Equalizing Income versus Equalizing Opportunity — A Comparison of the United States and Germany

Ingvild Almås*

Abstract

Germany has lower posttax income inequality than the United States and hence is doing better according to a strict egalitarian fairness ideal. On the other hand, the United States is doing better than Germany according to a libertarian fairness ideal, which states that people should be held fully responsible for their income. However, most people hold intermediate (responsibility-sensitive) positions, and hence it is interesting to study and compare fairness according to these positions.

Only if peoples' preferences are characterized by substantial degree of individual responsibility, the United States is considered less unfair than Germany. If we hold people responsible for the unexplained variation, the United States is considered fairer than Germany for all levels of responsibility sensitiveness. If we, on the other hand, demand compensation for the unexplained variation, Germany is fairer than the United States for all levels of responsibility. The latter may be seen as the preferred approach as it follows a 'benefit of the doubt' strategy.

1 Introduction

Posttax income inequality is greater in the United States than in most continental European countries. Based on this, the United States has been considered to have a more unfair income distribution than continental Europe. Drawing conclusions

*Thanks to Alexander Cappelen, Marc Fleurbaey, Jo Thori Lind, Kalle Moene, John Roemer, Bertil Tungodden and participant at the ECINEQ conference in Berlin 2007. The usual disclaimer applies.

about fairness from inequality alone can only be justified by a strict egalitarian fairness ideal. From experiments and surveys, we learn that a majority of people consider fairness ideals other than the strict egalitarian, and it is therefore important to study other fairness ideals when evaluating income distributions (Cappelen et al., 2007; Konow, 2003; World Value Survey, 2005).

The majority of citizens in both Germany and the United States hold fairness ideals other than the strict egalitarian. However, we have reasons to believe that Germans are more favorable towards redistribution than the citizens of the United States (Alesina and Glaeser, 2001; World Value Survey, 2005; Alesina and Angeletos, 2005; Luttens and Valfort, *mimeo*). There are two potential reasons for this. First, citizens of the United States and Germany may have different beliefs about the income-generating process. Second, the citizens of the two countries may have different perceptions of fairness. The first can be referred to as a difference in positive perceptions whereas the latter can be referred to as a difference in normative perceptions.

The main contributions of this paper are twofold. First, the pretax income-generating process is estimated, and subsequently the question of whether the income-generating processes of the two countries differ, is analyzed. That is, we analyze whether the citizens of the two countries have *reasons* to hold different beliefs about the income-generating process. Second, on the basis of the estimated income-generating processes, this paper evaluates, using different redistributive fairness ideals, the posttax income distribution in the two countries. This evaluation could be done by using two different approaches, both of which we have seen examples of in the earlier literature. First, we may group people according to their responsibility variables, and consider within-group inequality as unfairness. This would be similar to the procedure followed in Devooght (*forthcoming*) and Almås et al. (2007). Second, we may define groups according to their nonresponsible characteristics, and consider unfairness to be the variation across these groups. This would be in line with the Roemer tradition (Roemer, 1998).

The difference between the two approaches stems from the treatment of the unexplained variation. The former approach treats the unexplained variation as a nonresponsibility variable and hence gives us the upper bound of unfairness, whereas the latter approach treats the unexplained variation as a responsibility variable and hence gives us the lower bound of unfairness. In this paper, we follow both approaches, and we find that the gap between the two is substantial and, furthermore, that the fairness ranking of the two countries depends on the treatment of the unexplained variation. For the lower bound of unfairness, the United States is considered fairer than Germany for all levels of responsibility, whereas for the upper bound of unfairness, Germany is considered fairer than the United States for all levels of responsibility. The upper bound of unfairness may be seen as the preferred approach if researchers and political decision makers refuse to hold people responsible for processes that we are unable to measure correctly. This approach can be referred to as the 'benefit of the doubt' approach.

Given that the fairness preferences differ between the two countries, there is the important question of which fairness preferences should form the basis for a comparison between Germany and the United States. We may want to allow for different country-specific degrees of responsibility to form this basis or we may want to use the same degree of responsibility in both countries. The main approach in this paper is to use one and the same norm in the evaluation of both countries. It is shown, however, that the results are robust to the change of responsibility sensitivity in one country, as long as the unexplained variation is treated in the same way in both countries.

In order to evaluate the degree of unfairness of an income distribution, we need to identify the fair income distribution. Our main focus is on fair incomes calculated using the generalized proportionality principle (Bossert, 1995; Konow, 1996; Cappelen and Tungodden, 2007). According to this principle, each individual should be given the proportion of the total income in the society that is dependent on his or her responsibility variables, but independent of his or her nonresponsibility

variables.[1] In the ranking of the different distributions, a generalized version of the Gini index and the Lorenz framework is used (Almås et al. (2007)).[2]

The outline of the paper is as follows. Section 2 gives some background information on preferences for redistribution. Section 3 gives a description of the framework. Section 4 presents the estimation results. Section 5 evaluates the posttax income distribution in the two countries. Section 6 shows the results of applying principles other than the proportional to identify fair incomes. Section 7 concludes.

2 Preferences for redistribution

The political climate is different in the United States and Europe, and we have some evidence that Europeans tend to be less responsibility sensitive than Americans (World Value Survey, 2005). Figures 1–3 are drawn on the basis of the World Value Survey and illustrate that preferences or beliefs differ between Germany and the United States.

Figure 1 shows the cumulative percentage of the population in Germany and the United States, respectively, on a subjective scale from 1 to 10. Placing oneself close to the value 1 indicates that one believes that people should be more responsible for themselves, whereas the value 10 indicates that one believes that the government should ensure that everyone is provided for. As the cumulative distribution of the United States is steeper, the citizens of the United States tend to be more in favor of individual responsibility than the Germans. Hence we would expect them, on average, to hold fairness ideals closer to the libertarian ideal of no redistribution. However, we see that it is not the case that all citizens in the United States are purely libertarian—the median respondent chooses a value of 4. The value 4 indicates that the government should be partly responsible for individuals' outcome, and hence it departs from the libertarian ideal, which states that the less redistribution or the less governmental interference, the better. Figure 1 indicates that the median voter in the United States would advocate using a slightly more responsibility-sensitive

measure than the median voter in Germany would.

Figure 2 shows that very few citizens, in both Germany and the United States, would find it unfair that a secretary who was more reliable, more efficient and quicker than another also earned more, despite the fact that the two secretaries were doing practically the same job. Hence, we can conclude that almost all citizens, in both Germany and the United States, would like to hold people responsible for at least some of the differences described; reliability, efficiency, and how fast people work. In other words, Figure 2 indicates that very few citizens, in both Germany and the United States, are strictly egalitarian. There are more German than American citizens who find the unequal earnings of the two secretaries unfair, however, and this indicates that there are more strictly egalitarian citizens in Germany than in the United States.

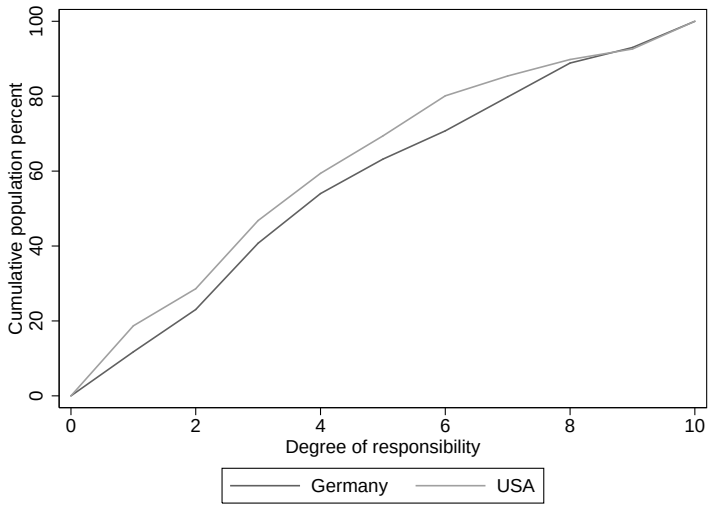
Figure 3 illustrates that perceptions of why people are in need are different in the two countries. We see that in the United States, more people tend to think that people are in need because of laziness and lack of willpower, whereas in Germany, more people tend to think that people are in need because of an unfair society. Hence, the citizens of the United States believe, to a larger extent than German citizens, that people in need are responsible for their own situation. This revealed difference between the two countries is positive rather than normative, however, as the question relates to the reasons why people are in need and not to the judgment of what they should and should not be responsible for. Subsequently, we have reasons to believe that the citizens in the United States would tend to hold people more responsible because they have different beliefs about the income-generating process than the German citizens do.

To sum up, Figures 1–3 illustrate that the citizens of Germany tend to be less responsibility sensitive than those of the United States. Figure 1 does not indicate whether the difference is because of different beliefs or different preferences for redistribution. Figure 2 indicates that the difference in responsibility sensitivity is because of different preferences for redistribution, whereas Figure 3 indicates that

the difference is because of different beliefs about the income-generating process. Hence, we have reasons to believe that the difference in responsibility sensitivity between the United States and Germany is a result of both different beliefs and different preferences for redistribution.

In this paper, we seek to identify the pretax income-generating process, which would allow us to discuss whether the citizens of the two countries have reasons to hold different beliefs about the income-generating process. Based on the estimated income-generating processes, we provide a normative evaluation of the posttax income in the two societies.

Figure 1 Public versus private responsibility. The figure gives the cumulative population proportion on a scale from 1 to 10. The respondents are asked the following question. "How would you place your views on this scale? 1 means you agree completely with the statement on the left [first statement]; 10 means you agree completely with the statement on the right [second statement]; and if your views fall somewhere in between, you can choose any number in between." Statements: "People should take more responsibility to provide for themselves vs The government should take more responsibility to ensure that everyone is provided for". The data are taken from the World Value Survey (2005). Survey year 1999.



3 Framework

The framework applied follows a three step procedure. First, the pretax income-generating process is estimated based on individual characteristics such as hours

Figure 2 Fairness. The respondents are asked the following question. "Imagine two secretaries, of the same age, doing practically the same job. One finds out that the other earns considerably more than she does. The better-paid secretary, however, is quicker, more efficient and more reliable at her job. In your opinion, is it fair or not fair that one secretary is paid more than the other?" 12.3 percent in Germany find it unfair, whereas 8.8 percent in the United States find it unfair. The data are taken from the World Value Survey (2005). Survey year 1999.

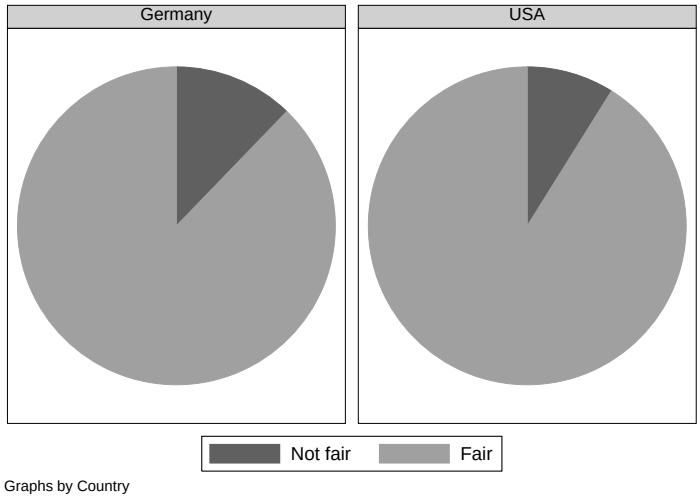
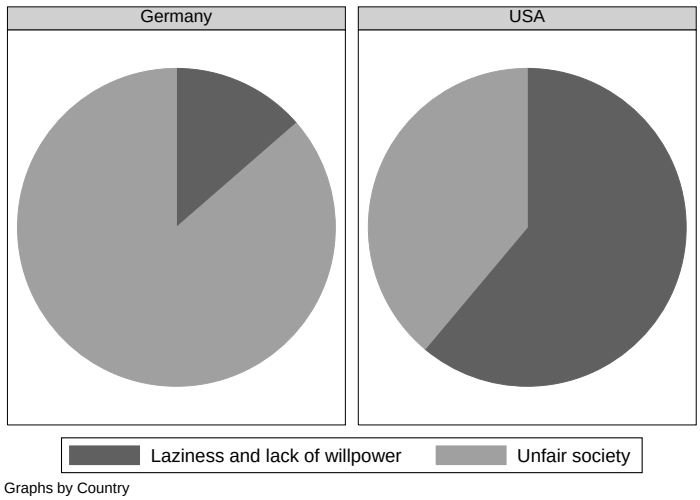


Figure 3 Laziness and lack of willpower versus unfair society. The respondents are asked the following question. "Why, in your opinion, are there people in this country who live in need? Here are two opinions: which comes closest to your view? 1. Poor because of laziness and lack of willpower. 2. Poor because of an unfair society." 61.2 percent in the United States says that it is because of laziness or lack of willpower, whereas 38.8 percent in Germany state this opinion. The data are taken from the World Value Survey (2005). Survey year 1995.



worked per week, education, age, gender, and immigration status. Second, based on the estimated pretax income-generating process, fair incomes are calculated by using the generalized proportionality principle. Third, the difference between the fair income and the posttax income is evaluated using a difference-based approach. The three steps are explained below in descending order.

3.1 Step 3: Evaluating the posttax income distribution

In the standard approach to inequality measurement, each individual has a fair income equal to the mean income in the society, and the fair income is therefore the same for all individuals. Hence, the fair income is not individual specific and we can restrict ourselves to focusing on the posttax income distributions. When considering responsibility-sensitive fairness ideals, however, the fair income is individual specific. Hence, the overall fairness in the societies can only be identified by considering the joint distribution of individual-specific fair and posttax income. The joint distribution of fair and posttax income can be expressed one-dimensionally, by focusing on the distribution of individual-specific differences between posttax and fair income. Almås et al. (2007) propose a generalized Gini index and difference-based Lorenz curves, which is anonymous in the difference between posttax income and fair income. We briefly present these concepts below.

3.1.1 The difference-based Lorenz curve

In the classical inequality framework, the Lorenz curve relies on a ranking of the population from the person with the lowest income to the person with the highest income. Acknowledging that the fair income in the standard framework is the mean income, the ordering underlying the classical Lorenz curve is identical to the ordering of differences, i.e., ordering of deviations from the fair income:

$$y_1 - \mu \leq y_2 - \mu \leq ... \leq y_N - \mu, \tag{1}$$

where y_k is the posttax income of individual k and N is the total number of individuals in the society. μ is the mean income in the society, which is also the fair income in the classical approach. The ordering of the deviation from the mean has a direct analogy in a fairness framework. When allowing for the possibility that the fair income for individual i, (z_i), is different from the mean income (μ), (1) has to be reformulated in the following way:

$$y_1 - z_1 \leq y_2 - z_2 \leq ... \leq y_N - z_N. \tag{2}$$

Denoting the difference d, the ordering can be expressed as follows:

$$d_1 \leq d_2 \leq ... \leq d_N. \tag{3}$$

As in the classical approach, the differences are negative for low ranks and positive for high ranks. Considering a given society, the difference-based Lorenz curve is given by:

$$l(\boldsymbol{d}, k, N) = \frac{\sum_{i=1}^{k} d_i}{\mu N} \ , k = 1, 2, ..., N, \tag{4}$$

where $\boldsymbol{d}$ is the vector of differences in this given society.

For an empty responsibility set, i.e. a strict egalitarian norm with no responsibility sensitivity, the difference-based Lorenz curve is identical to the one given by the differences in (1). On the other hand, for the libertarian view of no responsibility *and* if there is no redistribution in the society, the difference-based Lorenz curve takes the value zero for any k, and hence the difference-based Lorenz curve intersects the horizontal axis.

Imposing scale invariance and anonymity on the differences, a generalized Pigou–

Dalton criterion, and a weak condition of unfairism, the difference-based Lorenz curves have properties exactly analogous to those of the classical Lorenz curve (see Almås et al. (2007) for a detailed discussion).[3] Hence, if the difference-based Lorenz dominance criterion is satisfied, we know that any unfairness measure that satisfies the generalized Pigou–Dalton criterion gives the same unfairness ranking for the two distributions.

On the basis of the difference-based Lorenz curve, it is straightforward to generalize the classical and extensively used Gini index[4]:

$$G^u = \frac{1}{2N(N-1)\mu} \sum_i \sum_j |d_i - d_j|. \tag{5}$$

If considering an empty responsibility set, i.e., no responsibility sensitivity, the unfairness measure will collapse to the classical Gini index. If, on the other hand, considering the libertarian ideal that holds people fully responsible for their income, the generalized Gini index will take the value zero if there is no redistribution in the society.

In the empirical analysis, we study the difference-based Lorenz curve and the generalized Gini index according to different fairness ideals.

3.2 Step 2: Identifying fair posttax income

Individuals may differ both with respect to variables for which we want to hold them responsible and with respect to variables for which we do not want to hold them responsible. However, individual fair income should only depend on the individual nonresponsibility variables. A fair redistribution should eliminate inequalities because of nonresponsibility variables, *unfair inequality*, but preserve inequalities because of responsibility variables, *fair inequality*. Therefore, a fair posttax income distribution must satisfy at least two requirements. First, any two individuals with the same responsibility characteristics should have the same fair income. Second, there should be no redistribution for equal nonresponsibility characteristics. These

two requirements may be seen as the core elements of a responsibility-sensitive framework (Arneson, 1989; Cohen, 1989; Roemer, 1996; Roemer, 1998).[5]

There exist different formulations of the two above-mentioned criteria in the literature. Strong versions of these criteria can be referred to as 'equal income for equal responsibility variables' (EIER) and 'equal transfer for equal nonresponsibility variables' (ETEN) formulations. EIER states that two people with the same responsibility characteristics should get the same income. ETEN states that two people with the same nonresponsibility characteristics should get the same transfers.[6] EIER thus describes how we should compensate for nonresponsibility factors, whereas ETEN suggests that we should treat individuals with equal non-responsibility factors identically. These two criteria can generally not be met jointly. However, if defining an alternative formulation of the latter, the two can be met jointly. Cappelen and Tungodden (2007) suggest the following formulation of the latter. If we define groups as people with the same responsibility characteristics and all these groups have the same profile of nonresponsibility characteristics, then we should have no redistribution between groups. This criterion and EIER are met jointly if following an old idea of proportionality and applying the generalized proportionality principle (Bossert, 1995; Konow 2003; Cappelen and Tungodden, 2007).[7] The main idea captured in this principle is that the proportion of total posttax income that the individual should get is dependent on individual responsibility characteristics but independent of individual nonresponsibility characteristics. The generalized proportionality principle is the focus of the empirical analysis of this paper.

Consider again a given society with individual i's responsibility characteristics given by vector $\boldsymbol{e_i}$, and the nonresponsibility characteristics given by the vector $\boldsymbol{t_i}$, respectively. According to the generalized proportionality principle, individual i's fair income, z_i, is given by:

$$z_i = \frac{g(\boldsymbol{e_i})}{\sum_j^N g(\boldsymbol{e_j})} Y, \tag{6}$$

where Y is the sum of posttax income in society, subscript i and j indicate that the

variable belongs to individual i and j, respectively. $g(\boldsymbol{e_i})$ is given by:

$$g(\boldsymbol{e_i}) = \frac{1}{N} \sum_j f(\boldsymbol{e_i}, \boldsymbol{t_j}), \tag{7}$$

where f captures the income-generating process. $f(\boldsymbol{e_i}, \boldsymbol{t_i})$ is the pretax income of an individual with responsibility characteristics $\boldsymbol{e_i}$ and nonresponsibility characteristics $\boldsymbol{t_i}$. $f(\boldsymbol{e_i}, \boldsymbol{t_j})$ is the virtual pretax income of a person with the responsibility characteristics of person i and the nonresponsibility characteristics of person j.

There are well-known alternatives to the proportionality principle in the literature, which also have desired properties. Two of these are applied in the robustness analysis of this paper, namely the egalitarian equivalent principle and the conditional egalitarian principle (Bossert, 1995; Kolm, 1996; Bossert and Fleurbaey, 1996). The egalitarian equivalent principle ensures that EIER is met jointly with a different formulation of the latter requirement. The criterion for the egalitarian equivalent mechanism to be jointly met with EIER is that if all *individuals* have the same nonresponsibility characteristics, then there should be no redistribution between groups. This is clearly a weaker criterion than the one formulated in Cappelen and Tungodden (2007). This formulation as well as the formulation by Cappelen and Tungodden (2007) ensures that we do not interfere with differences because of responsibility characteristics. The fair income is, according to the egalitarian equivalent principle, independent of individual nonresponsibility characteristics but dependent on individual responsibility characteristics. The conditional egalitarian principle, on the other hand, ensures that ETEN is satisfied. ETEN is the strongest requirement and implies both the alternative criterion underlying the generalized proportionality principle and the alternative criterion underlying the egalitarian equivalent principle. However, the conditional egalitarian principle does not ensure that EIER is met. It ensures, however, that a weaker formulation related to EIER is satisfied: It ensures that for all people with responsibility characteristics equal to a reference responsibility characteristics, get the same income. We describe the

egalitarian equivalent and the conditional egalitarian principles in more detail in Section 6. (See also Fleurbaey (*forthcoming*) for a detailed discussion of how these two core requirements can be formulated and met.)

3.3 Step 1: Estimating the pretax income-generating process

In order to calculate the fair income defined in equation (6), we need to estimate the pretax income-generating process. The income equation is assumed to have the standard log-linear form:

$$\ln q_i = a + b\boldsymbol{e_i} + g\boldsymbol{t_i} + \epsilon_i, \tag{8}$$

where q_i is the pretax income of individual i.

The dependent variable in (8) is pretax income, whereas the explanatory variables included are: age in years, the square of age, hours worked per week, gender, immigration status, and educational dummies. The choice of explanatory variables is made on the ground of availability, and all variables that influence income, for which we have data, are included. The educational categories differ between the two countries, and in order to estimate the effect of education as precisely as possible, the countries' own educational categories are used.[8] The educational system of the United States is represented by 14 educational categories, whereas the German educational system is represented by 11 categories.

The pretax income is only applied in order to identify the fair income for each individual. In order to get consistent estimates, we focus on single households, and hence individual characteristics and household characteristics are identical.

Both pretax and posttax data are taken from the Luxembourg Income Study database wave five (Luxembourg Income Study, 2000). In order to make the data nationally representative, household weights are used throughout the analysis. The documentation for all country surveys can be found on the web page of the Luxem-

Table 1 Descriptive Statistics. The table shows the descriptive statistics of the variables used in the empirical analysis.

Germany	Mean value	Std. dev	Minimal value	Maximum value
Pretax inc	54987.01	38749.48	207.01	435898
Posttax inc	44720.3	25274	2723.532	244642.3
Age	40.94	12.16	20	80
Hours	39.00	13.31	.5	90
Education (%)				
Less high sch	1.61			
Grad high sch	61.98			
Post-secondary	13.01			
Univ. degree	23.41			
Female (%)	37.18			
Foreign (%)	5.62			
Observations	2367			
USA	Mean value	Std. dev	Minimal value	Maximum value
Pretax inc	38932.88	43712.87	24	391994
Posttax inc	34922.51	31825.88	241	347304
Age	42.53	12.86	20	90
Hours	41.49	11.06	1	111
Education (%)				
Less high sch	4.03			
Grad high sch	6.87			
Post-secondary	58.13			
Univ. degree	30.98			
Female (%)	47.24			
Foreign (%)	13.72			
Observations	10427			

bourg Income Study (Luxembourg Income Study, 2007). Table 1 gives the descriptive statistics of the variables used in the empirical analysis of the paper.

By (6) and (8), the fair income for individual k when considering the upper bound of unfairness, is expressed as follows:

$$z_k^U = \frac{\sum_i^N exp(b\boldsymbol{e_k} + g\boldsymbol{t_i} + \epsilon_i)}{\sum_j^N (\sum_i^N exp(b\boldsymbol{e_j} + g\boldsymbol{t_i} + \epsilon_i)} Y = \frac{exp(b\boldsymbol{e_k})}{\sum_j^N exp(b\boldsymbol{e_j})} Y, \tag{9}$$

whereas the fair income for the lower bound of unfairness is expressed as follows:

$$z_k^L = \frac{\sum_i^N exp(b\boldsymbol{e_k} + g\boldsymbol{t_i} + \epsilon_k)}{\sum_j^N (\sum_i^N exp(b\boldsymbol{e_j} + g\boldsymbol{t_i} + \epsilon_j)} Y = \frac{exp(b\boldsymbol{e_k} + \epsilon_k)}{\sum_j^N exp(b\boldsymbol{e_j} + \epsilon_j)} Y. \tag{10}$$

Table 2 Different responsibility cuts. The table shows the different responsibility cuts underlying the different fairness measures.

Responsibility factors	Hours	Education	Age	Female	Immigrant	Error term
Strict egalitarian						
RS1 upper	X					
RS2 upper	X	X				
RS3 upper	X	X	X			
Libertarian	X	X	X	X	X	X
RS1 lower	X					X
RS2 lower	X	X				X
RS3 lower	X	X	X			X

Five different degrees of responsibility, i.e. five different responsibility cuts, are considered. A crucial point in the philosophical as well as the political debate is where to draw the responsibility cut. In the philosophical literature, a prominent answer has been that individuals should be held responsible for factors under their control, but not for factors beyond their control (Cohen, 1989). In the political debate however, we need to be more pragmatic, and we will not always be able to separate completely the factors under control and beyond control. In this paper, we take a pragmatic view and leave aside the question of how a particular responsibility cut should be justified. We rather analyze the implications of various responsibility cuts and leave it to the reader, the voters, and the political decision makers to determine which is more appealing.

Table 2 gives an overview of the responsibility variables for each of the five responsibility cuts. First, we study the empty responsibility set characterizing the classical inequality measures. Second, we consider the case where people are only held responsible for hours worked, and then we extend this to hours worked and education, education being represented by the countries' own educational categories. Furthermore, the two age components, hours worked, and the educational dummies are contained in the responsibility set. The last responsibility cut is the libertarian cut, where all income-generating variables are considered to be responsibility variables and the fair distribution is simply the pretax income distribution.

4 Estimating the income-generating process

The estimation results are given in Table 3.

We see that the citizens of the two countries have reasons to have different beliefs. First, age has a larger positive effect in Germany than in the United States. Furthermore, the income age relationship is more curved in Germany as the coefficient of the square of age is larger in Germany than in the United States. Second, perhaps surprisingly, it pays more to work harder in Germany than in the United States. This contradicts the common perception that it pays more to work harder in the United States than in continental European countries, i.e. the story in Alesina and Angeletos (2005).

Third, education has a more substantial effect in the United States where we see a clear positive effect of education although not significant for all levels. Fourth, the negative effect of being a foreigner is larger in Germany than in the United States, whereas the negative effect of being a female is larger in the United States than in Germany.

Interestingly, the unexplained variation is larger in the United States than in Germany. Again, we have reasons to believe that this contradicts the Alesina and Angeletos story that luck determines income to a larger extent in continental Europe whereas working hard determines income to a larger extent in the United States. The adjusted R-squared is 0.43 for Germany and 0.33 for the United States.

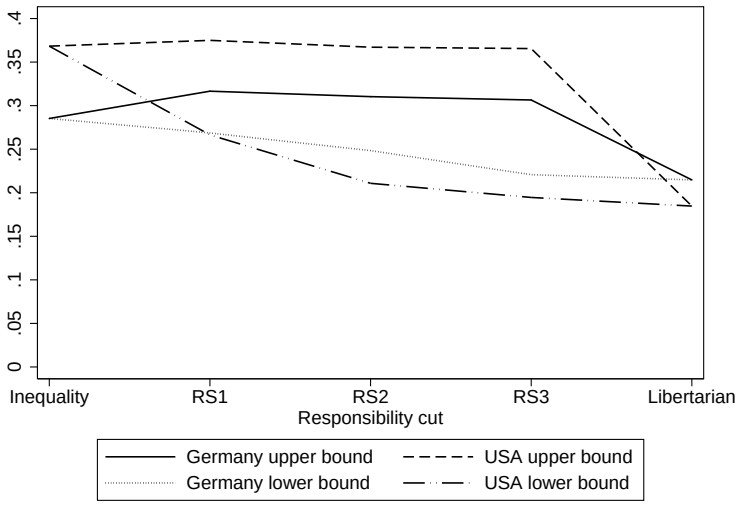
5 Measuring unfairness

Figure 4 illustrates how measured unfairness changes according to the generalized Gini index for the two countries when changing the responsibility cut. Because of the larger fraction of unexplained variation, the distance between the upper and the lower bound of the United States is larger than that of Germany. According to the upper bound of unfairness, Germany is considered to be less unfair than the United States for all the intermediate responsibility-sensitive measures as well as for the

Table 3 Regression results. The table shows the regression results for the two countries in the study (Robust Least Squares Estimation). The logarithm of pretax household income is the dependent variable. Standard errors are given in parentheses. * indicates that the coefficient is significant at 10 percent level, ** indicates that the coefficient is significant at 5 percent level, whereas *** indicates that the coefficient is significant at a 1 percent level.

Dep var: Gross income	Germany	St dev	USA	St dev
Age	0.143***	(0.0151)	0.0796***	(0.0047)
Age sq	-0.0015***	(0.0002)	-0.0008***	(0.00005)
Hours	0.0349***	(0.0027)	0.0234***	(0.0012)
Secondary, 1st stage	0.1183**	(0.0492)		
Secondary, 2nd stage	-0.1498	(0.0915)		
Academy / fachoberschule	0.1729*	(0.1025)		
Techn. col. (fachhochschule)	0.4276***	(0.0814)		
University	0.2858***	(0.1058)		
Foreign university	-0.0031	(0.1515)		
Technical school gdr	-0.0282	(0.1541)		
University gdr	0.2729*	(0.1604)		
Other diploma	-0.2021	(0.4385)		
No diploma	-0.3308	(0.2375)		
7th or 8th grade			0.0340	(0.1039)
9th grade			0.2038**	(0.0960)
10th grade			0.0333	(0.0831)
11th grade			0.0997	(0.0781)
12th grade, no diploma			0.1979	(0.1294)
High school graduate			0.4089***	(0.0617)
Some college, no degree			0.5806***	(0.0629)
Vocational program			0.6844***	(0.0670)
Academic program			0.6720***	(0.0709)
Bachelor's degree			0.9561***	(0.0625)
Master's degree			1.0980***	(0.0670)
Professional school degree			1.0886***	(0.1095)
Doctorate degree			1.1619***	(0.0933)
Foreign	-0.1291	(0.2890)	-0.0306	(0.0268)
Female	-0.1741***	(0.0451)	-0.3033***	(0.0174)
Constant	6.132***	(0.2874)	7.020***	(0.1195)
No of obs	2,367		10,427	
Adj R-sq	0.43		0.33	

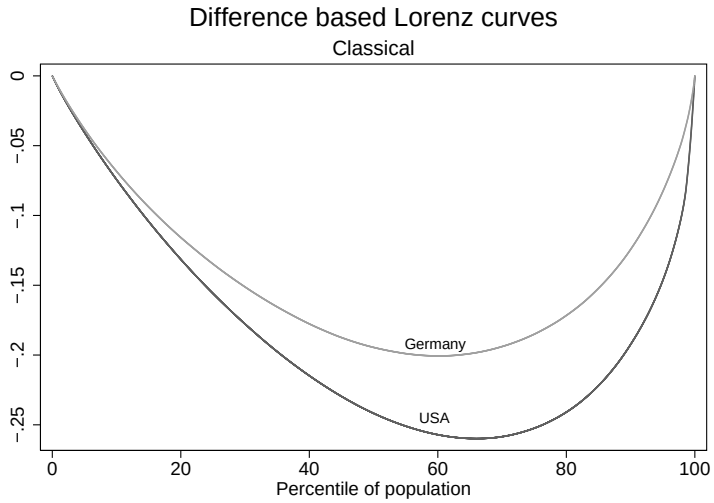
Figure 4 Unfairness and inequality. The Figure shows measured unfairness for four different responsibility cuts as well as the classical inequality measure. *Inequality* refers to the classical Gini index, *RS1*, refers to the generalized Gini index considering hours worked to be a responsibility variable, *RS2* refers to the generalized Gini index considering hours worked and education to be responsibility variables, and *RS3* refers to the generalized Gini index considering hours worked, education, and age to be responsibility variables. *Libertarian* corresponds to the generalized Gini index considering individuals responsible for all income differences.



classical inequality measure. The ranking of the two countries only changes when going from the most responsibility-sensitive measure to the libertarian measure of full responsibility, however. Hence, when regarding the unexplained variation as a nonresponsibility variable, the United States is a more unfair society unless one endorses the libertarian fairness ideal. According to the lower bound of unfairness, however, the United States is considered to be less unfair than Germany for all the intermediate responsibility-sensitive measures, i.e., when regarding the unexplained variation as a responsibility variable, the United States is a less unfair society unless one endorses the strict egalitarian fairness ideal. Hence, the fairness ranking of the two countries is very sensitive to the treatment of the unexplained variation.

The results for each of the five responsibility cuts and its robustness is discussed below.

Figure 5 Difference-based Lorenz curves when the responsibility set is empty.



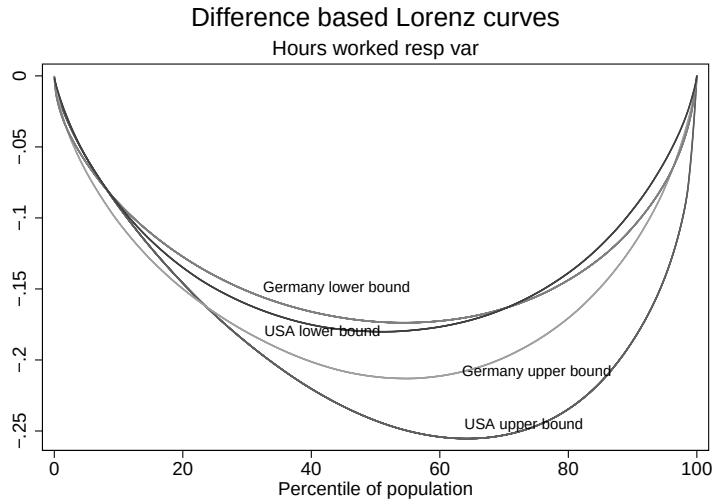
5.1 Classical inequality

Not surprisingly, Germany does better than the United States according to the classical inequality measure of no responsibility, i.e., the classical Gini index. It is relevant to discuss whether this finding is robust; would other inequality measures reveal the same finding? Figure 5 shows that the distribution of Germany Lorenz dominates that of the United States, and therefore we have the robust conclusion that Germany is less unfair than the United States according to the strict egalitarian fairness ideal.[9]

5.2 Hours worked as the only responsibility variable

Many people would not find it unfair that a person who worked more than another also earned more. Hence, it is reasonable to consider hours worked per week as a responsibility variable. When measuring unfairness according to a responsibility-sensitive fairness ideal where hours worked is the only responsibility variable, it is not straightforward to rank Germany and the United States for either the upper or the lower bound of unfairness. For the upper bound, the generalized Gini index reveals that Germany is less unfair than the United States. However, as the Lorenz curves cross (see Figure 6), there exists another unfairness measure satisfying the

Figure 6 Difference-based Lorenz curves when hours worked is considered to be a responsibility variable.



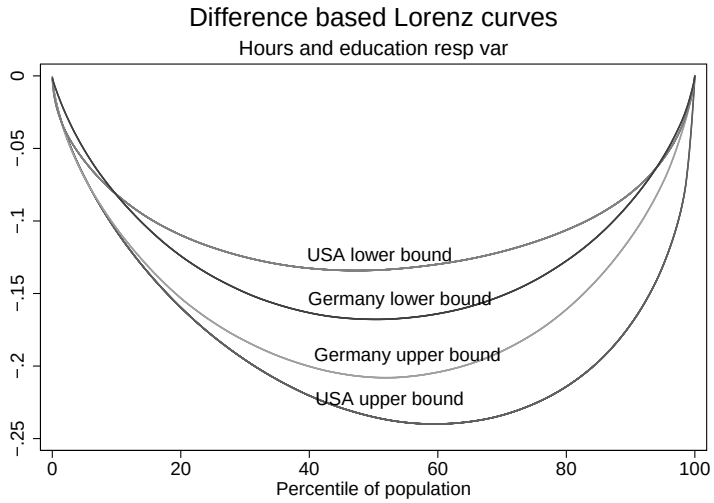
generalized Pigou–Dalton criterion that would evaluate the United States as less unfair than Germany. More specifically, this unfairness measure gives more weight to the most unfairly treated than the generalized Gini index does, as the Lorenz curve of the United States is closer to the horizontal axis for the lower tail of the difference distribution.

For the lower bound of unfairness, the generalized Gini index for the United States (0.269) is very similar to that of Germany (0.266). Neither in this case do we have a robust ranking of the two countries.

5.3 Education and hours worked as responsibility variables

Whether individuals should be accountable for their education is likely to be a debated issue in many countries. Successful education usually demands both effort and talent.[10] Adding education to the responsibility set gives slightly lower measured unfairness for the upper bound, in both Germany and the United States. As can be seen in Figure 7, for all practical purposes, we have the robust conclusion that the income distribution of Germany is less unfair than that of the United States, for the upper bound. However, the Lorenz curves cross slightly at the lower tail, and if we constructed an unfairness measure that gives absolute priority to the most unfairly

Figure 7 Difference-based Lorenz curves when hours worked and education are considered to be responsibility variables.

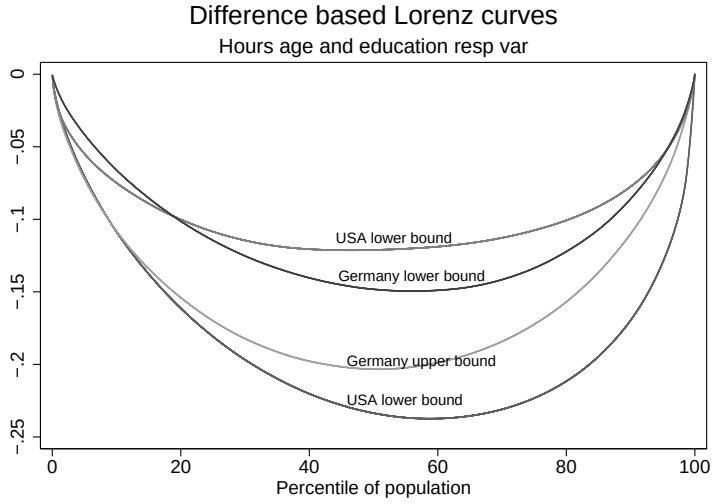


treated, we would reach the opposite conclusion.

The decrease in unfairness is more substantial for the lower bound of unfairness. Furthermore, for the lower bound, we have a clear crossing of the two Lorenz curves, and thus we have no robust ranking of the two countries according to the lower bound of unfairness.

5.4 Age as a responsibility variable

Figure 8 Difference-based Lorenz curves when hours worked, education, and age are considered to be responsibility variables



Age is one of the few variables in life that individuals cannot affect. It might therefore be surprising to suggest that people should be held responsible for their age. However, if people are asked whether they would like society to accept differences in income because of age, many would answer that they would. If life expectancy is the same for all citizens, income differences because of age do not affect permanent income, and this may be one reason why people find inequality because of differences in age justifiable. The earliest literature proposing to eliminate inequality because of certain factors before evaluating income distributions, focused on eliminating differences because of age.[11]

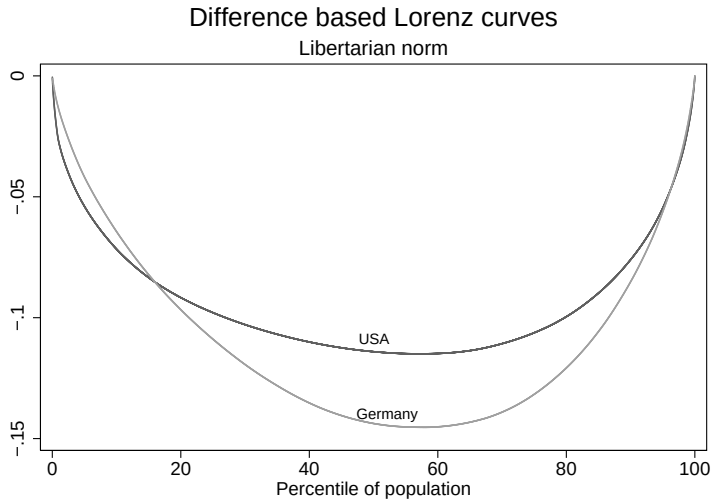
We see that although the country ranking stays the same, the measured unfairness decreases slightly for the upper bound of unfairness in both countries when age is included as a responsibility variable. Again, we have a slight crossing of the two Lorenz curves. However, the area between the curves where the United States is closer to the horizontal axis is small, and only if we gave full priority to the most unfairly treated we would get the conclusion that the United States is fairer than Germany. However, we cannot conclude as robustly as for the classical inequality measurement (see Figure 8). For the lower bound, the decrease in measured unfairness of including age as a responsibility variable is more substantial. For this bound, we have a clear crossing of the Lorenz curves, and hence, we have no robust ranking of the two countries.

5.5 The libertarian responsibility cut

For the upper bound, the ranking of the two countries is reversed when considering the libertarian fairness ideal: the United States is less unfair than Germany. However, as Figure 9 shows, the Lorenz curves cross when applying the libertarian ideal of no redistribution, and hence we have a mixed picture: There exist other fairness measures that would conclude that Germany is less unfair than the United States.

As such, the conclusion that the United States is fairer than Europe for the libertarian fairness ideal is not entirely clear. It is interesting to note that the shape

Figure 9 Difference-based Lorenz curves when all variables in addition to the error term are considered to be responsibility variables.



of the Lorenz curve for the United States is very different from the Lorenz curves for the European country for this responsibility cut. We see that the unfairness in the United States relates to the lower tail of the difference distribution. That is, the most unfairly treated are treated worse in the United States than in Germany. However, the major part of the population, in the middle of the fairness ranking given in Equation (3), seems not to be unfairly treated in the United States as the Lorenz curve is flat in the major part characterizing the middle of the distribution. In Germany, however, the citizens in the center of the fairness ranking in (3) are treated unfairly, and we see that the Lorenz curve for Germany has no flat part.

The measured unfairness is lower in both countries if applying the libertarian fairness ideal than for all other fairness ideals. The measured unfairness is substantially lower for the United States than for Germany, however. That is, the posttax income distribution is closer to the pretax income distribution in the United States than in Germany according to the generalized Gini index.

6 The egalitarian equivalent and conditional egalitarian fair income: A robustness analysis

We now turn to two fairness principles other than the generalized proportionality principle, namely the egalitarian equivalent and the conditional egalitarian principle. The fair income calculated from the *egalitarian equivalent* (Bossert, 1995) principle is given by:

$$z_i^{EE} = f(\boldsymbol{e_i}, \widetilde{\boldsymbol{t}}) - \frac{1}{N}\sum_j (f(\boldsymbol{e_j}, \widetilde{\boldsymbol{t}}) - f(\boldsymbol{e_j}, \boldsymbol{t_j})), \tag{11}$$

where $\widetilde{\boldsymbol{t}}$ is the reference nonresponsibility vector. The reference vector we consider is the vector of average nonresponsibility variables in society, $\bar{t}$.[12]

The empirical counterpart of this is the fair income:

$$z_i^{EE} = \exp(\beta \boldsymbol{e_i} + \gamma \bar{\boldsymbol{t}}) - \frac{1}{N}\sum_j (\exp(\beta \boldsymbol{e_j} + \gamma \bar{\boldsymbol{t}}) - \exp(\beta \boldsymbol{e_j} + \gamma \boldsymbol{t_j} + \varepsilon_j)),$$

where $\bar{\boldsymbol{t}}$ is the vector of mean nonresponsibility variables.

The *conditional egalitarian* (Kolm, 1996) fair income of individual i is given by:

$$z_i^{CE} = f(\boldsymbol{e_i}, \boldsymbol{t_i}) - f(\widetilde{\boldsymbol{e}}, \boldsymbol{t_i}) + \frac{1}{N}\sum_j f(\widetilde{\boldsymbol{e}}, \boldsymbol{t_j}), \tag{12}$$

where $\widetilde{\boldsymbol{e}}$ is the reference responsibility vector. We consider the reference to be the vector of average responsibility variables in society, $\overline{\boldsymbol{e}}$.[13] The empirical counterpart of this is the fair income given by:

$$z_i^{CE} = \frac{\exp(\boldsymbol{\beta}\overline{\boldsymbol{e}})}{N}\sum_j \exp(\boldsymbol{\gamma t_j} + \varepsilon_i) + \exp(\boldsymbol{\gamma t_i} + \varepsilon_i)\left[\exp(\boldsymbol{\beta e_i}) - \exp(\boldsymbol{\beta}\overline{\boldsymbol{e}})\right].$$

Table 5 presents generalized Gini indexes according to the different ideals applying the generalized proportional, the egalitarian equivalent and the conditional egalitarian approach, respectively. When considering the upper bound of unfairness, Germany is less unfair than the United States for all levels of responsibility except

Table 4 Measured unfairness for different responsibility cut. *gp* indicates that the generalized proportionality principle has been used in the calculation. *ee* and *ce* indicate that the egalitarian equivalent and the conditional egalitarian principles have been used. All unfairness measures are calculated using the generalized Gini index given in Equation (5).

Resp set	Germany	USA
Empty	0.285	0.368
RS1 gp upper	0.316	0.375
RS2 gp upper	0.310	0.367
RS3 gp upper	0.306	0.366
All	0.215	0.185
RS1 gp lower	0.269	0.266
RS2 gp lower	0.248	0.211
RS3 gp lower	0.221	0.195
RS1 ee upper	0.296	0.366
RS2 ee upper	0.289	0.350
RS3 ee upper	0.284	0.347
RS1 ee lower	0.259	0.258
RS2 ee lower	0.240	0.205
RS3 ee lower	0.218	0.191
RS1 ce upper	0.283	0.341
RS2 ce upper	0.279	0.304
RS3 ce upper	0.287	0.301
RS1 ce lower	0.228	0.221
RS2 ce lower	0.224	0.195
RS3 ce lower	0.216	0.189

for the libertarian case of full responsibility. When considering the lower bound of unfairness, the United States is less unfair than Germany for all levels of responsibility, except the egalitarian case of zero responsibility. Hence, the results are robust to the choice of fairness principle.

7 Concluding remarks

The paper compares the income distributions of Germany and the United States using a flexible group of fairness measures that allows us to calculate unfairness for different fairness ideals. The fairness ideals that are discussed are the libertarian ideal, the strict egalitarian ideal and different responsibility-sensitive intermediate positions. The main findings of this paper are twofold. First, for the extreme case

of no responsibility, Germany has lower unfairness than the United States, whereas in the extreme case of full responsibility, the United States has lower fairness than Germany. However, in the latter case, the conclusion that Germany is less unfair than the United States when considering a libertarian fairness ideal, depends on the choice of the Gini index. Another unfairness measure giving a larger weight to the most unfairly treated, would conclude that Germany is fairer than the United States also in this case.

Second, for the intermediate positions of responsibility sensitivity, the picture is mixed. When applying the upper bound of unfairness, Germany is measured to be fairer than the United States for all levels of responsibility sensitivity. However, when applying the lower bound of unfairness, the United States is measured to be fairer than Germany for all levels of responsibility sensitivity. Hence, the fairness ranking depends on the treatment of the unexplained variation. As responsibility sensitivity seems to get more and more attention from researchers, however, the hope is that more descriptives on cross-country comparable income-generating processes will be gathered in the near future as "description can be motivated by predictive interest or by prescriptive interest" (Sen, 1980). When more descriptives are in place, we will be able to narrow the bounds and hence make more accurate measurements of the unfairness in different societies. As has been advocated by Devooght (*forthcoming*) and Almås et al. (2007), it is plausible that researchers as well as political decision makers do not want to hold people responsible for variation they cannot explain. Hence, the preferred strategy might be to apply the upper bound of unfairness—a strategy that can be referred to as the 'benefit of the doubt' strategy.

However, it is possible to argue against the 'benefit of the doubt' strategy and consider the lower bound of unfairness to be the preferred strategy. Because we have no measure of luck and only an imperfect measure of abilities (education), we have reasons to believe that both luck and abilities are captured in the unexplained variation. For Germany, it may be reasonable to include both these variables in the nonresponsibility set. However, for the United States, this may be less obvious.

When the unexplained variation in the responsibility is included when evaluating fairness in the United States, but not in Germany, the fairness ranking of the two changes compared with the above mentioned 'benefit of the doubt' strategy. The United States is then fairer than Germany for all levels of responsibility. More generally, we might want to depart from the common norm for both countries and include more factors in the responsibility set for the United States than for Germany, as the citizens of the United States seem to be more responsibility sensitive (cf. the evidence from the World Value Survey (2005)). However, unless we include the unexplained variation in the responsibility set, applying a larger responsibility set in the United States than in Germany does not change the results.

The robustness of the findings is discussed through Lorenz curves and through applying different fairness principles, i.e. the egalitarian equivalent and the conditional egalitarian principles. As we have seen the Lorenz curves cross for some of the responsibility cuts, and hence we do not have robust ranking of the two countries for these cuts. However, all results are robust to the choice of fairness principle. For further checks of robustness one way to go could be to introduce formal inference tests (see for example Cowell (1999), Davies, Green, and Paarsch (1998), Bishop, Chakraborti, and Thistle (1991), Bishop, Chow, and Zheng (1995) and Bishop, Formby, and Zheng (1998), for discussions of inference tests and Barrett and Donald (2004) for a proposal of non-parametric tests). It is open for future research to apply these formal tests of inference to the generalization of the Lorenz curves and the Gini index applied in this paper.

Notes

[1]In the robustness analysis, two other extensively discussed principles are applied: the egalitarian equivalent and the conditional egalitarian principle (Bossert, 1995; Kolm, 1996; Bossert and Fleurbaey, 1996).

[2]The framework has some parallels to earlier work on formalizing criteria to rank distributions according to norm (fair) incomes (Garvy, 1952; Paglin, 1975; Jenkins and O'Higgins, 1989;

Devooght, *forthcoming*, Bishop, Formby and Smith, 1997).

[3]The generalized Pigou–Dalton criterion states that if you have two distributions, A and B with identical fair incomes, and all differences in A and B are identical except for the differences for individual i and j, which can be expressed by the following: $d_i^A < d_i^B \leq d_j^B < d_j^A$, then A is more unfair than B. The condition of unfairism states that if A and B have the same mean and all individual differences are identical, then A and B are equally fair.

[4]It follows that the generalized Gini has a maximum value of 2. A related measure was discussed in Wertz (1977).

[5]Note that if there are no responsibility variables, this approach is consistent with the classical framework based on a strict egalitarian fair distribution. On the other hand, if there are no nonresponsibility variables, the framework will be consistent with the libertarian fairness ideal giving no weight to inequality concerns.

[6]See Bossert (1995) and Fleurbaey (1994, 1995a, 1995b, 1995c)

[7]The concept of proportionality has a long tradition and can be traced back to Aristotle (Barnes, 1984), who proposed to distribute in proportion to individual effort.

[8]We have also estimated the relationship by using four comparable educational categories in the two countries. This specification gives less explanatory power, but the results of the fairness comparison do not change.

[9]The conclusion is robust in the sense that all classical inequality measures that satisfy the uncontroversial generalized Pigou–Dalton criterion will reveal a higher inequality in the United States than in Germany (see Almås et al. (2007) for a discussion of this).

[10]The question on equalizing the opportunities for education in the United States is discussed extensively in Betts and Roemer (2007).

[11]See Paglin (1975) and the many subsequent comments in the *American Economic Review* in the late 1970s and 1980s.

[12]If all variables are considered to be nonresponsibility variables, $\bar{t}$ includes average hours worked per week, average level of education (operationalized through including average dummies, i.e. between zero and one for all educational levels), average age, average sex, i.e. a dummy equal to 0.5 for females, and average immigration status, with a dummy variable equal to the average of the immigration dummy.

[13]The average responsibility variables are calculated in the same way as $\bar{\boldsymbol{t}}$.

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