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HOW INCOME INEQUALITY CHANGED IN GERMANY FOLLOWING REUNIFICATION: AN EMPIRICAL ANALYSIS USING DECOMPOSABLE INEQUALITY MEASURES

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This paper analyzes how inequality in Before and After Government income has changed in Germany since reunification using the 1990 through 1992 waves of the German Socio-Economic Panel. A Theil decomposable inequality index is used to measure inequality in Germany and in its eastern and western states. Massive public transfers from west to east have narrowed the east-west income gap, substantially offset the rise in income inequality from private sources, and lowered overall inequality in the western states. The net result of this policy has been a drop in After Government income inequality in Germany between 1990 and 1992.

1. INTRODUCTION

In October 1990, less than a year after the fall of the Wall, the eastern states (*die Fünf Neuen Länder*) and the western states of Germany were formally reunited. At that time the Kohl government pledged both to reduce the inequality that existed between the east and west and to mitigate the increase in inequality that was expected to occur within the eastern states. Since private sector economic activity in the east was, and continues to be, far behind that in the western states of Germany, public transfer payments were seen as an important part of this move toward equality. By 1993 more than 60 percent of the disposable income of those living in the eastern states was provided by transfers from the western states. This paper measures the success of government policy between 1990 and 1992 in achieving its two distributive goals as well as how this policy changed inequality within the western states themselves.

2. A MACRO-ECONOMIC VIEW OF INCOME IN REUNITED GERMANY

The reunification of Germany began immediately after the fall of the Wall in November 1989. After the first non-communist elections in March 1990 a monetary and social union between the German Democratic Republic (GDR) and the Federal Republic of Germany was established on July 1, 1990. Political

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unification followed in October 1990 and the first all-German elections since World War II took place in December 1990.

Productive and property assets were held by the GDR government when the reunification process began at the end of 1989. As a first step in the transition to a private economy, the *Treuhandanstalt* was founded by the transitional GDR government to serve as the holding company of all state-owned property. The *Treuhandanstalt* was responsible for privatising and restructuring state-owned enterprises. The total privatization of these 10,000 enterprises was almost completed by 1994. More than 90 percent of the enterprises that survived are owned by German companies with headquarters in the western states. About 7 percent were sold to foreigners. Only a small share are owned by their workers based on management buy-outs (Hall and Ludwig, 1994).

From the first days of monetary reunion, the Kohl government pressed for the full integration of the economy of the eastern states into a single German economy. Hence, markets in the eastern states were opened to the world, and the East German *Deutsche Mark* was valued on a one-for-one basis with the West German *Deutsche Mark*. Not surprisingly, under such circumstances many enterprises in the east were not competitive. Unlike other Eastern European economies, the eastern states were not able to use exchange rates to adjust their prices in the face of world competition. Nor were factor prices allowed to fall. As a result, economic production and employment fell dramatically. From 1990 to 1992 the employment rate in the eastern states fell from 90 percent to 70 percent and official unemployment rolls increased from zero to 1.2 million people (DIW, 1993).

Table 1 uses aggregated data from Germany's national accounts to show how the allocation and sources of disposable income changed during the first years of transition. While disposable income in the western states increased by 17.9 percent between 1990 and 1993—from 1,508 billion DM to 1,778 billion DM—disposable income in the eastern states increased by 57 percent—from 167 billion DM to 262 billion DM. However, only part of the dramatic increase in the east came from private economic activity. The gross national product in the eastern states rose by only 23 percent over this period, and in 1991 the gross national product was actually less than disposable income! The share of income from employment in the east decreased from 65.1 percent to 51.9 percent, while direct public transfer income increased from 24.8 to 39.6 percent. The share of income from self-employment remained nearly unchanged. Hence, increases in disposable income in the eastern states were primarily financed by public transfer payments from the western states.

By 1993, 164 billion DM in public transfers flowed from west to east (approximately $100 billion at current exchange rates). The magnitude of these transfer payments can best be understood as a share of disposable income. In 1993, 62.4 percent of disposable income in the eastern states was financed by such transfers. The difference between this 62.4 percent in public transfers, reported in the last row of Table 1, and the 39.6 percent reported in direct public transfers is accounted for by public transfers from the west that subsidize labour in the form of unemployment insurance and short-time-allowances (direct government wage subsidies to private sector workers). In 1992 subsidization from unemployment insurance was about 20 percent of the total transfer payments (DIW, 1994). Without these

TABLE 1

ALLOCATION AND SOURCES OF DISPOSABLE INCOME IN GERMANY AND ITS EASTERN AND WESTERN STATES, 1990–92

	1990[a]	1991	1992	1993
Disposable income (billions of DM)				
Germany	1,675	1,808	1,976	2,040
Eastern states	167	211	244	262
Western states	1,508	1,597	1,732	1,778
Gross National Product (billions of DM)				
Germany	2,658	2,826	3,044	3,106
Eastern states	233	195	245	286
Western states	2,425	2,631	2,799	2,820
Sources of income-Eastern states (percentage)				
Employment	65.1	52.3	52.1	51.9
Self-employment[b]	10.1	11.1	11.0	8.5
Public transfers[c]	24.8	36.6	36.9	39.6
Total	100.0	100.0	100.0	100.0
Western states transfers to Eastern states (billions of DM)				
Total	46	128	156	164
As share of disposable income				
Western states	3.1	8.0	8.9	9.2
Eastern states	27.5	60.8	63.7	62.4

Source: Compilation of the German National Income Accounts as prepared by the German Institute for Economic Research, Berlin, DIW, 1994.

[a]Year of reunification.

[b]Includes profits and property income.

[c]Includes payments from compulsory health care, old age, and unemployment insurance systems.

labour market subsidies, official unemployment in the eastern states would have been even higher. The Kohl government's massive transfers from west to east were meant to reduce income inequality between these two parts of Germany. However, at the time of reunification the government was virtually silent on the cost of the transfer payments and how they would affect income inequality within the western states. Table 1 shows that 9.2 percent of disposable income in the western states was transferred to the eastern states in 1993. Although a large share of the transfers were financed by increased public debt, taxes were also raised. Social security taxes were increased 1.5 percentage points from 1990 to 1993. In addition a "solidarity surplus tax" (*Solidaritätszuschlag*) was added to the personal income tax. The distributional effects of reunification can only be studied using micro data on individuals and households. It is this task which is undertaken in the remainder of the paper.

3. METHODOLOGICAL ISSUES AND DATA

There are numerous measures of cross-sectional inequality in the literature. (See Jenkins, 1991b for an overview of these measures.) The measure used here comes from a class of inequality measures which is additively decomposable.

Additively decomposable inequality measures satisfy the requirements of the Dalton–Pigou principle of transfers, as well as population replication and mean independence and, hence, are commonly used in the inequality literature. The specific measure used here is commonly called the Theil I(0) inequality measure where:

$$\text{(1)} \qquad \mathrm{I}(0)=\left(\frac{1}{N}\right)\sum_{i=1}^{N}\log\left(\frac{\mu}{y_i}\right),$$

and N is size of the population, y_i is individual income, and μ is mean income of the population. The Theil I(0) measure can be decomposed such that (see Shorrocks, 1980):

$$\text{(2)} \qquad \mathrm{I}(0)=\sum_{g=1}^{G} p_g \mathrm{I}(0)_g+\sum_{g=1}^{G} p_g \log\left(\frac{p_g}{v_g}\right).$$

The first term describes inequality within each of the G population subgroups. In this paper it first measures inequality within the western states and then within the eastern states. The second term measures inequality between these two subgroups, using v_g the share of total income in subgroup g $(\sum_{i=1}^{N_g} y_i/\sum_{j=1}^{N} y_j)$, and p_g the share of the total population in each subgroup (n_g/N). Overall inequality in reunited Germany, I(0), is thus the sum of inequality within and between the western and eastern states.

Data

The data used here come from the 1990 through 1992 waves of the German Socio-Economic Panel (GSOEP). The GSOEP is a longitudinal micro-database covering socio-economic information on households in Germany. The first wave of data was collected from about 6,000 families in the western states in 1984. The first wave of data from the eastern states was collected in June 1990, before official reunification. For a detailed discussion of these data see Wagner, Burkhauser, and Behringer (1993).[1]

Comparing income distributions between countries with different political and economic systems must be done cautiously.[2] For instance, prior to reunification the German Democratic Republic both subsidized commodities that were considered necessary for "basic needs" and required consumers to have political connections as well as cash to obtain "luxuries." Hence, income was not as good a yardstick of economic well-being in the eastern states as it was for the western states of Germany prior to reunification. However, subsidization and political clout was disappearing in the months before unification when the 1990 data were being collected. Therefore, our analysis for 1990 is less affected by non-market price constraints than previous years might have been.

[1]Table A-1 contains descriptive information on the data used, including the weights used to decompose inequality. To adjust for attrition and sampling discrepancies, a weighting scheme developed to make the GSOEP nationally representative is used (Rendtel, 1993).

[2]For a detailed discussion of the specific issues that must be considered in comparing income in the Federal Republic of Germany and the German Democratic Republic in 1990, see Hauser (1992).

Although the GSOEP questionnaires for the eastern and western states are similar in design, there are some differences in the income questions. Thus, while it is possible to measure income on a yearly basis in the western states, it is not possible to do so for the eastern states in 1990.[3] For this reason, in this paper income measures in the eastern and western states are calculated within a monthly time frame. Before Government income is the sum of total family income from monthly labour earnings and asset flows before taxes. Unfortunately, it is not possible to calculate monthly After Government income in the same way. Monthly After Government income figures come from a single question in which the head of the family is asked to report monthly family income as the sum of labour earnings, asset income, and private and public transfer payments, deducting income and social security taxes.[4]

The family is usually considered the appropriate unit for the measurement of economic status and it is the income unit used here. However, our unit of analysis is the individual. Hence, it is necessary to adjust family income to account for differences in family size. Since there is no official family-size adjusted equivalence scale in Germany, the equivalence scale used here is derived from the German social assistance program (*Bundessozialhilfegesetz*).[5] It is assumed that family members equally share family income during the period they are together.[6] So an equal family-size adjusted income value is calculated for each person in the family.

4. German Income Inequality, 1990–92

Table 2 reports Theil I(0) inequality measures for Germany, as well as for its eastern and western states. In 1990, the year in which east and west were reunited, the "new" Germany had considerable inequality in both Before and After Government income. Before Government inequality was 1.15, but government tax and transfer policy dramatically reduced this inequality; After Government inequality was 0.147.[7]

The results in Table 2 also indicate that Before Government inequality in Germany increased after 1990 and in 1992 was even higher than inequality in the western states of Germany in 1990. Although Before Government inequality remained nearly unchanged in the western states following reunification, it rose dramatically in the eastern states. This rise was consistent with expectations of

[3]All income information in the GSOEP is in a monthly time frame. However, Daly and Butrica (1994) describe the GSOEP-PSID equivalent data file which puts the GSOEP data for the western states in a yearly frame for both Before and After Government income. Equivalent yearly measures for the eastern states are not available.

[4]After Government income is based on reported income data. Before Government income is a "counterfactual" which makes the strong assumption that behavior does not change in the absence of government. This is clearly only an approximation of what would actually occur, especially for those who have retired. Hence, Before Government values are best thought of as a means of showing to whom current benefits go, given current government policy, rather than as a measure of what would actually occur in the absence of government.

[5]For a fuller discussion and criticism of this scale, see Burkhauser, Smeeding, and Merz (1994).

[6]Jenkins (1991a) makes a strong case for studying the within-family distribution of income.

[7]Compared to other countries, however, After Government inequality in Germany in 1990 was not extreme. For instance, in the United States, Burkhauser and Poupore (1993) computed a value of 0.287 for After Government income, substantially higher than the German value.

TABLE 2

THEIL I(0) INEQUALITY MEASURES OF BEFORE AND AFTER GOVERNMENT INCOME FOR GERMANY AND ITS COMPONENT STATES, 1990–92[a]

	Before Government Income Inequality			After Government Income Inequality		
Year	Germany	Eastern States	Western States	Germany	Eastern States	Western States
1990[b]	1.150	0.652	1.225	0.147	0.054	0.118
1991	1.163	0.956	1.204	0.137	0.067	0.110
1992	1.250	1.190	1.221	0.132	0.066	0.112

Source: The 1990 through 1992 waves of the German Socio-Economic Panel.

[a]Monthly income in 1990 Deutsche Mark. Income is adjusted for household size using an equivalence scale computed according to the *Bundessozialhilfegesetz*.

[b]Year of reunification.

the likely effects of reunification, especially of increasing unemployment. In 1992 Before Government inequality in the east was very close to that in the west.

Government policy appears to have mitigated the extent of Before Government inequality over the period. After Government inequality during the period decreased. In addition, while Before Government inequality essentially remained unaltered, After Government inequality actually fell between 1990 and 1992 in the western states. More importantly, the tremendous rise in Before Government inequality in the east was greatly offset by government tax and transfer policy so that the rise in After Government inequality in the east was substantially smaller.

The additively decomposable characteristic of the Theil I(0) measure allows total income inequality to be expressed in terms of the share of its various components. Table 3 shows how inequality within the eastern and western states contributes to overall German inequality. In 1990, the year of reunification, German Before and After Government inequality was clearly dominated by income inequality within the western states. Western inequality was responsible for 82.6 percent of German Before Government inequality and 62.5 percent of German After Government inequality. Nonetheless, the share of overall inequality accounted for by differences between states was considerable. It made up 4.7 percent of Before Government inequality and even 29.5 percent of After Government inequality. Inequality in the east was responsible for the rest—12.7 percent of Before Government inequality and 7.9 percent of After Government inequality.

Public transfers from the western to the eastern states, both to prop up wages and increase social security and other direct transfer programs, were meant to reduce the income gulf between east and west and to lessen the rise in Before Government inequality that was expected to occur within the east. Table 3 suggests that the government was successful in achieving these goals. Largely as a result of government subsidies to private sector employers and employees, the absolute amount of Before Government inequality due to between-state differences fell from 0.054 to 0.036 and its share fell from 4.7 to 2.9 percent between 1990 and 1992. Government labour market policies were less successful in reducing Before Government inequality in the eastern states. Inequality rose in absolute terms, and as a share of Before Government inequality it increased from 12.7 to 20.4 percent. However, government policy was more successful in mitigating After

TABLE 3

SOURCE OF THEIL I(0) INEQUALITY IN BEFORE AND AFTER GOVERNMENT INCOME FOR REUNITED GERMANY AND ITS EASTERN AND WESTERN STATES, 1990–92[a]

	Before Government Income Inequality[c]			
		Sources		
Year	Germany	Eastern States	Between States	Western States
1990[b]	1.150	0.146	0.054	0.950
	(100.0)	(12.7)	(4.7)	(82.6)
1991	1.163	0.206	0.045	0.914
	(100.0)	(17.9)	(3.7)	(78.6)
1992	1.250	0.255	0.036	0.959
	(100.0)	(20.4)	(2.9)	(76.7)
	After Government Income Inequality[c]			
		Sources		
	Germany	Eastern States	Between States	Western States
1990[b]	0.147	0.012	0.044	0.092
	(100.0)	(7.9)	(29.5)	(62.5)
1991	0.137	0.014	0.036	0.087
	(100.0)	(10.4)	(26.1)	(63.5)
1992	0.132	0.014	0.029	0.089
	(100.0)	(10.5)	(22.2)	(67.3)

Source: The 1990 through 1992 waves of the German Socio-Economic Panel.

[a]Monthly income in 1990 Deutsche Mark. Income is adjusted for household size using an equivalence scale computed according to the *Bundessozialhilfegesetz*.

[b]Year of reunification.

[c]Percentages of total inequality shares in parentheses.

Government inequality within the eastern states. Despite rising unemployment, absolute After Government inequality within the east remained virtually unchanged between 1990 and 1992 while between-state inequality fell both absolutely—from 0.044 to 0.029—and as a share of overall After Government inequality—from 29.5 to 22.2 percent.

Before Government inequality within the western states rose absolutely but fell as a share of total inequality over the period. In contrast, it rose as a share of After Government inequality but actually fell slightly in absolute value from 0.092 to 0.089.

Hence, it appears that the massive transfers from west to east achieved their goals, at least to some degree. The importance of between state differences in overall inequality has dropped substantially since 1990, with respect to both Before and After Government inequality measures. Significantly, this has been achieved with only modest increases in After Government inequality in the eastern states and with a slight decline in After Government inequality in the western states. The next section looks more closely at what is driving these results.

5. ANALYZING THE TREND IN GERMAN INCOME INEQUALITY

Equation (2) showed that inequality in Germany depended on the mean income levels, population shares, and the extent of inequality within its eastern and western states. Equation (3) expresses changes in equation (2) over time in a way that allows these changes to be decomposed into distinct parts. This method was first proposed by Mookherjee and Shorrocks (1982).

$$\text{(3)} \quad \mathrm{I}(0)_{t+1} - \mathrm{I}(0)_t = \sum_{g=1}^{G} \overline{p_g} \Delta \mathrm{I}(0)_g + \sum_{g=1}^{G} \overline{\mathrm{I}(0)_g} \Delta p_g + \sum_{g=1}^{G} \overline{\left(\frac{\mu_g}{\mu} - \log\left(\frac{\mu_g}{\mu}\right)\right)} \Delta p_g + \sum_{g=1}^{G} \left(\overline{p_g \frac{\mu_g}{\mu}} - \overline{p_g}\right) \Delta \mu_g,$$

where $\overline{p_g} = 0.5(p_{t+1} + p_g)$. The other elements signed by an overline are defined analogously. $\Delta \mathrm{I}(0)_g$ is computed as $(\mathrm{I}(0)_{t+1} - \mathrm{I}(0)_t)$ and the other elements signed by Δ are analogously computed.

The first term of equation (3) measures the effect of changes in inequality within the eastern and western states on overall inequality. The second term measures the effect of changes in population shares within the eastern and western states on overall inequality related to subgroup inequality. The third term measures the effect of changes in population shares between the eastern and western states on overall inequality related to subgroup mean income. The fourth term measures the effect of changes in relative mean income levels in the eastern and western states on overall inequality.

As we saw in Table 2, from 1990 to 1992 Before Government inequality in the eastern states rose from 0.652 to 1.19, while it remained nearly unchanged in the western states—1.225 to 1.221. Over the same period, After Government income rose from 0.054 to 0.066 in the east and fell slightly in the west—0.118 to 0.112. Hence, we expect changes in within-state inequality in the east (term 1 in equation (3)) over the period to have an important effect on our overall Theil I(0) measure.

Changing population shares (terms 2 and 3 in equation (3) reflect fertility and mortality changes in the population as well as migration. Migration from the east to the west was considerable over the period and is likely to be an important explanation of overall inequality changes. In 1990, 2.4 percent of the population of the eastern states migrated to the west. In 1992 1.3 percent moved (Schwarze and Büchel, 1994).[8] Hence, we expect population shifts to have some effect on our overall Theil I(0) measure.

From 1990 to 1992 Before Government income as well as After Government income in the eastern states rose on average by 16 percent, while both incomes remained about the same in the west. Hence, we expect changes in mean income to substantially reduce inequality. Term 4 can be considered a proxy of the importance of west to east transfers on overall inequality since, as was seen in Table 1, these transfers contributed the largest share, narrowing the gap in mean income between east and west.

[8]There is also a significant decline of the fertility rate in the eastern states (from 178,000 live births in 1990 to 87,000 live births in 1992, see Hall and Ludwig, 1994). Migration to the western states, however, seems to be a more important factor (844,000 persons between 1990 and 1992, see Schwarze and Büchel, 1994).

Since this paper considers only two subgroups, each term in equation (3) is considered separately for the eastern and western states. Of greatest interest is the impact of changes in inequality and mean incomes within east and west on overall German inequality.

The results of the trend decomposition are shown in Table 4. Our Theil I(0) measure of German Before Government income inequality increased by 0.10 from 1990 to 1992. Our After Government income inequality measure decreased by 0.015 over the same period. To make the effects comparable for both inequality values, these absolute values are standardized to +100 and −100, respectively and

TABLE 4

DECOMPOSITION OF THEIL I(0) INEQUALITY CHANGES IN GERMANY BEFORE AND AFTER GOVERNMENT INCOME FOR 1990–92[a,b]

	Marginal Change Relating to Total	
Sources of Change	Before Government[c]	After Government[d]
Within-group inequality		
Germany	113.8	−9.4
Eastern states	117.6	17.1
Western states	−3.8	−26.5
Population shares on		
Within inequality	3.3	2.5
Between inequality	−1.8	−6.4
Mean group incomes		
Germany	−15.3	−86.7
Eastern states	−15.4	−91.8
Western states	0.1	5.1

Source: The 1990 through 1992 waves of the German Socio-Economic Panel.

[a]Monthly income in 1990 Deutsche Mark. Income is adjusted for household size using an equivalence scale computed according to the *Bundessozialhilfegesetz*.

[b]Year of reunification.

[c]Before Government change in Theil I(0) between 1990 and 1992 was +0.10.

[d]After Government change in Theil I(0) between 1990 and 1992 was −0.015.

the influence of each term is relative to a change of 100 in the Theil I(0) measure.

Increases in mean income in the east had the most important influence on the decline in German After Government income inequality. Changes in mean income dominate the change in overall After Government income inequality. Its effect is to reduce inequality by 86.7. Separating the effect of mean income with respect to the eastern and western states shows that the reduction in inequality due to the increase in mean After Government income in the east is offset slightly by the small rise in mean income in the west. Changes in mean income also lowered the increase in overall Before Government income inequality. Compared to After Government income, however, the effect is small (−15.3) and depends on the mean change in East Germany only.

Since increases in mean income in the eastern states are primarily due to transfers from the west, it can be argued that the transfers are primarily responsible for declines in both Before and After Government income inequality in Germany since 1990 and, especially in the case of Before Government income, have lowered increases in the other factors that influence overall inequality.

Increased Before Government income inequality in the eastern states clearly increases German inequality, but once again the influence of government in mitigating private market outcomes is seen in the After Government measure. After Government inequality reductions in the western states completely offset slight inequality increases in the east so that, on net, After Government inequality is reduced in Germany.

The effects of changing population shares can also be seen in Table 4. Although the results should be interpreted carefully, they provide some indication of the impact of migration on German inequality. Migration from east to west increased German inequality by shifting the weighted inequality within the western states upwards as described by their positive effects (3.3 and 2.5). On the other hand, migration also lowered the weight of inequality between the eastern and western states of Germany (−1.8 and −6.4) even more. Therefore, migration from east to west reduced overall German inequality.

6. Summary

After almost a half century of separation, economic well-being in the eastern and western states of Germany was quite different. Mean income was considerably lower in the east but income inequality was also lower. While the Kohl government was less than forthcoming about the cost, it was clearly committed to narrowing the difference in the economic well-being of those living in the eastern and western states without dramatically increasing income inequality.

By 1992 the western states of Germany were transferring almost 10 percent of their disposable income to the east and over three-fifths of disposable income in the east could be directly traced to these transfers. While the Kohl government can clearly be criticized for its lack of candor with respect to the costs, this paper suggests that it has substantially reduced the share of After Government inequality in reunited Germany due to differences between the eastern and western states and has done it in a way that has substantially lowered the increase in Before Government inequality in the east and actually reduced After Government inequality in the west. What is less sure is how long the massive transfers that are primarily responsible for these outcomes will have sufficient economic productivity to keep the economic well-being of its citizens close to that of its western counterparts.

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TABLE A-1

BEFORE AND AFTER GOVERNMENT MEAN INCOME FOR REUNITED GERMANY AND ITS COMPONENT STATES, 1990–92[a]

	1990[b]	1991	1992
Germany			
Before Government income	1,472	1,495	1,508
After Government income	1,395	1,397	1,435
Eastern states			
Before Government income	719	780	832
Share of total population	22.5	21.5	21.4
Share of total income	11.0	11.2	11.8
After Government income	727	775	842
Share of total population	21.6	21.2	20.9
Share of total income	11.3	11.8	12.3
Western states			
Before Government income	1,691	1,692	1,693
Share of total population	77.5	78.5	78.6
Share of total income	89.0	88.8	88.2
After Government income	1,579	1,564	1,592
Share of total population	78.4	78.8	79.1
Share of total income	88.7	88.2	87.7

Source: The 1990 through 1992 waves of the German Socio-Economic Panel.

[a]Monthly income values in 1990 Deutsche Mark. Income is adjusted for household size using an equivalence scale computed according to the *Bundessozialhilfegesetz*.

[b]Last year before reunification.