Hamburg Institute
of International
Economics

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HWWI Research
Paper 174

Hamburg Institute of International Economics (HWWI) | 2016
ISSN 1861-504X

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# The social pay gap across occupations: Survey and experimental evidence

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April 2016

**Abstract**

Receiving equal wages for work of equal value is a legal right in many countries. However, it remains unknown to what degree the neglect of this principle yields differences in pay between social and other occupations. The results of a task-based analysis with survey data confirm a notable wage penalty of 0.5 standard deviations for social occupations (e.g., health care, education). Based on these results, we design a laboratory experiment that mimics actual income distributions (Germany, USA), incorporates social occupations in the lab society, and allows for (voluntary) redistribution among subjects. The results show that, regardless of (non-)random assignment to social jobs and the level of income inequality, individuals in social jobs are only partly compensated for their social effort. A downward spiral, induced by emotional reactions, results as social effort and donations converge to a 'low' equilibrium. This suggests that a market approach fails to eliminate the social pay gap.

*JEL classifications*: C90, D62, D63, H23, J31

*Keywords*: Inequality, tasks data, redistribution, experiment, voluntary payments, social returns, externality

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Albrecht Noll and Isabel Meier provided excellent research assistance. Financial support from the Max Planck Institute of Economics Jena and the Hamburg Institute of International Economics is gratefully acknowledged. We thank Christina Boll as well as participants of the EEA WinE 2015, ESA 2015, and the user conference of the Research Data Centres of the BIBB and of the Federal Statistical Office, and the statistical offices of the Laender 2015 for all helpful comments and suggestions. All remaining errors are ours.

# 1 Introduction

The International Labour Organisation, an entity of the United Nations, and the European Union obligate their members to ensure that equal pay is offered for equal work or for work of equal value. Countries additionally have similar laws on the national level, establishing the basis for a fair wage distribution. Often the principle "equal pay for equal work" is cited when addressing potential discrimination and mostly comparisons are made between individuals belonging to the same occupation. This implicitly assumes that payments are fairly divided between occupations or that different remunerations between occupations appropriately reflect differences in work value. However, this assumption remains to be tested in more detail. Workers in social occupations, e.g., nurses or teachers, are known to fulfill important functions in society but they earn substantially less than workers in, e.g., technical occupations. Still, apart from varying institutional settings, such as the level of trade union coverage, it is unclear to what degree these wage differences can be justified on the grounds of doing work of different value or whether individuals in social jobs derive 'intrinsic' utility, in the size of the negative wage difference, from generating social returns. In the latter case, utility levels among workers in social and other occupations would be similar and salary differentials therefore acceptable. However, in the former case, a lower pay for social occupations could also be regarded as a wage penalty, potentially leading to a labor shortage in the market, increased risk of labor disputes, and a lack of commitment to the job.

Against this background we conduct an analysis of occupational wages in the labor market using data from the field and the laboratory. We refer to any differences in income attributable to social factors as the social pay gap.[1] With field data we investigate whether there exist jobs with equal job content that only differ as regards their social and monetary returns. With laboratory data, we address whether workers in social occupations are sufficiently compensated by other members of the society (via voluntary redistribution) in order to keep up their work.

In a first step, we use survey data to measure the similarity of occupations, in terms of their job content, and occupational wage differentials. Recently, tasks data on occupational content have proved useful to explain, for instance, the impact of computer-based technologies on the demand for different skills (Autor et al., 2003; Goos and Manning, 2007; Goos et al., 2009), the dynamics of wage inequality (Autor et al., 2008;

[1] The conceptual idea behind the term social pay gap is that the social fabric influences remuneration schemes. To what degree differences in pay can be regarded as discriminatory is expected to also relate to "social" causes including, for instance, individual or job attributes. In our case, the social pay gap addresses wage differentials between social and other occupations, hence focusing on job characteristics.

Antonczyk et al., 2009), or the offshorability of jobs (Blinder, 2009; Blinder and Krueger, 2013). We therefore explore German tasks data to compare wages of occupations with similar tasks portfolios and skill requirements (occupational tasks twins). First, we run a factor analysis for 31 tasks and compute an occupational distance measure (see Bublitz, 2015). Then we carefully distinguish social from other occupations. Calculating the average wage differences between tasks equivalent occupations with and without social returns confirms that working to the benefit of society leads to an average wage reduction of €500, which is substantial considering that the mean occupational gross wage per month amounts to an average of €2,600. Naturally, this wage differential should be the consequence of various factors such as differences in, e.g., bargaining power, productivity of industries in terms of GDP, or labor union coverage. However, at this stage, survey data cannot further explain the value of social returns.

Therefore, in the second step, we develop an experimental design that allows observing individual decision making in a society where workers in social occupations are only partly compensated with money for their true work value. We refrain from modeling any additional characteristics relevant to wage setting in real labor markets, instead focusing on occupations with work of equal value (tasks twins) and social returns. Thus, we eliminate other potential sources for wage differences, as mentioned above (including any information asymmetries) leaving as only difference whether an individual holds a social job or not. The income distribution in the experiment reflects either the one of Germany or the United States, hence providing a test for different degrees of income inequality. Subjects are assigned to a position in the income distribution according to their abilities, as measured in a cognitive skills test conducted via an online survey prior to the experiment. The allocation to social return jobs is done either randomly or is based on social affinity as measured in the online survey. Subjects in social return jobs decide how much effort they put into generating social returns which are subsequently distributed evenly among all subjects. The size of the wage penalty in social return jobs is set at 0.5 standard deviations, based on our calculations with actual survey data. Subjects see the income (skills), social externalities, and effort before deciding on a tax rate and voluntary transfers to others. The experiment lasts for 20 rounds. This setup allows us to investigate to what extent experimental subjects are willing to level out wage penalties incurred by social return jobs.

Our analysis shows that the wage penalty incurred by subjects in social return jobs is only partly compensated via transfers that they receive from other subjects. The

social affinity of social return subjects (and knowledge of it) as well as the extent of income inequality have no effect on this result. An in-depth look at the processes behind generating social returns reveals a downward spiral. The emotional state of subjects in social return jobs is affected by the extent of being rewarded for own social effort by other subjects. The smaller the reward (in relation to own social effort) is, the less likely subjects are to feel content. This emotional state carries over to subjects' decision to provide social effort in the next round. Likewise, on the side of donors a lack of social returns triggers anger and subsequently less donations. Over the course of the experiment, social effort and donations levels converge to a 'low' equilibrium as a substantial amount of social return workers switch to jobs without a wage penalty.

The paper contributes to the literature on wage differentials (among others, Altonji and Blank, 1999) that so far has primarily covered the grounds of, for instance, male-female or white-black wage discrimination. Comparisons of work of equal value were made in the context of the gender pay gap in the literature on comparable worth, arguing that female-dominated occupations are undervalued against male-dominated occupations of comparable worth (among others, Sorensen, 1990; Bergmann, 1989; Johnson and Solon, 1986). Although we start the analysis with an occupational group with a high female share in the survey data, our experiment then removes any references to gender, allowing to focus on the "pure" social pay gap.

Furthermore, the paper relates to the recent work on the scope of markets as raised by Sandel's critique[2]: Markets may improve efficiency but is the imprint they leave on social values too high a price to pay? Our study looks at the domain of social occupations (e.g. health care and education). The positive externalities in this domain benefit the society as a whole but they are generated only by part of the society. Yet the existing labor market allocation mechanism in form of wages does not result in "equal pay for equal work". We investigate whether another market mechanism, namely voluntary transfers, compensates social return workers adequately. Our findings show that raising awareness about the social pay gap and facilitating redistribution only partly reduces the incurred wage penalty and eventually leads to a drop of social effort. Hence, a market setting (as established via the "trade" of chosen effort for transfers) seems only capable of reducing but not eliminating pay differentials which cannot be justified on the grounds of different abilities. This suggests that in our context the scope of a market

[2]Sandel (2012, 2013) argues that the use of markets on the grounds that they are more efficient in allocating resources has spread too far as, in some domains, markets corrupt human behavior by changing the underlying morals of individuals. These negative ethical spillovers may not be compensated by efficiency gains. See also Besley (2013), Bruni and Sugden (2013) or Falk and Szech (2013).

approach to address inequality is limited.

Finally, our paper contributes methodologically to the experimental literature on pro-social behavior. We combine two research methods in a complementary way as our analysis of survey data provides input for the parameters used in the experiment. This sound empirical basis allows us to analyze a more realistic decision environment in the experiment.

The paper is organized as follows. Section 2 summarizes our survey evidence. In section 3 we explain the design of our experiment while in section 4 we present the results. Section 5 concludes.

# 2 Survey evidence: Different pay for work of equal value

The first part of the analysis uses survey evidence to analyze the degree to which work of equal value actually receives different remuneration in the labor market. Any further analyses can hence be motivated with evidence from the field. We proceed in the following steps: After carefully identifying social occupations, we construct a index for the similarities between occupations to capture work of equal content. We then investigate the size of wage differentials and differences between occupations in satisfaction levels.

## 2.1 Identification of social occupations

Occupations can be rated on a social responsibility scale. Here, the term "social" is understood broadly as an activity that serves a common good or the public in general, that regulates and promotes human relations in the community, and that protects (economically) weaker persons. For instance, Frank (1996) conducts a survey where, in line with common expectations, the highest occupational social responsibility is assigned to emergency medical technicians and teachers. The lowest score is reported for stock brokers and salesmen. However, Frank's measure is based on individual perceptions from survey data, assuming very good knowledge by survey participants of all occupations. From our perspective, a more direct measure of social contributions would be what is reported as key content by individuals working in these occupations. Therefore, we suggest relying on tasks data which fulfill this prerequisite.

Our data come from the BIBB/BAuA Employment Survey 2006 which was undertaken in 2005 and 2006 by the Federal Institute for Vocational Education and Training

(BIBB) and the Federal Institute for Occupational Safety and Health (BAuA) (Hall and Tiemann, 2006; Rohrbach-Schmidt, 2009). This wave consists of a random sample of 20,000 people between the ages of 16 and 65 who are active in the labor force in Germany. In addition to individual-specific data, the survey includes information on self-reported job tasks. For further examples using this data base see among others Spitz-Oener (2006, 2008) and Borghans et al. (2014).

As a first step, the BIBB/BAuA Employment Survey offers a helpful classification of 56 occupational groups (Tiemann et al., 2008). It was developed on the basis of the occupational classification 1992 with the goal to group the data into fewer categories. Occupations were summarized by their key tasks, taking into account their key industry and distinguishing between the public and the private sector. The primary data source was the micro-census 2004, later complemented with the BIBB/BAuA Employment Survey 2006. We take this classification as a starting point and select five occupational fields that have a focus on one of the following three "social" tasks (according to our definition) which are classified as key tasks by Tiemann et al. (2008): (1) educating and teaching, (2) caring and helping (social context, health) and (3) treating medically or cosmetically. On the basis of these tasks, out of the 54 occupational fields the following five are identified as social jobs and potential candidates for social externalities: (1) health occupations with a medical doctor, (2) health occupations without a medical doctor, (3) social occupations, (4) teachers, and (5) occupations in body care.

For a test of the reliability of this selection, we empirically evaluate whether the occupational fields indeed score highest in the following three social tasks that are available in our data set and that slightly differ from the key tasks by Tiemann et al. (2008): (1) teaching, education (2) caring, curing, healing, and (3) responsibility for others' well-being. Indeed, the selected occupational fields are among the top 10 percent in these tasks.[3] Note that the comparison of work content appears more appropriate on a more detailed level and moving from almost 260 to 54 groups implies a loss of information. That is why in the following calculations of wage differentials the focus shifts back to occupations, instead of the occupational fields implemented by Tiemann et al. (2008). All occupations that fall within the selected social occupational fields are tagged as being social.

[3]Results are available upon request.

## 2.2 Work of equal value

In the next step of the analysis we determine the job content of occupations by using tasks data and we identify tasks equivalent occupations by computing a distance measure. In the survey, individuals are asked how frequently they perform tasks and what level of skills is required in specific subject areas. For all respondents, we know whether they perform a certain task in a job and how important that task is on a scale from zero to two, zero meaning not important. The sample is reduced to only include freelancers, dependently employed, and self-employed persons, leaving out, for instance, civil servants or family workers. In total, almost 18,000 observations remain. There have to be a minimum of three observations per occupation which leaves 259 occupations. A selection of 31 tasks provides the foundation for the principal factor analysis which is run to simplify the subsequent computations (see Appendix A for details). The uniqueness of the variables is relatively low and the Kaiser-Meyer-Olkin measure shows relatively high values; thus, both measures confirm that it is appropriate and necessary to combine the variables into factors. According to the Kaiser criterion, the principal factor analysis suggests retaining seven factors, which account for around 94% of the total variance. The factors can be labeled as intellectual, technological, commercial, health, instruction, production, and protection (see Table A.1). The assignment of occupations to factors makes intuitive sense, as can be seen in Table A.2. For instance, teachers have the highest score in the instruction factor and physiotherapists and doctors score highest in the health factor.

Next, the distance of occupations is determined by using the angular separation or uncentered correlation of two vectors representing two occupations (for details on the computational method, see Gathmann and Schönberg, 2010; Jaffe, 1986). The idea is that the job content of each occupation can be characterized by a 31-dimensional vector $q_o = (q_{o1}, ..., q_{oJ})$, where $q_{oj}$ denotes the fraction of workers in an occupation performing task $j$. To determine the distance between two occupations $q_o$ and $q_{o'}$ the equation reads

$$AngSep_{oo'} = 1 - \frac{\sum_{j=1}^{J} q_{jo} * q_{jo'}}{\left[\left(\sum_{j=1}^{J} q_{jo}^2\right) * \left(\sum_{k=1}^{J} q_{ko'}^2\right)\right]^{\frac{1}{2}}} \tag{1}$$

$$Distance_{oo'} = 1 - AngSep_{oo'} \tag{2}$$

where $q$ is the vector of all tasks in an occupation. The measure is slightly adjusted so that a value of 1 (0) means that the occupations are completely different (identical). This distance measure reflects the differences between occupations with regard to their

job content. It provides the basis for determining to what degree occupations carry out similar work and therefore could be regarded as work of equal value or occupational tasks twins.

The distance variable, calculated on the basis of the angular separation, takes on values between 0.02 and 0.88 with a mean of 0.24 and a standard deviation of 0.12. In line with this evidence, we therefore consider occupations with a maximum distance of 0.1, reflecting approximately one standard deviation, to be work of equal or very similar value, so called occupational tasks twins. We naturally acknowledge that in a more detailed analysis it would be helpful to take into account additional information on job requirements such as physical requirements, responsibility, or working conditions. However, as our ultimate goal is not to determine the similarities between two selected jobs but to identify the average wage difference between social and other occupations—by calculating an aggregated average—our procedure appears informative enough. In each instance, we compare one occupation to the remaining 258 occupations in our sample. The number of occupational tasks twin (with a maximum distance of 0.1) is on average 33, which means for each occupation, on average, 13% of the other occupations are highly comparable.

For illustration, Table 1 displays the first most similar tasks twins for three social occupations. The results for social work associate professionals and secondary education teaching professionals are easily comprehensible, showing that tasks content of social workers resembles the one of, for instance, religious or nursing professionals. Teachers show a large tasks overlap among each other but also with psychologists. The results for nursing associate professionals come as a surprise and need further investigation on the tasks level: Nurses share with vehicle, window and related cleaners, for instance, a high score on the task "Cleaning, waste disposal, recycling" and "Measuring, testing, quality control" and a low score on "Producing, manufacturing goods" and "Layout, design, visualization knowledge". Nurses and air traffic controllers score high on, for example, "Collecting information, investigating, documenting" or "Advicing, informing, consulting" and low on the same tasks as cleaners. Taken together, the examples confirm that the tasks assignment remains sensible and the distance variable provides a reliable measure for occupational tasks twins. In addition, the example of nurses illustrates that already among the five most similar occupational tasks twins there are occupations that do not fit the definition of a social job. From this we can conclude the following:

**Observation 1:** There exist occupational tasks twins where the job content is highly similar but only one occupation of the pair can be classified as social.

Table 1: Occupational tasks twins for three social occupations

| **Social work associate professionals** | *Occupational Distance* |
|---|---|
| Social work professionals | 0.011 |
| Religious professionals ("Pastor") | 0.017 |
| Pre-primary education teaching associate professionals | 0.032 |
| Nursing associate professionals | 0.035 |
| Protective services workers not elsewhere classified | 0.042 |
| **Secondary education teaching professionals** | |
| **("Real-, Volks-, Sonderschullehrer")** | |
| Secondary education teaching professionals ("Gymnasiallehrer") | 0.017 |
| Secondary education teaching professionals ("Fachschul-, Berufsschul-, Werklehrer") | 0.018 |
| Other teaching associate professionals | 0.022 |
| Psychologists | 0.023 |
| Workers without detailed occupation | 0.023 |
| **Nursing associate professionals** | |
| Vehicle, window and related cleaners | 0.029 |
| Air traffic controllers | 0.031 |
| Metal melters, casters and rolling-mill operators | 0.034 |
| Medical doctors | 0.035 |
| Social work associate professionals | 0.035 |

Notes: Own calculations with BIBB/BAuA Employment Survey 2006; translations correspond to ISCO88 labels.

## 2.3 The size of wage differentials

The analysis now proceeds in two steps. First, we test whether, in general, social occupations earn significantly less than other occupations, controlling for various other explanations. Second, we try to provide rough estimates of the wage differentials between occupational tasks twins.

We start by estimating a Mincer earnings equation with the logarithm of wage on the left hand side to test whether wage differences remain significant after controlling for additional factors (see Table 2). Note that we look at gross monthly wages corrected by working hours since particularly social occupations are well known to employ a significant share of part time workers.[4] The right hand side variables consist of a dummy for whether an occupation is classified as social, controlling for age, job tenure, different education levels (baseline is no occupational education), firm size, occupational status,

[4]Controlling for work hours decreases wage differences but this has to interpreted with care because it is unclear to what degree individuals have the opportunity to choose between full-time and part-time positions. In addition, we do not have enough information to reliably incorporate overtime.

industry sector, and federal state. Across all specifications, the control variables show the expected signs. Age is insignificant, most likely because it correlates with tenure.

Social occupations show a significant negative relationship with wages (Column 1). When controlling for sex, this coefficient loses significance and instead being female shows an important negative relation with wage (Column 2). This is in line with the literature on occupational segregation according to which women tend to work more frequently in low paid occupations with a social focus. Frank (1996) also shows that a large share of the wage differences between men and women can be explained by the higher likelihood of women to select into jobs with a higher occupational and employer social responsibility. Column 3 includes an interaction term between being female and social jobs, confirming a wage penalty for individuals in social jobs which is lower for women than men. One may speculate that primarily men who cannot find other jobs end up in social jobs, leading them to be, for instance, less motivated or even less qualified. Nonetheless, it continues to hold that social jobs correspond with lower wages for both sexes. From these calculations we conclude that social occupations indeed face a noticeable wage penalty but it should not be explained by sex only.

Table 2: The relationship between wages and social occupations

| | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| Social occupation (1=yes) | -0.029** | (0.010) | 0.018 | (0.010) | -0.082*** | (0.021) |
| Female (1=yes) | | | -0.198*** | (0.008) | -0.213*** | (0.008) |
| Social occ × female | | | | | 0.126*** | (0.023) |
| Vocational training (1=yes) | 0.252*** | (0.013) | 0.243*** | (0.013) | 0.242*** | (0.013) |
| Master craftsman (1=yes) | 0.411*** | (0.018) | 0.364*** | (0.018) | 0.361*** | (0.018) |
| University degree (1=yes) | 0.611*** | (0.015) | 0.568*** | (0.015) | 0.569*** | (0.015) |
| Job tenure | 0.016*** | (0.000) | 0.015*** | (0.000) | 0.015*** | (0.000) |
| Age | 0.000 | (0.000) | 0.000 | (0.000) | 0.000 | (0.000) |
| R-squared | 0.394 | | 0.422 | | 0.423 | |
| N | 14275 | | 14275 | | 14275 | |

Notes: OLS regression with standard errors in parentheses. Data come from the BIBB/BAuA Employment Survey 2006. The dependent variable is the logarithm of wage. The control variables are firm size, occupational status, industry sector, and federal state.
***p<0.01, ** p<0.05, * p<0.1

To determine the size of social externalities we need to combine the information on tasks similarities between social and other occupations with wage data. When calculating the wage differentials we only compare occupations of identical education levels in order to address additional job heterogeneity due to different skill levels. This is also captured in the factor analysis where we control for task and skill level.

We start by calculating average wage differences across all occupations with a max-

imum occupational distance of 0.1, that is, occupational task twins. The results show a negative average hourly wage differences of €78 for social occupations (see Table 3, row I). However, comparing social occupations with other social occupations leads to a downward bias because these occupations resemble each other in terms of job content and tend to earn less than other occupations. In fact, the data show that the average occupational wage[5] is €2924 with a standard deviation of €876. The average occupational wage for social jobs is €2854 and for other occupations €2938. We thus calculate wage differentials separately between one social and all its other occupational tasks twins. This increases the average negative wage difference to €117, considering 27 social occupations (row II, excluding own group). Focusing only on occupations that receive a wage penalty for their social status results in a negative difference of €533 (16 occupations, row III). For the experiment, we refer to the results from row III where the monthly average difference equals approximately 0.5 standard deviations of the average wage of all occupations in the sample.

From these analyses we can now derive the following:

**Observation 2:** There exists a wage penalty between occupational tasks twins, resulting in lower wages for workers in socially responsible jobs.

Table 3: Average wage differences between similar occupations

| | | Wage penalty of social occupations |
|---|---|---|
| I | Wage difference between all similar occupations | €78 |
| II | Wage differences (excluding own group) | €117 |
| III | Wage differences only for wage penalties (excluding own group) | €533 |

Notes: Own calculations with BIBB/BAuA Employment Survey 2006, including only occupations with a maximum distance of 0.1, calculated from occupations with identical qualification levels. The results show average monthly wage differences.

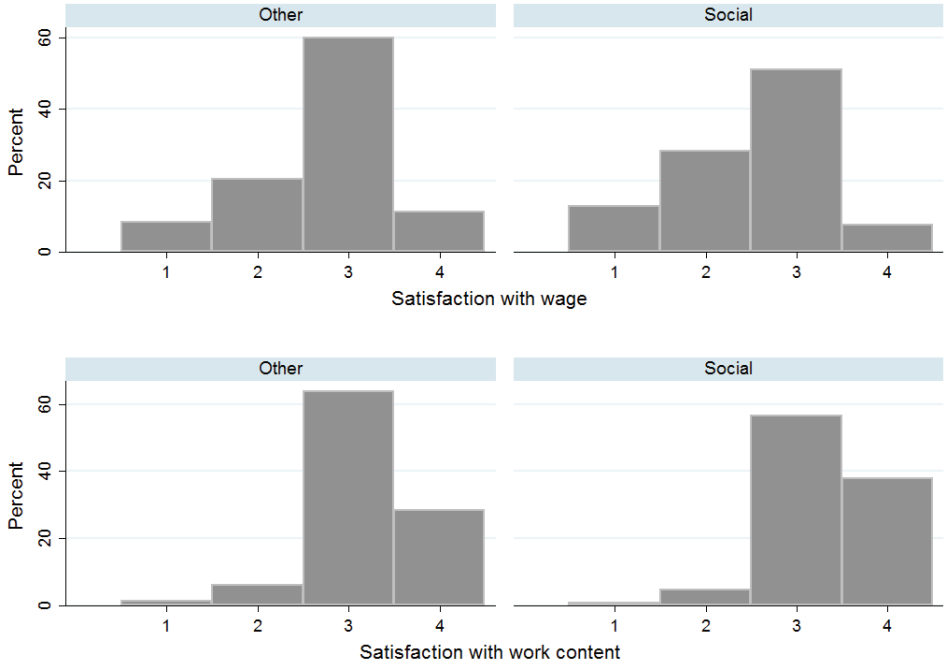
## 2.4 Satisfaction levels in social occupations

When considering the identified wage differentials, it appears plausible to assume that individuals in social occupations choose to forgo a certain amount of their wage because they derive utility from their work content. Finding empirical evidence for this argument

[5]The occupational wage is determined by first calculating the average by occupations before taking the average across all occupations. This procedure attaches the same weight to all occupations regardless of the number of observations per occupation, avoiding that the wage differences between occupations are driven by skewed distributions of workers across occupations.

is relatively difficult but as an approximation we can use data on satisfaction levels.

Figure 1: Satisfaction levels for social and other occupations




The BIBB/BAuA employment survey collects information on workers' satisfaction levels which we use as a proxy for intrinsic utility. Compared to other occupations, social occupations show a distribution for satisfaction with wage that is shifted more to the left and for satisfaction with work content it is shifted more to the right (see Figure 1). We also run a OLS regression using a similar model specification as in Section 2.3 but changing the dependent variable from wage to satisfaction. In Column 1 in Table 4 we see that individuals in social jobs are more satisfied with the content of their job tasks which might be the result of additional utility generated through social tasks, hence, a potential compensation for lower monetary returns. Column 2 shows that individuals in social jobs are less satisfied with their wages. This comes as no surprise because they earn significantly less than persons in other jobs. Note that the coefficient of social occupations is about twice as large for wages as for work content.

While the results have to be interpreted with care, they indeed suggest that wages (alone) may not be large enough to compensate workers in social occupations. The higher satisfaction with work content might be an additional reward but it is hard to directly weigh the two 'rewards' against each other. Also, these results do not inform us about the distribution of the different returns because the estimations rely on averages,

Table 4: The relationship between satisfaction levels and social occupations

| | (1) | | (2) | |
|---|---|---|---|---|
| Social occupation (1=yes) | 0.096*** | (0.014) | -0.207*** | (0.018) |
| Female (1=yes) | -0.020 | (0.010) | 0.000 | (0.013) |
| Vocational training (1=yes) | 0.034 | (0.018) | -0.015 | (0.023) |
| Master craftsman (1=yes) | 0.061* | (0.024) | -0.010 | (0.030) |
| University degree (1=yes) | 0.057** | (0.021) | 0.026 | (0.026) |
| Job tenure | 0.002*** | (0.001) | 0.008*** | (0.001) |
| Age | 0.000 | (0.000) | -0.000 | (0.000) |
| R-squared | 0.030 | | 0.057 | |
| N | 17081 | | 17054 | |

Notes: OLS regression with standard errors in parentheses. Data come from the BIBB/BAuA Employment Survey 2006. The dependent variable is the satisaction with work content (1) and with wage (2). The control variables are firm size, occupational status, industry sector, and federal state.
***p<0.01, ** p<0.05, * p<0.1

including, among others, medical doctors who earn very large wages. Hence, we can only conclude that significant differences in satisfaction levels exist between the two occupational groups.

**Observation 3:** Workers in social occupations show significant differences in satisfaction levels when compared to other occupations.

In sum, although we provide evidence that work of equal value does not receive equal wages, we cannot yet say anything about a socially accepted level of wage penalties and a maximum level of redistribution that can be achieved (via taxes or voluntary market mechanisms) to potentially lower wage differences. The data in the BIBB/BAuA employment survey do not allow further investigating these relationships and, hence, to find out to what degree members of a society reduce wage differentials we conduct an experimental study, taking the obtained results from the survey data as a starting point. Apart from considering unequal wages between occupational tasks twins, we vary the overall degree of inequality because it may influence the willingness to make direct transfers.

# 3 Experimental design

The second part of the analysis uses experimental data which is collected in a study specifically designed to address our research questions. The study consists of a survey

(administered via an online platform) and, one week later, a laboratory experiment.

### 3.1 Online survey

Completing the online survey was a requirement to participate in the experiment. It took approximately 30 minutes and subjects received €7 for completing the survey (if they showed up at the experiment).

We elicited two measures of cognitive abilities, a language-based test and one that focused on analytic skills. The language test, MWT-B (Lehrl, 2005), includes 37 questions, each consisting of 5 relatively similar words but only one of them actually exists. The subjects' task is to identify the word with a meaning. The difficulty increases over the course of the test. We further used the Raven Advanced Progressive Matrices Test (APM), a well-established measure of mental ability. Since the standard test version contains 48 items and requires 40 to 60 minutes to administer it, we opted for the APMs 20 minute version, consisting of 16 items, in the online survey. This shortened version is seen as an adequate predictor of the general APM score (Hamel and Schmittmann, 2006).

Affinity to social jobs was measured via a tasks preference test. Subjects ranked their interest for 18 different tasks on a scale from 1 to 5 where a value of 5 reflects the highest interest. The tasks come from the official questionnaire of the BIBB/BAuA Employment Survey 2006. This measure closely relates to a popular test for occupational preferences (AIST-R) which builds on the occupational themes by Holland (1973). Out of the available six dimensions by Holland we focused on helpers who belong to the category "social". In our experiment, subjects who rank highest in the available three social tasks (see Section 2.1) are assigned to social jobs.

We also collected information on perceived and ideal income inequality. The questions come from the International Social Survey Programme 2009 (ISSP). First, subjects had to estimate the actual monthly gross wage of six occupations: doctor in general practice, chairman of a large national corporation, shop assistant, unskilled worker in a factory, cabinet minister in the national government, and a kindergarten teacher. Second, subjects responded to the question what persons in these occupations should earn. Next, we asked a battery of questions on attitudes towards inequality. Subjects saw two statements, one on each side, and a scale of 1 to 10 where 1 meant that they agreed completely with the statement on the left and 10 meant that they agreed completely with the statement on the right. One half of the questions come from the World Values

Table 5: Data Sources

| Information | Source |
|---|---|
| *Low inequality distribution* | GER: BIBB/BAuA |
| *High inequality distribution* | USA: CPS |
| *Wage Penalty* | BIBB/BAuA, CPS: 0.5 standard deviations of average wage |
| *Share of social jobs in society* | BIBB/BAuA |
| *Position in income distribution* | Online survey: MWT-B, APM |
| *Preferences for social jobs* | Online survey: Tasks preference test |
| *Social Value orientation* | Online survey: SVO |

Notes: BIBB/BAuA Employment Survey 2006, US Census Bureau Current Population Survey (CPS) 2006.

Survey 2010-2014, we developed the other half that focused on social returns (see Table A.3 for a list of all questions).

Finally, subjects answered the first six items of the social value orientation (SVO) slider measure of Murphy et al. (2011). This basic version of the SVO provides us with a general measure of subjects' social and distributional preferences. An overview of the data sources which were accessed for the design of the experiment is in Table 5. Note that all income data stem from the BIBB/BAuA Employment Survey 2006 or the US Census Bureau Current Population Survey (CPS).

## 3.2 Laboratory experiment

The experiment emulates a real-life income distribution[6] and assigns a subject's position in the income distribution according to the subject's score in the cognitive skills test.[7] We employ a 2x2 between-subjects design. One dimension varies the extent of the *income distribution's inequality*. In the low inequality treatment the income distribution in the experiment corresponds to the German income distribution, while in the high inequality treatment it corresponds to the income distribution of the USA. The second dimension is about the *assignment of subjects to social return jobs*. We use subjects' replies to the online surveys' tasks preferences test to measure subjects' affinity to social jobs. The assignment of subjects to social return jobs is either random or according to their tasks preferences. Then, subjects with the highest scores are assigned to the social jobs (that also match their cognitive skills) and subjects are informed about this procedure in the instructions.

Our "society in the lab" consists of 15 subjects, three in social return jobs and 12 with

[6]The experiment always refers to income. Since there are no other income sources apart from wages, we use the two terms interchangeably in the following sections.

[7]We weighted the verbal and analytical test equally. More specifically, we divided subjects' scores in each test by the session average and added the resulting normalized scores to obtain one cognitive skills score.

jobs that generated only private returns. In the low inequality treatment the distribution of incomes (corresponding to data from the German BIBB/BAuA Employment Survey 2006) is as follows: 1000, 2000, 2000*, 2500, 2500, 2500*, 3000, 3000, 3000, 3000*, 3500, 3500, 4000, 4500, 5000. The stars indicate the position of social return jobs in the distribution which is as well in line with real data. Figures in the experiment are in Experimental Currency Units (ECU). In the high inequality treatment, the distribution of incomes (corresponding to data from the US Census Bureau Current Population Survey 2006) is as follows: 500, 500, 1000, 2000, 2000*, 2500, 2500*, 3000, 3000*, 3500, 4000, 4500, 5500, 7000, 8500. Figure 2 illustrates how the income distribution, the position of social return jobs (green bars) and a subjects own position (red edging) is visualized to subjects in the low inequality treatment (the Figure for the high inequality treatment can be found in Appendix B). In the experiment, having a social return job implies that the subject's income is less than it would be if he or she had a job with private returns only. While they generate social returns to the benefit of the entire society, they suffer from a wage penalty that as a default is set at 500 ECU in the low inequality treatment (1000 ECU in high inequality treatment).[8]

More specifically, occupational tasks twins now become "cognitive ability twins". The cognitive skills test score of the social returns subject with an income of 3000 ECU is similar to the score of subjects at the income level of 3500 ECU. The test score of the social returns subject with an income of 2500 ECU is similar to the score of subjects with "private return only" jobs at the income level of 3000 ECU and the score of the social returns subject with 2000 ECU is similar to the score of subjects with "private return only" jobs at the income level of 2500 ECU.

The experiment lasts for 20 rounds. In each round all subjects choose a tax rate, subjects with social return jobs pick an effort level, all subjects learn about their and other subjects' income (which depends on the implemented tax rate and the extent of social returns generated), all subjects can make transfers to other subjects, and, after learning their income after transfers were made, they are asked about their emotional state.

Subjects select one of four possible proportional tax rates (10, 20, 30, or 40%). The tax rate of one randomly chosen subject is implemented. While the respective tax is deducted from a subject's pre-tax income, each subject also receives an equal share of

[8]The extent of the social return jobs' wage penalty is also in correspondence to real life data, see our empirical analysis of the BIBB/BAuA Employment Survey 2006 in section 2.3. A wage penalty of €500 in the German income distribution is approximately 0.5 standard deviations. Assuming an equal effect of a social return job in the US income distribution results in a wage penalty of $1000.

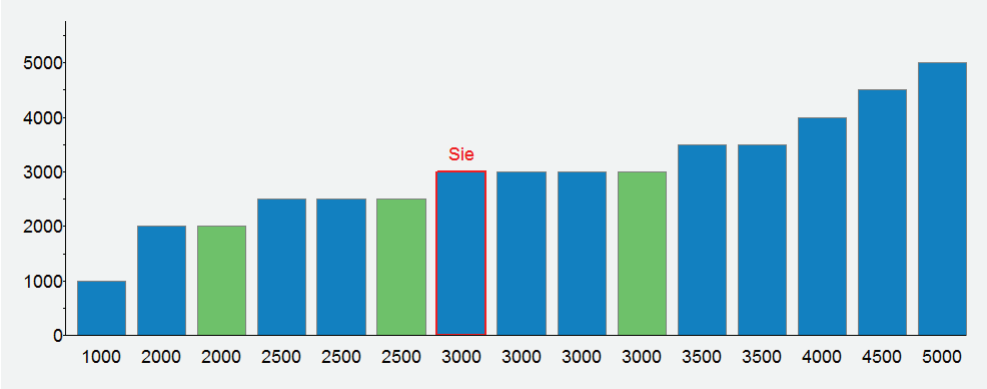



Figure 2: Screenshot of income distribution (low inequality treatment)

the overall generated tax revenue. More specifically, a subject's income after taxes is computed in the following way: the pre-tax income minus the tax rate multiplied with the pre-tax income plus the tax rate multiplied with the pre-tax incomes of all subjects divided by the number of subjects in the society. That is, a subject's income after taxes could be lower/higher than the pre-tax income depending on whether the pre-tax income is above/below the society's average pre-tax income (3000 in the low, 3333 in the high treatment). The effect of taxation is illustrated in the instructions by words, in a formula, and a table (for the four possible tax rates and the available pre-tax income levels, see the Appendix B).

Subjects in social return jobs choose their 'effort' from three levels: 0.5, 1, 1.5. While 1 means the implementation of the default social effort (500/1000 ECU in the low/high treatment), 0.5 means a reduction by 50% and 1.5 an increase of 50%. A choice of 0.5 results in a wage penalty of only 250 ECU and 1.5 in a penalty of 750 ECU (low inequality group). The social effort choices of the three subjects with social return jobs in a society are added and then multiplied by 2 (we assume a positive efficiency factor of social jobs). Every subject in a society benefits equally from the social returns generated, that is, all subjects are paid 1/15 of the overall social returns. In round 11, we introduce two additional options for the social effort: no social effort (0) and an increase of 100% (2). That is, we allow subjects in social return jobs to actually stop providing social effort.

After the tax rate has been chosen and social returns have been generated, subjects see a list with all subjects' incomes after taxes and, in the case of subjects with social return jobs, how much social return they have generated. Subjects can then enter for each subject the amount of ECU that they would like to transfer to this subject. Transfers are voluntary choices and thus can also be zero.

After subjects have learned their final income in the round, we elicit five emotion items. Subjects are asked to indicate on a seven point Lickert scale how much they agree with the following statements: "I am angry about the other participants", "I am content with my income", "I have a bad conscience with respect to the other participants", "I envy the other participants" and "I sympathize with the other participants".

### 3.3 Behavioral predictions

Our "society in the lab" reflects income inequality (based on the different cognitive abilities of subjects). It also features cognitive ability twins, one of them generating social returns at the expense of a privately incurred wage penalty and the other generating only private returns.

How does the society respond to income inequality and unequal pay for equal work? We assume that subjects, on average, have a desire to reduce (i) overall income inequality, and (ii) differences in pay between cognitive ability twins (following the principle equal pay for equal work). In the experiment, we analyze to what extent subjects' willingness to redistribute via voluntary transfers reduces the social pay gap.[9] We expect a positive correlation between transfers received by social return workers and the social effort they exert. Consequently, we also expect a reduction of the social pay gap (given subjects exert social effort). However, the extent of subjects' willingness to compensate is unclear. Therefore, we further test whether voluntary redistribution reaches the level of the incurred wage penalty.

**Prediction 1:** Voluntary transfers to social return workers reduce the social pay gap.

**Prediction 2:** Voluntary transfers to social return workers increase with the exerted social effort.

The extent of income inequality may have an effect on the willingness to compensate workers who generate social returns. High income inequality implies a higher need for social returns in order to provide basic services for the poor (e.g., in the fields of education or health services). Such a high income inequality society would rely more on voluntary transfers to redistribute and, indeed, donations are more prevalent in the

[9] While we focus on the social pay gap, our analysis also considers overall income inequality. Social return subjects 'compete' for redistribution with low income subjects in private return only jobs. Hence, we test the reduction of the social pay gap in the context of general income inequality.

US. Hence, we expect higher transfers in the high inequality society, controlling for the level of social effort and wage penalty.

**Prediction 3:** Ceteris paribus, compensation is more pronounced in the high inequality treatment.

Next, we test whether voluntary transfers are influenced by knowledge about the preferences of workers in social return jobs. Other subjects may anticipate that social return workers derive intrinsic utility if they have an affinity to social jobs. Hence, they may transfer less. When social return jobs are assigned based on subjects' preferences, we expect lower transfers in comparison to a random assignment of subjects to social return jobs because the latter group may be expected to derive less intrinsic utility.

**Prediction 4:** Ceteris paribus, workers in social return jobs receive less transfers if others know that they have a preference for social return jobs.

Finally, based on our analysis of survey data (see observation 3), we expect an emotional reaction among social return workers if their social pay gap persists after redistribution. More specifically, we expect a correlation between their satisfaction level and the transfers that they receive from other subjects. The discontent among social return workers is predicted to be higher, the fewer the rest of the society compensates the wage penalty. Furthermore, we expect a positive correlation between the satisfaction level and the extent of social effort that social return workers exert in the subsequent round.

**Prediction 5:** Satisfaction of social return workers is positively correlated with the reduction of their social pay gap and with the level of social effort they exert in the next round.

## 3.4 Participants and procedures

The experiment was conducted at the University of Jena with 240 students from various disciplines, providing a heterogeneous group of occupational interests. They were invited using the online recruitment system for economic experiments ORSEE (Greiner, 2004). The experiments were computer-based, using z-Tree (Fischbacher, 2007). In

each session, gender composition was approximately balanced. Subjects earned €22 on average including a show-up fee of €2.50 and €7 for the completed online survey. They spent on average 100 minutes in the laboratory. The experiment took place in November 2014 and in September 2015.

Upon arrival in the laboratory, subjects were randomly assigned to a cubicle, where they were instructed about the experiment. Eye contact was not possible during the experiment. Participants were given time to read the instructions and there was enough time to privately ask for clarifications about the instructions. Subjects had to answer several control questions before the experiment started in order to make sure that they understood the instructions properly. At the end of the experiment subjects were paid in cash. Privacy was guaranteed during the payment phase.

# 4 Experimental results

Our analysis of the experimental data begins with an assessment of the perceptions of wage inequality before moving to the descriptive statistics of the choice variables: preferred tax rates, exerted social effort, and voluntary transfers made. Next, we investigate the size of the social pay gap. We then proceed with an in-depth analysis of the generation of social returns and its underlying processes. The last steps consist of an investigation of the willingness to donate and overall changes in income inequality.

## 4.1 Perceptions of income inequality

In the online survey, subjects were asked for their views on different topics related to the income distribution. As Figure 3 shows, they clearly prefer smaller to larger income differences. In addition, they lean towards the statement that individuals in different occupations with highly similar work content should receive the same wage. Finally, they seem to be convinced that workers in social occupations are not paid enough money.

To verify their statements, we analyze subjects' estimates of the real wages (before taxes) and their stated ideal wages (before taxes). For instance, a ratio of 0.3 implies that a factory worker is, on average, estimated to earn 30% of the wage of a chairman. According to Figure 4, on average, subjects wish to decrease overall inequality, illustrated by an increasing ratio from 0.1 to 0.3 between workers with the on average lowest wages (factory worker) and the on average highest wages (chairman). As an example of a social occupation, the survey inquired about wages of kindergarten teachers. Here, respondents

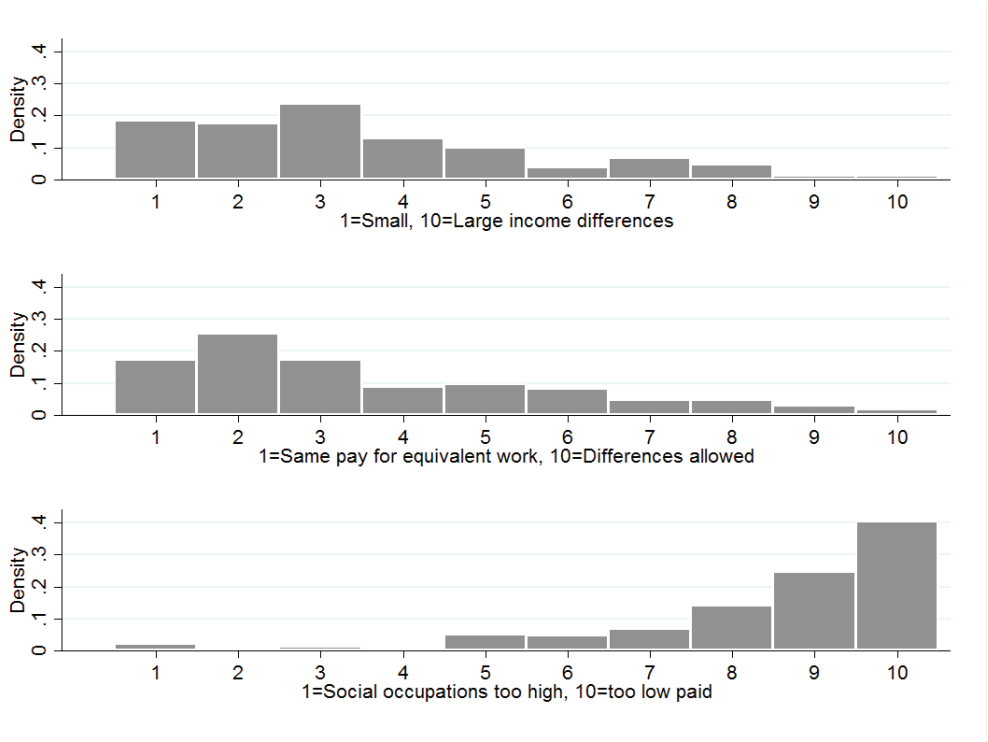



Figure 3: Distributions for survey questions on income differentials

wish to see an increase of from 0.4 to 0.5 when comparing kindergarten teachers to doctors which is the social occupation that requires more training but that is ranked as the social occupation with the highest earnings in the BIBB/BAuA Employment Survey. The occupation that may come a little closer to a kindergarten teacher in terms of the qualification level is a salesperson in a department store. Here, the ratio increases from 1.1 to 1.2, suggesting (i) that kindergarten teachers are expcted to earn more than salespersons and (ii) that this difference should increase even further.[10]

Taken together, evidence from the online survey confirms that individuals tend to prefer lower inequality than they believe exists today. They also wish to see increases in the wage of kindergarten teachers, for instance, in comparison to the wage of salespersons which is an indication for a desire to reduce the social pay gap.

## 4.2 Tax rates, social effort, and received transfers

The average tax rate in the experiment is 30.6% in the low and 31.2% in the high inequality treatment. There is almost no variation over rounds. Subjects tend to choose extremes. Around 50% choose a rate of 40% and around 20% have a preference for

[10] The actual ratios according to the BIBB/BAuA survey are 0.6 for kindergarten teachers and doctors and 1.5 for kindergarten teachers and salespersons. Hence, in both cases, the existing differences are overestimated.

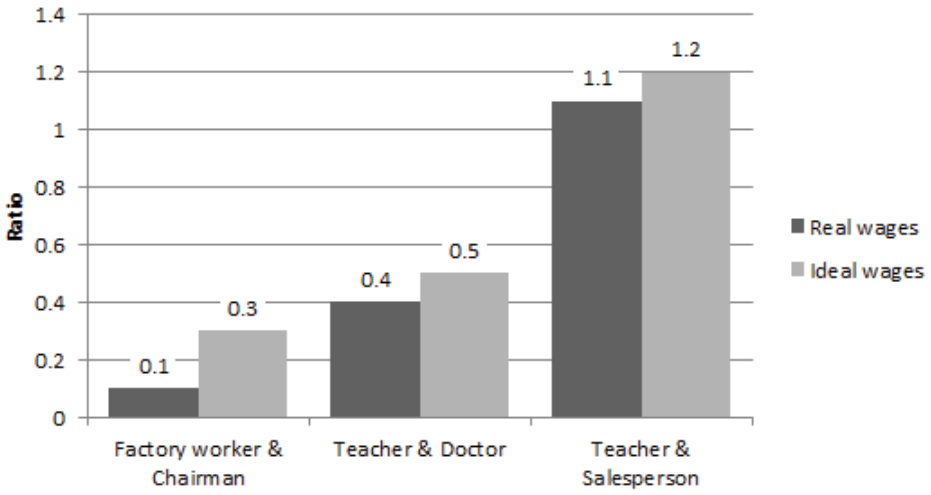



Figure 4: Real and ideal wage ratios for different occupations

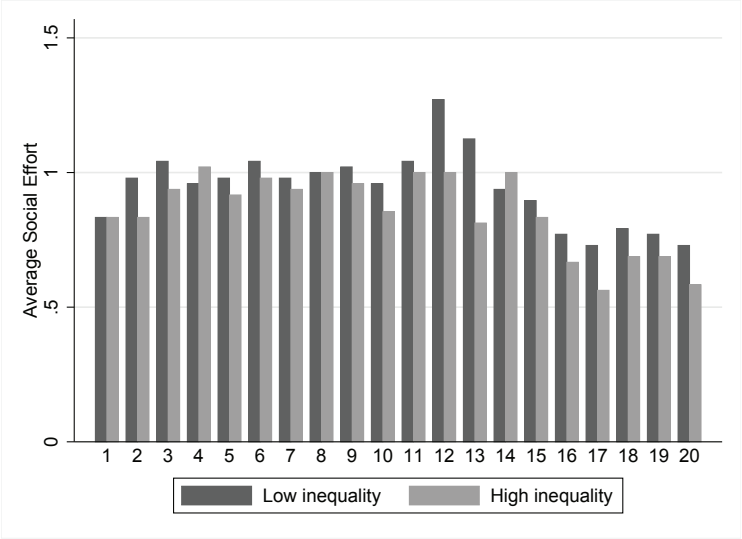



Figure 5: Average social effort over rounds for both inequality groups

a 10% tax. There is a high negative correlation between the preferred tax rate and income. What is the effect of taxation on redistribution? Due to taxation subjects with an income of 2,000 receive, on average, additionally 288 in the low and 415 in the high inequality treatment. Subjects with an income of 2,500 benefit, on average, with 144 in the low and 259 in the high inequality treatment. Subjects with an income of 3,000 neither gain nor lose by design as they are at the mean of the income distribution.

Figure 5 plots the average social effort level by inequality treatments over all rounds. During the first ten periods the social effort subjects in social return jobs exert is, on average, relatively stable. When subjects' choice sets are enlarged (from period 11 onwards), average social effort levels eventually drop substantially.

Table 6 shows summary statistics for the transfers subjects received by income level, inequality treatment, and their job type. Subjects at the lowest income level have by default a neutral job. Independently of the inequality of the income distribution, these subjects receive substantially higher voluntary transfers from other subjects in comparison to subjects with neutral jobs who earn more. In the high inequality treatment also the second lowest income level is by default a neutral job and also these subjects get significantly more. Also other low-earning subjects in neutral jobs receive transfers but not significantly more than the rest of the society. Subjects in social return jobs attract substantial voluntary transfers in both treatments. The average transfer received is negatively correlated with the income level. It seems that subjects in social return jobs with higher income receive lower transfers than those with lower income. Naturally, the individually exerted effort needs to be taken into account for a comprehensive analysis.

Table 6: Mean received transfers by income, inequality, and job type

| | Low inequality | | High inequality | |
|---|---|---|---|---|
| Income | social jobs | neutral | social jobs | neutral |
| 500 | – | – | – | 299.41 (17.37) |
| 1,000 | – | 311.7 (29.45) | – | 87.39 (13.23) |
| 2,000 | 572.06 (44.19) | 48.88 (6.37) | 778.12 (68.68) | 12.36 (1.95) |
| 2,500 | 231.35 (18.66) | 24.51 (2.49) | 485.29 (45.2) | 48.96 (26.55) |
| 3,000 | 196.13 (19.48) | 20.73 (1.94) | 326.04 (36.96) | 11.3 (3.72) |
| 3,000+ | – | 43.03 (9.63) | – | 6.81 (2.14) |

Notes: Standard errors in parentheses.

## 4.3 The social pay gap

From the descriptive analysis we know that workers in social return jobs do exert social effort, albeit a decay over time is noticeable, and that workers at the lowest income level as well as social return workers attract voluntary transfers by other members of the society. We now investigate to what extent social return workers are compensated and whether there are differences across treatments.

The histograms in Figure 6 illustrate the relationship between social effort exerted and transfers received in the low/high inequality treatment. They show the difference between the received transfers and the wage penalty born by a subject, i.e. the chosen social effort level in all periods and for all social returns subjects. The mean wage penalty is 138.18 in the low inequality and 325.39 in the high inequality treatment (both significantly different from zero). In neither treatment social returns subjects are, on average, fully compensated for their social effort by others' transfers. Overall,

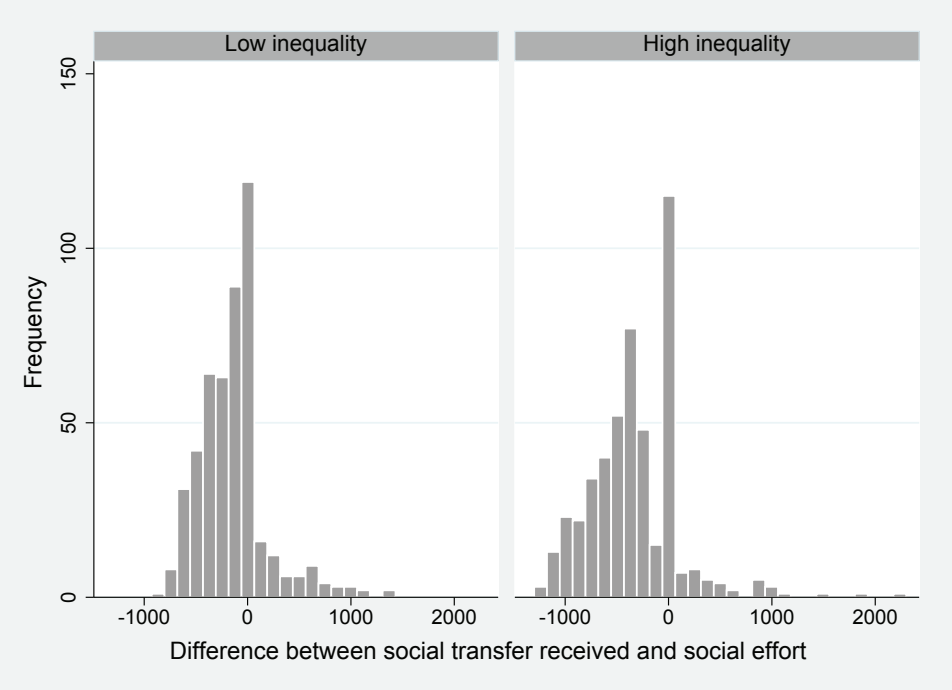



Figure 6: Difference between transfers received and wage penalty born (for all social returns subjects in all periods)

in 22.29% (low) and 17.71% (high inequality treatment) of all choices the transfers received by social returns subjects were higher than the wage penalty they incurred. The distributions' modes are at zero, indicating the high joint prevalence of no social effort provision coupled with no transfers received. When the social effort choice set is relaxed in the second half, it occurred in 21.88% of all observations that social return workers provided no effort (essentially switching to a job without wage penalty) and received no transfers. Summing over all periods, the majority of workers with social return jobs is left with a social pay gap (83.33% in the low and 81.67% in the high inequality treatment).

**Result 1:** The transfers received by workers in social return jobs partly compensate the incurred wage penalty.

Figure 7 shows average transfers received and social effort exerted by social return workers (right panels) over periods. It illustrates that the social pay gap is driven by choices in the first half of the experiment. In the second half of the experiment, when subjects are allowed to choose a social effort level of zero, subjects tend to decide against generating social returns. The average level of social effort provision appears to converge to the average level of transfers received. The social pay gap is reduced, however, at

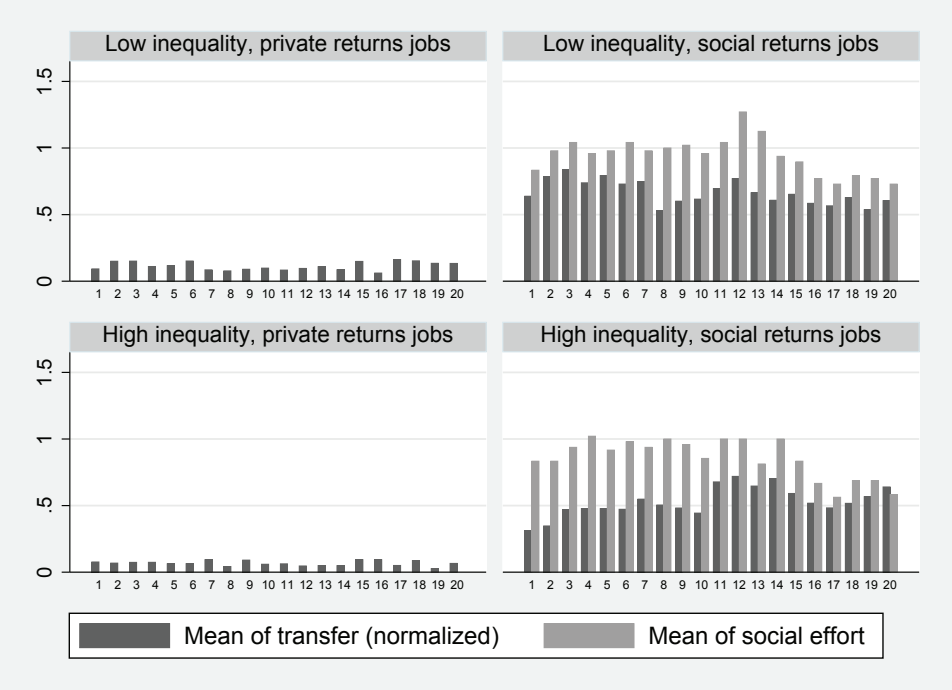



Figure 7: Transfers received (normalized) and social effort over periods and by job type

the expense of social effort provision. In the left panels, Figure 7 shows that the mean transfer received by a worker with private returns only is relatively small and does not really change over time. It seems that money is not channelled to poorer subjects when social return workers reduce their social effort.

In the further analysis we use panel regressions to investigate the dynamics behind the provision of social effort. Standard errors are always clustered at the matching group level (a society of 15 subjects). Table 7 reports the results of a set of random effects regressions with the sum of the transfers a social return subject receives in one period as the dependent variable. In column 1, explanatory variables are the income level, the implemented tax, the exerted social effort, treatment dummies, and a dummy that is one when the period is greater than ten.

We find that the transfers received by a social returns worker are positively correlated with the level of social effort exerted (significant at the 1%-level). The main effect of income is insignificant. The interaction effect is negative and significant at the 1%-level. Hence, there is a negative effect of income only when social effort is exerted. For instance, when two individuals in social return jobs exert the same social effort, the one with the lower income will receive higher transfers (approximately 40% of the income difference). The dummy for the high inequality treatment is positive and significant at the 5%-level.

Table 7: Determinants of transfers received by subjects in social returns jobs

| | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| Income before taxes | 0.0025 | (0.10) | 0.014 | (0.08) | 0.022 | (0.08) |
| Implemented tax | 36.8 | (73.2) | 10.6 | (68.7) | 11.5 | (68.5) |
| Social effort | 1519.8*** | (377.4) | 817.9*** | (281.2) | 830.8*** | (282.3) |
| Income before taxes × social effort | -0.38*** | (0.1) | -0.40*** | (0.1) | -0.41*** | (0.1) |
| High inequality (1=yes) | 245.3*** | (65.1) | -185.7*** | (55.8) | -181.0*** | (54.2) |
| Social job random (1=yes) | 29.0 | (60.6) | 105.1* | (57.3) | 84.1* | (47.9) |
| Periods 11 to 20 (1=yes) | 101.1** | (48.0) | 105.3** | (43.7) | 105.0** | (43.5) |
| Social effort × high inequality | | | 477.4*** | (70.8) | 476.7*** | (70.3) |
| Social effort × social job random | | | | | 23.2 | (55.4) |
| Constant | -528.8 | (332.3) | 93.0 | (218.5) | 72.6 | (213.9) |
| Observations | 960 | | 960 | | 960 | |

Notes: The dependent variable is the transfer received by a social return worker;
standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

**Result 2:** Transfers received by workers in social return jobs are positively correlated with the social effort they exert.

The specification in column 2 adds an interaction term for the high inequality treatment and social effort. We estimate a return of effort provision of 818 (low inequality) which is, however, not significantly higher than 500, the incurred wage penalty of one unit of social effort exerted. Transfers tend to be generally higher in periods 11 to 20. Moreover, the effect of social effort on the received transfer is significantly bigger in the high inequality treatment. The estimated coefficient of 477 is not significantly different (5%-level) from the additional amount of social returns (500) that one unit of social effort generates in the high inequality treatment. The negative coefficient of the high inequality treatment main effect indicates that received transfers are, on average, lower when no social effort is exerted.

**Result 3:** In the high inequality treatment, transfers compensate the wage penalty to similar extents as in the low inequality treatment.

In the specification in column 3 we add an interaction term between the dummy for the social job assignment (random assignment vs. assignment based on tasks preferences) and social effort. The interaction term is not significant and the effect of the social job assignment treatment remains insignificant. Hence, donating subjects do not provide higher monetary compensation to randomly matched workers in social return jobs who may derive less intrinsic utility than those who were matched according to

their social preferences. In a further specification (results available upon request) we add a treatment interaction term which, however, turns out to be insignificant. The other results remain the same.

**Result 4:** Knowledge of the social affinity of social return workers does not reduce transfers.

To summarize, we find that a significant social pay gap remains despite substantial voluntary transfers. How much financial support a social return worker receives strongly depends on the exerted effort but also on the income as poorer ones attract relatively more transfers. Our estimates indicate that effort provision is rewarded adequately (i.e., to similar extent as its cost) by transfers. Nevertheless, during the second half of the experiment, when social returns subjects are essentially free to switch to jobs with private returns only, the average level of social effort provision drops significantly as it seems to converge to the average level of transfers received. Finally, we find no treatment effects of high income inequality or random assignment to task preferences.

## 4.4 The dynamics behind generating social returns

In the following, we further dissect the processes behind exerting social effort. For this purpose, we investigate the relationship between the transfers received by social return workers and their emotional reaction and then the effect of the emotional reaction on the provision of social effort in the subsequent period.

Generally, we find that a social return worker's relative compensation (the difference between transfers received and the wage penalty born) leads to an emotional reaction. In Table 8 we show the results of two random effects regressions for the emotional states of being content (column 1) and angry (2) for social return workers. The extent to which a subject is content is positively correlated to the relative compensation of a worker (significant at the 1%-level). Moreover, we find a positive correlation between being content and the income (before taxes) as well as the implemented tax level. The level of anger a subject reports is negatively correlated with the relative compensation and the implemented tax (both at the 1%-level). Social return subjects report higher anger levels in periods 11 to 20 (5%-level).

Columns 3 (being content) and 4 (anger) report results for subjects in jobs with private returns only. The income before taxes is positively correlated with being content

and negatively with anger (both at the 1%-level), while the tax rate is negatively correlated with being content and positively with anger (both at the 10%-level). We also find a positive correlation of the extent of social returns generated with being content and a negative one with anger. The received transfers are positively correlated with being content and negatively with anger. Reported anger levels are higher in periods 11 to 20 and content levels are lower.

Table 8: Relationship between transfers received and emotional states

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Difference transfer social effort | 0.0017*** | -0.0012*** | | |
| | (0.0003) | (0.0003) | | |
| Income before taxes | 0.0014*** | -0.00016 | 0.00070*** | -0.00026*** |
| | (0.0004) | (0.0005) | (0.00006) | (0.00007) |
| Implemented tax | 1.36*** | -1.07*** | -0.31* | 0.40* |
| | (0.3) | (0.3) | (0.2) | (0.2) |
| Social return | 0.000028 | -0.00011 | 0.00018*** | -0.00017*** |
| | (0.00007) | (0.00009) | (0.00002) | (0.00003) |
| Social job random (1=yes) | 0.088 | 0.025 | 0.13 | 0.15 |
| | (0.5) | (0.3) | (0.3) | (0.2) |
| High inequality (1=yes) | 0.25 | -0.44 | -0.68*** | 0.25 |
| | (0.5) | (0.4) | (0.3) | (0.2) |
| Periods 11 to 20 (1=yes) | -0.083 | 0.31** | -0.11*** | 0.28*** |
| | (0.1) | (0.1) | (0.04) | (0.06) |
| SVO angle | 0.014 | -0.0071 | 0.0023 | 0.0036 |
| | (0.02) | (0.01) | (0.01) | (0.006) |
| Transfers received | | | 0.00031** | -0.00063** |
| | | | (0.0001) | (0.0002) |
| Constant | -0.12 | 3.98*** | 2.84*** | 3.01*** |
| | (1.3) | (1.3) | (0.5) | (0.6) |
| Observations | 960 | 960 | 3840 | 3840 |

Notes: The dependent variable is either being content (columns 1 and 3) or anger (2 and 4); columns 1 and 2 report results for social returns workers, 3 and 4 for workers in jobs with private returns only; standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Finally, we look at the determinants of the social effort choice. Table 9 reports the results of two random effects regressions. Explanatory variables are the emotional state of being content[11], the income level, treatment dummies, and a dummy that is one when the period is greater than ten. In specification 1 we find a positive correlation between being content in the previous round and the social effort choice (significant at the 5%-level). The dummy for periods 11 to20 is negative and also significant at the

[11] Generally, the elicited emotional states are relatively similar (correlations are significant at the 1%-level). Cronbach's $\alpha$ equals 0.6 (with anger and envy reversed) indicating that the scale reliability of a joint emotional response item would not be sufficient. Hence, we only use one of the items (being content) in the following regressions.

5%-level. Specification 2 adds the social value orientation of a subject. Social effort choices are not correlated with subjects' distributional preferences, while the effect of the emotional state remains.

Table 9: Determinants of social effort

| | (1) | | (2) | |
|---|---|---|---|---|
| Content (previous period) | 0.035** | (0.02) | 0.035** | (0.02) |
| Income before taxes | -0.00015 | (0.0002) | -0.00015 | (0.0002) |
| Social job random (1=yes) | -0.036 | (0.1) | -0.038 | (0.1) |
| Periods 11 to 20 (1=yes) | -0.13** | (0.06) | -0.13** | (0.06) |
| High inequality (1=yes) | -0.091 | (0.1) | -0.090 | (0.1) |
| SVO angle | | | 0.0021 | (0.005) |
| Constant | 1.35*** | (0.5) | 1.29*** | (0.5) |
| Observations | 912 | | 912 | |

Notes: The dependent variable is the social effort exerted;
standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

To summarize, these results indicate that workers in social return jobs are emotionally affected by the relative monetary compensation they receive for their social effort exerted. Lack of compensation, as perceived by them, leads to discontent and a subsequent reduction of their social effort engagement. In other words, when the social pay gap is too large (for cognitive ability twins), the incentives to perform well in social jobs decrease. This results in a significant drop of social effort provision as a substantial fraction of social return workers decides to switch to private return only jobs (by exerting zero social effort).

**Result 5:** The social pay gap leads to discontent among social return workers and a drop in social effort provision.

## 4.5 Willingness to donate

After investigating the receiving end of transfers, our analysis shifts now to those subjects making transfers. We therefore look at the determinants of donations in order to improve our understanding of what explains donating behavior in this setting.

Table 10 shows the results of a set of Tobit random effects regressions. The dependent variable is the sum of transfers a subject made in one period. Explanatory variables are the initial income, the tax level, anger measured in the previous period, the generated social returns in the current period, a dummy variable that is one when the subject is a social return worker, treatment dummies, and a dummy that is one when the period

is greater than ten.

In specification 1, we find a positive correlation between the donated amount and the income as well as the implemented tax level (significant at the 1%-level), while the interaction term is significantly negative The interaction between these two explanatory variables is significantly negative, implying a reduced willingness to donate of high income subjects if a high tax rate had been chosen. Measured anger is negatively correlated with donations (5%-level) and the generated social returns are positively correlated (1%-level). The dummy for periods 11-20 is positive and significant at the 5%-level. Treatment dummies are not significant. The interaction term between the generated social returns and the treatment dummy *Social Job Random* is also insignificant, another indication that subjects do not seem to react to the variation of the assignment of social return jobs.

Specification 2 adds two variables that measure subjects' attitudes towards the principle equal pay for equal work. *Social occupations pay* expresses to which degree subjects believe workers in social occupations are not paid enough. *Ideal minus real wage* is the difference between the ideal and estimated real wage ratio of teachers and salespersons. None of them is significant. It appears that subjects who expressed a dislike of a social pay gap are not necessarily doing something about it with their own money.[12] Instead, as specification 3 shows, subjects' distributional preferences, measured via the SVO, seem to be a determinant of making donations.

Overall, income after taxes appears to be a major factor for donating. We also find that subjects respond to the extent of social returns generated. Moreover, their emotional state has an impact on their willingness to donate. The angrier subjects are, the less they transfer voluntarily.

Taken together with the findings on the dynamics behind generating social returns, we find evidence of a downward spiral that leads to a decrease of social effort. A lack of social returns triggers anger of other workers and subsequently lower donations. Simultaneously, a lack of donations for exerted social effort leads to discontent among social return workers and a reduction of their social effort engagement. The downward spiral kicks in when subjects in social return jobs are not forced to keep their social jobs anymore. Towards the end of the experiment, social effort and donations converge at a

[12]The insignificant coefficients of the survey questions may also be driven by the following reasons. The variable *Ideal minus real wage* builds on participants' guesses and wishes for wages of two occupations. However, the wage distribution in the experiment may not mirror the guesses nor the wishes for the income distribution mentioned by the participants. Hence, the question may not be applicable to our specific experimental context. The insignificant coefficient of *Social occupations pay* may be due to a lack of variation as most observations cluster at one end of the distribution (see Figure 3).

Table 10: Determinants of donations

| | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|
| Income before taxes | 0.22*** | (0.02) | 0.21*** | (0.02) | 0.21*** | (0.02) |
| Implemented tax | 737.5*** | (96.3) | 737.9*** | (96.3) | 735.2*** | (96.3) |
| Income before taxes × implemented tax | -0.32*** | (0.03) | -0.32*** | (0.03) | -0.32*** | (0.03) |
| Anger (previous period) | -11.9** | (4.9) | -11.9** | (4.9) | -11.7** | (4.9) |
| Social returns | 0.023*** | (0.005) | 0.023*** | (0.005) | 0.023*** | (0.005) |
| Periods 11 to 20 (1=yes) | 21.0** | (10.6) | 21.0** | (10.6) | 20.9** | (10.6) |
| Social return job (1=yes) | -125.0* | (69.6) | -136.1* | (70.6) | -124.7* | (67.9) |
| High inequality (1=yes) | -29.2 | (55.1) | -32.9 | (55.3) | -43.7 | (53.2) |
| Social job random (1=yes) | 92.9 | (61.8) | 90.3 | (61.9) | 90.5 | (60.0) |
| Social returns × Social job random | 0.0039 | (0.007) | 0.0038 | (0.007) | 0.0040 | (0.007) |
| Social occupations pay | | | 3.24 | (13.5) | 1.19 | (13.0) |
| Ideal minus real wage | | | 63.5 | (70.1) | 44.8 | (67.3) |
| SVO angle | | | | | 10.2*** | (2.2) |
| Constant | -639.3*** | (139.6) | -653.5*** | (173.3) | -897.0*** | (175.1) |
| Observations | 4560 | | 4560 | | 4560 | |

Notes: Random-effects Tobit models; 2,152 left-censored observations; the dependent variable is the sum of donations made; standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

'low' equilibrium as social effort levels drop to the level of transfers.

## 4.6 Changes in income inequality

As the final step of our analysis, we compare changes in the income distribution in the two inequality groups. This illustrates how inequality changes by the means of taxes and transfers.

Figure 8 shows the Lorenz curves for the initial income as well as income after taxes and after transfers. Each type of redistribution leads to a reduction of the overall income inequality. It appears that the reduction is larger in the high inequality group when compared to the low inequality group. For an easier comparison, we additionally calculate Gini coefficients for the different income variables and inequality groups. Table 11 shows the Gini coefficients at different stages of the experiment. For the initial income, inequality is twice as large in the high inequality group when compared to the low inequality group. The Gini coefficients then decrease from the initial income to the income after taxes and even further to the income after transfers. For the low inequality group the total amount corresponds to a decrease of around 27.78% and for the high inequality group of 38.89%, leading the groups to become more similar in terms of their distribution.

These results show that individuals indeed redistribute in ways that decrease inequality and that they do not exclusively rely on taxes but additionally make use of transfers to achieve this goal. It is interesting to note that transfers reduce inequality

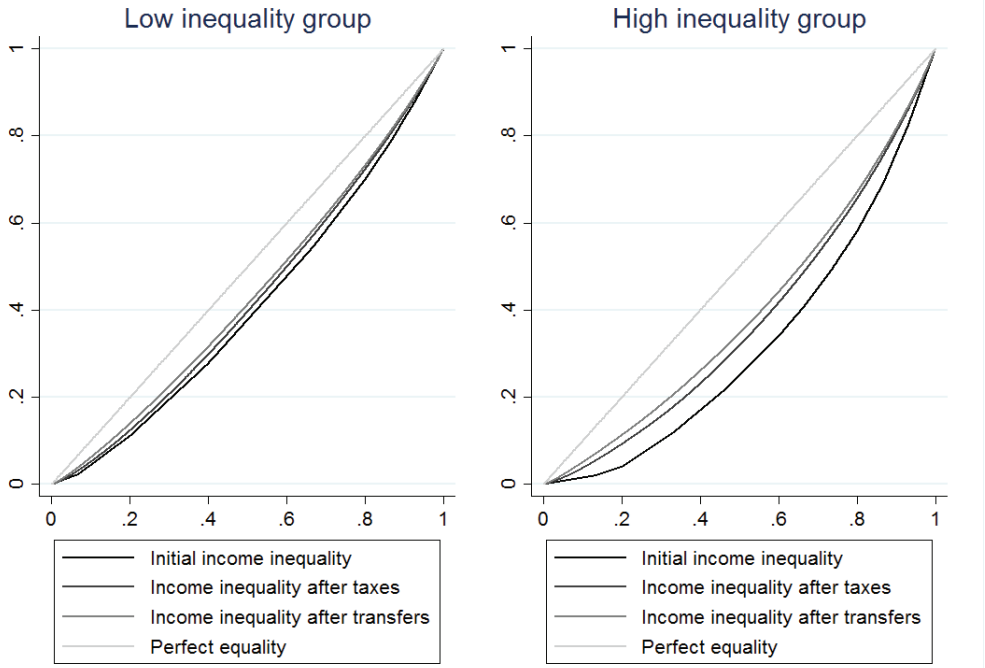



Figure 8: Lorenz curves for income distribution at different stages of the experiment

Table 11: Gini coefficients for different income variables

| | M | |
|---|---|---|
| | Low inequality | High inequality |
| Initial Income | 0.18 | 0.36 |
| Income after taxes | 0.15 | 0.25 |
| Income after transfers | 0.13 | 0.22 |

Source: Own calculations for experiment.

by 13.34% (low inequality group) or 12% (high inequality group) points, suggesting in line with the previous results that the way that donations are allocated between richer and poorer individuals are related across treatment groups and less influenced by the overall degree of inequality. On an aggregate level, participants seem to follow up on their answers in the online survey regarding the goal to decrease income inequality.

# 5 Conclusions

Equal pay for equal work or work of equal value is a basic right in many countries but the German case shows that this principle is violated for social occupations. Using tasks data, we find large wage differences of around 0.5 standard deviations for occupational tasks twins, corresponding to a wage penalty of approximately €500. The failure of the

labor market to take the positive externalities of social occupations into account could have negative long term effects for society as social return workers may decide to stop bearing a wage penalty, resulting in their exit from social occupations in favor of private sector work. However, hypothetically, the social pay gap might be evened out via an additional market mechanism (donations) and, thus, society would remain in balance.

In our experimental study, subjects decrease both overall inequality and the social pay gap through voluntary transfers but, despite their social efforts, subjects in social return jobs continue to earn less than their cognitive ability twins. Furthermore, there is evidence of a downward spiral as subjects in social return jobs reduce effort levels in response to low donations and donors reduce transfers in response to low effort levels. Low satisfaction levels among subjects in social return jobs and high anger levels among donors appear to partly drive this development. The results hold irrespective of the overall level of inequality (high/low) and the assignment procedure into social jobs (randomly/based on preferences).

Our findings suggest that a market mechanism in the form of voluntary transfers is only capable of reducing but not eliminating the social pay gap. As voluntary transfers to compensate social return workers are not sufficient to keep them satisfied, social return workers leave for the private sector where they do not incur a wage penalty. We tentatively conclude that a market approach — donations to those in need — is not sufficient to level out the social pay gap. Other approaches seem necessary in order to keep social occupations attractive enough and avoid the erosion of public capital. This is in line with Stiglitz (2012) who argues that pay differentials between occupations have grown too large, inducing the need for government intervention. In this respect, our findings also relate to the recent discussion on inequality and how much of it a society can take, as recently initiated by Piketty (2014).

Note that our experimental test of whether a donations market can close the social pay gap is conservative in several aspects. First, redistribution is relatively easy as donations are possible by just a mouse click. Second, one of our experimental conditions simulates a high inequality society based on the income distribution of the USA, a country that relies more than others on the 'donations market' to keep inequality at bay. This may lead to a more pronounced willingness to donate among the population. However, we do not find behavioral differences. Third, the recent stream of articles on the scope of markets (Sandel, 2012, 2013; Besley, 2013; Bruni and Sugden, 2013; Falk and Szech, 2013) discusses whether, in certain domains, efficiency improving markets

commodify behavior, resulting in a depletion of social norms and a crowding out of intrinsic motivations. Hence, the identified effect probably would have to be discounted as in the experiment social returns are not generated via personal interaction, for instance, like caring for or helping an individual. Instead, the experiment directly elicits the willingness to generate social returns. Thus, our study cannot take the potential crowding out of social values/activities fully into account.

To overcome some limitations of our study, in further research one may consider putting additional effort into creating an experimental environment that allows a direct social interaction which could more closely resemble the benefits generated by real life social return workers. In addition, for a direct test of the theory of comparable worth, one could include gender references in the experiment and compare how behavior differs from a gender-neutral environment. Regarding the measurement of the social pay gap, the size of the wage penalty cannot be extended beyond the context of this study. It would thus be interesting to repeat the analysis for other countries that have tasks data available while simultaneously considering a refined measure that considers variables such as responsibility or work schedules.

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# A Appendix

## Measuring job content with tasks and skills

Tasks sets of occupations are determined with a set of questions from the BIBB/BAuA Employment Survey 2006 that includes 31 tasks (for details on questionnaire, see Rohrbach-Schmidt, 2009 and for the computational method Bublitz, 2015).

Part one consists of 17 job tasks (questions F303-F319) where respondents are asked: "Please remember your current job as a <...>. I will name some selected job tasks. Would you please tell me how frequent these tasks appear in your job?" (Rohrbach-Schmidt, 2009) Answers are given on a frequency scale, with (1) never, (2) sometimes, and (3) frequently. Another included task is taken from question F301, which asks about the respondent's managerial responsibility, with the answers being coded as none, responsibility for 10 or less employees, or responsibility for more than 10 employees. Part two includes 13 specific subject areas (questions F403_1 - F403_13). Respondents are asked: "I will now read several skills in specific subject areas (German: Kenntnisgebiete) to you. Please tell me for each of these skills whether you require them in your current job as a <...>, and, if yes, whether you require basic or "expert"/specialized skills (German: Fachkenntnisse)? In the case that you require "expert" skills only for a sub domain within a specific subject area, nevertheless please state that you need "expert" skills." This question is followed by an item battery that requests the respondent to answer by using the following rating scale: (1) no such skills required, (2) basic, (3) expert/specialized. Note that the German word here can be translated as either skills or tasks. In addition, the context of the question asks for those skills that are actually applied in the current job and that therefore can be taken to be equivalent to tasks. In the following analysis, we weigh subject areas according to the level to which they are required because it will help distinguish between occupations with similar subject areas but different education levels (e.g., medicine for doctors and nurses).

Our data consist of 17,969 observations that can be categorized into 263 occupations and on which we run a principal factor analysis. The uniqueness of the variables and the Kaiser-Meyer-Olkin measure confirm that the variables need to be summarized into seven factors, which account for around 91% of total variance (compared to 74% in the principal component analysis). See also Tables A.1 and A.2.

# B Appendix

## Experimental instructions

**Welcome and thank you for participating!** In this experiment you can earn money depending on your decisions and the decisions of the other participants. **Therefore, it is very important that you read the instructions carefully.**

Please note that these instructions are directed to you only and you are not allowed to exchange any information with the other participants. Also, you may not talk to other participants during the whole experiment. Whenever you have questions please raise your hand. We will come to your place and answer your question. Please never ask your question(s) aloud. In the case you break these rules, we will have to end the experiment. Please switch off your mobile phones now.

*GENERAL PROCEDURE*

The experiment will take around 60 minutes. All decision situations will be shortly explained on your screen again. You can earn a monetary amount in this experiment. Your earnings will be stated in ECU (Experimental Currency Units) with an exchange rate of 500 ECU = 1 EURO. At the end of today's session your earnings in ECU will be converted to EURO and will be paid to you in cash. You will receive a basic payment of 2.50 EURO for participating in this experiment as well as 7 EURO for filling out the online questionnaire completely. Your earnings from this experiment depend on your decisions and possibly on the other participants.

After filling out a questionnaire you will have reached the end of the experiment and you will receive your payment.

Here is another overview of the procedure:

- reading the instructions, answering the control questions (online)
- decision situations (20 rounds)
- questionnaire
- payment and end of the experiment

*DETAILS OF THE PROCEDURE*

*Income*

The experiment consists of 20 rounds. In each round you will receive an income. **The amount of your income is based on your answers in a cognitive skill test.** This

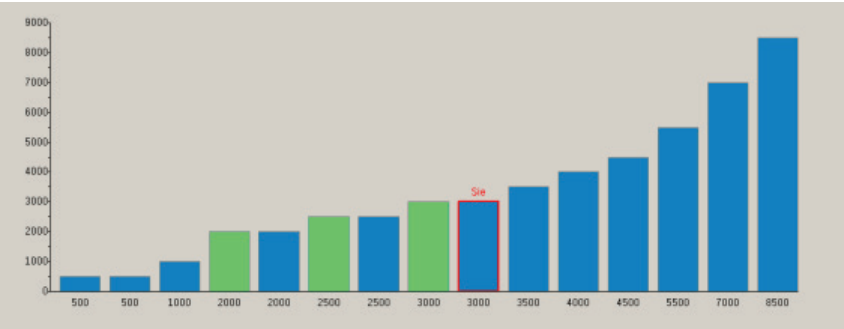


Figure A.1: Screenshot of income distribution (high inequality treatment)

test was part of the online questionnaire and consisted of a linguistic and an analytical part. The participant with the lowest test score will receive the lowest income and the participant with the highest score will receive the highest income. In the experiment 15 participants represent a society. The distribution of income varies from 1000 ECU (500 in high inequality) to 5000 ECU (8500 in high inquality). At the beginning of the experiment you will see your own income as well as the other participants' income.

*Types of participants*

In this experiment there will be two types of participants: X and Y

- X participants receive an income corresponding to their cognitive skills. There will be 12 X participants in the society.
- The income of the Y participants will be lower than their cognitive skills would indicate. **The reason for this is because Y participants will generate a social return with their skills of which the society will profit (all 15 participants).** The additional value will be twice as big as the income losses of a Y participant. For example, the society will have an extra profit of 1000 ECU (which will be distributed equally between all members) if the income of participant Y is 500 ECU lower than his score in the cognitive skill test would suggest. There are 3 Y participants in the society.

**Whether you will be participant X or Y in this experiment will be decided randomly.** In the experiment you will see the income distribution of the society as well as your own position (outlined in red) in it. Additionally, you will see how much the Y participants get (marked with a green green color in the experiment) (see Figure 2).

*Social return*

Participants Y can influence the social return they generate. They can decide between

different levels of effort:

- A low level of effort corresponds to an income loss of 250 ECU and a social return of 500 ECU
- A medium level of effort corresponds to an income loss of 500 ECU and a social return of 1000 ECU
- A high level of effort corresponds to an income loss of 750 ECU and a social return of 1500 ECU

A high level of effort implies a reduced income for Y but also a higher social return. Accordingly, a low level of effort implies a higher income for participant Y but also a lower social return.
All participants will profit from the social return, meaning that all participants (whether X or Y) will receive an equal share. For example, if all three participants Y decide in favor of the medium effort a social return of 3000 ECU will be generated and all participants will receive 200 ECU.

*Tax rate*
All participants will be asked to decide which tax rate they prefer. They can choose between a tax rate of 10, 20, 30, or 40%. For example, a tax rate of 20% implies that 20% will be subtracted from the income of each participant and will be added to a common pool. The ECU amount in the common pool will be distributed equally between all participants.
In the following table you can see the income before and after taxes for each of the different tax rates: (see Table A.4)
**If you have a "low" income, taxes will be subtracted from your income (according to the chosen tax rate) but you will also get a higher income due to the tax redistributions.** After each participant decided for a tax rate, the computer will randomly select a participant. The tax rate this participant has chosen will then be applied. No one will know which participant set the tax rate.

*Option to make transfers*
After the social return has been determined (depending on the level of effort of the Y participants) and the tax rate has been set each participant will know his income after taxes as well as the amount he receives due to the social return. Additionally, the income

of the other participants and the social returns generated by the Y participants will be shown.

**Now all participants have the option to make voluntary transfers to other participants.** If you want to send a transfer to another participant the amount will be subtracted from your own income and added to the other participant's income.

*Earnings*

At the end of each round your earnings will be shown. As described above your earnings consist of the following parts:

- e: your income as defined by the cognitive skill test
- E: The total income of all 15 participants as the sum of the income of all participants
- s: the tax rate which can be 0.1, 0.2, 0.3, or 0.4
- M: the social return generated by Y
- T: the transfers that were sent to other participants
- D: the transfers you received from other participants
- A: the level of effort (only for participant Y)

$$\text{earnings} = e * (1\text{-}s) + E * s \;/\; 15 \;\; A + M/15 \;\; T + D$$

*Final payoff (2 of 20 rounds)*

For your final payoff only two of the 20 round will be relevant. These rounds will be selected randomly (one of the first 10 rounds, one of the last 10).

Table A.1: Results from the factor analysis

| | Question | Task Description | **Factor 1** *intellectual* | **Factor 2** *technological (manual)* | **Factor 3** *commercial* | **Factor 4** *health* | **Factor 5** *instruction* | **Factor 6** *production* | **Factor 7** *protection* | **Uniqueness** |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | F301 | Managerial responsibility | 0.2439 | 0.2189 | 0.1294 | 0.0062 | 0.3272 | 0.0982 | 0.3166 | 0.4639 |
| 2 | F303 | Producing, manufacturing goods | -0.3012 | 0.3806 | -0.1263 | -0.118 | -0.1072 | 0.66 | -0.1232 | 0.2649 |
| 3 | F304 | Measuring, testing, quality control | -0.0658 | 0.6795 | -0.0757 | 0.014 | -0.0126 | 0.5492 | -0.0057 | 0.1743 |
| 4 | F305 | Operating, monitoring machines | -0.2085 | 0.5022 | -0.3497 | -0.0053 | -0.1467 | 0.4749 | 0.3422 | 0.1836 |
| 5 | F306 | Repair (machines) | -0.3012 | 0.8141 | -0.0396 | -0.0185 | 0.0033 | 0.0771 | 0.0838 | 0.2106 |
| 6 | F307 | Purchase, procure, selling | 0.089 | 0.0448 | 0.8423 | 0.2124 | 0.0525 | -0.0469 | -0.0598 | 0.1876 |
| 7 | F308 | Transport, stock, shipping | -0.3948 | 0.2878 | 0.2247 | -0.0128 | -0.1516 | 0.1391 | 0.2517 | 0.5125 |
| 8 | F309 | Advertising, Marketing, PR | 0.3432 | -0.2568 | 0.5777 | 0.1051 | 0.3065 | -0.0769 | -0.0696 | 0.2829 |
| 9 | F310 | Organization, planing other peoples work processes | 0.4449 | 0.153 | 0.2553 | 0.1404 | 0.3641 | -0.0038 | 0.0618 | 0.3098 |
| 10 | F311 | Develop, research, design | 0.5952 | 0.3067 | 0.0227 | 0.0509 | 0.201 | 0.0604 | -0.3565 | 0.2231 |
| 11 | F312 | Teaching, educating | 0.3344 | 0.0482 | 0.0991 | 0.3237 | 0.762 | -0.0162 | 0.0448 | 0.1668 |
| 12 | F313 | Collecting information, investigating, documenting | 0.807 | -0.097 | 0.1698 | 0.2348 | 0.2304 | -0.1462 | 0.09 | 0.1325 |
| 13 | F314 | Advicing, informing, consulting | 0.5169 | -0.0634 | 0.5386 | 0.2267 | 0.3479 | -0.232 | 0.0397 | 0.1818 |
| 14 | F315 | Serving, accomodating, meals preparation, entertaining | -0.1719 | -0.2677 | 0.2737 | 0.2724 | 0.2103 | 0.0891 | 0.0819 | 0.4466 |
| 15 | F316 | Caring, curing, healing | -0.0099 | -0.0988 | 0.1005 | 0.8696 | 0.24 | -0.0007 | 0.0785 | 0.144 |
| 16 | F317 | Protecting, guarding, observing, controlling traffic | -0.0435 | 0.2705 | -0.1654 | 0.2385 | 0.0761 | -0.0783 | 0.656 | 0.3847 |
| 17 | F318 | Working with computer (frequency) | 0.853 | -0.1693 | 0.0536 | 0.0103 | 0.0277 | 0.0653 | 0.0688 | 0.1758 |
| 18 | F319A | Cleaning, waste disposal, recycling | -0.6383 | 0.2619 | 0.0337 | 0.19 | -0.0728 | 0.2938 | 0.1177 | 0.2272 |
| 19 | F403_01 | Natural science knowledge | 0.4625 | 0.3428 | 0.1559 | 0.4669 | 0.0877 | 0.0231 | -0.0063 | 0.2779 |
| 20 | F403_02 | Manual (artisan) knowledge | -0.3026 | 0.8792 | 0.001 | -0.0383 | 0.0107 | 0.0596 | -0.0449 | 0.1144 |
| 21 | F403_03 | Pedagogy knowledge | 0.2934 | -0.0877 | 0.198 | 0.4392 | 0.7195 | -0.1399 | -0.0456 | 0.1113 |
| 22 | F403_04 | Law knowledge | 0.4867 | -0.137 | 0.303 | 0.2365 | 0.2371 | -0.3235 | 0.2722 | 0.2048 |
| 23 | F403_05 | Project management knowledge | 0.7587 | 0.0291 | 0.2678 | 0.0286 | 0.242 | -0.1533 | -0.1069 | 0.1444 |
| 24 | F403_06 | Medical, care related knowledge | 0.0688 | -0.0328 | 0.1238 | 0.8668 | 0.1487 | -0.0519 | 0.0361 | 0.1952 |
| 25 | F403_07 | Layout, design, visualization knowledge | 0.6139 | 0.0036 | 0.3015 | -0.0388 | 0.2608 | -0.0477 | -0.3223 | 0.2246 |
| 26 | F403_08 | Math, advanced calculus, statistics knowledge | 0.4501 | 0.5195 | 0.2907 | -0.0919 | 0.1264 | 0.0309 | 0.016 | 0.2359 |
| 27 | F403_09 | German language, writing, grammar knowledge | 0.7319 | -0.1768 | 0.2531 | 0.1229 | 0.2442 | -0.1543 | -0.0247 | 0.1805 |
| 28 | F403_10 | Computer knowledge in application software (level) | 0.7791 | 0.0448 | 0.1535 | -0.0814 | 0.0512 | -0.095 | -0.0237 | 0.3133 |
| 29 | F403_11 | Technological knowledge | 0.2522 | 0.8844 | -0.097 | -0.0591 | -0.0386 | 0.0545 | 0.1007 | 0.1041 |
| 30 | F403_12 | Business and commercial knowledge | 0.4815 | -0.1504 | 0.7254 | 0.0378 | 0.0904 | -0.0633 | -0.0326 | 0.1372 |
| 31 | F403_13 | Foreign languages knowledge | 0.7379 | -0.1288 | 0.1282 | 0.1121 | 0.1447 | -0.0614 | -0.0221 | 0.2848 |
| | | Variance (after orthogonal variance rotation) | 7.09028 | 4.14893 | 2.82412 | 2.49757 | 2.14063 | 1.39087 | 1.12365 | |

Table A.2: Ranking of occupations for seven factors

| Occupations with highest score | Occupations with lowest score |
|---|---|
| FACTOR 1: Intellectual | |
| Other production engineers | Helpers and cleaners in offices, hotels and other establishments |
| Mechanical engineers | Building structure cleaners |
| Computer assistants | Domestic helpers |
| Mining engineers, metallurgists, and related professionals | Upholsterers and related workers |
| Electronics engineers | Roofers |
| FACTOR 2: Technological | |
| Aircraft engine mechanics and fitters | Meat-processing-machine operators |
| Industrial machinery mechanics and fitters | Judges |
| Shoe makers and related workers | Data entry operators |
| Structural metal preparers and erectors | Real estate agents and administrators |
| Optometrists and opticians | Personal care and related workers not elsewhere classified |
| FACTOR 3: Health | |
| Dentists | Real estate agents and administrators |
| Medical doctors | Accounting and bookkeeping clerks |
| Veterinarians | Home loan bank clerks |
| Nursing associate professionals | Bookkeepers |
| Physiotherapists and related associate professionals | Banking experts |
| FACTOR 4: Commercial | |
| Shop salespersons and demonstrators | Judges |
| Optometrists and opticians | Plant security officers, detectives |
| Personal care and related workers not elsewhere classified | Data entry operators |
| Filling station attendant | Metal finishing-, plating- and coating-machine operators |
| Druggist | Mineral-ore- and stone-processing-plant operators |
| FACTOR 5: Instruction | |
| Secondary education teaching professionals* ("Fachschul-, Berufsschul-, Werklehrer") | Personal care and related workers not elsewhere classified |
| Secondary education teaching professionals* ("Real-, Volks-, Sonderschullehrer") | Farmhands and laborers |
| Pastor | Translators and interpreters |
| Secondary education teaching professionals* ("Gymnasiallehrer") | Other beverage machine-operators |
| Secondary education teaching professionals* ("Lehrer für musische Fächer") | Judges |
| FACTOR 6: Production | |
| Dairy-products-machine operators | Legal and related business associate professionals |
| Paper-products-machine operators | Crane operators |
| Mineral-ore- and stone-processing-plant operators | Building frame workers |
| Fiber-preparing-, spinning- and winding-machine operators | Judges |
| Rolling-mill operators | Building construction laborers |
| FACTOR 7: Protection | |
| Locomotive engine drivers | Florist |
| Safety inspectors | Jewelry and precious metal workers |
| Dairy-products-machine operators | Upholsterers and related workers |
| Ships' deck officers | Tailors and dressmakers |
| Plant security officers, detectives | Draftspersons |

Notes: Source: Own calculations with BIBB/BAuA Employment Survey 2006. The translations correspond in the majority of cases to the ISCO88 labels.

* The German classification includes a very detailed classification of teachers because of the diversified German school system for secondary education. While the age of students will be roughly the same in all school types, the intellectual requirements and the educational focus differ.

Table A.3: Questions on inequality preferences from online survey

- (a) Incomes should be made more equal. (b) We need larger income differences as incentives for individual effort
- (a) Government should take more responsibility to ensure that everyone is provided for. (b) People should take more responsibility to provide for themselves.
- (a) People can only get rich at the expense of others. (b) Wealth can grow so theres enough for everyone.
- (a) The government should achieve a just income distribution via taxes. (b) The income distribution should be determined via a free market.
- (a) Persons in different occupations with very similar work content and requirements should receive the same wage. (b) Wages in different occupations should (despite similar work content and requirements) be allowed to differ.
- (a) Social occupations, in which work is dedicated to fellow human beings (e.g. caregivers, teachers, social workers), are paid too much. (b) Individuals in social occupations are paid too little.

Table A.4: Overview of income with different tax rates

| Income before taxes | 1000 | 1500 | 2000 | 2500 | 3000 | 3500 | 4000 | 4500 | 5000 |
|---|---|---|---|---|---|---|---|---|---|
| Income after taxes with a tax rate of 10% | 1200 | 1650 | 2100 | 2550 | 3000 | 3450 | 3900 | 4350 | 4800 |
| Income after taxes with a tax rate of 20% | 1400 | 1800 | 2200 | 2600 | 3000 | 3400 | 3800 | 4200 | 4600 |
| Income after taxes with a tax rate of 30% | 1600 | 1950 | 2300 | 2650 | 3000 | 3350 | 3700 | 4050 | 4400 |
| Income after taxes with a tax rate of 40% | 1800 | 2100 | 2400 | 2700 | 3000 | 3300 | 3600 | 3900 | 4200 |

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