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Running Title: The Biological Standard of Living in the two Germanies.

Abstract: Physical stature is used as a proxy for the biological standard of living in the two Germanies before and after unification in an analysis of a cross-sectional sample (1998) of adult heights, as well as among military recruits of the 1990s. West Germans tended to be taller than East Germans throughout the period under consideration. Contrary to official proclamations of a classless society, there were substantial differences in physical stature in East-Germany. Social differences in height were greater in the East among females, and less among males than in the West. Spatial inequality was greater in the East than in the West, pointing to the relatively underdeveloped nature of the East-German rural sector. The difficulties experienced by the East-German population after 1961 is evident in the increase in social inequality of physical stature thereafter, as well as in the increasing gap relative to the height of the West-German population. After unification, however, there is a tendency for East-German males, but not of females, to catch up with their West-German counterparts.

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## 1. Introduction

The conventional indicators of the standard of living are not particularly well suited for comparisons across widely divergent economic and political systems such as the two Germanies prior to unification. There are generally insurmountable problems of comparison of utility levels as some vectors of prices, wages, and exchange rates, are determined by markets and others not. Moreover, the typical basket of consumption goods diverges from one another substantially in both quality, quantity, and availability. One can argue similarly with respect to social entitlements, unemployment risks, environmental degradation, and different levels of political freedom. The problem is, of course, compounded by the fact that statistics published by authoritarian governments are often less reliable than those of democratic ones (von der Lippe, 1996), and surveys of contentment are prohibited (Frey and Stutzer, 2001). What, for example, is the meaning of the facts that employees in East-Germany earned about half of their Western counterparts in 1980, and were unable to travel at will, but had full employment and a more equal distribution of income (Bundesamt für Statistik, 1980, Statistisches Amt der DDR, 1990; Sinn and Sinn, 1992)? How are we to interpret the multidimensional quality-of-life experiences in the two Germanies in face of such varied evidence? There are no simple answers or objective formulas. In such cases, but not exclusively in such cases, biological indicators, including physical stature, are useful complements to conventional welfare measures, because they can provide new perspectives on complex phenomenon (Bogin 1999, Komlos 1999). Biological indicators have been used extensively in such settings to monitor, for example, the decline in the health of the Soviet population during the last decades of its existence,<sup>1</sup> or the suffering of the Chinese population during Mao-Tse Tung's "Great-Leap-Forward" policy of the late 1950s and early 1960s (Morgan 1999).

Hence we shall use physical stature as a measure of the biological standard of living in the two Germanies. Physical stature is affected by many socio-economic variables. These include,

but are not limited to the state of medical technology, the access to health-maintenance systems, the virility of the disease environment, and the degree of pollution. Social stratification is usually an important determinant of height and health outcomes insofar as income effects are substantial and persistent, and better educated parents have superior consumption skills, are better informed about long-range health effects of consumption patterns, and, thus, are usually able to take better care of their off-springs (Cigno 1991; Bogin, 1999, 308). Height is a function of income inasmuch as the consumption of nutrients, particularly of proteins, vitamins, and minerals, and the regularity with which those nutrients are consumed, all influence height at a particular age until adulthood. Urban/rural differences are also useful predictors of health outcomes, insofar as the supply of specialised medical services is usually better, and the delivery of medical services more efficient in metropolitan areas than in rural regions. Moreover, in some cases, the availability of consumption goods might be more plentiful and more regular in large towns than in small ones, and such quality-of-life can attract higher income individuals and families.

The examination of trends in physical stature across the two Germanies opens up the possibility of comparison of a biological welfare indicator across societies that were close genetically, but worlds apart in their socio-economic system. Such analysis illuminates patterns and processes of change that would otherwise allude the observers. Physical stature enables us to quantify how well the human organism itself thrives during childhood and adolescence in its socio-economic and epidemiological environment. Height has been shown to be a good measure for health in general throughout the life-course and the biological standard of living in particular (Komlos and Baten, 1999). In brief, human size expands in good circumstances and contracts in bad ones, no doubt as an evolutionary adaptation to increase survival chances.

Adult size by social status has not been studied extensively in either East- or West-Germany, and comparisons between the Federal Republic (GFR) and the former Democratic Republic (GDR) have not been systematic (Kromeyer-Hauschild, and Jaeger, 1997). (We refer to those regions that belonged to the FRG prior to unification as West-Germany, and

those areas that belonged to the GDR before unification as East-Germany.) The issue was considered politically taboo in the officially classless East-German society, and when intimated at all, it was done so in a disguised manner. Greil, for example, divided a sample of East-German men and women into those 1) “in sitting professions without heavy work,” 2) “standing and walking professions,” and 3) “manual occupations with decisive muscular activity and more than 50% heavy work,” and found a negative height gradient from category 1) to 3) of some 2.5 cm among men and 2.4 cm among women (1991, p. 127). However, she did not note that the work categories were closely correlated with social status. Instead, she concluded that, “height measurements were found to decrease on average for both sexes with increased physical stress.”

The common wisdom is that height differences by social class did not exist in the GDR (Greil, 1998, 493). Kromeyer-Hauschild and Jaeger found “that social factors were not significantly associated with height in either sex” in the East German town of Jena (1997, p. 236). Kromeyer, Hauspie, and Susanne conclude: “This absence of social differences in height of these children [in Jena] may be caused by an equalisation of living conditions between social groups in East Germany in the past, meaning that the health and nutritional status of the children of different social strata was nearly the same. Often children grew up in public institutions (nursery, kindergarten) with ‘community food’ and with a general health precaution (e.g. compulsory vaccination for children). In most cases the amount of money available per family in the GDR was one of the most important factors influencing living conditions, not associated with professional status of the parents, because differences in the salaries were only small” (1997, 348). This was argued, even though the effect of socio-economic status has been demonstrated in other state-socialist societies (Bielicki, Szczotke, and Charzewski, 1981).

Differences in height by residence was politically less sensitive and was reported more often. Greil comments that both men and women living in East-German villages tended to be

shorter than those who lived in small towns, who, in turn, were shorter than those living in large cities (1991, 125). Difference in physical stature between East- and West- Germany were attributed entirely to different degrees of urbanisation<sup>2</sup> (Greil, 1998, 493).

In exploring the trends and social correlates of physical stature in the two Germanies, we also consider the extent to which the height of East-Germans are catching up to West German levels after unification. Hermanussen reports that 19-year-old West-German military recruits measured in 1992 were still 1.46 cm taller than East-German ones. However, by 1994 the difference declined substantially to just 0.59 cm<sup>3</sup> (1995, 1997). In contrast, Kromeyer, Hauspie, and Susanne imply that to the extent that social differences do exist currently in East Germany they are likely to have been caused by unification: “This process [of unification] brought important changes in social (especially in the professional status-unemployment), cultural and individual environments for the people, because a free-market economy was established in the eastern part. Possibly these changes will lead to an increase in social differences” (1997, p. 350).

## **2. Data**

The German “Federal Health Survey” (Bundesgesundheitssurvey) of 1998 is used to determine the secular trend in physical stature of adults and their correlates for men and women in East- and West-Germany (Public Use File BGS98). The survey was conducted by the Robert-Koch-Institute on behalf of the Bundesministerium für Gesundheit<sup>4</sup> (Ministry of Health of the FRG) (Bellach, Knopf, Thefeld 1998). The random sample pertains to 7,124 individuals between ages 18 and 79 (birth cohorts of 1919-1980); of these, 6,619 observations are used<sup>5</sup> (Table 1). Height was measured by professionals in a laboratory (Stolzenberg 2000). The socio-economic status is a composite indicator determined on the basis of four criteria: general education (allgemeine Schulbildung: Volks-, Realschulabschluß, Abitur), vocational education (Berufsausbildung: abgeschlossene Lehre, Berufsfachschule, Fachhochschulabschluß, Abschluß einer Universität), occupation, and income. Each variable

obtains a score from 1 to 7 points, and their sum is divided into three equal parts: lower, middle and upper status (Winkler 1998).

Table 1 about here

The 18-20 year olds in the study are not strictly comparable to the adults in the sample insofar as they have not yet reached their final height.<sup>6</sup> In order to compensate for this difference we add an increment to their height based on growth of Dutch youth at these ages<sup>7</sup> (Frederiks, 2000. Whether the subject resided in East- or in West-Germany in 1988 is known.<sup>8</sup> The hypothesis to be tested is whether there were differences in height within East and West Germany by social status, and between the two parts of Germany longitudinally, as a function of social status, urban/rural residence, gender, and age. The date of birth (age) variable is obviously a proxy for an array of missing environmental and socio-economic variables that possibly changed over time.

### **3. Results**

The differences in height between the various socio-economic/gender/residential, categories are calculated by fixed-effects regressions using dummy variables (Tables 2 and 3). Only the coefficients of these dummy variables and their significance are reported here. The values of the coefficients are the average differences for the period under consideration, while the levels of heights in Figures 1-6 are calibrated for the birth cohorts of the 1970s. West-Germans were taller than East-Germans in 30 out of the 32 categories and significantly so in 17 of the 32 ones (Table 2). The West-German height advantage averaged across all groups is only about 1 cm, not a very large amount, but it is particularly large (>2 cm) among male village residents in middle- and upper-status categories as well as among high-status women village dwellers. This pattern might be caused, at least to some extent, by the choice of residence among middle- and upper-status men in the West, insofar as wealthier persons apparently tend to choose to live in smaller communities in the West, whereas in the East this is not at all the case. The inference is supported by the evidence that high-status male and

female East-German town dwellers were somewhat taller than their West-German counterparts (Table 2), which implies that the richer among these groups in the West might have shifted into the village category. To some degree, this is also true of middle-status male city dwellers. The West-German height advantage tends to increase with increasing social status among males, but decreases among females. The difference in height among men is 0.69 cm, 0.83 cm and 1.27 cm in favour of respectively lower-, middle-, and upper-status West-German men (Table 2). Among females, lower-status West-Germans are 1.22 cm, middle-status are 1.03 cm and upper-status are 0.63 cm taller than East-German women. Hence, the height-advantage of West-German men increased, but that of West-German woman decreased with increasing social status (Figures 1-6). Clearly, the more educated and higher earning females were able to enjoy a biological standard of living more similar to their western counterparts.

Exploring spatial differences in height within East- and West- Germany separately, we note that differences in physical stature by residence are considerably larger and more frequently significant in the East than in the West among both men and women (Table 3). Among East-German males, village residents are considerably shorter (by 0.86 - 2.34 cm) than town or city residents, and the average difference is significant in all three social-status categories. Among West-Germans the rural disadvantage is evident only among low-status men, but not in the other two social categories. Among females the differences are less than among males in both Germanies. Among East-German females the rural disadvantage vanishes entirely among the middle class, but on average the difference was 0.87 cm and significant. The upper-status West-German females fare somewhat better in small communities than in the towns or cities, but none of the residence variables was significant. In sum, in East-Germany spatial inequality of physical stature was considerably more pronounced than in West-Germany, and was greater among men than among women.



Trends by socio-economic status are analysed by comparing West- to East-German heights by averaging them across the three residence classifications (Figures 7-9). Among low and middle-status men differences in height among the cohorts born in or before 1961 are negligible. The West-German height advantage actually developed in the 1960s – with the further isolation of the GDR through the erection of the Wall. The effect on living standards of the impending economic crisis is also quite evident among this cohort, whose growth span extended from the 1960s through the 1980s.<sup>9</sup> In contrast, the middle-class East-German male birth cohorts of the 1970s – who lived during a part of their youth (up to 9 years) in the unified Germany have drawn closer to their West-German counterparts – halving their previous deficit (from 1.7 cm to 0.8 cm). However, neither low-status or high-status men did so. The West-German height advantage among high-status men tended to be small throughout the post-war period including (0.5 - 0.9 cm). Among females the West-German height advantage was constant among low-status women until the gap diminished among the 1970s birth cohorts. Among middle-status women the difference increased in the 1960s, as among the men, and remained practically unchanged after unification. Among high status women the difference was inconsequential in the post-war period, but the height of East-German women declined after unification. In the main, high status men and women fared considerably better under the DDR regime than their middle-class or lower-class counterparts. They did not seem to have been affected by the erection of the wall, as did the other groups. In addition, men benefited more from unification than women.

Evidence on the height of military recruits substantiates the above findings. The height advantage of West-German over East-German men at age 19 (+1.2 cm) is comparable to those of adult men (+0.86) and was greater than average in rural districts (+1.6 cm), as among adults (+2.17) (Table 4). Moreover, the advantage has diminished considerably during the course of the 1990s in all categories, as among adult men. We can also obtain a glimpse of urban height trends in East-Germany by considering recruits from Berlin, the only city for

which such data are available in the East. Admittedly, Berlin is an ambiguous indicator of East-German urban nutritional status, insofar as no distinction is made between its two constituent parts, yet it is, nonetheless, noteworthy that the height of Berlin 19-year-olds has caught up fully to the West-German urban average. The pattern among the military inductees corroborates both findings, that spatial inequality was greater in the East than in the West before unification, and that the gap between the height of East- and West-German men has diminished after unification.

Table 2 and 3 about here

Social differences within West- and East-Germany were also analysed separately. High- and middle-status men tended to be substantially taller than lower-status men throughout the period under consideration in both Germanies (Figures 10 and 11). The difference between West-German upper-class and lower-class men is 3.9 cm ( $p < 0.001$ ), whereas the comparable figure for East Germany is 2.5 cm ( $p < 0.01$ ). (These regressions are not reported here.) Social differences among females are also substantial: West-German upper-class women are 2.7 cm ( $p < 0.001$ ) taller than their West-German lower-class counterparts; the comparable difference in East-Germany is 3.2 cm ( $p < 0.001$ ). Thus, among men social differences in height are smaller in East- than in West-Germany, while among females the reverse is the case. In East-Germany the advantages accruing to the upper-class was particularly noticeable for the birth cohorts of the 1960s, among both men and women (Figure 11). As noted above, the effects of the building of the wall are evident in these comparisons. Among the 1970s birth cohorts differences in height between the upper and middle-classes vanished in both East and West and among both men and women. It appears that the upper classes have reached the asymptotic upper bound in physical stature, which meant that middle-classes were able to catch up to them.

#### **4. Conclusion**

A comparison of physical stature of adults across the two Germanies, indicates that there were persistent differences in physical stature of the two populations for both men and women by social class holding place of residence constant. The results, therefore, contradict the notion that social differences were minimal or non-existent in the officially classless society of East-Germany: for the first time substantial social differences in height among the East-German population were identified, regardless of urban residence. It would be quite unusual, indeed, if this were not the case, since socio-economic differences in physical stature exist in practically all societies (Bogin, 1999, 308; Komlos, 1998; Lasker and Mascie-Taylor, 1996). As Tanner has suggested, childrens' growth is an extremely useful and accurate measure of the social structure of a society (1987, p. 156). In fact, social differences in physical stature were more pronounced among females in East- than in West Germany in spite of the avowed egalitarian policy on income distribution. Moreover social differences were increasing among both men and women after the erection of the Berlin Wall.

The West-German height advantage was evident in almost all social and spatial categories for both men and women. The advantage increased with increasing socio-economic status among males, but decreased with increasing socio-economic status among females. Because almost all of the adults in the sample (94%) reached their final height prior to unification, the physical stature of East Germans reflect, on the whole, the socio-economic and environmental circumstances experienced under the political system of the GDR. It appears that the West-German economy and environment was more conducive to the growth of the human organism, than the state-socialist system in the East. Yet, the West-German height advantage was by no means commensurate with the substantial divergence in per capita income. In spite of low incomes, high levels of pollution, and a relatively underdeveloped rural infrastructure, the East-German population was as tall as that of the United States<sup>10</sup> (National Center for Health Statistics, 2000; Greil 1999, 486; DeBardeleben, 1989).

Moreover, the spatial distribution of biological living standards was more unequal in Eastern than in Western Germany. The West-German height advantage compared to the East-German population decreased with increasing urbanisation, and was particularly large among village residents (Table 2). The implication is, that incomes were probably less in rural areas in the East than in towns and cities, due perhaps to the fact that the agricultural sector was four times as large in the East relatively to the West. There were also problems of distribution in the East associated with its considerably smaller service sector (by as much as a third).<sup>11</sup> Medical services, as well as nutritional resources were probably not as uniformly distributed spatially in the East as in the West, in spite of the fact that according to official statistics there were not significant differences on a per capita basis in the number of doctors available, or in the consumption of basic food items, and the intake of calories and proteins in the East exceeded those of the West. However, it is not at all clear that these statistics are reliable (von der Lippe, 1996). On the basis of the evidence presented here, we rather tend to think the contrary.

Table 4 about here

The gap that opened up between East- and West-Germans born in the 1960s could well reflect the worsening socio-economic, environmental, or medical circumstances between the building of the Wall, and the end-phase of the GDR. Social inequality also rose in the East after 1960. In contrast, a study of the state of Brandenburg indicates that the biological standard of living rose markedly among children in the 1990s (Schilitz 2001, 68). This is all the more noteworthy if one considers that that sample pertains to a considerable degree to a rural and small-town populations which were at the greatest disadvantage under the DDR regime. Hence, it is possible that spatial inequality diminished markedly after unification. There is some evidence in the Bundesgesundheitsurvey as well that East-German men, benefited relatively to their West-German counterparts after unification. The convergence in male heights is consistent with the convergence in real incomes across the two Germanies

(Sinn, 2002). As real income, convergence in height among male inductees reached a plateau after 1996. However, convergence among females is not evident, leading to the hypothesis that girls are at a possible disadvantage relative to boys in gaining access to nutritional and medical resources within East-German households.<sup>12</sup>

To be sure, the physical stature of a population ought not be conflated with the standard of living. Rather, it is useful to distinguish between conventional conceptualizations of living standards (based on monetary aggregates), and the biological well-being of a population. Thus, the biological standard of living is meant to indicate how well the human organism thrives in its socio-economic, epidemiological and natural environment. The concept is conceived so as to capture the biologically relevant quality-of-life component of welfare, and acknowledges explicitly that the human experience is inherently multidimensional. Welfare encompasses more than the command over goods and services: it includes health in general, the frequency and duration of sickness, the extent of exposure to diseases, and longevity all have a contribution to welfare independent of income.

The United Nations acknowledged these shortcomings of the conventional measures of living standards by formulating a human development index, that merges such factors as life expectancy, education, and, of course, income as well. As one of the reports stated, „Human development is the end -- economic growth a means. So, the purpose of growth should be to enrich people's lives. But far too often it does not.... there is no automatic link between [economic] growth and human development (United Nations, 1996, p. 1). Hence, we use anthropometric indicators as proxy measures for biological welfare. To be sure, by no means do they measure the contribution of all goods and services to well-being, and therefore they lay no claim to being a universal indicator of living standards. Nonetheless, the extent to which a socio-economic system can provide an environment – broadly conceived - propitious to the growth of the human organism, so that that organism can reach its biological growth

potential is arguably a useful indicator of the humanistic nature of that political system. We conclude on the basis of the evidence and analysis presented above, that the West-German welfare state with a mixed economy (soziale Marktwirtschaft) has provided a consistently superior biological standard of living to its children and youth, than did the socialist state of East-Germany, even if its advantage was surprisingly small, given the great difference in consumption across the two Germanies.

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Table 1: Characteristics of the Sample

Distribution by birth cohorts

Birth Cohorts	East			West			Total
	Male	Female	Total	Male	Female	Total	
1919-30	112	159	271	218	260	478	749
1931-40	212	225	437	363	384	747	1184
1941-50	193	220	413	378	374	752	1165
1951-60	224	258	482	417	391	808	1290
1961-70	237	243	480	418	446	864	1344
1971-80	161	151	312	305	270	575	887
	1139	1256	2395	2099	2125	4224	6619

Distribution by Social Status

	East			West			Total
	Male	Female	Total	Male	Female	Total	
Low	233	353	586	397	518	915	1501
Middle	652	710	1362	1141	1148	2289	3651
High	247	192	439	547	436	983	1422
	1132	1255	2387	2085	2102	4187	6574

Distribution by Residence

	East			West			Total
	Male	Female	Total	Male	Female	Total	
Village	259	266	525	290	281	571	1096
Town	352	449	801	659	602	1261	2062
City	528	541	1069	1150	1242	2392	3461
	1139	1256	2395	2099	2125	4224	6619

Table 2: Average Differences in Adult Height (cm), Between West- and East-Germany (West-East) by Residence and Socio-Economic Status, 1921-1980.

	Socio-Economic Status							
	Male				Female			
	Low	Middle	High	Ave	Low	Middle	High	Ave
Village	+0.11	+2.31**	+2.50**	+1.98**	+0.61	+0.62	+2.43*	+1.21**
Town	+0.83	+0.82	- 0.17	+0.58	+1.51**	+1.23**	- 0.97	+0.94**
City	+0.29	+0.07	+1.50**	+0.44	+0.99	+1.03**	+1.05	+0.98**
Ave	+0.69	+0.83**	+1.27**	+0.86**	+1.22**	+1.03**	+0.63	+1.02**

Note: \* denotes significance at the 10 percent level.

\*\* denotes significance at the 5 percent level.

Table 3: Average Differences in Adult Height (cm), by Residence and Socio-Economic Status, Germany, 1921-1980. Compared to Village Residents.

	Socio-Economic Status							
	Male				Female			
	Low	Middle	High	Ave	Low	Middle	High	Ave
East								
Town	+0.86	+1.69**	+2.32*	+1.64**	+0.34	+0.01	+2.42*	+0.85*
City	+2.17*	+2.34**	+1.50	+2.56**	+0.73	+0.09	+0.97	+0.87**
Ave	+2.41** <sup>1)</sup>	+2.02**	+1.85*	+2.17**	+1.20 <sup>1)</sup>	+0.00 <sup>1)</sup>	+1.54	+0.87**
West								
Town	+1.53	+0.31	- 0.61	+0.12	+1.05	+0.83	- 1.23	+0.46
City	+2.35**	+0.23	+0.23	+0.64	+0.83	+0.65	- 0.51	+0.53
Ave	+2.02**	+0.26	- 0.00	+0.44	+0.91	+0.71	- 0.72	+0.51

Note: \* denotes significance at the 10 percent level.

\*\* denotes significance at the 5 percent level.

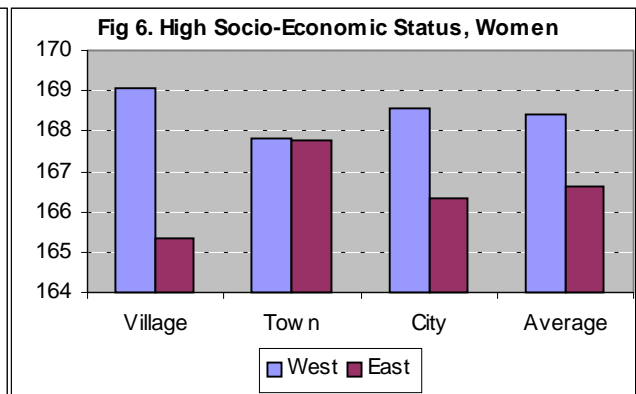
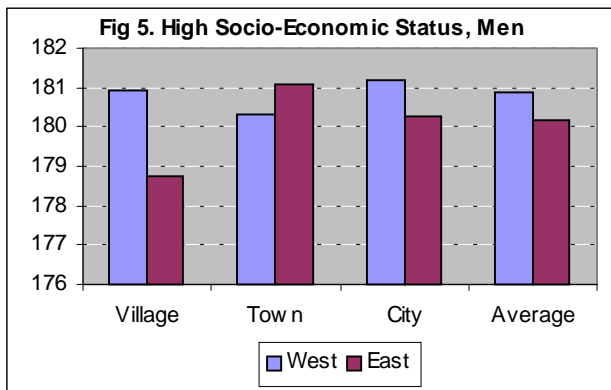
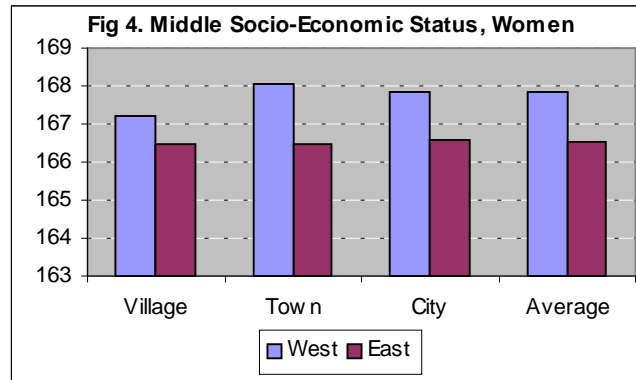
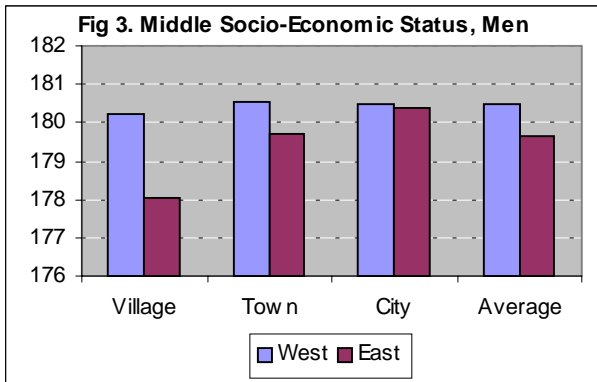
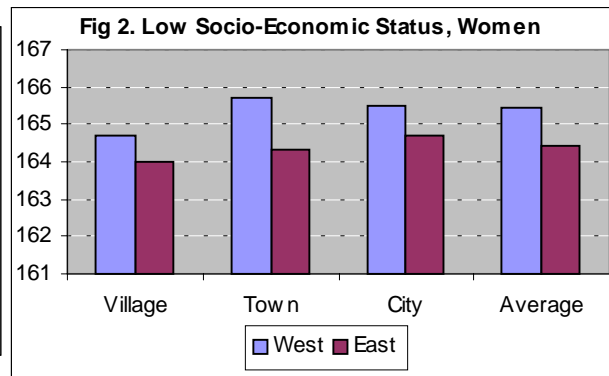
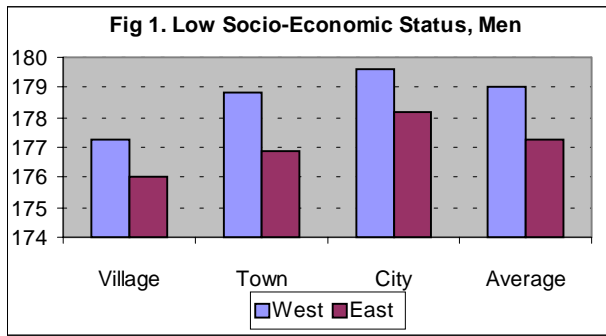
<sup>1)</sup> The average for a particular social status is in some cases outside of the range of the estimated coefficients for town and city variables on account of the fact that the coefficients are estimated with separate regressions, with different degrees of freedom.

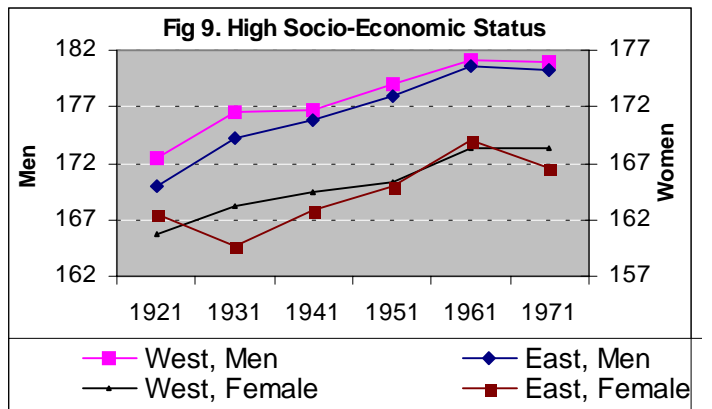
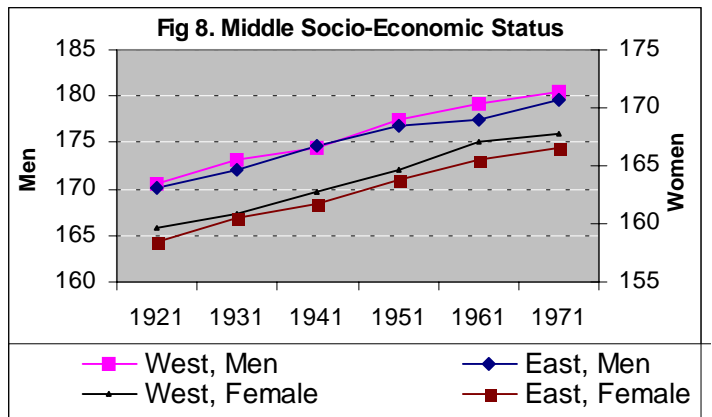
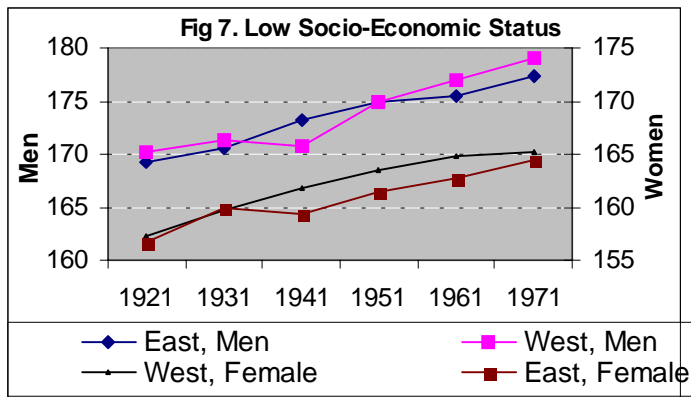
Table 4: Difference between the Height (cm) of West- and East German 19-Year-Old Men

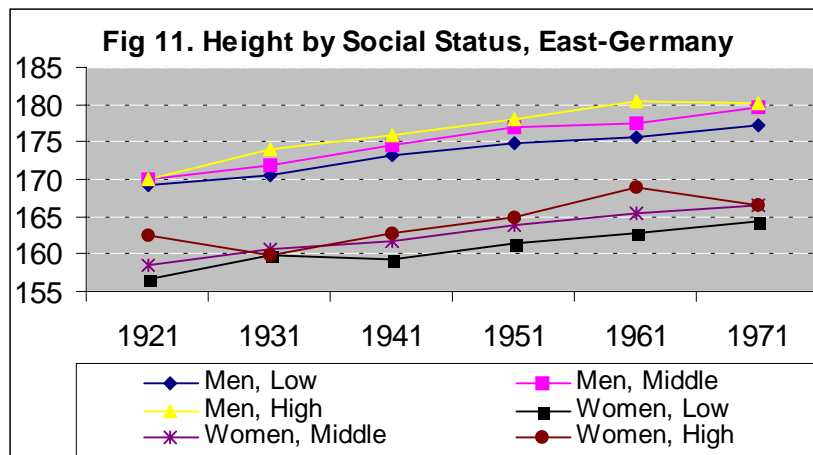
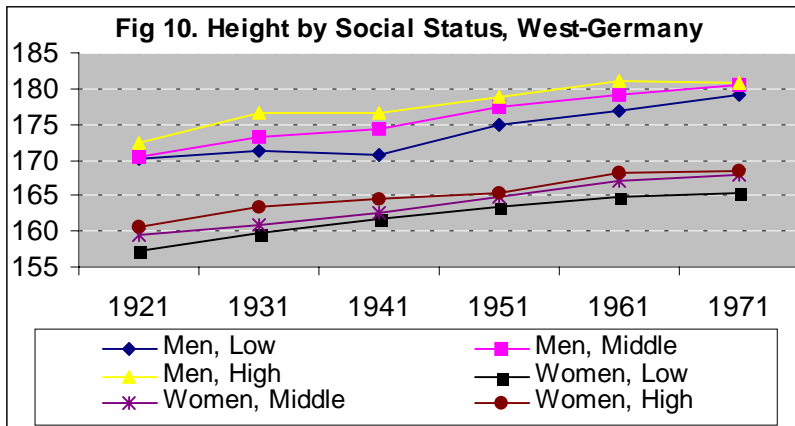
	Average	Rural	Urban
1992/93	+1.2	+1.6	+0.7
1994/95	+0.4	+0.8	+0.0
1996/99	+0.5	+0.9	+0.1

Note: Urban West is the average height of recruits from Hamburg, Munich and Düsseldorf. The East pertains to Berlin, without distinguishing between its Eastern or Western Sections.

Source: Bundesministerium, 1997; Hermanussen, 1995.







## Endnotes

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<sup>1</sup> By 1990, the life expectancy of Moscow residents was ten years less than in the 1970s, and Moscow ranked 70<sup>th</sup> among the world's largest cities in life expectancy (Feshbach and Friedly 1992, p. 9).

<sup>2</sup> The share of the population living in rural areas and villages with less than 2000 inhabitants was 6 percent in the West, but 23 percent in the East (Bundesamt für Statistik, 1990, Statistisches Amt der DDR, 1990).

<sup>3</sup> Birth weights also increased after unification, seemingly reversing an earlier tendency to diminish (Zellner, Kromeyer, and Jaeger, 1996, p. 381).

<sup>4</sup> The sample was obtained by first randomly selecting geographic areas, then within towns neighbourhoods, while in rural regions electoral districts were chosen. The actual addresses of the individuals were drawn randomly from the residence registries (Einwohnermelderegister). The subjects were then interviewed and subsequently examined by a physician.

<sup>5</sup> Cases with missing observation were eliminated. We generally refer to birth cohorts, and not to date of measurement.

<sup>6</sup> We need to point out that humans begin to shrink after about the fifth decade of life so that the upward trends before the 1950s birth cohort is not an indication of improvements in adult height but is confounded by the extent of shrinkage in old-age. We present the evidence, nonetheless, with this caveat in mind.

<sup>7</sup> The increments used (regardless of provenance or social status) are: men- age 18 +1.4 cm, age 19 +1.1 cm, age 20 +0.8 cm, age 21 +0.5 cm and women- age 18 +0.8 cm, age 19 +0.65 cm, age 20 +0.5 cm, age 21 +0.35 cm. There is evidence that a similar pattern obtains in Germany where discharged soldiers were 0.8 cm taller (at age 20) than at mustering (at age 19). Thus, they grew 0.15 cm more than the Dutch youth of the same age. (Bundesministerium der Verteidigung 1997. p. 30).



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<sup>8</sup> Migration between the two parts of Germany after 1989 was rare: only 3.8 % of the inhabitants of the East in the sample moved to the West and only 1% moved in the other direction; (BGS98).

<sup>9</sup> According to Ritschl „a severe economic crisis was mounting“ in the GDR before unification (1996, p. 533).

<sup>10</sup> This is the case even if one considers only those Americans born in the USA, white and of non-South American ancestry.

<sup>11</sup> The service sector had 38% of the employed in the East and 57 percent in the West, while the respective figures for agriculture were 12 and 4 percent (Bundesamt für Statistik, 1990, Statistisches Amt der DDR, 1990).

<sup>12</sup> Another possibility is that females are less sensitive to environmental change (Bogin 1999). A study on children in Brandenburg also reports that the increase in height of females was less than than of males (Schilitz 2001, 69).