Money Does Matter! Evidence from Increasing Real Income and Life Satisfaction in East Germany Following Reunification

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One of the most prominent political and economic events of recent decades was the falling of the Berlin Wall on November 9, 1989, which was quickly followed by the reunification of the formerly separate entities of East and West Germany. It is well acknowledged that the falling of the wall was widely unanticipated in Germany (Stefan Bach and Harold Trabold, 2000), and thus it provides some useful exogenous variation with which we can more firmly establish causality in empirical analyses. In this paper, we aim to contribute to the growing economics literature on the determinants of life satisfaction (or happiness) by investigating how life satisfaction in East Germany changed over the decade following reunification.[1] We are particularly interested in identifying the contribution that the substantial increase in real household income in East Germany in the post-reunification years (i.e., around 60 percent between 1990 and 2001) made to reported levels of life satisfaction.

In order to achieve this aim, we apply a new conditional fixed-effect ordinal estimator to our measure of life satisfaction using data from the German Socio-Economic Panel (GSOEP). The estimates from this new model are then decomposed, using a new causal technique, in order to identify the factors that drove average changes in life satisfaction in East Germany following reunification. Our methodology exploits the fact that the GSOEP is an evolving panel, allowing us to make a distinction among changes in variables affecting everyone, changes in the aggregate unobserved fixed individual characteristics of the panel due to new entrants (who are also mostly younger cohorts), and panel attrition.

In Section I, we briefly review the literature and describe our data. In Section II, we present the fixed-effect methodology and the causal decomposition approach that we adopt. Section III presents the results. Finally, Section IV concludes.

I. Literature and Data

A. *Literature*

The investigation of the factors affecting human life satisfaction or happiness is central to the discipline of psychology, but economists have become increasingly active in this field in recent years.[2] In particular, economists have been interested in establishing the relationships between income, unemployment and life satisfaction. While there is a firm consensus based on both cross-sectional and longitudinal data that unemployment leads to a substantial loss of life satisfaction regardless of the exact definition of life satisfaction, the relationship between income and satisfaction is less clear. Perhaps the most widely accepted viewpoint is that in-

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[1] A detailed investigation of changes in life satisfaction for West Germans, as well as additional details for East Germans, can be found in Frijters et al. (2004).

[2] For informative reviews and recent contributions (but not an exhaustive list), see Andrew Clark and Andrew Oswald, 1994; Clark et al., 1996; Knut Gerlach and Gesine Stephan, 1996; Tomas Korpi, 1997; Oswald, 1997; Ioannis Theodossiou, 1998; Liliana Winkelmann and Rainer Winkelmann, 1998; Daniel Kahneman et al., 1999; Bruno S. Frey and Alois Stutzer, 2000; Frijters, 2000; Marianne Bertrand and Sendhil Mullainathan, 2001; Clark et al., 2001; Raphael Di Tella et al., 2001; Richard A. Easterlin, 2001; Michael McBride, 2001; Martin Ravallion and Michael Lokshin, 2001; Ada Ferrer-i-Carbonell and Bernard M. S. van Praag, 2002; Frey and Stutzer, 2002; Shields and Allan Wailoo, 2002; Clark, 2003; Di Tella et al., 2003; Ferrer-i-Carbonell and Frijters, 2004; Frijters et al., 2004.

come does matter, but not very much (Easterlin, 1995; Oswald, 1997; Ed Diener and Shigehiro Oishi, 2000; Frey and Stutzer, 2002). This has led to interest in the role of relative rather than absolute income in determining life satisfaction (e.g., Clark and Oswald, 1994; McBride, 2001), and the relationship between income and life expectations (Easterlin, 2001). An additional result from both psychology and the recent economics literature that is highly relevant to this paper is the strong presence of individual heterogeneity, especially unobserved personality traits (Kahneman et al., 1999). This makes it important to use econometric models that take account of fixed individual traits. The other variables that economists minimally include in their models are age, marital status, children, and health variables. Most studies have found a U-shaped relationship between age and life satisfaction, with satisfaction being lowest in the 30's and 40's. Marriage is often (but not always) found to be positively associated with higher life satisfaction, while the converse is true for poor health. There is no consistent finding for the effect of children on life satisfaction.

B. *Data*

To examine the impact of reunification and socioeconomic characteristics on the life satisfaction of East German residents, we use data from the German Socio-Economic Panel (GSOEP). The GSOEP is a nationally representative panel that has closely followed around 13,500 West Germans each year since 1984. Following reunification, the panel was extended to include residents of the former East Germany.[3] In this paper we focus on males and females, aged 21–64, who resided in East Germany, whom we follow from 1991–2001.[4] However, sample attrition is a notable problem

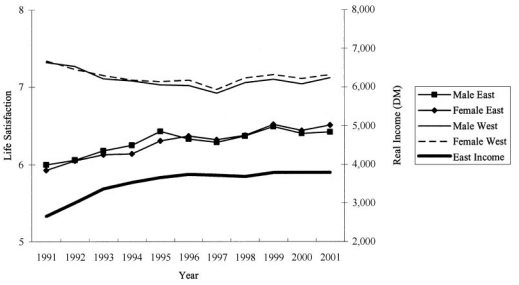

FIGURE 1. AVERAGE LIFE SATISFACTION IN EAST AND WEST GERMANY, AND AVERAGE REAL HOUSEHOLD MONTHLY INCOME IN EAST GERMANY, 1991–2001

in a panel of this length, with only around 35 percent of respondents observed in all eleven waves in the East German sample. The average length in the panel is 5.4 years. Consequently, the GSOEP is an evolving panel that automatically incorporates new members into the panel each wave to maintain the size and representativeness of the data. We allow for possible biases due to the differing unobservable characteristics (e.g. personality traits) of new entrants and exits in our decomposition methodology. This methodology is outlined in the following section.

The central variable in our analysis is a measure of life satisfaction derived from the following question posed to respondents in each wave of the GSOEP: "How satisfied are you at present with your life, all things considered?" The responses run from 0 (completely dissatisfied) to 10 (completely satisfied).

Figure 1 highlights both the change in aggregate life satisfaction and the change in average real household monthly income (in 1995 prices) experienced by East German males and females over the period 1991 to 2001. For comparison purposes, we also provide the corresponding profiles for life satisfaction in West Germany. It is clear that real household incomes rose substantially in East Germany following reunification, increasing by over 40 percent between 1991 and 2001. Moreover, average life satisfaction in East Germany also increased considerably, while West Germans experienced a fall in life satisfaction between 1991 and 1997, which was somewhat offset by improvements in the later years. Table 1 illustrates the changing distribution of life satisfaction in East Germany

[3] In this paper we use the German version of the GSOEP data (see Haisken-DeNew and Joachim Frick, 2000, for details), although the same analysis can be conducted with the international 'scientific use' version, albeit with around 5 percent fewer observations.

[4] We do not use the 1990 wave of the data since household income was still measured in East German marks, and we do not have an exchange rate (which changed almost daily) to make household income in that year comparable with later years.

TABLE 1—THE DISTRIBUTION OF LIFE SATISFACTION IN EAST GERMANY BY GENDER, 1991 AND 2001

	1991		2001	
Percentage	Males	Females	Males	Females
10 (very satisfied)	1.5	1.6	1.0	1.5
	(0.32)	(0.30)	(0.28)	(0.34)
9	3.7	4.2	3.5	4.8
	(0.48)	(0.50)	(0.53)	(0.60)
8	18.7	17.6	25.4	25.3
	(0.10)	(0.96)	(1.25)	(1.2)
7	21.8	19.3	27.3	27.0
	(1.07)	(0.99)	(1.28)	(1.3)
6	14.1	14.4	15.7	12.5
	(0.90)	(0.88)	(1.05)	(0.93)
5	22.4	25.2	15.0	18.3
	(1.08)	(1.11)	(1.03)	(1.09)
4	7.3	6.5	5.4	5.5
	(0.67)	(0.63)	(0.65)	(0.64)
3	6.1	6.5	4.5	3.1
	(0.62)	(0.62)	(0.60)	(0.49)
2	2.5	2.5	0.7	1.1
	(0.40)	(0.39)	(0.25)	(0.29)
1	0.7	0.8	1.0	0.8
	(0.22)	(0.22)	(0.28)	(0.25)
0 (very unsatisfied)	1.2	1.5	0.5	0.1
	(0.28)	(0.30)	(0.20)	(0.10)
Mean	6.00	5.93	6.42	6.51
Observations	1,504	1,582	1,211	1,262

Notes: Standard errors of mean values are in parentheses. The mean values for 2001 are significantly higher at the 95-percent confidence level than for 1991, for both males and females.

between 1991 and 2001. The main change is the increase in the percentage of respondents reporting satisfaction scores of 7 and 8, and a decline in those reporting scores between 1 and 5. There appears to be little change in the percentage reporting scores of 9 or above over this period.

II. Econometric Framework and Decomposition Approach

A. *Fixed-Effects*

The recent psychology literature has found that fixed personality traits are very important predictors of general satisfaction (see, for example, Michael Argyle, 1999; Diener and Richard E. Lucas, 1999). Lacking these variables, we use the following fixed-effect ordered logit model developed in Ferrer-i-Carbonell and Frijters (2004) in order to correct for the presence of such unobservables:[5]

$$(1)\qquad GS^*_{it} = x'_{it}\beta + \delta_t + f_i + \varepsilon_{it}$$

$$GS_{it} = k \Leftrightarrow GS^*_{it} \in [\lambda_k, \lambda_{k+1}\rangle$$

where GS^*_{it} is latent life satisfaction; GS_{it} is observed satisfaction; λ_k is the cut-off point (increasing in k) for the satisfaction answers; x_{it} are the observable time-varying characteristics; δ_t denotes unobserved time-varying general circumstances; f_i is an individual fixed characteristic and ε_{it} is a time-varying logit-distributed error term that is orthogonal to all characteristics. Our conditional estimator for δ_t and β maximizes the following conditional likelihood:

$$(2)\quad L\left[I(GS_{i1} > k_i), \ldots, I(GS_{iT} > k_i) \,\middle|\, \sum_t I(\mathrm{GS}_{it} > k_i) = c \right] = \frac{e^{\sum_{t=1}^{T} I(GS_{it} > k_i) x'_{it}\beta}}{\sum_{\mathrm{GS} \in S(k_i, c)} e^{\sum_{t=1}^{T} I(\mathrm{GS}_{it} > k_i) x_{it}\beta}},$$

which is the likelihood of observing which of the T satisfactions of the same individual are above k_i, given that there are c out of the T satisfactions that are above k_i. Here, $S(k_i, c)$ denotes the set of all possible combinations of $\{GS_{i1}, \ldots, GS_{iT}\}$ such that $\Sigma_t I(\mathrm{GS}_{it} > k_i) = c$, where GS_{it} is used to denote the random variable and GS_{it}, the realization.

[5] Most of the studies that have used panel data to examine the determinants of life satisfaction have tested the appropriateness of the random effects versus fixed-effects specifications. In each case, the random-effects model, based on the assumption that the unobservable individual effect (e.g., personality traits) is uncorrelated with the explanatory variables, is clearly rejected. Our own test results support this finding; therefore we only report results for the fixed-effects specification in this paper.

This model is an extension of the fixed-effect logit model by Gary Chamberlain (1980). Unlike the Chamberlain methodology, which imposes a common threshold for everyone (say, k), our model uses person-specific thresholds (say, k_i). When some individuals only report values between 4 and 6, and others only between 7 and 9, then the use of the same barrier for everyone cannot record changes for both groups of individuals. Some individuals then have to be dropped from the estimation procedure. With individual specific barriers all individuals whose satisfactions differ over time can be included. The most important advantage is that this allows us to use more than 90 percent of the observations. In comparison, the loss of data in applications with the Chamberlain method is usually close to 50 percent (see, for example, Winkelmann and Winkelmann, 1998; Clark et al., 2001; Daniel S. Hamermesh, 2001; Clark, 2003).

B. *Explanatory Variables*

Following the previous literature we include the most commonly used observable time-varying predictors of life satisfaction, which are marital status, number of children, health, employment status, and real household monthly income. Our measure of health is less subjective than most, and is based on whether or not the individual is registered as being disabled and the extent of their disability (which is measured in percentage terms). In addition, given the "caring" responsibilities that many of the sample respondents report we also control for whether there is an invalid in the household (usually the spouse or a parent). We have also been able to derive a "Border" variable equaling unity if the respondent lives on the border of East and West Germany (zero otherwise). The latter variable is included because we might expect the immediate effect of reunification on those living in a region on the border to be relatively higher. In order to capture changes in aggregate circumstances we also include dummy variables for each year. Since we cannot simultaneously identify the effects of aging and time with our panel data, the aging of the panel complicates the interpretation of the time dummies. We will discuss this in more detail in the results section. We fit separate models for males and females to allow the determinants of life satisfaction to differ by gender.

C. *Causal Decomposition Analysis*

We decompose changes in expected latent satisfaction for East German men and women separately in the post-reunification period using the estimates from the fixed-effects models. This means we analyze:

$$(3)\quad \widehat{E\{GS^*_{t+1} - GS^*_t\}} = (\bar{x}'_{t+1} - \bar{x}'_t)\hat{\beta} + (\widehat{\delta_{t+1}} - \hat{\delta}_t) + (E_{t+1}f - E_t f).$$

Denote the set of East Germans who are in the sample at time t and at time $t + 1$ as S_t. For the individuals in S_t (the balanced panel), this decomposition is straightforward, because for these individuals, $(E_{t+1}f - E_t f) = 0$. A complicating factor arises when we consider the importance of those individuals who are only observed in either t or $t + 1$, i.e. the inflows and outflows of the GSOEP. For these individuals, $(\bar{x}'_{t+1} - \bar{x}'_t)\hat{\beta} + (\widehat{\delta_{t+1}} - \hat{\delta}_t)$ is still easily computed, but the unknown component $(E_{t+1}f - E_t f)$ poses a problem. This term is only equal to zero when the distribution of the unknown characteristics is constant over time. This is clearly very improbable because, for example, education levels and expectations will differ. From the fixed-effect ordered logit results alone, there is no information on $(E_{t+1}f - E_t f)$. So we have to use extra information in order to get an estimate of this term.

In order to obtain an estimate of $(E_{t+1}f - E_t f)$, we make the following assumption:

$$(4)\quad E\{GS(GS^* + \Delta) - GS(GS^*)\} = \Delta\mu + \sigma(\Delta)$$

where Δ is an arbitrary small increase in latent life satisfaction, and the $\sigma(\Delta)$ is the approximation error which we will ignore in the remainder. This assumption implies that the change in observed satisfaction is (by approximation) linear in the change in latent satisfaction. The responsiveness itself, μ, is taken to be constant over time. This first-order approximation can now be used by noting that we can estimate μ by calculating, for those individuals whom we observe in all time periods, what the response is

of the observed satisfaction levels to the estimated changes in latent satisfaction. A consistent estimator for μ is therefore:

$$\hat{\mu} = \frac{\sum_t \sum_{S_t} (GS_{t+1} - GS_t)}{\sum_t \sum_{S_t} (z'_{it+1} - z'_{it})\hat{\gamma}} \tag{5}$$

where z_t includes both x_t and the time dummies, and where γ includes β and δ. Having this estimate of μ, we can now use this to obtain an estimate of $(E_{t+1}f - E_t f)$:

(6)

$$\widehat{(E_{t+1}f - E_t f)} = \frac{\overline{GS}_{t+1} - \overline{GS}_t}{\hat{\mu}} - (\bar{z}'_{t+1} - \bar{z}'_t)\hat{\gamma}$$

This captures the degree of changes in the sample composition over time. In order to provide additional insight into the factors affecting life satisfaction we further decompose $(\bar{z}'_{t+1} - \bar{z}'_t)\hat{\gamma}$ into separate groups of variables. In particular, we decompose the total changes in latent satisfaction into changes in:

1. Household income.
2. Employment status variables: employed, nonparticipation, part-time employed, on maternity leave.
3. Family-related variables: the number of children, marital status, divorced, separated, widowed.
4. Health-related variables: whether someone is disabled and the level of disability, invalid in household.
5. Living in a region on the border.
6. Time (which also includes the effects of aging).
7. The unobserved individual-effects distribution.

It is possible to attach a causal explanation to the changes due to groups 1 to 5. Given the changes in characteristics, they explain a part of the changes in latent satisfaction levels. The changes due to groups 6 and 7 are not explained by anything observed and hence form the "true" unexplained part of the changes over time. The larger these terms, the less well our variables capture the important aspects of the changes over time.

We can construct confidence intervals for most elements in the decomposition by noting that, because $\hat{\beta} \sim N(\beta, \Sigma)$, it holds that $(\bar{x}'_{t+1} - \bar{x}'_t)\hat{\beta} \sim N((\bar{x}'_{t+1} - \bar{x}'_t)\beta, (\bar{x}'_{t+1} - \bar{x}'_t)\Sigma(\bar{x}'_{t+1} - \bar{x}'_t)')$. When we replace Σ with its Maximum Likelihood estimate, this yields confidence intervals. Since the term $(\overline{GS}_{t+1} - \overline{GS}_t)/\hat{\mu}$ in the formula $\widehat{(E_{t+1}f - E_t f)}$ in (6) is not well behaved (i.e., there is no a priori reason for it to have a bounded mean or variance), we cannot use standard inference or bootstrapping methods to compute confidence bands for $\widehat{(E_{t+1}f - E_t f)}$. So what we report is whether $\widehat{(E_{t+1}f - E_t f)}$ contains zero in the set of values when each of the stochastic elements in $\widehat{(E_{t+1}f - E_t f)}$ can range in its 95-percent confidence interval.

III. Empirical Results

A. *Fixed-Effects Results*

Table 2 provides the causal estimates from the fixed-effect ordered logit models for East German males and females, respectively. Unfortunately, the fixed-effects model does not provide estimates of the probabilities of having a particular level of life satisfaction, so it has no Marginal Effects (ME) proper. By approximation, however, an increase of 1 in a variable with coefficient β has an effect of $\hat{\mu}\beta$ on *expected* life satisfaction.

We find that both employment status and real household income are important predictors of life satisfaction for East Germans. A one-unit increase in log income leads to around a 0.5 increase in life satisfaction for both men and women. This large effect concurs with the economists' intuition that money should matter a great deal, even though many other studies find only small effects (see Oswald, 1997). Similarly, being employed, either full or part time, leads to a substantial satisfaction gain for both genders. In fact, being a nonparticipant, even for males, is associated with a far higher satisfaction relative to being unemployed. These effects are large, with full-time employment

TABLE 2—THE DETERMINANTS OF LIFE SATISFACTION FOR EAST GERMAN MALES AND FEMALES: ORDERED LOGIT MODELS WITH FIXED EFFECTS

	Males		Females	
Covariates	β	t-stat	β	t-stat
Married	0.271	1.98	−0.038	0.27
Separated	0.069	0.29	0.134	0.64
Divorced	0.306	1.46	0.209	1.14
Widowed	0.464	1.49	0.192	0.81
Number of children	0.110	2.76	0.067	1.64
Disabled	−0.260	0.98	−0.009	0.04
Level of disability	−0.009	1.92	−0.003	0.72
Invalid in household	−0.310	1.99	−0.597	3.92
Employed full time	0.704	11.45	0.751	12.20
Employed part time	0.468	2.30	0.741	9.40
Maternity leave	—	—	0.864	7.32
Nonparticipant	0.561	6.22	0.638	7.93
Log real household income (post-tax)	0.855	12.44	0.717	11.30
Live on the border of East and West Germany	−0.572	3.68	0.108	0.70
1992	−0.074	0.92	0.073	0.93
1993	−0.031	0.38	0.152	1.93
1994	0.114	1.42	0.060	0.76
1995	0.307	3.67	0.230	2.84
1996	0.235	2.81	0.289	3.52
1997	0.104	1.24	0.159	1.90
1998	0.293	3.44	0.342	4.05
1999	0.531	6.10	0.528	6.22
2000	0.360	4.08	0.387	4.53
2001	0.288	3.20	0.456	5.12
Mean log-likelihood	−3.575		−3.704	
$\hat{\mu}$	0.641		0.764	
Individuals	1,796		1,852	

Notes: The omitted categories are single, no disability, no invalid in the household, unemployed (maternity leave was not included in the male model), not living on the border of East and West Germany and 1991. By approximation, an increase of 1 in a variable with coefficient β has an effect of $\hat{\mu}\beta$ on *expected* life satisfaction.

leading to a 0.451 (=0.704∗0.641) increase in satisfaction for males and a 0.574 (=0.751∗0.764) increase for females. It is therefore clear that it is not the most unobservably "unhappy" or "pessimistic" who are observed in unemployment, and this firmly points to the involuntary nature of unemployment for both sexes (Clark and Oswald, 1994).

As to marriage, divorce, separation and widowhood, it is important to keep in mind that the reference group is those who have never been married. Having been married is hence clearly favored above never being married for males, but no such effect is found for females. In contrast to our expectations, we find no evidence that becoming separated or divorced causes a loss in satisfaction for East Germans. For both males and females, children have a positive

effect on life satisfaction. Interestingly, the gain in satisfaction of having an additional child is greater for men (0.071) than for women (0.051).

Both having a disability and the extent of disability are negatively associated with life satisfaction. However, these effects are not precisely determined, with the level of disability for males being the only variable to be statistically significant. In contrast, having an invalid in the household (other than oneself) leads to a substantial loss in life satisfaction, which is much greater for females (0.456) than males (0.199). This could tentatively reflect the fact that females typically carry much of the caring responsibility for an invalid spouse or parent.

Turning to the reunification variables, we find that living on the border of East and West Germany is associated with a large loss of life satisfaction for males (0.367), but not for females. This is a difficult result to explain, as our expectation would be that living on the border would be satisfaction-enhancing given the close proximity to many of the "better" public amenities in the West (especially in the first few years following reunification). Perhaps the reason for this result is precisely because East Germans near the border are more influenced by unfavorable comparisons with the West Germans than the other East Germans are.

The time profiles tell an interesting story. For both males and females there was a clear improvement in aggregate circumstances over the decade. Life satisfaction, however, peaked in 1999, with satisfaction being 0.340 and 0.404 higher for males and females, respectively, than in 1991. Examples of such improved circumstances are greater personal freedom and mobility, and better housing and public services. However, as noted earlier, given the panel nature of our data we cannot disentangle the effects of aging in the panel from the time effects. While many studies using cross-sectional or random-effects models have found a U-shaped relationship between age and life satisfaction, the marginal effect of an additional year of age at any point in the age distribution is typically very small. Thus we would argue that the aging of the panel is not the main component of the time effects.

B. *Decomposition Results*

The results from our decomposition analyses for East German males and females are provided in Tables 3 and 4, respectively. In order to explore whether reunification benefited some groups more than others, we also provide separate results for younger (i.e., those under the age of 40, 61 percent of sample) and older (i.e., 40 years or over, 39 percent of sample) East Germans, as well as for the more highly educated (i.e., 12 or more years of schooling, 35 percent of sample) and the lower educated (i.e., less than 12 years of schooling, 65 percent of sample).

Beginning with females, we see that in the five years after transition average latent life satisfaction increased by 0.567. Higher real household income accounted for just over two-fifths (0.255) of this increase, with unobserved aggregate variables accounting for the lion's share of the rest (0.289). Real household income increases were from DM 2,662 to DM 3,751 (a 41-percent increase) per month in this period. These gains were somewhat offset by negative changes in job status (the unemployment rate increased for females from 10.4 percent in 1991 to 16.8 percent by 1996). Changes in family circumstances and health circumstances seem on average to have had little effect on life satisfaction in this period. The findings on the unobserved component suggest that the new entrants into the panel (who were typically younger) were structurally happier than the older female cohorts.

The decomposition results differ considerably for the later years following reunification. Although average latent life satisfaction increased by 0.177 between 1996 and 2001, this can mostly be attributed to the higher aggregate unobserved variables: the general change in life satisfaction captured by the year variables remained important (0.167), suggesting that the general living environment (for example, political and social, since we capture economic changes through the income and job variables) for East German females further improved after 1996. There were additional small negative effects stemming from family and health changes.

Turning to East German males, we find that average latent life satisfaction in East Germany rose by 0.689 over the period 1991 to 2001 (i.e., $=0.545 + 0.144$). As with the total change found for females (0.744), the size of this improvement in life satisfaction for males over a one decade time period is very large by inter-

TABLE 3—DECOMPOSITION RESULTS FOR EAST GERMAN MALES

From → to	Year	Income	Job	Family	Health	Border	*f*	Total
All males								
1991 → 1996	0.235*	0.281*	−0.042*	−0.039*	0.002*	−0.006*	0.115	0.545
1996 → 2001	0.052	−0.004*	−0.019*	−0.028*	−0.002*	−0.005*	0.150*	0.144
Younger males								
1991 → 1996	0.303*	0.238*	−0.030*	−0.044*	0.010*	−0.009*	0.210*	0.678
1996 → 2001	−0.084	0.007*	−0.039*	−0.031*	−0.007*	0.000*	0.181*	0.027
Older males								
1991 → 1996	0.153	0.378*	−0.078*	−0.048*	0.000	−0.002	−0.104	0.298
1996 → 2001	0.430*	−0.054*	−0.023*	−0.013	−0.006	−0.005	−0.077	0.253
Low-educated males								
1991 → 1996	0.205*	0.236*	−0.059*	−0.041*	0.003	0.000	0.160*	0.504
1996 → 2001	0.032	−0.003*	−0.025*	−0.025*	−0.002	−0.002	0.156*	0.131
High-educated males								
1991 → 1996	0.262	0.399*	−0.025*	−0.001	0.007	−0.044*	0.021	0.619
1996 → 2001	0.093	−0.006*	0.008	−0.013	−0.005	−0.007*	0.100	0.169

Notes: * indicates statistical significance at the 95-percent confidence level. No significance level is provided for "Total." Younger males and females are defined as those under the age of 40, Older males and females are defined as being over 39 years of age. Low educated is defined as having less than 12 years of schooling, High educated is defined as having 12 or more years of schooling. To aid interpretation of these results we provide the following example: Looking at the results for all males over the period 1991–1996, average latent life satisfaction increased by 0.545. Of this increase, 0.281 is explained by real income changes, 0.235 is explained by aggregate changes affecting all East Germans, and the remainder is accounted for by changes in the fixed-effects distribution (0.115). Very little is explained by changes in the other explanatory variables used in the model, e.g., health-related variables.

TABLE 4—DECOMPOSITION RESULTS FOR EAST GERMAN FEMALES

From → to	Year	Income	Job	Family	Health	Border	*f*	Total
All females								
1991 → 1996	0.289*	0.255*	−0.051*	−0.006	0.001	0.000	0.080	0.567
1996 → 2001	0.167*	0.005*	0.011	−0.007	−0.003	0.001	0.003	0.177
Younger females								
1991 → 1996	0.222*	0.257*	−0.038*	0.000	0.006*	0.002	0.146	0.595
1996 → 2001	0.013	−0.008*	−0.008	−0.004	0.004	0.003	0.181*	0.181
Older females								
1991 → 1996	0.324*	0.256*	−0.057*	−0.032*	−0.004	0.004	0.023	0.514
1996 → 2001	0.457*	0.006*	0.015*	−0.013	−0.030*	0.000	−0.370*	0.064
Low-educated females								
1991 → 1996	0.290*	0.219*	−0.074*	−0.003	0.001	−0.002	−0.021	0.411
1996 → 2001	0.060	0.004*	0.016*	−0.003	−0.003	0.002	0.035	0.112
High-educated females								
1991 → 1996	0.292*	0.310*	−0.015	−0.012	0.005	−0.004	0.318*	0.895
1996 → 2001	0.344*	−0.016*	−0.009	−0.004	−0.007	−0.004	−0.063	0.241

Note: See notes to Table 3.

national standards. About one-third of this is explained by increases in real income (0.276), which entirely occurred between 1991 and 1996. General circumstances, captured by the year variables, increased life satisfaction by 0.288; however, once again this occurred in the first few years following reunification. The contribution of the combined effect of new entrants

and exits from the panel was to increase unobserved individual effects steadily throughout this period by a cumulative 0.265 (i.e., = 0.115 + 0.150). Apart from these main effects, we find a small fall attributable to worsening job outcomes (unemployment rose for men from 7.1 percent in 1991 to 12.2 percent by 2001). Family circumstances also slightly deteriorated in this period, with the health and border variables contributing little to the aggregate changes.

From separate analyses, we also find evidence of differentials changes in life satisfaction in the post-reunification by age group and education level.[6] Most notably, for both males and females, those aged under 40 experienced larger satisfaction gains than their older counterparts. For example, latent life satisfaction for young males increased by 0.705 between 1991 and 2001, with the vast majority of this improvement occurring between 1991 and 1996. In contrast, older males experienced a total increase of 0.551 between 1991 and 2001. Interestingly, real income increases explained a larger proportion of these total changes for the older group (for males 59 percent; for females 45 percent) than the younger group (for males 35 percent; for females 32 percent). Similarly, the more highly educated saw greater satisfaction growth over the decade than the less educated. The latter differential is clearly more pronounced for females (1.136 compared to 0.523) than males (0.788 compared to 0.635). However, the role played by income changes was greater for the more educated males than those with fewer years of education (50 percent compared to 37 percent), while the opposite was the case for females (26 percent compared to 43 percent).

The main conclusions from the decomposition analyses are that higher real household incomes following reunification led to significant gains in satisfaction levels for East Germany. The largest effects, however, were clearly seen in the immediate post-reunification years. Furthermore, the improvement in life satisfaction was greatest for the younger and more highly educated East Germans.

[6] For brevity, we do not include the parameter estimates for these separate models. However, they are available from the authors on request.

IV. Conclusions

Recent years have seen a growth of interest by economists in the determinants of life satisfaction and happiness. In this paper, we contribute to this literature by investigating how life satisfaction changed as a result of a large-scale exogenous shock—German reunification. In particular, we are interested in establishing the role of the increased real household income in improving life satisfaction. Life satisfaction in East Germany was significantly below that of West Germany throughout the decade following reunification. However, there was clear convergence resulting from a continual increase in life satisfaction in East Germany up until 1999.

We implemented a new fixed-effect estimator for ordinal life satisfaction in the German Socio-Economic Panel (1991–2001) and developed a decomposition approach which accounts for the differing unobservable characteristics of new entrants and exits from the panel. As with previous studies for other countries, we find that income and employment status are very important predictors of life satisfaction. Importantly, our decomposition results suggest that around 35–40 percent of the increase in life satisfaction in East Germany was attributable to the large increase in real household incomes. There were also clear improvements in aggregate circumstances, such as improved personal freedom and public services. We further find that the younger and more highly educated East Germans experienced the largest improvements in life satisfaction following reunification.

Finally, our results clearly emphasize the importance of controlling for changes in the fixed-effects distribution when using an unbalanced panel (with new entrants and attrition) data for econometric analysis. Failure to control for such effects would have led us to overestimate the role that exogenous income changes had on improving life satisfaction. Our future research aims to further untangle the improvement in aggregate circumstances by using disaggregated regional data on housing and public services.

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