

Grabka, Markus M.; Schwarze, Johannes; Wagner, Gert G.

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How Unification and Immigration Affected the German Income Distribution

Markus M. Grabka^a, Johannes Schwarze^{a,b}, Gert G. Wagner^{a,c,d*}

^a German Institute for Economic Research (DIW),
Koenigin Luise Strasse 5, D-14191 Berlin, Germany

^b University of Bamberg, Bamberg, Germany

^c Viadrina European University, Frankfurt (Oder), Germany

^d CEPR, London, UK and IZA, Bonn, Germany

* Corresponding author. Tel. +49-30-89789 290; fax +49-30-89789 109; e-mail: gwagner@diw.de

Abstract: The German Economy is not only affected by the Unification of Germany but by a significant influx of immigrants from abroad and huge migration from East to West Germany around the date of unification. Data from the German Socio-Economic Panel Study (GSOEP) allows to disentangle those effects by decomposition of the Theil I (0)-Index of inequality. In addition, the paper offers insights in the transition of a socialist economy into a market oriented one.

JEL classification: D31, J21, J31

Keywords: Decomposable Inequality Measure, Economics of Transition, Economic Impact of Immigration,

1. Introduction

In an international comparison Germany seems to be one of the economies with a small degree of income-inequality (regardless of the concept of measurement). Moreover, whereas the income distribution became much more unequal in the United States and Great Britain, for example, in the last 10 or 15 years (cf. Jaentti, 1997), the situation in Germany seems to be quite stable, and this is true not only before German unification happened, but after unification also.

From a German point of view the evaluation is more or less the opposite: There is an increasing concern about the widening of the income distribution, in connection with increasing poverty in West-Germany. In addition the lower earnings in East-Germany are a reason for the debate about income-inequality between the "old" Western and the "new" Eastern parts of Germany. A special reason for the public debate about inequality and poverty is some very "visible" inequality and poverty which is due to immigration.

In 1990 not only was Germany unified but in this year immigration into West Germany peaked. Beginning around 1984 the influx of immigrants from abroad increased. From 1988 to 1993 more than half a million immigrants came to West Germany year by year (this means that for more than 5 years the net immigration rate was about 1 percent of the residence population) (cf. Frick et al., 1999). This large influx was not only due to refugees and labor migrants but the major part was the re-migration of so called "Ethnic Germans" who settled mainly in some parts of the former Soviet Union, Poland and Romania (cf. Kurthen et al., 1998). Starting on the eve of unification many of East Germans began to move to West Germany; this migration stream peaked also in 1990 and was still considerable in 1991. Thus in 1997 about 8 percent of the resident population in West Germany immigrated since 1984, whereas in East Germany the immigrant population is far less than 1 percent because due to serious labor market problems East Germany does not attract immigrants.

In East Germany in 1997 the official unemployment rate was about 18 percent. This very high rate is the outcome of "shock therapy" which was applied to East Germany after unification in 1990 (cf. Frick et al., 1995, Ott and Wagner, 1996). The common currency of the Deutsch Mark and a considerable increase of earnings raised the unemployment rate in the course of transition of the socialist economy of the German Democratic Republic to the market oriented economy in unified Germany. However, together with this shock the West Germany safety net came to East Germany also. Schrettl (1992) calls this kind of transformation which is unique in Eastern Europe "Transition

with Insurance". More than 50 percent of the "national income" of East Germany still comes as subsidies and transfers from West Germany (cf. Schwarze 1996, 3). After the unification boom which occurred in West Germany the economy slipped into a recession (starting 1992/3). In 1997 the unemployment rate was about 10 percent in West Germany.

The analysis of the German income distribution must take into account (1) considerable effects of composition of the population and (2) the difference of pre-government income which is heavily affected by unemployment and post-government income which shows the outcome of the redistribution process of the safety net. This paper makes an attempt to disentangle the empirical evidence. The paper is organized as follows: Section 2 describes the inequality measures and the decomposition technique which are applied and the data base (German Socio-Economic Panel Study). Section 3 presents and discusses the empirical results. Section 4 summarizes the paper and draws some conclusions for further research.

2. Data and Methods

There are numerous measures of cross-sectional inequality in the literature (see Jenkins, 1991, Bourgnigon et al., 1998). A well known measure is the Gini coefficient

$$(1) \quad G = \left[\frac{1}{2n^2\mu} \sum_{i=1}^n \sum_{j=1}^n |y_i - y_j| \right]$$

where y is individual income, n the number of individuals, and μ is mean income. The other 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 (see Shorrocks, 1980). The specific measure used here is commonly called the Mean Logarithmic Deviation (MLD or Theil $I(0)$) measure where:

$$(2) \quad I_{(0)} = \left(\frac{1}{n} \right) \sum_{i=1}^n \log \left(\frac{\mu}{y_i} \right)$$

and n is size of the population, y_i is individual income, and μ is mean income of the population¹. The I_0 measure can be decomposed such that (see Shorrocks 1980):

¹ Zero incomes which are found for pre-government income cause problems because the log cannot be applied to zero (see equation 2). We are following a suggestion by Jenkins (1991, 34) by assessing a very small number to cases with

$$(3) \quad I_{(0)} = \sum_{g=1}^G p_g I_{0_g} + \sum_{g=1}^G p_g \log \left(\frac{p_g}{v_g} \right) .$$

The first term describes inequality within each of the G population subgroups. 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). This decomposition can be used to show how income inequality in East and West Germany, as well as immigrants have influenced overall German income inequality.

Equation (3) 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 (4) expresses changes in equation (3) 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).

$$(4) \quad I(0)_{t+1} - I(0)_t = \sum_{g=1}^G \overline{p_g} \Delta I(0)_g + \sum_{g=1}^G \overline{I(0)_g} \Delta p_g + \sum_{g=1}^G \left(\frac{\overline{\mu_g}}{\overline{\mu}} - \log \left(\frac{\overline{\mu_g}}{\overline{\mu}} \right) \right) \Delta p_g + \sum_{g=1}^G \left(\overline{p_g} \frac{\overline{\mu_g}}{\overline{\mu}} - \overline{p_g} \right) \Delta \mu_g ,$$

where $\overline{p_g} = 0.5(p_{t+1} + p_g)$.² The other elements marked by an overline are defined analogously.

$\Delta I(0)_g$ is computed as $(I(0)_{t+1} - I(0)_t)$ and the other elements signed by Δ are analogously computed.

The first term of equation (4) 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. And the fourth term measures the effect of changes in relative mean income levels in the eastern and western states on overall inequality.

We are using microdata from the German Socio-Economic Panel Study (GSOEP) (cf Wagner et al., 1993). The GSOEP is a longitudinal sample of about 5,000 private households and about 14,000 interviewed persons².

zero income. We are using 1 DM. The problem is not as large as one may imagine because most of retirees who earn no labor market income do have some interest earnings. All children who have no incomes at all get their share of household income when we estimate equivalent incomes. Thus the share of the population with pre-government incomes of zero is rather small and does not affect the empirical calculations heavily. Broken down by the major subgroups of the population the shares are: 4.6 percent for West Germans, 3.4 percent for East Germans, 3.3 percent for East-West-Movers, and 11.2 percent for the fresh immigrants who came since 1984 to West Germany.

² For example the British Household Panel Study looks very much like the GSOEP.

Pre-government income includes information on income from earnings, self-employment, earnings from secondary jobs and private transfers. Additional information about income is available for the 13th or 14th monthly income, bonuses, profit sharing, holiday pay or other special payments. For the pre-government income we also consider the household capital income and income from rental or leasing³. "Post-government income" is the net income, which is reported by the head of household only one month in a year. In most international studies of the income distribution "annual incomes" are used. However, those incomes would underestimate the speed of the transition process in East Germany.

To adjust for differences in family size we use a common international equivalence scale. Its weights are computed as the square root of household size.

3. Income Inequality in Germany 1990 to 1997

We start our investigation with an analysis of the components of income inequality in unified Germany in 1997. Table 1 presents indicators for the overall income inequality and table 2 displays the decomposition for the major groups in the population: "native" West Germans⁴, East Germans (who are staying in East Germany), East-West-Movers, and immigrants (coming from abroad to West Germany).

First of all, the means, respectively medians of pre- and post-government incomes are of interest. As one may expect the pre-government incomes are higher than post-government incomes because not all taxes which are paid by private households are spent by the government for private purposes. A considerable share of taxes is spent to firms and the non-profit sector of an economy. For West Germans as well as for immigrants and movers, the difference between pre- and post-government-income is as expected, but for East Germans this difference is rather small. This is the indication for the huge amount of transfers which are paid from West to East Germany. Nevertheless the post-government-income average in East Germany is lower than in West Germany.

³ All missing variables are filled by mean imputation.

⁴ This population includes foreigners also, who immigrated before 1984.

The indicators for pre-government incomes show the largest inequality for East Germans whereas the movers have by far the smallest amount. For the East Germans who still remain in East Germany this is due to the high level of unemployment. For those who moved to West Germany the reason is a strong attachment to the labor force which makes zero-incomes due to unemployment unlikely⁵. Inequality within the immigrants group is small also. Again this is due to high employment rates; in addition most immigrants earn low market incomes which are distributed within a narrow range. On the other hand due to some regulations in Germany, the unemployment rate of immigrants is high also. This is the reason why the bottom-sensitive Theil measure shows a considerable degree of inequality for immigrants whereas the Gini coefficient shows a smaller degree.

Looking at post-government income we get a completely different impression. The movers and immigrants are the groups with the highest degree of inequality. This is due to the fact that within those groups there are more or less no retirees who make post-government distributions rather "equal". In East Germany, the German welfare state works quite impressively: post-government income in East Germany is by far more equally distributed than in West Germany. The "transition with insurance" still works. Both parts of Germany have comparatively low degrees of income inequality if we compare them with other western economies (cf. Gottschalk and Smeeding, 1997). Table 2 shows the relative contributions of the four groups and the between-group-effect on total inequality. Most impressive is the small amount of between-inequality. We come back to this issue by the interpretation of table 4.

Table 3 reports Theil inequality measures for the full period of transition. In 1990, the year in which east and west were reunified, the "new" Germany had considerable inequality in both pre and post-government income. Pre-government inequality was 0.9473. However, government tax and transfer policy dramatically reduced this inequality with post-government inequality being 0.1436⁶. The results in table 3 also indicate that pre-government inequality in Germany increased up to 1.13 in 1997. Although pre-government inequality increased only slightly in the western states following reunification, it rose dramatically in the eastern states, from 0.50 in 1990 up to 1.19 in 1997, and therefore was higher than in the western states. This rise was consistent with expectations of the likely effects of reunification, especially of increasing unemployment.

⁵ Because migrants have a higher probability for having no interest income the overall share of zero-incomes is not much smaller than in the stayer population.

⁶ These figures are different from the decomposition analysis by Schwarze (1996) because of a slightly different definition of pre and post-government income. In addition, another equivalent scale is used here.

Government policy appears to have mitigated the extent of pre-government inequality over the period. Post-government inequality during the period decreased. More importantly, the tremendous rise in pre-government inequality in the east was greatly offset by government tax and transfer policy so that the rise in post-government inequality in the east was substantially smaller.

Table 4 shows how inequality within the eastern and western states contributes to overall German inequality. In 1990, the year of reunification, German pre and post-government inequality was clearly dominated by income inequality within the western states. Western inequality was responsible for 83.3 percent of German pre-government inequality and 61.9 percent of German post-government inequality. Nonetheless, the share of overall inequality accounted for by difference between states was considerable. It made up 5.6 percent of pre-government inequality and even 27.9 percent of post-government inequality. Inequality in the east was responsible for the rest.

Public transfers from the western to the eastern states, both to subsidize up wages and increase social security and other direct transfer programs, was meant to reduce the income gap between east and west and to lessen the rise in pre-government inequality that was expected to occur within the east. Table 4 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 pre-government inequality due to between-state differences fell from 0.053 to 0.0072 and its share fell from 5.6 to only 0.6 percent between 1990 and 1997. Government labor market policies were less successful in reducing pre-government inequality in the eastern states. Inequality rose in absolute terms, and as a share of pre-government inequality it increases from 11.1 to 19.8 percent. However, government policy was more successful in mitigating post-government inequality within the eastern states. Despite rising unemployment, absolute post-government inequality within the east remained virtually unchanged between 1990 and 1997 while between-state inequality fell significantly both absolutely (from 0.040 to 0.0032) and as a share of overall post-government inequality - from 27.9 to 2.7 percent. Pre-government inequality within the west rose absolutely but fell as a share of total inequality over the period. In contrast, it rose as a share of post-government inequality and in absolute values.

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 pre and post-government inequality measures. And this has been

achieved with only modest increases in post-government inequality in the eastern states and with a slight decline in post-government inequality in the western states.

As we saw in Table 3, from 1990 to 1997 pre-government inequality in the eastern states rose from 0.505 to 1.19, while it rose only slightly in the western states: from 0.995 to 1.1075. Over the same period, post-government income rose by 0.070 to 0.089 in the east and remained nearly unchanged in the west. Hence, we expect changes in within-state inequality (term 1 in Equation 4) over the period in the east 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. Because more than 5 percent of the pre-unification population of East Germany moved to West Germany in the period of investigation we expect population shifts to have some effect on our overall Theil $I(0)$ measure.

From 1990 to 1997 pre-government income as well as post-government income in the eastern states rose on average by 16 percent, while both income measures 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 these transfers contributed the largest share, narrowing the gap in mean income between east and west (see Schwarze 1996).

Since this paper considers only two subgroups, each term in equation (4) 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 pre-government income inequality increased by 0.18 from 1990 to 1997. Our post-government income inequality measure decreased by 0.027 over the same period. To make the effects comparable for both inequality values, these absolute values are standardized to +100 and -100, respectively and 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 post-government inequality. Changes in mean income dominate the change in overall post-government

income inequality. Its effect is to reduce inequality by 127.7. 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 post-government income in the east (172.5) is offset by the rise in mean income in the west (44.8). Changes in mean income also lowered the increase in overall pre-government income inequality. Compared to post-government income, however, the effect is small (-23.5) and depends mostly on the mean change in East Germany.

Because increases in mean income in the east are primarily due to transfers from the west, it can be argued that the transfers are primarily responsible for declines in both pre and post-government income inequality in Germany since 1990 and, especially in the case of pre-government income, have lowered increases in the other factors that influence overall inequality.

Increased pre-government income inequality in the east clearly increases German inequality. However, once again the influence of government in mitigating private market outcomes is seen in the post-government measure. Although, rising within group inequality increased overall inequality, this effect is only small as compared to pre-government income inequality. Moreover, rising inequality within west Germany contributed more to overall post-government income inequality, then rising inequality in the east did.

The effects of changing population shares can also be seen in Table 5. Although the results should be interpreted carefully, they provide some indication of the impact of migration from East to West Germany on overall 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 effect (2.1 and 2.5). On the other hand, migration also lowered the weight of inequality between East and West Germany (-1.3 and -6.0) even more. Therefore, migration from east to west reduced overall German inequality.

4. Conclusions

This paper confirms the international view that Germany is an economy with a small degree of income-inequality. The German notion, that income-inequality is increasing, is confirmed also, but the increase of inequality occurring in West-Germany is small. Although "shock therapy" was

applied to the eastern German economy, the income inequality of post-government-income is still smaller in East than in West Germany. This is a strong indication that the German safety net is still working effectively.

Important other research questions which are connected with the distribution of earnings and income are not addressed in this paper. Especially the question is not addressed whether the earnings for non-qualified workers are above their (potential) productivity.

Our results demand further research from a methodological point of view. First of all we will calculate confidence intervalls for our results which are based on a medium-sized sample. Some of the differences displayed above will not be significant but it is not straightforward to calculate confidence intervalls for clustered samples which are part of an ongoing panel study with a considerable amount of attrition. Secondly we shall try to compute proxies for "annual income" for the period of fast transition in East Germany. A third extension of this paper could deal with a heavily ignored problem of all analyses of income distributions: different levels of consumer prices in different regions. We have some indication that at the beginning of transformation, the price level was lower in the East than in West Germany. Differences between North and South Germany are not unlikely, as well. As in other countries we have insufficient information on regional differences of price levels only. However, especially in a common European market where one currency will be used soon, the impact of different prices on the distribution of income shall be addressed much more carefully .

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Table 1: Evolution of household inequality in Germany (1997)

	West	East	Movers	Immigrants	All
Pre-government Income					
GINI	0,4694	0,4898	0,3837	0,4533	0,4760
Theil I(0)	1,1204	1,1922	0,4894	1,0643	1,1306
mean	37776	27204	42800	28459	35464
median	35072	23480	36981	23700	32292
Post-government Income					
GINI	0,2347	0,2065	0,2261	0,2494	0,2369
Theil I(0)	0,1173	0,0896	0,0890	0,1018	0,1159
mean	31948	25565	30737	23509	30364
median	29393	24248	27577	21477	27712
Source: GSOEP 1997.					

Table 2: Decomposition of income inequality in Germany 1997

	West	East	Movers	Immigrants	Between
Pre-government Income Theil0	74,67%	19,75%	0,66%	4,14%	0,78%
Post-government Income Theil0	76,24%	14,46%	1,18%	3,86%	4,26%
Source: GSOEP 1997.					

Table 5: Decomposition of Theil I(0) Inequality Changes in German Pre-and Post-government Income for 1990 to 1997

Sources of Change	Marginal Change Relating to Total	
	Pre-government ^a	Post-government ^b
Within-group inequality		
Germany	122.7	31.2
Eastern states	73.8	14.1
Western states	48.9	17.1
Population shares on		
Within inequality	2.1	2.5
Between inequality	-1.3	-6.0
Mean group incomes		
Germany	-23.5	-127.7
Eastern states	-30.6	-172.5
Western states	6.6	44.8
^a Pre-government change in Theil I(0) between 1990 and 1992 was + 0.18. ^b Post-government change in Theil I(0) between 1990 and 1992 was -0.0277 Source: GSOEP 1990 and 1997.		