	48,4	45,2	18,4	9,2	49,4	41,4	17,4	9,8	44,1	46,1	17,5	20,8	67,2	12,1
1,0 - 1,25	19,5	4,3*	22,9	72,8	16,9	2,9*	21,0	76,1	16,5	4,7	23,0	72,3	13,3	3,7*	25,0	71,3	11,4	3,5	19,5	76,9	14,1	8,2	46,6	45,2
1,25 - 1,5	10,3	**	13,6*	84,2	9,9	**	11,4	86,3	10,7	**	14,4	83,4	7,8	2,5*	13,3	84,2	8,5	2,8*	11,9	85,3	7,1	**	17,6	80,6
1,5 - 2,0	8,0	/	18,3	81,7	9,4	**	12,3	87,1	9,2	**	17,9	81,7	7,1	**	18,3	81,4	8,4	**	19,0	79,2	6,2	**	25,2	74,5
2,0 - 3,0	2,8	/	21,0*	79,0	3,1	/	19,3*	80,7	3,0	/	13,1*	86,9	2,6	**	17,6*	82,4	4,3	**	18,4	80,8	2,2	/	30,8*	69,2
3,0 u. m.	**	/	**	**	0,4*	/	**	51,5*	0,7	/	49,8*	50,2	0,4*	/	**	68,5*	0,7	/	36,8*	63,2	**	/	**	**

Dis_1 = Distribution by relative equivalent market income (in % of all persons).

c = Share of persons without movement to another relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

+ = Share of persons with ascent to a higher relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

- = Share of persons with descent to a lower relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

M = Equivalent market income.

* = Number of cases in the sample: 10 - 30.

** = Number of cases in the sample: less than 10.

1 See footnotes 1 and 2 in table 2.

2 Individual equivalent market income in relation to average equivalent net income.

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

Table A5: From equivalent market income to equivalent net income¹: ascents and descents of persons between relative income brackets in Germany 1973 to 1993

- Only persons in households with its head in the age of 60 years or older -

Relative M from... to less than... ²	1973				1978				1983				1988				1993				1993			
	West Germany (resident foreigners excluded)																				East Germany			
	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-	Dis_1	+	c	-
- 0,5	66,2	84,2	15,8	/	77,6	88,6	11,4	/	78,1	87,6	12,4	/	77,9	89,8	10,2	/	74,0	89,8	10,2	/	89,6	98,9	1,1*	/
0,5 - 0,75	7,9	69,9	27,3	2,8*	6,2	79,5	19,1	**	5,9	85,6	13,0	**	6,2	85,7	13,2	**	8,7	83,6	14,7	**	2,6	96,1	**	/
0,75 - 1,0	7,4	43,2	36,6	20,2	5,0	53,4	33,7	13,0	4,4	57,3	29,6	13,1	4,6	59,9	27,6	12,5	5,8	66,1	24,7	9,2*	4,0	82,6	**	**
1,0 - 1,25	6,4	24,0	29,1	47,0	3,6	42,4	25,2	32,4	3,6	35,3	29,4	35,3	3,5	39,7	26,9	33,4	3,7	40,7	34,6	24,7	1,6*	87,8*	**	**
1,25 - 1,5	4,0	17,1	19,4	62,5	2,3	28,4	20,6	50,9	2,2	29,3	18,3	52,5	2,5	23,4	22,3	54,3	2,5	32,9	22,9	44,3	0,7*	38,3*	46,7*	**
1,5 - 2,0	4,4	9,3	28,9	61,9	2,5	14,6	29,7	55,7	2,5	17,3	33,0	49,8	2,4	19,2	26,7	54,2	2,4	19,1	30,8	50,0	1,0*	**	65,2*	**
2,0 - 3,0	2,6	1,9*	43,6	54,5	1,7	6,9*	36,2	56,9	2,1	8,0*	37,8	54,3	1,8	8,4*	38,8	52,9	1,6	12,2*	45,9	41,9	0,3*	**	**	**
3,0 u. m.	1,1	/	67,2	32,8	1,1	/	52,3	47,7	1,3	/	60,2	39,8	1,1	/	55,0	44,9	1,2	/	59,4	40,6	**	/	**	**

Dis_1 = Distribution by relative equivalent market income (in % of all persons).

c = Share of persons without movement to another relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

+ = Share of persons with ascent to a higher relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

- = Share of persons with descent to a lower relative income bracket by taxes and transfers (in % of the respective equivalent market income bracket).

M = Equivalent market income.

* = Number of cases in the sample: 10 - 30.

** = Number of cases in the sample: less than 10.

1 See footnotes 1 and 2 in table 2.

2 Individual equivalent market income in relation to average equivalent net income.

Source: EVS-Databank (Income and Consumption Surveys); own calculations.

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Arbeitspapiere des EVS-Projekts
„Personelle Einkommensverteilung in der Bundesrepublik Deutschland“
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Arbeitspapier Nr. 1: The Development of the Income Distribution in the Federal Republic of Germany during the Seventies and Eighties
(Richard Hauser und Irene Becker).

In überarbeiteter Fassung erschienen als: Hauser, Richard, Irene Becker (1997): The development of income distribution in the Federal Republic of Germany during the 1970s and 1980s. In: Gottschalk, Peter, Björn Gustafsson, Edward Palmer (Hrsg.): Changing patterns in the distribution of economic welfare. An international perspective, Cambridge, S. 184-219.

Arbeitspapier Nr. 2: Die Entwicklung der Einkommenslage von Familien über zwei Dekaden - einige empirische Grundlagen zur Würdigung der deutschen Familienpolitik
(Richard Hauser)

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(Irene Becker und Richard Hauser)

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