# Wage Convergence and Inequality after Unification: (East) Germany in Transition

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**Abstract:**
This paper investigates the convergence of the wages of East German workers with West German colleagues after unification. Our research is based on a comparison of three groups of workers who lived in East Germany in 1989 (stayers, migrants and commuters to West Germany) and groups of matched West German workers (extracted from GSOEP). According to our findings, wage convergence for stayers is roughly 75 percent, for commuters 85 percent and wages for migrants to West Germany have equaled to matched West German workers. Inequality among East German workers is higher today compared to their matched West German colleagues.

**Keywords:**
Wage convergence; German unification; regional mobility

**JEL-classification:**
J31, J30, J61

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# 1 Introduction

German reunification might become a paradigm of convergence and integration of neighbouring regions with unequal starting conditions (Burda and Hunt 2001, Sinn 2000). For instance, one of the most ambitious political goals was the equalisation of living conditions and wages in both parts of Germany. There are various channels through which wages and living condition may converge. With unification barriers to labour market competition and migration were removed. Competition for jobs and wages increased and changed the allocation of labour and skills through massive migration, unemployment and wage adjustments in both German regions.

This paper is concerned with the evolution of the wage distribution after unification in both parts of Germany as well as the wages and the wage distribution of East German migrants and commuters to West Germany. While wages may adjust as a result of central wage bargaining, the adjustment of qualification and skills follows different pathways and patterns, for instance through migration or unemployment dynamics (see Akerlof et al. 1991, Krueger and Pischke 1995).

Whether wages and the wage distribution already converged is a topic of considerable debate among empirical researchers and is discussed in our paper. Our research approach is to compare the wage distribution of East German workers, migrants from East to West Germany and commuters from East to West Germany with their matched counterparts from the West German workforce. Migration to West Germany, especially concentrated among the 18 - to 25-years old, is still going on, indicating ongoing transition processes (see Burda 2006, Uhlig 2006, Hunt 2006). Our empirical part builds on samples for these groups of workers extracted from the German Socioeconomic Panel (GSOEP) 1992-2005. Based on regression and non-parametric matching methods we search for a group of West German workers comparable to the East German workers. Based on this comparison in observables, wages and the convergence (or divergence) of wage distributions in the transition period from 1992 to 2005 is investigated.

our contribution is related to the issue of rising wage inequality (see Acemoglu, 2002, Autor et al., 2006, 2005a, b). For instance, for a long time rising wage inequality in Great Britain and the United States has been contrasted with a stable wage distribution in Europe and especially in Germany (e.g. Prasad, 2004). This issue has been highlighted by Krugman (1994) who argued that rising inequality and low unemployment rates in the United States and rising unemployment and a stable wage distribution in Europe are the two sides of one coin. Findings from Fitzenberger et al. (2001), Gernandt and Pfeiffer (2006), Kohn (2006), Möller (2005), among others, however, suggest that wages in Germany have always been flexible to some degree. Be that as it may, wage inequality is still rising and adjustment forces are shaping

the ongoing processes of convergence and divergence in Germany`s economic and labour markets transition.

Between 1992 and 2005 the average hourly wage of prime age dependent workers living and working in East Germany increased by 52 percent, while it increased only by 9 percent for workers in West Germany. Today, mean wages in East Germany are on average about 70 percent of western wages (Statistisches Bundesamt 2006). For prime age dependent employees living and working in East Germany, the ratio of wages for high wage workers as measured by the ninetieth percentile of the wage distribution and low wage workers as measured by the tenth percentile of the wage distribution increased from 2.00 to 2.93 (for comparison: from 2.40 to 2.85 in West Germany) between 1992 and 2005. While the group of stayers receives on average 70 percent (in the 2000er years 75 percent), migrants receive 95 percent and commuters 85 percent of wages of their matched West German colleagues. Interestingly, however, wage inequality among East German workers today (2005) is higher compared to their matched West German colleagues. This significant wage dynamic hints at ongoing adjustment of wages and labour through commuting and migration from East to West Germany.

The rest of the paper is organized as follows. Chapter 2 gives an overview over migration, unemployment, wages and productivity after unification in East Germany. Chapter 3 introduces the data and the samples drawn from GSOEP. Chapter 4 is concerned with the regression and matching methods employed. Chapter 5 discusses the empirical results, while Chapter 6 concludes.

# 2 Migration and Aggregate Dynamics after Unification

In East Germany privatisation and restructuring of state enterprises and wage bargaining began after the monetary union on July 1st 1990. Because eastern unions were strongly connected with the old system, western unions settled down in East Germany and installed a bargaining system similar to the system in West Germany. Since firms were still in a process of privatization their bargaining power was rather weak. In addition, western unions may have feared wage competition in West Germany through migration and western employers may have feared wage competition from East Germany. The result was a rapid rise of wages after unification and a high rate of unemployment (see Akerlof et al. 1991).

**Figure 1:** GDP, Rate of Unemployment and Migration to the West in East Germany, 1991-2005


Source: Statistisches Bundesamt, 2006, Statistische Ämter der Länder, 2005; own calculation.

*Figure 1* shows the development of GDP, unemployment rate for East Germany and gross migration flows to West Germany between 1991 and 2005. Nominal GDP in East Germany (without Berlin) was 107 billion Euro in 1991, or 7 percent of the German GDP was generated in the East (2005: 258 billion Euro, 11.5 percent of GDP). GDP in East Germany first increased rapidly and then, beginning in the mid 1990s, stabilized. Until 1995 the wage level in East Germany increased to 70 percent of the western level and stabilized at that level in the following years. Similarly, labour productivity increased to 70 percent of the western level, while GDP per capita increased only to 65 percent. Unemployment rates increased from 10.2 percent in 1991 to 20.6 percent in 2005 (Statistisches Bundesamt 2006, Statistische Ämter der Länder 2005).

Migration to the West (without Berlin) was highest in 1991 with 229,200 persons (compared to 63,800 who migrated from West to East Germany), decreased to 124,900 persons in 1997, increased again to 192,000 in 2001 and finally decreased to 137,200 in 2005. Until 2001, overall 7.5 percent of the population in East Ger-

many in 1989 migrated to West Germany (see Brücker and Trübswetter 2004). Migration in 1989 was high (around 3 percent of the East German population, Pischke et al. 1994), nearly at the level before closing the border in Berlin by building the wall in 1963. Favourite destinations in West Germany are neighbouring regions like Hesse for workers from Thuringia or general economic strongholds like Bavaria, Baden-Wuerttemberg or North Rine-Westphalia (Heiland 2004, Parikh and van Leuvensteijn 2002). There was high wage mobility in the eastern compared to western part of Germany between 1990 and 1995 (Hauser and Fabig 1999, Hunt 2001).

Migrants are better educated compared to commuters. Furthermore, commuting is often regarded as a first step to migration. 5 percent of commuters became migrants after a time of commuting, which means that 19 percent of the migrants have been commuters for a time (Hunt, 2000). Economic incentives for migration from East to West result from job availability and higher wages in West Germany, despite the fact that migrants may loose some of their more specific human capital (Burda 1993, Burda et al. 1998, Brücker and Trübswetter 2004). Highest returns to education were achieved in new firms, so economic returns to job mobility were quite high for qualified eastern workers in the years directly after the unification. Hence, especially young and highly qualified workers gained from the unification (see Bird et al. 1994, Franz and Steiner 2000), while workers born between 1935 and 1945 may have suffered (Hauser and Wagner 1996).

# 3 Data and Descriptive Analysis

For the purpose of the analysis a sample from the German Socio-Economic Panel (GSOEP)[1] for the period from 1992 to 2005 was drawn.[2] We restrict the sample to workers aged between 25 and 55, who are wage worker (in a cross-section) and hold the German citizenship. All observations with missing information on household residence in 1989, workplace residence between 1992 and 2005, wages, and controls have been dropped.[3] The variable real gross hourly wage is obtained by the division of last month salary through last month's work hours.[4] Wages are trimmed by the two percent highest and lowest observations on hourly wages.

For the analysis of wage convergence and inequality we extract four separate samples from the GSOEP 1992 to 2005 for each year separately (see *Table 1*). Sample 1

[1] See Haisken-DeNew and Frick (2005).

[2] Samples 4 and 7 of the GSOEP have been omitted. Sample 4 concentrates on immigrants to West Germany between 1984 and 1993. There are no immigrants to East Germany. Sample 7, which is available only for 2002, 2003 and 2004, is an expansion of the GSOEP, concentrated among high wage earners. Several tests to check the sensitivity of the selected sample have been performed. Inclusion of sample 4 does not alter our findings. Sample 6 is included to exploit the number of observations in the GSOEP.

[3] Since 1999 there are more observations with missing information about household residence in 1989.

[4] All wages are deflated with the Consumer Price Index for Germany, base year 2000, taken from Statistisches Bundesamt (2006).

(West Germans) contains workers who live in West Germany, who already lived there before unification (1989) and who do not commute for working to East Germany in a cross-section. This is the largest sample. Sample 2 (East Germans) contains workers living in East Germany, who lived there before unification and who are working in East Germany as well in a cross-section. Sample 3 (Migrants) contains former East Germans who migrated to West Germany and also work in West Germany. The last sample (Commuters) contains East Germans who lived in East Germany before the unification and still live there in the observation period but commute for working to West Germany. Samples 3 and 4 are obviously the smallest samples.

Wages are highest for workers living and working in West Germany (West Germans and Migrants), followed by workers who commute to West Germany (cp. *Table 1*). Workers living and working in East Germany earn about 70 percent of West Germans (75 at the end of the period), while former East Germans who migrated to the West earn higher wages, as well as commuters. Nevertheless, their wages are still below the level of West Germans. The differences between real wages for West German workers and the three other groups of workers are statistically significant as indicated by the 95 percent confidence intervals given in *Table 1* which do not overlap.

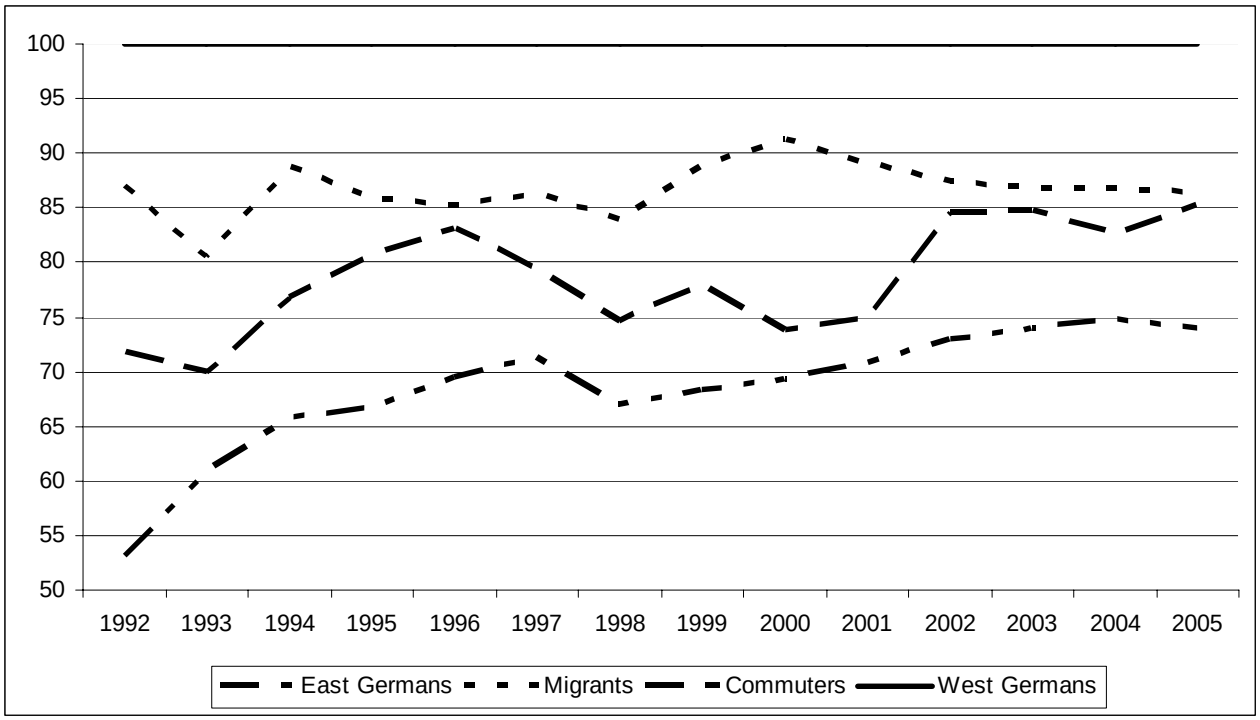
In 2005, workers who work and live in West Germany and also lived there before unification earned 14.14 € per hour, workers living and working in East Germany and also lived there before unification 10.46 € (74 percent of West German wages). Workers who migrated from East to West Germany earned on average 12.21 € (86 percent of West German wages) and workers who commute for working from East to West Germany earned 12.04 € (85 percent of West German wages). The hourly wage of commuters is higher compared to stayers but lower compared to migrants. *Figure 2* shows the wage catch up to wages of West Germans. Migrants earn about 86 percent of western wages, commuters narrowed to this wage in the last years and East Germans in all years earned lowest wages. Interestingly, the gap between East Germans, Migrants and Commuters narrowed. One has to notice, that these levels reported here are for overall groups without correcting for individual characteristics. Later on, in chapter 5 we will compare East Germans, Migrants and Commuters with matched West Germans.

**Table 1**: Real gross hourly wages in Euro

| | West Germans (*Sample 1*) | | East Germans (*Sample 2*) | | Migrants (*Sample 3*) | | Commuters (*Sample 4*) | |
|---|---|---|---|---|---|---|---|---|
| | **N** | **Euro, 95% confidence interval** | **N** | **Euro, ratio to West Germans, 95% confidence interval** | **N** | **Euro, ratio to West Germans, 95% confidence interval** | **N** | **Euro, ratio to West Germans, 95% confidence interval** |
| **1992** | 1,585 | 12.96<br>12.75 – 13.18 | 1,582 | 6.88 (53%)<br>6.77 – 6.98 | 34 | 11.29 (87%)<br>9.95 – 12.63 | 82 | 9.31 (72%)<br>8.74 – 9.89 |
| **1993** | 1,628 | 13.24<br>13.02 – 13.45 | 1,415 | 8.04 (61%)<br>7.90 – 8.19 | 53 | 10.67 (81%)<br>9.96 – 11.78 | 87 | 9.25 (70%)<br>8.63 – 9.86 |
| **1994** | 1,677 | 13.24<br>13.03 – 13.45 | 1,341 | 8.72 (66%)<br>8.57 – 8.87 | 63 | 11.74 (89%)<br>10.76 – 12.72 | 85 | 10.15 (77%)<br>9.52 – 10.78 |
| **1995** | 1,695 | 13.52<br>13.30 – 13.74 | 1,309 | 9.01 (67%)<br>8.84 – 9.18 | 79 | 11.62 (86%)<br>10.76 – 12.47 | 84 | 10.90 (81%)<br>10.15 – 11.65 |
| **1996** | 1,721 | 13.55<br>13.33 – 13.77 | 1,245 | 9.41 (69%)<br>9.22 – 9.59 | 87 | 11.54 (85%)<br>10.71 – 12.37 | 79 | 11.25 (83%)<br>10.55 – 11.94 |
| **1997** | 1,747 | 13.35<br>13.14 – 13.56 | 1,173 | 9.51 (71%)<br>9.31 – 9.70 | 91 | 11.51 (86%)<br>10.62 – 12.40 | 90 | 10.61 (79%)<br>9.89 – 11.33 |
| **1998** | 1,821 | 13.58<br>13.37 – 13.79 | 1,092 | 9.76 (72%)<br>9.54 – 9.97 | 89 | 12.22 (90%)<br>11.28 – 13.16 | 91 | 10.87 (80%)<br>10.07 – 11.67 |
| **1999** | 1,177 | 14.01<br>13.75 – 14.28 | 550 | 9.57 (68%)<br>9.26 – 9.87 | 58 | 12.45 (89%)<br>11.20 – 13.69 | 69 | 10.91 (78%)<br>10.16 – 11.65 |
| **2000** | 2,150 | 14.21<br>14.01 – 14.41 | 709 | 9.85 (69%)<br>9.58 – 10.11 | 86 | 12.95 (91%)<br>11.91 – 13.98 | 82 | 10.47 (74%)<br>9.73 – 11.22 |
| **2001** | 2,031 | 14.22<br>14.01 – 14.44 | 676 | 10.06 (71%)<br>9.77 – 10.36 | 90 | 12.65 (89%)<br>11.66 – 13.65 | 104 | 10.65 (75%)<br>9.84 – 11.46 |
| **2002** | 3,745 | 14.07<br>13.90 – 14.24 | 1,375 | 10.27 (73%)<br>10.06 – 10.49 | 184 | 12.29 (87%)<br>11.61 – 12.96 | 123 | 11.90 (85%)<br>11.15 – 12.66 |
| **2003** | 3,681 | 14.45<br>14.27 – 14.62 | 1,275 | 10.67 (74%)<br>10.43 – 10.90 | 202 | 12.53 (87%)<br>11.82 – 13.24 | 145 | 12.25 (85%)<br>11.50 – 12.99 |
| **2004** | 3,585 | 14.28<br>14.10 – 14.46 | 1,252 | 10.68 (75%)<br>10.44 – 10.93 | 210 | 12.39 (87%)<br>11.73 – 13.06 | 144 | 11.78 (82%)<br>11.07 – 12.49 |
| **2005** | 3,325 | 14.14<br>13.96 – 14.32 | 1,167 | 10.46 (74%)<br>10.20 – 10.72 | 209 | 12.21 (86%)<br>11.54 – 12.88 | 145 | 12.04 (85%)<br>11.32 – 12.75 |

Source: Samples from GSOEP 1992-2005, see text; own calculations.

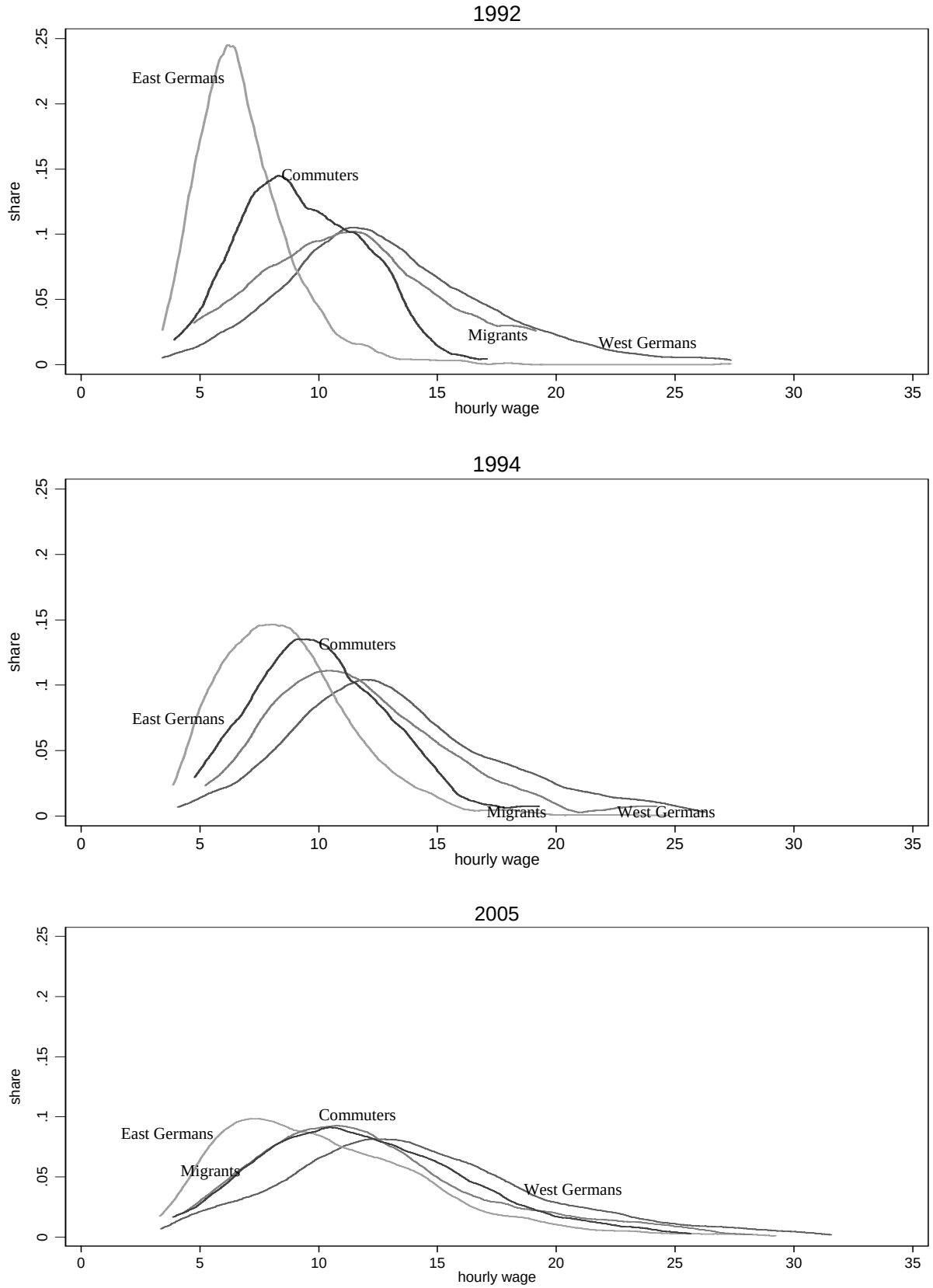
**Figure 2:** Wage convergence between 1992 and 2005: East Germans, Migrants and Commuters compared to West Germans




Source: Samples from GSOEP 1992-2005, see text; own calculations.

*Figure 3* shows the wage distribution for these four groups of workers (West Germans, East Germans, Migrants and Commuters) for selected years (1992, 1994 and 2005) to illustrate the evolution of wages and their distribution over time. The figures indicate the usual shape of wage distributions (for instance Juhn et al. 1993). The evolution over time seems to illustrate wage convergence, although a closer look (especially on the right side of the distributions) seem to reveal that considerable differences remain. Wages for East Germans were much more compressed in 1992 compared to 2005, illustrating the increase in inequality (for instance Gernandt and Pfeiffer 2006).

**Figure 3:** Selected wage distributions for four groups of workers




Source: Samples from GSOEP 1992-2005, see text; own calculations.

The vector of observables for our wage regression and matching procedures contains formal educational qualification[5], firm size, potential experience, tenure, indicators of economic sectors, an indicator variable which equals one if the worker is born in 1975 or later and zero otherwise and a variable which indicates whether the worker still works in the job of her first educational qualification. *Table 2* shows descriptive statistics for some selected variables for the years 1992 and 2005.

**Table 2:** Descriptive Statistics of socio-economic characteristics, 1992 and 2005

| | **West Germans** | **East Germans** | **Migrants** | **Commuters** |
|---|---|---|---|---|
| | | **1992** | | |
| **Age (in years)** | 38.89 | 39.79 | 35.65 | 37.43 |
| **Females** | 42.71% | 48.36% | 35.29% | 18.29% |
| **Low skilled** | 13.82% | 1.96% | 5.88% | 2.44% |
| **Skilled** | 73.44% | 65.55% | 58.82% | 75.61% |
| **High skilled** | 12.74% | 32.49% | 35.29% | 21.95% |
| **Tenure (in years)** | 10.44 | 9.32 | 1.99 | 1.72 |
| **Still in job of first education** | 61.58% | 60.62% | 50.00% | 45.12% |
| | | **2005** | | |
| **Age (in years)** | 41.21 | 41.99 | 37.22 | 39.74 |
| **Females** | 47.76% | 53.38% | 54.55% | 35.86% |
| **Low skilled** | 9.62% | 4.28% | 5.26% | 4.14% |
| **Skilled** | 70.56% | 64.01% | 74.16% | 68.28% |
| **High skilled** | 19.82% | 31.71% | 20.57% | 27.59% |
| **Tenure (in years)** | 11.55 | 10.80 | 6.02 | 8.05 |
| **Still in job of first education** | 62.32% | 61.27% | 56.94% | 57.93% |

Low skilled: education categories 1 and 2 - workers without vocational training; Skilled: education categories 3 and 4 – workers with vocational training; High skilled: education categories 5 and 6 – workers with a degree from (technical) university. Source: Samples from GSOEP 2000-2005, see text; own calculations.

In general, workers migrating to the West are youngest, commuters are younger compared to East Germans who work in East Germany but significantly older than workers who migrate to West Germany. The share of working females is higher in East (48 percent in 1992, 53 percent in 2005) compared to West Germany (43 percent in 1992, 48 percent in 2005). In 1992, only 35 percent of migrants and 18 percent of commuters were females, so females are under-represented in these groups. In 2005 females were over-represented in the migration force while the share of commuting females doubled since 1992 but did not catch up in total.

[5] For a detailed description of the German educational system see www.bildungsserver.de.

Formal education has been divided into six categories[6]. At least formally, East German workers are better educated than West German workers. In 2005, 19.8 percent (29.8 percent) of the workforce in our sample lived in West (East) Germany before unification were high skilled, that means they had a degree from technical university or university while 9.6 percent (4.4 percent) are low educated, that means they had no vocational training or even no school degree. Workers who lived in East Germany before unification are formally better educated.

Potential experience is defined as age minus years of education minus 6. It is the time a worker potentially is active in the labour market to gain human capital. The variable has 17 categories: less or equal than 3 years of potential experience, 4-6 years, 7-9 years and so on till more than 48 years. Tenure is often regarded as a proxy for specific human capital and is divided into 13 categories: less or equal than 3 years, 4-6 years, 7-9 years and so on. The highest category is more than 36 years of tenure. Potential experience is comparable between East (21.33 years in 1992, 23.05 years in 2005) and West Germans (21.24 years in 1992, 22.86 years in 2005) while tenure is higher for West Germans (10.44 years in 1992; 11.55 years in 2005) compared to East Germans (9.32 years in 1992, 10.80 years in 2005). Migrants and commuters have lowest tenure what is caused by job changes going hand in hand with migrating or commuting. In 2005 tenure increased, so there seems job stability and especially commuters seem to commute for a long time to the same employer.

In West compared to East Germany more workers are still working in their job of their first educational qualification. Migrants to the West change their job more often compared to West and East Germans. In 1992, 50 percent of migrants and 45 percent of all commuters were still working in the job of their first training. These shares increased till 2005 what can be caused by the increasing share of workers who were educated after unification. Workers who are born before 1975 had the chance of being employed in East Germany before unification. They may have a higher attachment to the East German labour market and region.

Firm size is measured by 4 categories[7]. There is a tendency towards smaller enterprises in both German regions. However, in East Germany more workers are employed in firms with less than 200 employees (59.3 percent in 2005), while in West Germany more workers are employed in firms with more than 2000 employees (48 percent in 2005). In addition, we control for 11 economic sectors. By and large more East German workers are engaged in agriculture/ mining and construction while

[6] Without a school qualification and without vocational training; with a school qualification but without vocational training; with a medium school qualification and with vocational training; with highest school qualification and with vocational training; with a degree from technical university; with a degree from a university.
[7] Small firms with less or equal than 19 employees; medium firms with 20-199 employees; large firms with 200-2000 employees; largest firms with more than 2000 employees.

more West German workers are engaged in industry sectors and in finance/ business service.

# 4 Remarks on the Empirical Framework

To investigate the evolution of wage convergence and wage inequality in the different groups we employ a non-parametric matching procedure. The basic idea is to find samples of West German workers living and working in West Germany and lived their before unification who are similar with respect to the observable characteristics with East German workers. This is done for each of the three groups of East German workers and for each cross-section separately, as introduced in the previous chapter 3. First, we employ a matching procedure to find a sample of West German workers that is similar to the group of East German workers, living and working in East Germany for each year starting in 1992 and ending in 2005. In these new samples of East and matched West German workers we study wage convergence and inequality. Second, we employ a matching procedure to find a sample of West German workers that is similar to the group of East German workers, who migrated to West Germany. Third, we employ a matching procedure to find a sample of West German workers that is similar to the group of East German workers, who live in East Germany and commute for working in West Germany. For observational reasons, the second and third part of the analysis is restricted to the samples from 2000 to 2005.

The matching procedure for part one, concerning sample 1 (West Germans) and sample 2 (East Germans) shall be briefly described (for a more general discussion and introductions to the evaluation literature see for instance Blundell et al. 2005 and Lechner and Pfeiffer 2001). Living in East Germany (currently and before unification) and working in East Germany is our “treatment” (D=1) group of workers. The matched group of workers (D=0) is chosen from the sample of workers who live in West Germany, lived there before unification and currently work in West Germany.

For our purpose we want to interpret the difference in wages from East German workers and matched German workers as evidence on wage convergence with respect to the observed characteristics and not as an average treatment effect. So our purpose is somewhat more modest: the matching procedure allows a comparison of the wages of East German workers with the wages in the groups of matched West German workers, who are similar in the observed characteristics. If there no longer remains any difference between the groups compared, than we may interpret this result as evidence on wage convergence. Furthermore, we can compare the evolution of the whole wage distributions over time and not just means and variance. We will investigate the evolution of wage inequality based on econometric decomposition

methods, which is described in Appendix A1. If, however, a difference remains this may indicate that wage convergence has not yet taken place.

Define $Y_1$ to be the hourly wage of workers living in East Germany, and $Y_0$ for the West German workers. Under the conditional independence and the common support assumption the difference in mean is a result of belonging to the "treatment" group.

$$(1)\ (Y_0, Y_1) \perp\!\!\!\perp D \mid X \quad \forall \quad x \varepsilon X$$

As a rule, the conditional independence assumption (Assumption 1) may never be true for real empirical data, since for instance real data do not contain all the relevant variables for explaining wages (Blundell et al. 2005). For comparing East and West German workers this could be especially challenging since on the one hand, their histories before unification may differ considerably. On the other hand one may argue that we can learn something when we compare the evolution in a period of seventeen years after unification. Workers attitudes and skills may for instance converge specifically for migrants and presumably to a lower degree for commuters.

$$(2)\ 0 < \Pr(D = 1 \mid X) < 1 \quad \forall \quad x \varepsilon X$$

Assumption 2, the common support condition, requires that workers in West Germany have similar characteristics than those from East Germany. From our point of view this is to some degree questionable. However, East and West Germany once were unified and some traditions, like the language used, survived. Therefore, assumption 2 may not be too restrictive.

The following matching procedure is used[8]:

1. An observation from the pool of workers living in East Germany and lived there before the unification is drawn.
2. For these workers the nearest neighbour (identified by the propensity score, see Rosenbaum and Rubin 1983) from the pool of workers living in West Germany and lived there before unification is determined.
3. The worker from the West Sample, drawn on step two, is deleted (matching without replacement).
4. Steps 1-3 are repeated for all East German workers.
5. Finally, matches of bad quality are excluded (caliper 0.05).

This procedure helps to find workers form the sample of all West German workers who are more similar with respect to the observed characteristics to the workers

[8] The estimations have been performed with STATA (psmatch2, see Leuven and Sianesi 2003).

from the three groups. *Table A1* in the appendi*x* shows the comparison of East Germans (sample 2) with all West Germans (sample1) and matched West Germans for the year 2005. After matching, the two groups under scrutiny for instance have statistical no differences in means for all characteristics. This is as a rule the case for each of the years 1992 to 2005.

# 5 Empirical Findings on Convergence and Inequality

*Table 3* describes the wage development between 1992 and 2005 for West German workers in general (sample 1 in the first line), East German workers (sample 2, second line) and matched West German workers (third line). This chapter discusses the empirical findings of wage inequality and compares wages and wage convergence of East German workers, migrants and commuters with matched West German workers. Our measure of wage inequality is the ninetieth to tenth percentile of real gross hourly wage, as well as its two sub-groups, the ninetieth to fiftieth, and fiftieth to tenth percentile of the wage distribution. *Table 3* presents the central measure for wage inequality, the ratio of the ninetieth to tenth percentile in the wage distribution.

Mean wages of East German workers und their matched West German (statistical) twins are lower in each cross-section what can be seen by comparing the 95 percent confidence intervals in Table 3 (in brackets). East German workers earned about 70 percent, in the last years about 75 percent, of the wage of their matched West German counterparts. These levels are similar with the results shown in chapter 3, where East Germans were compared with the overall group of West German workers. *Figure 4* shows the development between 2000 and 2005 for all samples.[9] Our finding indicate that the considerable remaining wage differentials between East and West German workers are not attributable to differences in the structure of the socio-economic characteristics that we did take into account in our approach. This result seems to confirm findings from Burda and Schmidt (1997) who decompose wage differences between East and West Germany using the Oaxaca-Blinder decomposition technique and show that different rates to returns (price effects) and not the endowment of skills helps for explaining the wage gap.

[9] Matched West Germans are three different groups, each for East Germans, migrants and commuters and set to 100 percent.

**Table 3:** Wages and wage inequality for West Germans, East Germans and matched West Germans

| | Mean wage in € | 90/10 percentile | 90/50 percentile | 50/10 percentile | N |
|---|---|---|---|---|---|
| | | | **1992** | | |
| **West Germans** | 12.96 (12.75 – 13.18) | 2.40 (2.25 – 2.54) | 1.52 (1.48 – 1.56) | 1.57 (1.49 – 1.66) | 1585 |
| **East Germans**[10] | 6.75 (6.61 – 6.89) (51%) | 2.01 (1.90 – 2.12) | 1.46 (1.39 – 1.52) | 1.38 (1.33 – 1.43) | 904 |
| **Matched West Germans** | 13.11 (12.82 – 13.40) | 2.32 (2.17 – 2.47) | 1.52 (1.46 – 1.58) | 1.53 (1.45 – 1.61) | 904 |
| | | | **1994** | | |
| **West Germans** | 13.24 (13.03 – 13.45) | 2.34 (2.24 – 2.44) | 1.51 (1.46 – 1.56) | 1.55 (1.51 – 1.60) | 1677 |
| **East Germans** | 8.56 (8.37 – 8.76) (64%) | 2.26 (2.13 – 2.39) | 1.45 (1.39 – 1.51) | 1.56 (1.50 – 1.62) | 805 |
| **Matched West Germans** | 13.35 (13.04 – 13.66) | 2.49 (2.36 – 2.63) | 1.58 (1.50 – 1.65) | 1.58 (1.53 – 1.64) | 805 |
| | | | **2000** | | |
| **West Germans** | 14.21 (14.01 – 14.41) | 2.43 (2.34 – 2.52) | 1.54 (1.50 – 1.58) | 1.58 (1.53 – 1.63) | 2150 |
| **East Germans** | 9.91 (9.61 – 10.20) (72%) | 2.63 (2.45 – 2.82) | 1.62 (1.54 – 1.70) | 1.63 (1.52 – 1.73) | 606 |
| **Matched West Germans** | 13.80 (13.42 – 14.19) | 2.60 (2.38 – 2.82) | 1.60 (1.52 – 1.67) | 1.63 (1.52 – 1.75) | 606 |
| | | | **2005** | | |
| **West Germans** | 14.14 (13.96 – 14.32) | 2.85 (2.75 – 2.96) | 1.60 (1.56 – 1.63) | 1.79 (1.73 – 1.84) | 3325 |
| **East Germans** | 10.52 (10.25 – 10.80) (74%) | 2.90 (2.71 – 3.08) | 1.70 (1.60 – 1.79) | 1.70 (1.64 – 1.77) | 1022 |
| **Matched West Germans** | 14.16 (13.83 – 14.50) | 2.80 (2.58 – 3.02) | 1.61 (1.55 – 1.67) | 1.74 (1.62 – 1.85) | 1022 |

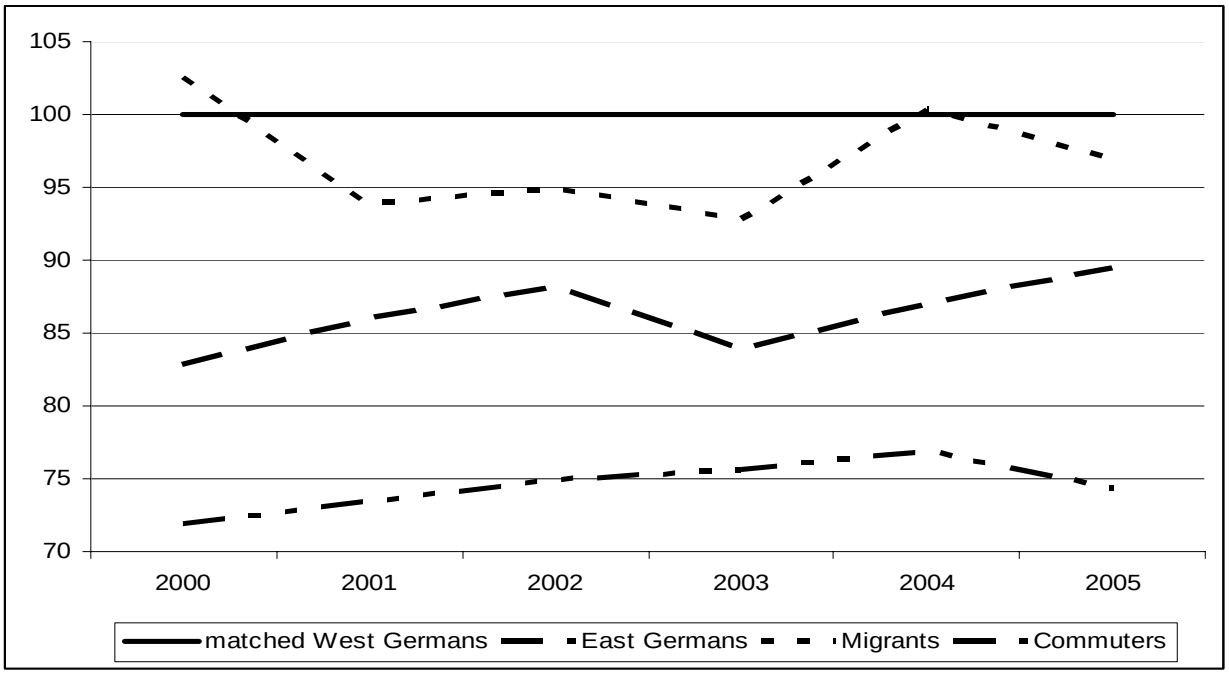
95 percent confidence interval and percentage to matched West Germans in brackets. Confidence intervals for percentile ratios are calculated by bootstrapping (1,000 replications). Source: Samples from GSOEP 1992-2005, see text; own calculations.

For commuters and migrants comparable results are cautious to interpret - there are few observations in our data set, *Table 4*. Matching West Germans to commuters does not lead to different evidence like comparing commuters with the overall sample of West German workers. Commuters earned about 85 percent of matched West German workers. Differences are significant with exception to the years 2002 and 2005 what can be seen by comparison of the 95 percent confidence intervals given

[10] For comparison reasons we restrict the sample of native East Germans in this table to workers with a matched native West German counterpart, so some observations get lost caused by bad match quality (calliper matching).

in *Table 4* in brackets. Tom sum up: If workers commute for working to West Germany, lower wages compared to West Germans are not caused by different observable characteristics.

**Figure 4:** Wage convergence between 1992 and 2005: East Germans, Migrants and Commuters compared to matched West Germans




Source: Samples from GSOEP 2000-2005, see text; own calculations.

For migrants the results differ: It seems that West Germans with comparable characteristics as East German migrants earn wages more equal to these than to average West Germans. The hypothesis, that wages between migrants and matched West Germans differ, can be dismissed in all years as seen by comparing the 95 percent confidence intervals in Table 4 which do not overlap. So, controlling for observable characteristics, the wage gap between West Germans and East German migrants has disappeared. Lower wages for migrants therefore are caused by individual characteristics, like lower tenure and working in smaller companies. Overall, migrants earned about 97 percent of the wage of their matched West German statistical twins. As can be seen in Figure 4, in some years wages of migrants even outcast the wage of their West German collegues.

**Table 4:** Wage Convergence: Migrants and commuters vs. matched West German workers

| | Migrants | | Matched West Germans | Commuters | | Matched West Germans |
|---|---|---|---|---|---|---|
| | **N** | **Euro, 95% confidence interval, ratio to West Germans** | **Euro, 95% Confidence Interval** | **N** | **Euro, 95% confidence interval, ratio to West Germans** | **Euro, 95% confidence interval** |
| **2000** | 85 | 12.97<br>(11.92 – 14.01)<br>(103%) | 12.64<br>(11.69 - 13.60) | 80 | 10.46<br>(9.71 – 11.22)<br>(83%) | 12.63<br>(11.52 – 13.74) |
| **2001** | 89 | 12.71<br>(11.71 – 13.71)<br>(94%) | 13.55<br>(12.50 – 14.60) | 97 | 10.70<br>(9.86 – 11.54)<br>(86%) | 12.45<br>(11.61 – 13.29) |
| **2002** | 178 | 12.36<br>(11.67 – 13.05)<br>(95%) | 13.02<br>(12.20 – 13.85) | 120 | 11.93<br>(11.17 – 12.69)<br>(88%) | 13.54<br>(12.56 – 14.51) |
| **2003** | 189 | 12.42<br>(11.71 – 13.14)<br>(93%) | 13,39<br>(12.67 – 14.11) | 131 | 12.20<br>(11.43 – 12.97)<br>(84%) | 14.55<br>(13.59 – 15.51) |
| **2004** | 205 | 12.46<br>(11.79 – 13.13)<br>(100%) | 12.41<br>(11.71 – 13.11) | 142 | 11,80<br>(11.09 – 12.52)<br>(87%) | 13.56<br>(12.66 – 14.45) |
| **2005** | 199 | 12.28<br>(11.58 – 12.97)<br>(97%) | 12.68<br>(11.96 – 13.40) | 141 | 12.03<br>(11.30 – 12.76)<br>(89%) | 13.45<br>(12.52 – 14.37) |

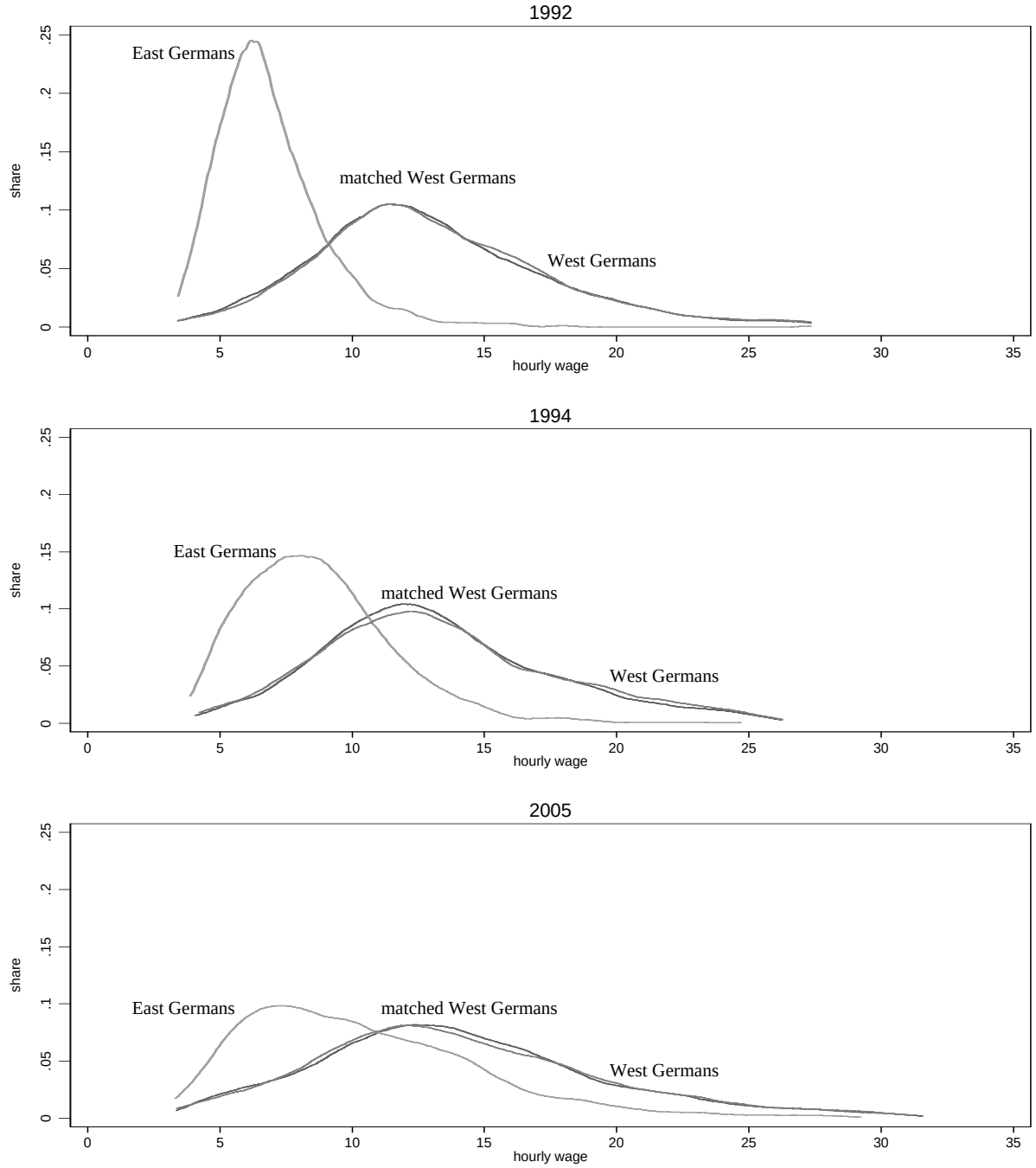
Source: Samples from GSOEP 1992-2005, see text; own calculations.

Further analysis concerns the development of wage inequality. In the sample of West German workers the ratio of the ninetieth to tenth percentile first decreased from 1984 to 1992, indicating moderate wage compression (Gernandt and Pfeiffer 2006). Beginning in the mid 1990s, wage inequality increased in both parts of Germany. In our samples (see *Table 3*, for all remaining years see *Table A2* in Appendix) wage inequality, measured by the ninetieth to tenth wage percentile ratio, increases by 19 percent (from 2.40 to 2.85) in West Germany, while in East Germany wage inequality increased by 44 percent between 1992 and 2005. In West Germany it is concentrated below the median, in East Germany more equal but also over represented below the median. Overall, the trend of rising wage inequality in both parts is clear, but one has to be cautious, the amount of rising wage inequality depends on time of observation. Especially in 1992 and 1993 there were high wage dynamics in East Germany. So, looking at the development between 1994 and 2005 wage inequality, measured by the ninetieth to tenth wage percentile ratio, increases by 22 percent in West Germany, concentrated below the median and by 28 percent in East Germany, concentrated above the median. Wage inequality was lower in the sample of East German workers in 1992 and has become higher now, 2.90 in the year 2005. Interestingly wage inequality in the sample of the matched West German workers

inequality was significantly higher in 1992 than that of East Germans (2.32 to 2.01). In 2005 we don`t measure a significant difference between East Germans, West Germans and matched West Germans any more, although mean wages for East Germans are still lower.

*Figure 5* illustrates the wage distribution for East and West Germans which is the same like in Figure 3 but here combined with the wage distribution of matched West German workers. The development of wages in the group of matched West Germans is more comparable to the development of native West Germans. Again, this is a hint that different situations in East and West Germany are not caused by personal differences. Structural differences of the West and East German labour market, resulted from differences in technologies, finances and infra structure for instance seem to cause different wages and different wage development after unification.

**Figure 5**: Selected wage distributions for three groups of workers




Source: Samples from GSOEP 1992-2005, see text; own calculations.

To investigate the development of wage inequality the decomposition method by Juhn et al. (1993) is employed (see Appendix for a detailed description of the method). *Table A3* in the appendix shows the decomposition results for the time between 1992 and 2005, base year is 1992. For workers living and working in West Germany and also lived in West Germany before unification, the $90^{th}$ to $10^{th}$ wage

percentile inequality increased by 0.180 log points, corresponding to 19.72 percent[11] (see third line, second column in *table A3*). *Table 5* shows the same for the time between 1994 and 2005, base year here is 1994. While between 1992 and 2005 wage inequality increased by 0.366 log points, two third below the median, looking to the same equation with base year 1994 wage inequality increases only by 0.248 log points, concentrated above the median. This could be caused by the adaptation process of East German wages to West German wages that was still under way in the early 1990s, so especially low wages increased.

**Table 5:** Decomposition 1994-2005

| Differential | Total | Quantities | Prices | Unobserved |
|---|---|---|---|---|
| | | **West Germans** | | |
| **90-10** | 0.197 | 0.028 | 0.068 | 0.101 |
| **90-50** | 0.056 | -0.007 | 0.021 | 0.041 |
| **50-10** | 0.141 | 0.035 | 0.047 | 0.060 |
| | | **East Germans** | | |
| **90-10** | 0.248 | 0.002 | 0.159 | 0.087 |
| **90-50** | 0.159 | 0.024 | 0.095 | 0.040 |
| **50-10** | 0.089 | -0.022 | 0.064 | 0.047 |
| | | **Matched West Germans** | | |
| **90-10** | 0.116 | -0.028 | 0.054 | 0.091 |
| **90-50** | 0.024 | -0.035 | 0.027 | 0.031 |
| **50-10** | 0.093 | 0.007 | 0.026 | 0.060 |

Source: GSOEP 1994-2005, see text; own calculations.

As seen in *Table5*, in West Germany rising wage inequality measured by the nineteth-tenth wage percentile quotient is mainly driven by residual (51 percent) and price effects (35 percent), in East Germany price effects (64 percent) are the most important reason for rising wage inequality followed by residual effects (35 percent). The development of wage inequality in the group of matched West German workers is more equal to the development of West German workers. The observed stronger rise of wage inequality in East Germany should therefore be caused by some structural differences, for instance in the infrastructure and provision with capital and the unemployment rate in East Germany.

# 6 Concluding Remarks

Between 1992 and 2005 the average hourly wage of prime age dependent male workers living and working in East Germany increased by 52 percent, while it increased only by 9 percent for workers in West Germany. Our research approach in

[11] $e^{0.180} - 1 = 0.1972$

this study is to compare the wage distribution for East German workers, migrants from East to West Germany and commuters from East to West Germany with matched West German workers. Our paper contributes to the empirical analysis of wage convergence in East and West Germany after unification.

Our empirical part employs samples for these groups of workers extracted from the German Socioeconomic Panel (GSOEP) 1992-2005. Based on regression methods and non-parametric matching methods for the group of East German workers we search for comparable West German workers who are similar in observables and compare wages and the convergence (or divergence) of wage distributions over the transition period from 1992 to 2005. From official statistics it is known that East German wages and productivity have reached a level of roughly 70 percent of West Germany. Our research is based on a comparison of mean wages and the wage distribution of three groups of workers who lived in East Germany in 1989 (stayers, migrants and commuters to West Germany) and a group of matched West German workers. East Germans who stayed in East Germany earned about 70 percent (in the last years about 75 percent) about western wages, while migrants earned about 90 percent and commuters about 80 percent. After controlling for individual characteristics wages of migrants are equal to the wages of West German workers while for commuters and workers who stayed in East Germany this is not the case. So the process of wage convergence is still under way.

Interestingly however, wage inequality among East German workers in 2005 is higher compared to their matched West German colleagues. This significant wage dynamic further hint at ongoing adjustment of wages and labour through commuting and migration from East to West Germany. Before unification wage inequality was lower in East compared to West Germany (see Krueger and Pischke 1995). For prime age dependent employees living and working in East Germany the ratio of wages for high wage workers as measured by the ninetieth percentile of the wage distribution and low wage workers as measured by the tenth percentile of the wage distribution increased from 2.00 to 2.93 (for comparison reason: from 2.40 to 2.85 in West Germany) between 1992 and 2005.

In future work, the reason behind wage and employment dynamics in Germany, a country with a significant degree of central wage bargaining, employment protection laws and wage rigidity should be investigated with better and more detailed data. Unobserved components of the skill structure and individual heterogeneity might determine migration and commuting processes as well as bargaining power in employer employee relationship.

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# Appendix

## A1: Decomposition method of Juhn, Murphy and Pierce (1993)

The idea of this decomposition method is to divide changes in wage inequality into three basic components. First, changes in the prices for observable characteristics of workers, second, changes in the composition of the workforce and, third, unobserved or residual wage inequality. It is assumed that the log of wages depends linearly on a vector of observed characteristics, and an unobserved term:

$$(A1) \quad Y_{it} = X_{it}\,\beta_t + u_{it}$$

$Y_{it}$ is the real log hourly wage of individual *i* in year *t*, $X_{it}$ is a vector of individual characteristics that defines the observed composition of the workforce, $\beta_t$ is a vector of "prices" for these observable characteristics in year *t* and $u_{it}$ is the residual. Juhn et al. (1993, 425) define $u_{it}$ to contain two components: "an individual's percentile in the residual distribution, $\theta_{it}$, and the distribution function of the wage equation residuals, $F_t(.)$. $F_t^{-1}(\cdot|X_{it})$ is the inverse cumulative residual distribution for workers with characteristics $X_{it}$ in year *t*":

$$(A2) \quad u_{it} = F_t^{-1}(\theta_{it}|X_{it})$$

To study changes in wage inequality a base year needs to be defined. In this study 1992 and 1994 are the base years. The vector of prices $\overline{\beta}$ and the residual distribution $\overline{F}^{-1}(.)$ are fixed to the values of the base year. To decompose the wages, equation (A1) is transformed into equation (A3):

$$(A3) \quad Y_{it} = X_{it}\overline{\beta} + X_{it}(\beta_t - \overline{\beta}) + \overline{F}^{-1}(\theta_{it}|X_{it}) + [F_t^{-1}(\theta_{it}|X_{it}) - \overline{F}^{-1}(\theta_{it}|X_{it})]$$

The desired results are derived in a three step procedure. In the first step, prices and the residual distribution are fixed to the estimated value of the chosen base year. Only changes of the composition of the workforce are allowed:

$$(A4) \quad Y_{it}^1 = X_{it}\overline{\beta} + \overline{F}^{-1}(\theta_{it}|X_{it})$$

In the second step changing prices of the observables are estimated by fixing the common distribution of the residuals:

$$\text{(A5)} \quad Y_{it}^{2} = X_{it}\beta_t + \overline{F}^{-1}(\theta_{it}\,|\,X_{it})$$

The third step allows for workforce composition, price and residual changes and equation (A1) is estimated:

$$\text{(A6)} \quad Y_{it}^{3} = X_{it}\beta_t + F_t^{-1}(\theta_{it}\,|\,X_{it}) = X_{it}\beta_t + u_{it} = Y_{it}$$

The three steps deliver three predictions of real wage, denoted $Y_t^1$, $Y_t^2$ and $Y_t^3$, from which decomposition results are obtained. $Y_{t+1}^1 - Y_t^1$ results from changes in the composition of the workforce between the actual year t and the year t-1 (base year). $Y_{t+1}^2 - Y_t^2 - (Y_{t+1}^1 - Y_t^1)$ from changes in the prices for observables, while $Y_{t+1}^3 - Y_t^3 - (Y_{t+1}^1 - Y_t^1) - (Y_{t+1}^2 - Y_t^2)$ is the residual wage inequality, due to changes in the price or composition of unobservable variables. These latter changes might be the consequences of a revaluation of unobservable characteristics, like intelligence, motivation, self-discipline, social skills or the like. To correctly estimate composite, price and residual effects, in principle the relevant variables should be observed, which as a rule cannot be achieved in real data. Without the full set of relevant variables it may be difficult to distinguish between correlation and causality (in the context of wage inequality see Taber, 2001 among others).

# A2: Further tables

**Table A1:** Comparison of East German workers with unmatched and matched West German workers, 2005

| Variable | Sample | Mean treated | control | t value |
|---|---|---|---|---|
| **With school qualification, without vocational training** | unmatched | 0.04308 | 0.08947 | -4.95 |
| | matched | 0.04599 | 0.0411 | 0.54 |
| **With medium school qualification, with vocational training** | unmatched | 0.51696 | 0.54410 | -1.55 |
| | matched | 0.54501 | 0.55969 | -0.67 |
| **With highest school qualification, with vocational training** | unmatched | 0.11182 | 0.16472 | -4.21 |
| | matched | 0.11937 | 0.11546 | 0.27 |
| **With a degree from technical university** | unmatched | 0.18057 | 0.08283 | 9.06 |
| | matched | 0.13699 | 0.13992 | -0.19 |
| **With a degree from university** | unmatched | 0.14757 | 0.11887 | 2.46 |
| | matched | 0.15264 | 0.14384 | 0.56 |
| **<20 employees** | unmatched | 0.27956 | 0.23016 | 3.28 |
| | matched | 0.27691 | 0.28963 | -0.64 |
| **20-199 employees** | unmatched | 0.35655 | 0.27000 | 5.44 |
| | matched | 0.34932 | 0.33953 | 0.47 |
| **200-2000 employees** | unmatched | 0.19432 | 0.23237 | -2.61 |
| | matched | 0.19472 | 0.20646 | -0.66 |
| **>2000 employees** | unmatched | 0.16590 | 0.26241 | -6.49 |
| | matched | 0.17515 | 0.16243 | 0.77 |
| **female** | unmatched | 0.53712 | 0.47739 | 3.41 |
| | matched | 0.52838 | 0.50587 | 1.02 |
| **0-3 years experience** | unmatched | 0.00183 | 0.00348 | -0.85 |
| | matched | 0.00196 | 0.00196 | -0.00 |
| **4-6 years experience** | unmatched | 0.01925 | 0.01170 | 1.85 |
| | matched | 0.01957 | 0.01957 | 0.00 |
| **7-9 years experience** | unmatched | 0.04766 | 0.04837 | -0.09 |
| | matched | 0.04892 | 0.04990 | -0.10 |
| **10-12 years experience** | unmatched | 0.06874 | 0.06386 | 0.56 |
| | matched | 0.07045 | 0.07826 | -0.67 |
| **13-15 years experience** | unmatched | 0.06416 | 0.07208 | -0.88 |
| | matched | 0.06751 | 0.06360 | 0.36 |
| **16-18 years experience** | unmatched | 0.07883 | 0.09769 | -1.85 |
| | matched | 0.08317 | 0.08708 | -0.32 |

| | | | | |
|---|---|---|---|---|
| **19-21 years experience** | unmatched | 0.11366 | 0.12393 | -0.90 |
| | matched | 0.11644 | 0.12524 | -0.61 |
| **22-24 years experience** | unmatched | 0.11366 | 0.12899 | -1.32 |
| | matched | 0.11546 | 0.11546 | -0.00 |
| **25-27 years experience** | unmatched | 0.14482 | 0.12362 | 1.80 |
| | matched | 0.13601 | 0.13014 | 0.39 |
| **28-30 years experience** | unmatched | 0.13474 | 0.11635 | 1.61 |
| | matched | 0.12622 | 0.12133 | 0.34 |
| **31-33 years experience** | unmatched | 0.10632 | 0.09105 | 1.48 |
| | matched | 0.10568 | 0.10176 | 0.29 |
| **34-36 years experience** | unmatched | 0.06691 | 0.07177 | -0.54 |
| | matched | 0.06849 | 0.06360 | 0.45 |
| **37-39 years experience** | unmatched | 0.03941 | 0.04711 | -1.06 |
| | matched | 0.04012 | 0.04207 | -0.22 |
| **0-3 years tenure** | unmatched | 0.18698 | 0.19159 | -0.33 |
| | matched | 0.19667 | 0.19472 | 0.11 |
| **4-6 years tenure** | unmatched | 0.17324 | 0.18211 | -0.66 |
| | matched | 0.18297 | 0.16536 | 1.05 |
| **7-9 years tenure** | unmatched | 0.12007 | 0.12077 | -0.06 |
| | matched | 0.12720 | 0.12427 | 0.20 |
| **10-12 years tenure** | unmatched | 0.13016 | 0.09453 | 3.33 |
| | matched | 0.12818 | 0.13992 | -0.78 |
| **13-15 years tenure** | unmatched | 0.17965 | 0.08884 | 8.26 |
| | matched | 0.14286 | 0.16243 | -1.23 |
| **16-18 years tenure** | unmatched | 0.04216 | 0.08283 | -4.48 |
| | matched | 0.04501 | 0.04892 | -0.42 |
| **19-21 years tenure** | unmatched | 0.03575 | 0.06513 | -3.60 |
| | matched | 0.03816 | 0.03425 | 0.47 |
| **22-24 years tenure** | unmatched | 0.02383 | 0.04711 | -3.34 |
| | matched | 0.02544 | 0.02446 | 0.14 |
| **25-27 years tenure** | unmatched | 0.03391 | 0.04426 | -1.48 |
| | matched | 0.03523 | 0.03425 | 0.12 |
| **28-30 years tenure** | unmatched | 0.02750 | 0.03478 | -1.16 |
| | matched | 0.02935 | 0.02544 | 0.54 |
| **31-33 years tenure** | unmatched | 0.02750 | 0.03478 | -0.38 |
| | matched | 0.02935 | 0.02740 | 0.27 |
| **34-36 years tenure** | unmatched | 0.01100 | 0.1075 | 0.07 |
| | matched | 0.01174 | 0.00783 | 0.90 |

| | | | | |
|---|---|---|---|---|
| **37-39 years tenure** | unmatched | 0.00825 | 0.00759 | 0.21 |
| | matched | 0.00783 | 0.01076 | -0.69 |
| **Agriculture/ mining** | unmatched | 0.02291 | 0.00854 | 3.73 |
| | matched | 0.01859 | 0.01370 | 0.88 |
| **Industry (low tech)** | unmatched | 0.03575 | 0.03320 | 0.40 |
| | matched | 0.03816 | 0.03425 | 0.47 |
| **Industry (basic)** | unmatched | 0.08433 | 0.12235 | -3.43 |
| | matched | 0.08806 | 0.08317 | 0.40 |
| **Industry (high tech)** | unmatched | 0.06966 | 0.12046 | -4.68 |
| | matched | 0.07339 | 0.07828 | -0.42 |
| **Transport/ providing service** | unmatched | 0.07058 | 0.06165 | 1.04 |
| | matched | 0.07241 | 0.06654 | 0.52 |
| **Construction** | unmatched | 0.07608 | 0.04837 | 3.45 |
| | matched | 0.07241 | 0.07632 | -0.34 |
| **Commerce** | unmatched | 0.11824 | 0.13279 | -1.24 |
| | matched | 0.12329 | 0.11937 | 0.27 |
| **Finance/ business service** | unmatched | 0.04400 | 0.08441 | -4.41 |
| | matched | 0.04599 | 0.04697 | -0.11 |
| **Other service** | unmatched | 0.11091 | 0.08062 | 3.04 |
| | matched | 0.11252 | 0.10959 | 0.21 |
| **Administration/ education** | unmatched | 0.22181 | 0.19127 | 2.18 |
| | matched | 0.21331 | 0.21233 | 0.05 |
| **Health service/ social service** | unmatched | 0.14574 | 0.11635 | 2.54 |
| | matched | 0.14188 | 0.15949 | -1.11 |
| **Born 1975 or later** | unmatched | 0.11366 | 0.09643 | 1.63 |
| | matched | 0.11546 | 0.11448 | 0.07 |
| **Still in job of first education** | unmatched | 0.64161 | 0.64464 | -0.18 |
| | matched | 0.63699 | 0.67319 | -1.72 |

Source: Samples from GSOEP 1992-2005, see text; own calculations.

**Table A2:** Wage and inequality development

| | Mean wage | 90/10 percentile | 90/50 percentile | 50/10 percentile | N |
|---|---|---|---|---|---|
| | | | **1993** | | |
| **West Germans** | 13.24 | 2.38 | 1.54 | 1.54 | 1,628 |
| | (13.02 – 13.45) | (2.26 – 2.49) | (1.50 – 1.58) | (1.48 – 1.61) | |
| **East Germans** | 7.91 | 2.25 | 1.48 | 1.52 | 846 |
| | (7.72 – 8.10) | (2.15 – 2.36) | (1.42 – 1.55) | (1.48 – 1.55) | |
| | (59%) | | | | |
| **Matched West Germans** | 13.36 | 2.43 | 1.54 | 1.58 | 846 |
| | (13.05 – 13.68) | (2.27 – 2.60) | (1.48 – 1.59) | (1.48 – 1.68) | |
| | | | **1995** | | |
| **West Germans** | 13.52 | 2.39 | 1.52 | 1.57 | 1,695 |
| | (13.30 – 13.74) | (2.29 – 2.49) | (1.48 – 1.56) | (1.51 – 1.63) | |
| **East Germans** | 9.02 | 2.38 | 1.50 | 1.58 | 769 |
| | (8.79 – 9.24) | (2.22 – 2.54) | (1.42 – 1.58 ) | (1.52 – 1.65) | |
| | (67%) | | | | |
| **Matched West Germans** | 13.50 | 2.41 | 1.58 | 1.52 | 769 |
| | (13.16 – 13.84) | (2.25 – 2.58) | (1.52 – 1.65) | (1.44 – 1.60) | |
| | | | **1996** | | |
| **West Germans** | 13.55 | 2.43 | 1.54 | 1.58 | 1,721 |
| | (13.33 – 13.77) | (2.32 – 2.53) | (1.50 – 1.57) | (1.52 – 1.64) | |
| **East Germans** | 9.55 | 2.29 | 1.49 | 1.54 | 762 |
| | (9.30 – 9.79) | (2.14 – 2.44) | (1.41 – 1.57) | (1.47 – 1.62) | |
| | (71%) | | | | |
| **Matched West Germans** | 13.53 | 2.40 | 1.53 | 1.57 | 762 |
| | (13.20 – 13.86) | (2.21 – 2.57) | (1.47 – 1.60) | (1.46 – 1.67) | |
| | | | **1997** | | |
| **West Germans** | 13.35 | 2.45 | 1.51 | 1.62 | 1,747 |
| | (13.14 – 13.56) | (2.32 – 2.57) | (1.47 – 1.55) | (1.55 – 1.69) | |
| **East Germans** | 9.50 | 2.41 | 1.52 | 1.58 | 810 |
| | (9.27 – 9.73) | (2.27 – 2.55) | (1.46 – 1.59) | (1.51 – 1.65) | |
| | (71%) | | | | |
| **Matched West Germans** | 13.47 | 2.51 | 1.54 | 1.63 | 810 |
| | (13.16 – 13.78) | (2.32 – 2.69) | (1.48 – 1.60) | (1.52 – 1.74) | |
| | | | **1998** | | |
| **West Germans** | 13.58 | 2.35 | 1.56 | 1.50 | 1,821 |
| | (13.37 – 13.79) | (2.25 – 2.44) | (1.52 – 1.61) | (1.46 – 1.55) | |
| **East Germans** | 9.66 | 2.39 | 1.49 | 1.60 | 814 |
| | (9.42 – 9.90) | (2.26 – 2.53) | (1.42 – 1.56) | (1.54 – 1.68) | |
| | (72%) | | | | |
| **Matched West Germans** | 13.48 | 2.40 | 1.59 | 1.51 | 814 |
| | (13.17 – 13.80) | (2.24 – 2.57) | (1.51 – 1.67) | (1.44 – 1.58) | |
| | | | **1999** | | |
| **West Germans** | 14.01 | 2.34 | 1.51 | 1.54 | 1,177 |
| | (13.75 – 14.28) | (2.24 – 2.43) | (1.46 – 1.57) | (1.49 – 1.60) | |
| **East Germans** | 9.77 | 2.60 | 1.62 | 1.60 | 389 |
| | (9.38 – 10.15) | (2.39 – 2.80) | (1.52 – 1.72) | (1.51 – 1.70) | |
| | (71%) | | | | |
| **Matched West Germans** | 13.82 | 2.37 | 1.55 | 1.53 | 389 |
| | (13.35 – 14.28) | (2.19 – 2.55) | (1.45 – 1.65) | (1.44 – 1.62) | |

| | | | | | |
|---|---|---|---|---|---|
| | | | **2001** | | |
| **West Germans** | 14.22 | 2.44 | 1.51 | 1.62 | 2,031 |
| | (14.01 – 14.41) | (2.33 – 2.55) | (1.47 – 1.56) | (1.56 – 1.67) | |
| **East Germans** | 10.11 | 2.60 | 1.66 | 1.57 | 579 |
| | (9.79 – 10.43) | (2.44 – 2.75) | (1.58 – 1.73) | (1.50 – 1.64) | |
| | (73%) | | | | |
| **Matched West** | 13.79 | 2.58 | 1.52 | 1.70 | 579 |
| **Germans** | (13.39 – 14.18) | (2.36 – 2.81) | (1.44 – 1.60) | (1.58 – 1.83) | |
| | | | **2002** | | |
| **West Germans** | 14.07 | 2.69 | 1.58 | 1.71 | 3,745 |
| | (13.90 – 14.24) | (2.59 – 2.80) | (1.54 – 1.61) | (1.65 – 1.76) | |
| **East Germans** | 10.26 | 2.79 | 1.67 | 1.67 | 1,209 |
| | (10.04 – 10.49) | (2.65 – 2.94) | (1.59 – 1.75) | (1.60 – 1.75) | |
| | (75%) | | | | |
| **Matched West** | 13.70 | 2.74 | 1.58 | 1.73 | 1,209 |
| **Germans** | (13.41 – 14.00) | (2.55 – 2.93) | (1.52 – 1.64) | (1.63 – 1.83) | |
| | | | **2003** | | |
| **West Germans** | 14.45 | 2.74 | 1.60 | 1.71 | 3,681 |
| | (14.27 – 14.62) | (2.64 – 2.83) | (1.57 – 1.62) | (1.66 – 7.77) | |
| **East Germans** | 10.63 | 2.79 | 1.65 | 1.69 | 1,083 |
| | (10.38 – 10.88) | (2.64 – 2.94) | (1.59 – 1.72) | (1.61 – 1.76) | |
| | (76%) | | | | |
| **Matched West** | 14.06 | 2.63 | 1.54 | 1.70 | 1,083 |
| **Germans** | (13.75 – 14.37) | (2.41 – 2.85) | (1.49 – 1.60) | (1.57 – 1.83) | |
| | | | **2004** | | |
| **West Germans** | 14.28 | 2.86 | 1.60 | 1.79 | 3,585 |
| | (14.10 – 14.46) | (2.73 – 2.98) | (1.57 – 1.63) | (1.72 – 1.86) | |
| **East Germans** | 10.74 | 2.89 | 1.69 | 1.71 | 1,133 |
| | (10.48 – 11.00) | (2.74 – 3.04) | (1.61 – 1.76) | (1.64 – 1.78) | |
| | (77%) | | | | |
| **Matched West** | 13.97 | 2.97 | 1.60 | 1.86 | 1,133 |
| **Germans** | (13.64 – 14.29) | (2.78 – 3.16) | (1.53 – 1.66) | (1.76 – 1.96) | |

95 percent confidence interval and percentage to matched West Germans in brackets. Confidence intervals for percentile ratios are calculated by bootstrapping (1,000 replications). Source: Samples from GSOEP 1992-2005, see text; own calculations.

## **Table A3:** Decomposition 1992-2005

| **Differential** | **Total** | **Quantities** | **Prices** | **Unobserved** |
|---|---|---|---|---|
| | | **West Germans** | | |
| **90-10** | 0.180 | 0.057 | 0.039 | 0.083 |
| **90-50** | 0.053 | 0.015 | 0.005 | 0.033 |
| **50-10** | 0.127 | 0.042 | 0.034 | 0.051 |
| | | **East Germans** | | |
| **90-10** | 0.366 | 0.037 | 0.234 | 0.095 |
| **90-50** | 0.154 | -0.013 | 0.122 | 0.044 |
| **50-10** | 0.212 | 0.050 | 0.111 | 0.051 |
| | | **Matched West Germans** | | |
| **90-10** | 0.189 | 0.053 | 0.052 | 0.084 |
| **90-50** | 0.060 | 0.005 | 0.033 | 0.023 |
| **50-10** | 0.129 | 0.049 | 0.019 | 0.061 |

Source: GSOEP 1992-2005, see text; own calculations.