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The social pay gap among occupational twins: a task-based comparison

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Abstract

The relevance of certain occupations for society has become evident during the COVID-19 pandemic. However, the societal appreciation does not show in earnings, particularly not for care work. In light of the ongoing calls for pay raises in these occupations, our paper provides a rationale to identify differences in job content and pay between social and other occupations. We propose a data-driven approach that compares all jobs based on their tasks content. Accordingly, 13 % of all occupations are highly comparable and, within this group, the wage penalty of social occupations (e.g., health care, education) corresponds to up to around €500 lower earnings per month.

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1. Introduction

The COVID-19 pandemic has sparked a new discussion on the appreciation of system-relevant occupations. Nurses, teachers and other social occupations are known to fulfill important functions in society but they earn notably less than workers in, e.g., technical occupations. Although a daily applause of the quarantined population may indicate gratitude, this does not (yet) appear to be reflected in tangible rewards.

Thus, we analyze the size of wage differences between social and other task-equivalent jobs, i.e. jobs with similar content. Detected differences in income are labelled the social pay gap. After marking social occupations, we run a factor analysis for 31 tasks. Next, we compute an occupational distance measure with the angular separation that identifies 13% of all occupations to be highly similar or as tasks twins. On this basis, the wage differences between tasks twins in social and other domains confirm that working to the benefit of society leads to an average wage reduction of up to €533, which is substantial considering that the mean occupational gross wage per month amounts to an average of around €2,900. Naturally, this wage differential could also 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. Nonetheless, the size of the wage difference is considerable.

The paper can be placed into the literature on the task-based approach. Occupational tasks data have proven useful to explain, for instance, the impact of computer-based technologies (Autor et al., 2003) or wage inequality (Autor et al., 2008). It further contributes to the research on wage differentials (e.g., Altonji and Blank, 1999), including the gender pay gap (e.g., Goldin, 2014; Kleinjans et al., 2017) because women are still overrepresented in social jobs. To our knowledge, we are the first to combine both literature strands and apply the task-based approach to quantify the differential rewarding of social occupations. Tasks data have the advantage that they allow detailed documentation of job content in relation to wages. Further, we are the first to develop a measure that is independent from the personal assessment of comparable tasks. Instead, any similarities and differences are purely data driven.

2. Different pay for work of equal value

Our database is the BIBB/BAuA Employment Survey 2006 from the Federal Institute for Vocational Education and Training and the Federal Institute for Occupational Safety and Health (Hall and Tiemann, 2006). The survey consists of a random sample of 20,000 people who are active in the labor force in Germany and includes self-reported job tasks. We classify social occupations based on social tasks (e.g. educating, caring, treating medically), therewith identifying five occupational fields: health occupations with/without a medical doctor, social occupations, teachers, and occupations in body care.[1]

[1] For further details on calculations and potential applications, see Bublitz and Regner (2016).

2.1 Work of equal value

Respondents report how frequently they perform tasks and what level of skills is required in specific subject areas. We use this information to determine the job content and similarity of occupations. We start with a principal factor analysis for 31 tasks to reduce the complexity of the data. According to the Kaiser criterion, we retain seven factors, accounting for 94% of the total variance. We label the factors intellectual, technological, commercial, health-related, instructive, productive, and protective. The assignment of occupations to factors seems intuitive (results available upon request). For instance, teachers have the highest score in the instruction factor and physiotherapists and doctors score highest in the health factor.

To determine the distance (similarity) of occupations we calculate the angular separation of two vectors that represent two occupations (Gathmann and Schönberg, 2010). The job content of each occupation is characterized by a 7-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

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

$$Distance_{oo'} = 1 - AngSep_{oo'} \quad (2)$$

where q is the vector of all tasks in an occupation. The measure is adjusted so that a value of 1 (0) means that the occupations are completely different (identical).

The distance variable takes on values between 0.02 and 0.88 with a mean of 0.24 and a standard deviation of 0.12. We therefore consider occupations with a maximum distance of 0.1 (i.e. one standard deviation) to be work of equal or very similar value, so called tasks twins. We then compare one occupation to the other 258 occupations in our sample. The number of tasks twins (with a maximum distance of 0.1) is on average 33, which means for each occupation around 13% of the other occupations are highly comparable.

Table 1 displays the most similar tasks twins for two social occupations. The results for teachers are intuitive, showing high similarity with other teaching professionals and with psychologists. The results for nursing associate professionals need further investigation: Nurses share with vehicle and related cleaners, e.g., 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, e.g., “Collecting information, investigating, documenting” or “Advising, informing, consulting” and low on the same tasks as cleaners. This illustrates that social occupations show high similarities with other jobs.

2.2 Pecuniary and non-pecuniary returns

Starting with pecuniary returns, we calculate average monthly wage differences for occupations with identical education levels and with a maximum occupational distance of 0.1, that is, tasks twins (Table 2). The results show a negative average wage difference of €78 for

social occupations when compared to other jobs. However, as Table 1 showed, this approach biases the results because it includes similar social occupations that potentially also earn less than other occupations. In fact, the average occupational wage is €2924 with a standard deviation of €876. The average occupational wage for social jobs is €2854 and for other occupations €2939. Calculating wage differentials separately between one social and all its other tasks twins increases the average negative wage difference to €117, considering 27 social occupations. Finally, these results may still be distorted, e.g. by well-paid social occupations, and thus we compute the average penalty (i.e. only negatively affected occupations) instead of the average wage difference. This measure shows a wage reduction of €533 per month (16 affected occupations).

Table 1: Tasks twins

Secondary education teaching professionals ("Real-, Volks-, Sonderschullehrer")	*Occupational Distance*
Secondary education teaching professionals ("Gymnasiallehrer")	0.017
Secondary education teaching professionals ("Fachschul-, Berufsschul-, Werklehrer")	0.018
Other teaching 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.

Table 2: Average monthly wage differences between social and other tasks twins

	Wage difference
I All similar occupations	-€78
II Excluding own occupational group	-€117
III Only affected occupations but excluding own occupational group	-€533

Notes: Own calculations with BIBB/BAuA Employment Survey 2006.

Continuing with non-pecuniary returns, individuals in social occupations may choose to forgo a higher wage share because they derive utility from their work content (Frank, 1996). This may be used to justify wage differences (England et al., 2002). We use workers' satisfaction levels (measured on a 4-point scale with high levels indicating high satisfaction) as a proxy for utility. The OLS regressions with satisfaction as the dependent variable confirm that individuals in social jobs are more satisfied with the content of their job tasks but less satisfied with their wages than individuals in other jobs.

Table 3: Relationship between satisfaction levels and social occupations

	(1) Work content		*(2) Wage*	
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)
Constant	3.034***	(0.036)	2.419***	(0.049)
R-squared	0.030		0.057	
N	17081		17054	

Notes: OLS regressions with standard errors in parentheses. BIBB/BAuA Employment Survey 2006. Control variables are firm size, occupational status, industry sector and federal state.
***p<0.01, ** p<0.05, * p<0.1

3. Conclusions

Equal pay for work of equal value is a basic right. Nonetheless, our task-based analysis for German workers shows that this principle is violated for social occupations. We find large wage differences for tasks twins, corresponding to a wage penalty of up to around €500 per month. A failure of the labor market to take positive externalities of social occupations into account could have negative long-term effects for society (Bublitz and Regner, 2016). Workers in social occupations may decide to stop bearing a wage penalty, resulting in their exit from these occupations. In light of the COVID-19 pandemic there appears to be a greater awareness and willingness for improvement and it will be of great interest to observe the effect of this movement on the social pay gap.

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