

## The Skill Loss of Older East Germans after Unification

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### Abstract

This paper documents and analyzes changes in relative wages of older East Germans after unification. In 1990, employees above 45 started out with very low wages relative to younger East Germans or West Germans in the same cohort. Results suggest that older employees lost up to 30 percent of their earnings because socialist work experience fully depreciated after the regime change. Older employees lost further in relative terms because their returns to education and occupational skills were much lower than younger East Germans early in the transition.

*JEL Classifications: J31, J38, J61, P51*

### 1. Introduction

Older cohorts are often considered especially vulnerable to the sweeping changes of the transition as their labor market skills are obsolete or less adaptable to the new economic environment. Prior evidence from Russia suggests that older employees suffered substantial wage losses relative to the average employees and especially recent labor market entrants during the 1990s (Brainerd 1998). Since East Germany experienced the most rapid transition to a market economy, older cohorts might be hit especially hard.<sup>1</sup>

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<sup>1</sup> Gross Domestic Product declined by 15.6 percent in 1990 and another 22.7 percent in 1991 – more than in most other transition countries. Mirroring the initial collapse of production, aggregate employment plummeted by 25 percent in the first two years and declined a further 10 percent in 1992.

This paper documents and analyzes the determinants of changes in relative wages of older East Germans shortly after unification. The data reveal two stylized facts. First, older employees start out with just 25 percent of the wage of West Germans in the same cohort in 1990. In contrast, young employees born after 1965 earn more than 40 percent of their cohort counterparts in the West. Second, wages of older East Germans rise at a similar rate as for younger employees after 1991.

New results are presented that quantify the initial wage loss from limited transferability of skills across economic regimes. Calculations show that cohorts with 35 or more years of experience in 1990 lose between 23 and 30 percent of their earnings power compared to a situation where returns had remained at 1989 levels. In addition, older employees also earn lower returns to educational and occupational skills than younger East Germans. In contrast, differences in educational attainment across cohorts or their distribution across industries and occupations explain only a small fraction of the relative wage loss early in the transition.<sup>2</sup>

The next section describes the changes in the relative wages after unification. Section 3 quantifies the wage losses of older workers due to skill depreciation, while Section 4 concludes.

## 2. Changes in Relative Wages after Unification

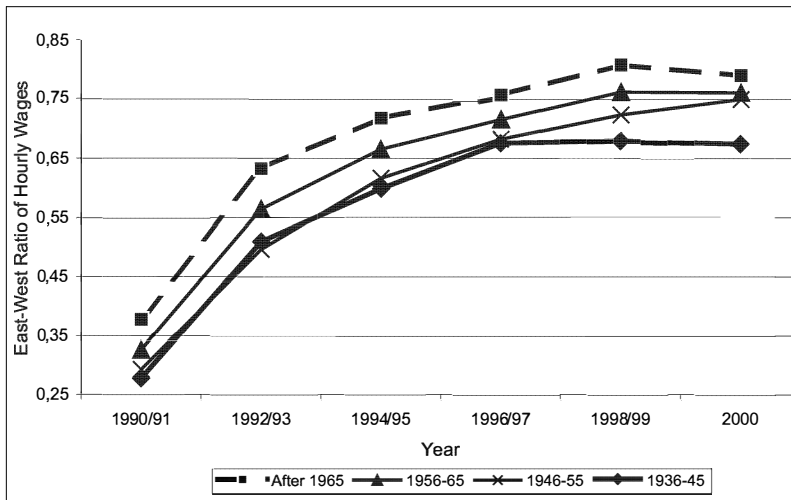
The empirical analysis is based on the German Socio-Economic Panel from 1990 until 2001.<sup>3</sup> East Germany experienced remarkable aggregate wage growth over the 1990s with average growth rates of 14 log points. As a consequence, there was substantial wage convergence between East and West Germany over the 1990s. Focusing on aggregate wages as done by the literature (Burda and Schmidt 1997, Franz and Steiner 2000) however masks substantial heterogeneity in convergence across different cohorts.

Figure 1 shows wages of East Germans relative to their cohort counterpart in West Germany. Two facts emerge: first, older cohorts in East Germany start out with lower relative wages shortly after unification. The two oldest cohorts, between age 35–44 and 45–54 in 1990 respectively, earn just about one-fourth of West Germans in the same cohort. In contrast, the youngest cohort under 25 in 1990 starts out with close to 40 percent of the wages earned by their cohort counterparts in West Germany. Second, all cohorts experience considerable wage convergence over the course of the transition. Ten years after unification, the cohort born after 1965, now 35 years and younger, earns

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<sup>2</sup> For a complete analysis of initial wage losses and later recovery of older East Germans, see Gathmann (2004a).

<sup>3</sup> For details on construction of the sample, see Gathmann (2004a).



Source: Author's calculations based on the German Socio-Economic Panel, Waves 1990–2002.

Figure 1: East-West Wage Ratio by Birth Cohort

almost 80 percent of West German wages while the cohort born between 1936–45 approaching retirement earn around 65 percent.<sup>4</sup>

Another way to illustrate the initial wage loss for older employees is to compare relative wages in East Germany before and after the regime change. Median wages for employees aged 45 or above fell by 10 percent relative to the 25–34 age group between 1989 and 1991.<sup>5</sup> Similarly, median wages of 45–54 year-olds drop from the 65th percentile in 1989 to the 57th percentile in 1991 in the wage distribution of under 35 year-olds.

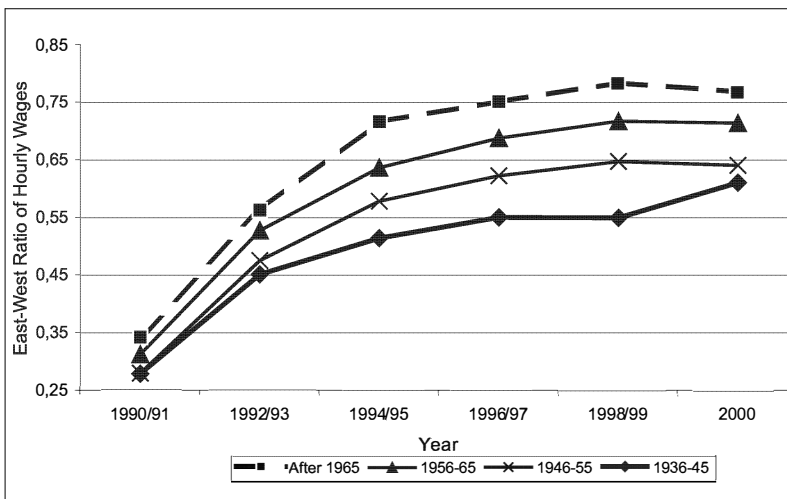
The evidence above is based on the sample of workers and potentially affected by changes in the composition of the workforce. While employment has declined for all age groups early in the transition process, the decline has been most pronounced for older East Germans. If those dropping out of the labor market come from the bottom of the wage distribution, relative wages of older cohorts from a sample of workers are upward biased. This would understate their relative wage losses early in the transition and overstate their 'keeping up' later in the transition. Suppose however that all nonworkers in

<sup>4</sup> A similar picture emerges for relative wages across age groups within East Germany. For example, men above 45 earn only about 10 percent more than younger employees in 1990, whereas West German men above 45 earn 17 to 25 percent more.

<sup>5</sup> Only relative wages are compared. In the absence of a price deflator that accounts for subsidies and quantity constraints in the socialist economy, wage levels between 1989 and 1991 are not directly comparable.

East and West Germany are from the lower half of the wage distribution and the fraction of nonworkers in the sample does not exceed fifty percent. Under this assumption, the median of the full wage distribution can be recovered from the observed wages by adjusting the median of workers for the fraction of censored observations from nonworkers (Neal and Johnson 1996).<sup>6</sup>

Figure 2 shows median relative wages between East and West including nonworkers under this assumption. The corrected plot still exhibits substantial wage growth for all cohorts during the 1990s, but younger cohorts now experience more rapid wage growth than older cohorts. As a result, the wage profiles of different birth cohorts fan out over the 1990s and the convergence gap between the oldest (born 1936–45) and youngest cohort (born after 1965) more than doubles between 1990 and 2000.



Source: Author’s calculations based on the German Socio-Economic Panel, Waves 1990–2002.

Figure 2: East-West Wage Ratio Including Nonworkers

<sup>6</sup> The assumption that all nonworkers earn wages below the median for workers is strong. If some nonworkers are in fact high-wage workers, the corrected plot understates the wage gains of East relative to West Germans in the labor market. More importantly, relative wages in East Germany are misleading if young and old labor market dropouts come from different parts of the wage distribution. For example, if young nonworkers are high-wage earners and older nonworkers low-wage earners, the fanning out would still understate the true relative wage gains of younger workers.

### 3. The Transferability of Skills across Economic Regimes

#### 3.1 Depreciation of Socialist Work Experience

One explanation for the low relative wages of older employees documented above is that some skills are only partially transferable across economic regimes. In particular, older cohorts worked a greater fraction of their career in the socialist economy, which often used outdated technologies or production methods. If those skills are not valuable in the new market economy, older employees suffer relative and potentially absolute wage losses. To estimate the returns to labor market experience carried over from the socialist regime, the following earnings equation is specified<sup>7</sup>

$$(1) \quad \ln w_{it} = \alpha_t + \beta' X_{it} + \gamma_1 OExp + \gamma_2 OExp^2 + \lambda_1 NExp_{it} + \lambda_2 NExp_{it}^2 + \varepsilon_{it}$$

where *OExp* denotes old socialist work experience, *NExp* work experience since unification and *X* other control variables like education and demographic characteristics.<sup>8</sup> In the above specification, older East Germans might suffer wage losses for two reasons: first, low returns to old experience decrease the wages relative to younger cohorts. Second, older workers might also earn lower returns to new experience, if for example, their productivity to acquire new skills is lower than for younger workers. To capture the latter, new experience and new experience squared are also interacted with age dummies.

The results for East German men and women are reported in Table 1. The estimates show that socialist labor market experience has no economic value in the post-unification labor market. Returns to ‘socialist’ work experience are not statistically significant from zero for men and small or zero for women across all specifications. In contrast, returns to work experience accumulated after unification are very large, especially for men. The much lower returns to new work experience for women suggest that transition affected men and women differently.<sup>9</sup> Column (2) and (5) add occupation and industry dummies. Conditional on occupation and sector, returns to new experience are somewhat lower. Column (3) and (6) interacts the new work experience variable with age dummies with the reference category being those under 25. For both men and women, returns to new work experience are not statistically different

<sup>7</sup> See Mincer and Ofek (1982) for an application to female labor force participation.

<sup>8</sup> Since labor force participation was high and unemployment rates below 2 percent in the socialist economy, the empirical measure of old experience is essentially a dummy variable for people born in the same year and the same years of schooling. The new work experience variable is derived from calendar files that report the actual employment status for each month. Variation in new experience across individuals arises from unemployment and temporary nonemployment spells after 1990.

<sup>9</sup> For a detailed analysis of how the transition process affected East German men and women, see Gathmann (2004b).

across age groups (not reported). The F-Test for joint significance reported in the last row of Table 1 is rejected at the 5 percent level.<sup>10</sup>

*Table 1*  
**Depreciation of Socialist Work Experience after Unification**

	Men			Women		
	(1)	(2)	(3)	(4)	(5)	(6)
Old Experience	0,002 (0,0017)	0,0016 (0,0017)	-0,0009 (0,0027)	0,0124 (0,0018)**	0,0071 (0,0017)**	0,0029 (0,0030)
Old Experience Squared	0 0,0000	-0,0001 0,0000	-0,0001 (0,0001)	-0,0003 (0,0000)**	-0,0002 (0,0000)**	-0,0001 (0,0001)
New Experience	0,5847 (0,1874)**	0,5384 (0,1996)**	0,5486 (0,2087)**	0,1942 (0,0624)**	0,1431 (0,0616)*	0,0864 (0,0826)
New Experience Squared	-0,0351 (0,0123)**	-0,0336 (0,0129)**	-0,0386 (0,0158)*	0,0032 (0,0046)	-0,0043 (0,0045)	0,0009 (0,0095)
Vocational Training	0,1403 (0,0339)**	0,0885 (0,0338)**	0,075 (0,0347)*	0,305 (0,0278)**	0,154 (0,0264)**	0,1553 (0,0265)**
University Degree	0,4658 (0,0356)**	0,2416 (0,0375)**	0,221 (0,0383)**	0,6585 (0,0310)**	0,3133 (0,0302)**	0,3084 (0,0307)**
Migrant or Commuter to West	0,1703 (0,0173)**	0,2032 (0,0174)**	0,2034 (0,0175)**	0,1004 (0,0244)**	0,151 (0,0231)**	0,1496 (0,0231)**
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Age Dummies	No	No	Yes	No	No	Yes
Other Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	No	Yes	Yes	No	Yes	Yes
Occupation Dummies	No	Yes	Yes	No	Yes	Yes
R-Squared	0,39	0,47	0,47	0,39	0,55	0,55
Observations	7001	6733	6733	6642	6398	6398
F-Test Age-Specific Returns		2,35			2,27	
Prob > F		(0,0159)			(0,0204)	

*Source:* author’s calculations based on the German Socio-Economic Panel, Waves 1990–2002.

*Notes:* The results are based on a pooled regression of log hourly wages for East German men and women between 20 and 60 years of age in 1990. People in full-time education or vocational training (“berufliche Lehre”) are excluded from the analysis. Robust standard errors are reported in parentheses. Coefficients with \* are significant the 5 percent, those with \*\* at the 1 percent level. New experience refers to actual work experience in years accumulated after unification, while old experience is potential experience before 1990. The reference educational group is no vocational degree and the reference age group are those under 25. Other controls are whether the person is married and in column (2)–(3) and (5)–(6) also firm tenure. The occupation and industry dummies in column (2) and (5) control for 7 occupational and 12 industry categories.

<sup>10</sup> Very similar results were found when the sample was restricted to those working in East Germany. Interaction terms between old work experience and education were not significant. Thus, the depreciation of socialist skills appears to have affected all education levels in a similar fashion.

The high returns to new work experience could be driven by selection effects as variation in the new experience variable relies on unemployment and nonemployment spells. If selection into work is positive and covariances between new work experience and other control variables are ignored, this leads to an upward bias in  $(\lambda_1, \lambda_2)$ . Estimation of a fixed effect model that controls for time-invariant unobserved heterogeneity in levels shows that returns to new experience are still substantial but around 30 percent lower than the least-squares estimates in Table 1.<sup>11</sup>

Another potential explanation for the high returns to new experience is that the data only covers the first twelve years of the transition process. If wage profiles with respect to new experience are steep at the beginning of the post-1990 working career, the returns mainly reflect the steep portion of the wage profile similar to new labor market entrants. While data constraints prohibit a fully nonparametric approach, a spline function was used with the knot placed at four years of experience. The result confirm that returns decline with accumulated experience: while the return to the first four years of experience after unification is 0.43, it falls to 0.07 for the years 5 to 11.

To quantify the wage loss that can be attributed to the depreciation of socialist work experience, the following thought experiment was used. Suppose that the wall had fallen but returns to experience had remained at their 1989 level. What would wages of high-experience workers be? In a first step, wage regressions for 1989 and 1990 were estimated separately for men and women and the wage distribution in 1990 predicted conditional on experience and experience squared. The counterfactual log hourly wage for 1990 in the absence of skill depreciation was then calculated by adding labor market experience in 1990 evaluated at 1989 returns. The calculation shows that high-experience workers suffered substantial wage losses from skill depreciation. For women with 35 or more years of potential work experience, the wage loss amounts to 23 percent of 1990 log wages. For men in the same experience category, the wage loss is almost 30 percent of the actual log wage in 1990.<sup>12</sup>

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<sup>11</sup> With respect to age-specific returns to new experience (column (3) and (6)), selection effects work however against the expected finding of higher returns to new experience for younger workers. This is true as long as the larger employment decline among older workers translates into a more severe upward bias in the experience coefficients.

<sup>12</sup> An alternative interpretation of the relative decline of wages after unification is that labor market experience was overvalued in the socialist economy. The fact that returns to work experience in socialist East Germany in 1989 were actually smaller than in West Germany (Bird, Schwarze and Wagner, 1994) speaks however against this argument.

### 3.2 Lower Returns to Education and Occupational Skills

Experience is only one labor market skill whose value adjusted after unification. If the value of formal education increased shortly after unification and older employees have on average less education, this compresses relative wages across cohorts. Older East Germans might have also been employed more than proportionally in sectors and occupations whose relative wages declined after unification. In both cases, older employees lose because the skills they possess earn lower returns after the regime change. Alternatively, their relative wages would also decline with the regime change if older employees earn lower returns for the same observable skills than younger ones. This could for example occur if age acts as a proxy for adaptability to the new economic regime and employers value more adaptable workers conditional on other observable skills.<sup>13</sup>

To distinguish between the two explanations, the log wage differential between older and younger workers in 1990 is decomposed into differences in characteristics and differences in returns:

$$(2) \quad \log W^{old} - \log W^{young} = (X^{old} - X^{young})\beta^{old} + X^{young}(\beta^{old} - \beta^{young})$$

The results of the decomposition are reported in Table 2. For men, differences in educational attainment matter little in explaining the wage differential.<sup>14</sup> The distribution across occupations leads to higher wages for older workers, mostly because older workers are more likely to work in high-wage occupations like administrators or professionals.

The contribution of characteristics is however small compared to the differences in returns to those characteristics. Most importantly, returns to education are much lower for older workers in 1990. Also, returns to occupations are lower for the age group 45–54, while for men 55 and older, returns to the sector of employment are a more important determinant of the wage differential. For women, a somewhat different picture emerges. First, younger women actually earn higher wages than older women. This is mostly driven by the

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<sup>13</sup> After unification, East Germans, who were employed by the former secret service (“Stasi”), were banned from entering certain occupations, for example in the public sector. If those occupations pay high wages and older East Germans worked more often for the “Stasi” than younger ones, this would provide an alternative explanation for low returns to observable skills unrelated to employer preferences. I thank an anonymous referee for pointing this out.

<sup>14</sup> Older East Germans are on average less educated. There is however surprisingly little variation in the distribution across economic sectors. The distribution among occupations is more dispersed: older men are much more likely to be employed as administrators or professional. At the same time however, the share of unskilled labor among the oldest cohort is more than double that of the young (16 percent compared to only 9 percent for men under 25).



Table 2: Decomposition of Wage Differential by Age Group in 1990

	Men				Women			
	Characteristics Effect	Percentage Contribution	Coefficient Effect	Percentage Contribution	Characteristics Effect	Percentage Contribution	Coefficient Effect	Percentage Contribution
<i>Age 45 – 54 Relative to 25 – 34</i>								
Log Wage Differential	0,054				-0,043			
Education	0,01	16,6	-0,16	-294,0	-0,03	68,3	-0,22	509,5
Occupations	0,045	83,2	0,030	55,4	-0,016	37,1	-0,095	223,2
Industries	0,005	10,1	-0,067	-124,9	-0,005	12,2	0,147	-344,2
<i>Age 55 and Older Relative to 25 – 34</i>								
Log Wage Differential	0,030				-0,043			
Education	0,004	13,2	-0,202	-684,2	-0,052	121,2	-0,264	618,8
Occupations	0,031	105,4	-0,070	-235,5	-0,016	38,5	-0,081	190,9
Industries	-0,009	-30,1	0,023	77,5	-0,028	66,4	0,180	-420,8

*Source:* author's calculations based on the German Socio-Economic Panel, Waves 1990 – 2002.

*Notes:* The table reports the coefficients from a Oaxaca decomposition of the log hourly wage differential in 1990 between the age groups indicated into characteristics and coefficient effect. The coefficients are from a log wage equation that also included the following variables: experience, experience squared, marital status, state of residence and whether the person lives or works in West Germany. Seven occupational categories (technician, clerk, sales worker, agricultural or production worker, service worker, unskilled worker and the reference group professionals and administrators) and seven industry categories (manufacturing, construction, trade/repair, other service, public administration, health/education with the reference category agriculture) are included to calculate the decomposition.

fact that younger women are better educated and employed in better paying occupations and industries. Like men, the contribution of differences in returns is much larger than differences in labor market skills. Returns to education and occupations are lower for older women in both age groups. Returns to sector of employment are however higher, which tends to decrease the wage differential.

#### 4. Conclusion

Older employees started out with low wages both relative to younger East Germans and to their cohort counterpart in West Germany after unification. The analysis shows that older East Germans experienced substantial wage losses with the regime change for two reasons: first and most importantly, because labor market experience accumulated in the socialist economy fully depreciated with the regime change. Second, because older employees earned lower returns to educational degrees and occupational skills than younger ones. In contrast, differences in observable labor market skills can explain only a small fraction of the wage differential early in the transition.

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