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ARTICLE

Gregariousness, interactive jobs and wages

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Abstract Gregariousness and social interaction are important aspect of human life with implications also for labour markets. To the best of our knowledge, this paper is the first to examine gregariousness and social interaction at the workplace and associated wages for Germany. Our empirical findings with samples from the German Socio-Economic Panel (SOEP) demonstrate that extravert people more often work in jobs with more social interaction. Furthermore, females tend to work more often in interactive jobs compared to males. There is evidence that gregariousness and social interaction are associated with (moderately) higher wages, except when high interaction occurs in large firms.

Keywords Gregariousness · Social interactions · Labour markets · Sorting · Wage differentials

JEL Classification J01 · J24 · J31

Geselligkeit, soziale Interaktion im Beruf und Löhne

Zusammenfassung Geselligkeit und soziale Interaktion sind wichtige Dimensionen menschlichen Daseins, deren Konsequenzen für die Verteilung der beruflichen Tätigkeiten und der Löhne noch wenig erforscht sind. In dieser Studie werden daher, unseres Wissens erstmals für Deutschland, die Bedeutung von Geselligkeit und soziale Interaktion in der beruflichen Tätigkeit sowie für damit einhergehende Lohnunterschiede untersucht. Der empirische Teil der Studie basiert auf Stichproben aus dem Sozio-Ökonomischen Panel (SOEP). Die Ergebnisse deuten darauf hin, dass Geselligkeit die Wahrscheinlichkeit erhöht, in einem Beruf mit sozialer Interaktion tätig zu sein. Zudem sind Frauen häufiger in Berufen mit mehr sozialer Interaktion tätig. Die Regressionsergebnisse deuten darauf hin, dass Geselligkeit und eine Tätigkeit in einem beruflichen Umfeld mit einem hohen Maß an sozialer Interaktion mit (moderat) höheren Löhnen einhergehen.

> *The human being is in the most literal sense* [...] *not merely a gregarious animal, but an animal which can individuate itself only in the midst of society*.
>
> Karl Marx (1857)[1]

1 Introduction

Gregariousness means seeking and enjoying the company of other people. As the quotation from Karl Marx suggests, gregariousness is an important aspect of human life. It should also have significant implications for the distribution of jobs and wages in the economy.[2] However, there

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[1] See Marx (1993: 84). In German: „Der Mensch ist im wörtlichsten Sinn ... nicht nur ein geselliges Tier, sondern ein Tier, das nur in der Gesellschaft sich vereinzeln kann." (Karl Marx and Friedrich Engels, 1961, Werke Band 13, Dietz Verlag, Berlin, page 616).

[2] According to the "theory of equalizing differences" (Rosen 1986) individual tastes and preferences related to work activities create sorting in the labour market and wage differences. Workers do not only differ in their competences for the different job requirements but also in their tastes with respect to the working environment and attributes of the job. Differences in preferences for gregariousness for instance may lead in-

is not much research on the relationship between gregariousness, interactive jobs and labour market outcomes. The study by Krueger and Schkade (2008) indicates that gregarious female workers sort themselves into jobs that entail more social interaction. To the best of our knowledge, there is no comparable evidence on sorting by males and on the relationship between interactive jobs and wages. A number of related studies examine the role of personality factors for wages. Among others, the work by Heineck and Anger (2010) and Mueller and Plug (2006) suggest that outgoing, talkative and sociable, in other words, more gregarious workers may suffer some wage penalty.

Our contribution to the literature utilises data from the German Socio-Economic Panel (SOEP, Wagner et al. 2007). We examine the implication of gregariousness for sorting into interactive jobs and related wage differences for male and female workers in Germany. The richness of socio-economic characteristics and psychometric measures on personality, gives us the opportunity to focus on the determinants of sorting and on wages from working in a job with more or less social interaction. In our study, social interaction at the workplace has been constructed by expert assessments based on the level of the standard occupational four-digit classification scheme. Individual tastes for gregariousness are taken from the personality factor extraversion as well as from respondents' information on the extent of social interaction in leisure time.

Krueger and Schkade (2008) explore the drivers for sorting into interactive jobs with data based on the day reconstruction method. Since the authors do not have direct information on the personal taste for gregariousness, they interpret social interactivity during leisure time as a proxy for gregariousness preferences also during working hours. Social interaction is defined "as the percentage of the day that a job requires a worker to be engaged in conversation with customers, clients or co-workers" (ditto, p. 861). They find that female workers who are more gregarious in their leisure time also exhibit a higher probability to be employed in a job with more social interaction. Furthermore, they demonstrate that females working in interactive jobs are on average more satisfied with their jobs compared with workers in jobs with less social interaction.

Since measured personality factors may depend—at least to some extent—on job attributes, interdependency may create biased estimates. To investigate the direction of such a potential bias in our study, a supplemental sample of seventeen-year-olds is utilised. The sample is taken from the SOEP youth questionnaires. Questions deal with preferred job attributes later at work, among them the desirability of social interaction. Since the youth questionnaire contains the same psychometric measures of personality as the questionnaire for adults, the sample allows us to investigate the relevance of gregariousness without the problem of interdependency as the seventeen-year-old respondents are not employed yet.

Our empirical findings suggest first that around 83 per cent of the female workers and 80 per cent of the male workers are gregarious during leisure time. At the working place, 59 per cent of women and 30 per cent of men are engaged in jobs with medium or high interpersonal interaction. The estimates indicate a significantly positive relationship between the personality factor *extraversion* and the probability to work in an interactive job. The analysis with the SOEP youth questionnaire demonstrates that *extraversion* contributes to the desire for social interaction in the job already in adolescence, strengthening the results in the samples of adults. There is some initial evidence that gregariousness in leisure time and social interaction at the working place are associated with (moderately) higher wages, except when high interaction occurs in large firms. Future research is needed to assess the time spent in social interaction at the work place and its productivity effects for each worker in greater detail.

The rest of the paper is structured as follows. In Sect. 2 a theoretical model of sorting and wage differentials in an environment of heterogeneously interactive jobs and divergent tastes for social interaction at the working place is introduced, together with a review of empirical findings. In Sect. 3 data are introduced. Section 4 discusses the econometric results on the determinants of choosing interactive jobs and Sect. 5 on the extent of wage differences. Section 6 concludes.

2 Theoretical and empirical findings on gregariousness, interactive jobs and wages

The model discussed in Krueger and Schkade (2008) is briefly introduced to understand the relationship between gregariousness, interactive jobs and wages. Let us assume that jobs are either interactive ($S = 1$) or non-interactive ($S = 0$) and that all workers have the same productivity but differ in their valuation of job interactivity. A utility function is defined that includes wages, w, and social interaction at the working place: $u_i(w, S)$. Workers derive a positive utility from an increase in their wage, i.e. $\partial u_i(w, S)/\partial w > 0\ \forall i$. The valuation of interactivity depends on the gregariousness (z_i) of the individual worker. While some workers like interactivity, others may dislike interactivity: $\partial u_i(w, S)/\partial S > 0$ or $\partial u_i(w, S)/\partial S < 0$. A worker's individual gregariousness

dividuals to sort themselves in working environments with different levels of social interaction. As a consequence, wages may differ between jobs with equal competence requirements but divergent extents of social interaction.

z_i is defined by $u_i(w_1 + z_i, 0) = u_i(w_1, 1)$. z_i is the compensating wage variation for working in a non-interactive job. z_i is higher (lower) for workers who enjoy (dislike) interaction.

If the offered wage premium in the labour market for working in a non-interactive job $\Delta w = w_0 - w_1$ is higher than z_i, the individual sorts into a non-interactive job (with $S = 0$). If $\Delta w < z_i$, then the individual sorts into an interactive-job (with $S = 1$). In equilibrium, the number of jobs with social interaction depends on the distribution of gregariousness in the working population, on the firms' costs that are associated with creating interactive and non-interactive jobs, and on possible negative or positive productivity effects of being more or less gregarious. In this simple framework, two equilibrium wages may result, one for interactive, one for non-interactive jobs. Further wage differentials may exist between individuals working in the same type of job (i.e. in $S = 0$ or $S = 1$) related to differences in their preferences and in job creation costs.

In social reality, workers differ not only in their taste for gregariousness but also in schooling and other competences as well as in their preferences towards risk, other working place characteristics and facets of personality. Therefore, our empirical analysis of wage differentials utilises social interactivity at the workplace and gregariousness, together with a number of control variables such as sex, East German heritage, foreign heritage, number of children, experience, tenure, schooling, measures of risk attitudes, and other personality factors. In addition, an indicator of firm size is used. Firm size is related to productivity and wages, see Oi and Idson (1999) and Gerlach and Schmidt (1990), among others. According to Fox (2009) the wage gaps due to firm size effect increase with job responsibility. However, we are not aware on research on social interaction and wages at different firm sizes.

Krueger and Schkade (2008) analyse four different data sets from the U.S. (Texas, Columbus) and France (Rennes). The data include detailed information[3] on the time that individuals found themselves in social interactions at work and at home. On average 57 per cent of the leisure-time and 72 per cent of working time (in conversation) are spent in social interactions. The authors estimate Tobit models with the share of time spent interacting at work as a dependent variable. The main focus is to find a proxy variable for z_i. The idea is to use the share of time spent interacting with others in their leisure time. Furthermore, the control variables *age, household income* and the dummies for marriage, college degree, union membership and race are used. The results indicate a significant and relatively strong relationship between the proportion of time spent interacting during leisure time and the proportion of time spent interacting during working time in all data sets. A 10-percentage-point increase of the proportion of time spent interacting during leisure time leads—on average—to a positive 5-percentage-point change in the proportion of time spent interacting at work.

Krueger and Schkade (2008) discuss two critical issues in their analysis. First, the data include only DRM-questioning for a single working day. Thus, results could be biased because of unusually shaped working days in combination with the relatively small sample size. Second, it is not possible to infer causal statements from the analysis as it is unclear whether the job environment affects the social behaviour in the leisure time or vice versa.

Our empirical study intends to complement the findings by Krueger and Schkade (2008). We provide initial evidence on the distribution of gregariousness and the amount of social interaction in jobs in samples from male and female workers in Germany and its association with wages. Jobs are categorised as having *no*, *low*, *medium* or *high social interaction*. A priori wage differences may be positive or negative, depending on preferences and productivity effects. The following shortcomings remain. First, interactivity at the working place is measured at the occupational, not at the individual level. Second, if discrimination at the level of occupations exists, then wage differentials may stem from discrimination as well. To solve these two related issues, better data are needed which are left for future research. Third, we are also not able to tackle the simultaneity issue in our econometric analysis with adults. To get some idea about the bias, we provide additional evidence for the sorting equations by utilising data from not working juveniles on their job aspirations.

Our study is related to a literature that investigates the role of personality factors for wages based on augmented Mincer-type regression analyses. Although data and methods differ to a great degree, the studies by Heineck and Anger (2010) (based at the SOEP) and Mueller and Plug (2006) (based at the Wisconsin Longitudinal Study), suggest that more extravert workers suffer some (moderate) wage penalty. These studies utilise no information on social interaction at the job, on gregariousness during leisure time or on firm size.

Our study is furthermore related to literature that investigates the role of pro-social behaviour and preferences as an incentive to provide effort at the workplace (Croson and Gneezy 2009; Tonin and Vlassopoulos 2009, among others). Workers with pro-social preferences may be concerned with social aspects in the organisation of working places. These workers may require less monetary compensation for doing the same job compared to a worker without pro-social

[3] The high degree of detail is achieved by using the Day Reconstruction Method (DRM) in which individuals are asked to segment their days into episodes and give a description of their social environment in each episode. The result is a share of total work time in which the respective individual was interacting with others at work and a share of total leisure time in which the respective individual was interacting with others during leisure time.

behaviour. Gregariousness might share similar dimensions with social preferences. However, it focuses on enjoying the company of other people. It does neither imply nor exclude that people have pro-social preferences.

3 Data

3.1 The samples selected and the construction of variables

The empirical part is based on samples taken from the German Socio-Economic Panel (SOEP), waves 2004 to 2007. The SOEP provides representative data for the German population. We use a sample of employed adults who were between 18 and 65 years old in the year 2007. Furthermore, a sample of seventeen-year-olds is taken from the SOEP youth questionnaires 2005 to 2007. Samples are further defined by the availability of information for all variables utilised.

The variable indicating the degree of interaction at the working place (*social interaction*) in the adult samples has been created using the ISCO-88 classification compiled in 2007. The ISCO-88 defines attributes and tasks for each individual job according to the standard occupational four-digit classification scheme (DIW Projectgroup 2007: 14 ff). To classify an occupation as 1 "no interaction", 2 "low interaction", 3 "medium interaction" or 4 "high interaction", five researchers (three women, two men) from the Centre for European Economic Research (ZEW) in Mannheim were asked to categorise the jobs' social interactivity levels (having regular contact to colleagues and customers and spent time in social interaction at the workplace) for each four-digit occupation, in addition to the joint assessment of the authors.

The average correlation among the six ratings was high, 0.76, so that the variable provides us with a simple, although specific, idea of social interaction at the workplace. In Appendix (Table 5) the scores of the variable *social interaction* and average wages are summarised for the samples of females and males on the two-digit ISCO-88 levels. The scores vary widely. For instance, the occupations "machine operators and assemblers" or "labourers in mining, construction, manufacturing and transport" was assessed to have no interaction (1) while "life science and health professionals" or "teaching professionals" was assessed to be highly interactive (>3.7) by all raters.

A dummy variable for *gregariousness during leisure time* was created. This variable is obtained from respondents' assessment on the frequency of meeting with friends, relatives or neighbours during leisure time in the year 2007. *Gregariousness during leisure time* is one if respondents meet friends or relatives regularly, at least once a month. In the spirit of Krueger and Schkade (2008), it is interpreted as one rough indicator for individual taste for gregariousness.

Hourly wage in 2007 (w) is calculated by the following formula: $w = y_{month}/(h_{week} \times 4.3)$, where y_{month} is the individual gross monthly income and h_{week} is the number of working hours per week.[4]

The *Big Five* personality factors *openness to experience*, *conscientiousness*, *extraversion*, *agreeableness*, *neuroticism* (Borghans et al. 2008; Costa and McCrae 1992; Gerlitz and Schupp 2005, among others) were derived from data compiled in the year 2005. The Big Five personality factor *extraversion* is closely related to gregariousness. Extravert people are more gregarious, outgoing and talkative. Furthermore, the *external locus of control* (Heineck and Anger 2010, among others), derived from data compiled in the year 2005, as well as *willingness to take risks* (Dohmen et al. 2010, among others) compiled in the year 2004 are utilised. A person with a higher value on the *external locus of control* believes that there is only a weak causal link between actions and outcomes. We hypothesise a negative or zero association with social interaction. According to Heineck and Anger (2010), *external locus of control* has a negative impact on wages. Raw data on personality preferences are aggregated with factor analysis[5] to employ comprehensive measures of personality and preferences in the regression analysis.

Additional controls used are indicators for *East Germans*, *fulltime workers*, the *number of children*, the number of years spent in education (*schooling*), the number of years of potential professional experience ($experience = age - schooling - 6$), *tenure*, and indicators of *firm size*.

3.2 Descriptive evidence

Table 1 gives a gender-specific overview on all manifestations of the utilised variables, based on a total sample size

[4] To eliminate implausible declarations, only observations from individuals who work between 15 and 100 hours a week and have a gross monthly income of at least 250 € are taken. In addition, hourly wages are trimmed (Bottom/Top one percentile) to avoid biases from extreme outliers (see Gernandt and Pfeiffer 2007, among others).

[5] The Principal Component Factor method was used with an oblique rotation to obtain the Big Five personality factors (cf. Costa and McCrae 1992; Kline 1994; Borghans et al. 2008, p. 9 ff.). Despite the fact that in the literature orthogonal rotation is widely used to obtain the Big Five factors from personality inventories (cf. Block 1995), oblique factor rotation was used because a highly significant correlation was observed between factors when using the oblique rotation method. Calculation of *Cronbach's Alpha* for *external locus of control* yields a value of 0.69, which is feasible, whereas the *Cronbach's Alpha* for *internal locus of control* of 0.42 indicates a relatively low reliability of the available scale. Since the factors for *positive and negative reciprocity* are correlated only weakly, it is feasible to use orthogonal rotation in this case. The factors for *external and internal locus of control* significantly correlate. Therefore oblique rotation is more feasible. However, utilising *Cronbach's Alpha* (cf. Cortina 1993) indicates that of those two only the factor for *external locus of control* is reliable. Hence, we concentrate our analysis on *external locus of control* and do not further include the factor for *internal locus of control*.

Table 1 Definition of variables and descriptive statistics

Variables	Description	Mean (std.-dev.)	
		Males	Females
No social interaction	0,1	0.36	0.17
Low social interaction	0,1	0.34	0.24
Medium social interaction	0,1	0.21	0.23
High social interaction	0,1	0.09	0.36
Gregariousness in leisure time	0,1	0.80	0.83
w (gross hourly wage 2007)	Euro	16.65 (8.15)	13.06 (6.45)
Schooling	Years	12.76 (2.80)	12.86 (2.68)
Potential experience	Years	24.90 (10.59)	23.94 (10.78)
Potential experience squared	–	731.95 (530.53)	689.51 (511.02)
Tenure	Years	12.55 (10.39)	10.79 (9.35)
Openness to experience	Normalised	−0.00 (0.92)	0.11 (0.92)
Conscientiousness	–	0.06 (0.91)	0.16 (0.86)
Extraversion	–	−0.05 (0.97)	0.18 (0.97)
Agreeableness	–	−0.26 (0.98)	0.15 (0.91)
Neuroticism	–	−0.28 (0.93)	0.12 (0.96)
Locus of control	–	−0.17 (0.95)	−0.10 (0.95)
Willingness to take risk	11 Likert scale	5.21 (2.11)	4.46 (2.11)
Number of children	0, 1, 2, ...	1.30 (1.20)	1.26 (1.11)
East German	0,1	0.16	0.19
Foreigner	0,1	0.11	0.09
Fulltime worker	0,1	0.94	0.55
Very small firm (<20 employees)	0,1	0.25	0.31
Small firm (20 to 200 employees)	0,1	0.27	0.29
Medium firm (200 to 2000 empl.)	0,1	0.22	0.20
Large firm (>2000 employees)	0,1	0.26	0.20

Source: Sample taken from SOEP 2007 (see text); 3,789 male and 3,117 female observations

of $n = 3{,}789$ males and $n = 3{,}117$ females. About 83 per cent of women and 80 per cent of men in our samples of the German working population respond to be socially interactive in their leisure time (meet with friends or relatives). If responding in this way indicates a taste for gregariousness, these findings suggest that most German workers can be categorised as being gregarious, confirming the introductory citation of Karl Marx. There is a small gender difference in the working population.

At the working place, 59 per cent of women and 30 per cent of men actually are engaged in jobs with *medium social interaction* or *high social interaction*. There is no significant correlation between being in an interactive job and *gregariousness during leisure time* in our data. Females have a lower gross hourly wage compared to males (females: 13 €/h vs. men: 16.6 €/h) and work *fulltime* less often. The average number of years of education (*schooling*) and *potential experience* is similar for both sexes, while *tenure* is nearly two years lower for females, which presumably is a consequence of longer periods of absence in the labour market. Moreover, females work in small or very small firms more often.

The means for preferences and personality traits lie around zero with a standard deviation of unity, a consequence of factor analysis. These variables indicate individual differences in personality in a standardised way. The benchmark is the average individual in the sample. Men and women are comparably open to experience, conscientious, and external regarding their *locus of control*. However, men are significantly less extravert, agreeable and neurotic than women and seem to be more willing to take risks.

4 Determinants of sorting into an interactive job

To test the association between tastes for gregariousness and being in an interactive job, an ordered logit model is estimated. Utilising first pooled samples and second separate samples for females and males, we test the significance of *sex*, *schooling*, *personality factors*, *gregariousness in leisure*

Table 2 Odds-ratios from logistic regression models for *social interaction* at the job

	Pooled	Males	Females
Sex	2.948[c]	–	–
Gregariousness in leisure time	0.941	0.956	0.937
Schooling	1.162[c]	1.231[c]	1.093[c]
Potential experience	0.990	0.990	0.997
Potential experience squared	1.000[a]	1.000	1.000
Tenure	1.009[c]	1.016[c]	1.002
Openness to experience	1.085[c]	1.053	1.114[c]
Conscientiousness	0.937[b]	0.928[a]	0.950
Extraversion	1.113[c]	1.168[c]	1.075[a]
Agreeableness	1.076[b]	1.036	1.136[c]
Neuroticism	0.995	1.014	0.971
Locus of control	1.004	0.950	1.058
Willingness to take risks	1.034[c]	1.049[c]	1.020
Number of children	1.031	1.001	1.039
East German	0.893[a]	0.902	0.907
Foreigner	0.813[c]	0.652[c]	1.089
Fulltime worker	0.565[c]	0.555[c]	0.631[c]
Small firm	0.874[b]	1.002	0.771[c]
Medium firm	0.684[c]	0.802[b]	0.585[c]
Large firm	0.778[c]	0.919	0.631[c]
w	1.004	1.003	1.001
Cut 1	0.912	1.828	−0.948
Cut 2	2.350	3.512	0.324
Cut 3	3.516	4.936	1.293
Log likelihood	−8,818.8	−4,592.5	−4,111.4
Pseudo R^2	0.072	0.055	0.021
N	6,906	3,789	3,117

Source: Sample taken from SOEP 2007, own regressions
[a] $p < 0.10$, [b] $p < 0.05$, [c] $p < 0.01$

time, firm size and the further control variables for *social interaction* at the working place. The results in the form of odds-ratios are shown in Table 2. In all regressions, w is included as an additional control variable in order to conduct a simple causality check.

Three findings emerge from Table 2. First, females have a higher probability of working in an interactive job compared to males. The odd ratio for working in an interactive job is 2.9 times higher for females than for men. This holds when controlling for educational and professional background, for firm size as well as personality and preference-related variables.

Second, schooling, personality and firm size seem to matter, often in a gender-specific way. More *extraversion* and more *schooling* significantly increase the probability of working in an interactive job. The associations seem to be stronger for males than for females. Neither *neuroticism* nor *locus of control* is related to working in a job with more social interaction. *Agreeableness* and *openness to experience* matter, but only in the sample of females. More w*illingness to take risk* increases the probability to work in interactive jobs but only in the sample of males. A possible explanation is that working in interactive jobs exerts somehow greater risk (for instance, a higher risk of infection during interaction) so that more risk-loving workers are engaged there.

Third, the findings indicate that there is no significant (partial) correlation between wages and *social interaction*. Therefore, simultaneity between individual wages and social interaction at the job in the ordered logit model does presumably not bias results. However, since personality is not measured systematically *before* the individuals self-sorted into their professions, these estimates may not show a causal relationship. For example, workers may become more extraverted when they work in an environment with high social interactivity. In this case, personality factors and *social*

Table 3 Odds-ratios for *social interaction in a desired job* in a youth sample

	(1) Pooled	(2) Males	Means (sd)	(3) Females	Means (sd)
Sex	2.057[c]	–	–	–	–
Openness to experience	1.029	1.042	−0.06 (0.99)	0.991	0.10 (0.99)
Conscientiousness	0.962	0.909	−0.11 (0.99)	1.024	0.14 (0.99)
Extraversion	2.034[c]	2.296[c]	−0.07 (0.99)	1.727[c]	0.13 (0.95)
Agreeableness	1.543[c]	1.447[c]	−0.15 (1.02)	1.719[c]	0.15 (0.97)
Neuroticism	0.993	0.962	−0.19 (0.94)	1.025	0.19 (1.03)
Locus of control	1.162[b]	1.194[a]	−0.01 (1.02)	1.115	−0.02 (0.98)
Willingness to take risk	1.009	0.982	6.19 (2.07)	1.016	5.84 (1.96)
Immigrant	0.977	0.605	0.18 (0.39)	1.775[a]	0.21 (0.41)
Cut 1	−3.832[c]	−5.178[c]	–	−4.496[c]	–
Cut 2	−0.338	−1.669[c]	–	−0.867	–
Cut 3	1.814[c]	0.421	–	1.453[b]	–
Log likelihood	−817.24	−445.82	–	−360.51	–
Pseudo R^2	0.100	0.091	–	0.087	–
N	808	426	–	382	–

Source: Sample taken from SOEP 2007, Youth Questionnaires; Ordered Logit model. Variables included in the regression but not documented in the Table are: dummy for East-German origin, educational background of parents, dummy variable indicating that the individual lived with both parents until he/she was fifteen (the coefficients for these variables do not significantly differ from zero)
[a] $p < 0.1$, [b] $p < 0.05$, [c] $p < 0.01$

interaction at the job are interdependent, and the estimates are biased.

In order to understand the role of personal factors for social interaction at the working place more deeply, we use supplement data with a similar set of psychometric personality measures. These data have been taken from the youth questionnaires available in the SOEP[6] to estimate a model similar to the one that has been estimated for adults. In these supplement data, there is a main difference. The adolescent respondents are not employed yet and were instead asked about the importance of *social interaction in a desired job* as a selection criterion for their desired jobs in the future. Interdependency between personality and job attributes seem to be no problem here.

The variable preference for *social interaction in a desired job* has been measured on a four-point Likert scale (1 = "unimportant", 2 = "not very important", 3 = "important", 4 = "very important"). An ordered logit model is estimated. The right hand side variables include the same personality factors that were utilised in the adult samples. Results are summarised in Table 3. In the pooled model (both males and females in one sample), an individual with a score one standard deviation higher in *extraversion* is about 2 times more likely to prefer more social interaction in a job than the average individual. In the adult sample it was lower, 1.1 (see Table 2). In the sample of males the relationship is stronger compared to the female sample, mirroring findings from the adult sample. While confirming the existence of a strong and highly significant effect of gender, the findings indicate that the association between the personality factor *extraversion* for sorting into gregarious jobs has been rather underestimated than otherwise in the models with adult data.

5 *Social interaction* and wages

In this section the hypothesis that wage differences are related to the job attribute *social interaction* is investigated with Mincer-type regressions with the natural log gross hourly wage as the dependent variable. In the regressions, indicators of gregariousness are used in addition to the ones for social interaction at the workplace. Human capital variables are controlled for, among them *schooling, experience* and *tenure* and further controls, especially *firm size*. Table 4 summarises the results of two regressions, each one estimated for males and females separately. Specification (1) contains three dummy variables indicating *low*, *medium*, or

[6] We include the waves 2005 to 2007 of the youth questionnaires in each of which the seventeen-year-olds answer questions on various topics including their personality and their preferences for their future employment.

Table 4 Wage differences from *social interaction* in the job

	(1) Males	(1) Females	(2) Males	(2) Females
Low social interaction	0.149[c]	0.128[c]	0.012	0.044[b]
Medium social interaction	0.186[c]	0.014	0.041[b]	−0.003
High social interaction	0.201[c]	0.048[a]	−0.055[b]	0.024
Gregariousness in leisure time	0.053[b]	0.063[c]	0.063[c]	0.065[c]
Schooling	–	–	0.070[c]	0.072[c]
Potential experience	–	–	0.036[c]	0.042[c]
Potential experience squared	–	–	−0.001[c]	−0.001[c]
Tenure	–	–	0.008[c]	0.011[c]
Openness	–	–	0.028[c]	−0.016[a]
Conscientiousness	–	–	−0.022[c]	0.006
Extraversion	−0.025[c]	0.005	−0.009	0.000
Agreeableness	–	–	−0.032[c]	−0.019[b]
Neuroticism	–	–	−0.007	−0.027[c]
Locus of control	–	–	−0.051[c]	−0.029[c]
Willingness to take risk	–	–	0.003	−0.004
Number of children	–	–	0.011[a]	−0.022[c]
East German	–	–	−0.269[c]	−0.219[c]
Foreigner	–	–	0.008	−0.019
Fulltime worker	–	–	0.489[c]	0.144[c]
Small firm	–	–	0.094[c]	0.125[c]
Medium firm	–	–	0.216[c]	0.257[c]
Large firm	–	–	0.246[c]	0.294[c]
Constant	2.536[c]	2.343[c]	0.535[c]	0.699[c]
Adj. R^2	0.026	0.011	0.485	0.432
N	3,789	3,117	3,789	3,117

Source: Sample taken from SOEP 2007, OLS regressions dependent variable: $\ln(w)$
[a] $p < 0.1$, [b] $p < 0.05$, [c] $p < 0.01$

high social interaction at the working place, *gregariousness in leisure time* and the personality factor *extraversion*. Specification (2) additionally includes *schooling, personality factors, firm size* and controls.

Results from regression (1) suggest a positive wage difference for more social interaction at the working place and a positive wage difference for *gregariousness in leisure time*. *Extraversion* is negatively related to wages for males but not for females (confirming Heineck and Anger 2010). When further variables are included (see regression (2)), most of the coefficients decrease, with one notable exception: The coefficient for *gregariousness in leisure time* and its significance remains (nearly) unaffected. In regression (2) it is 0.063 for males and 0.065 for females. If *gregariousness in leisure time* measures a taste for *gregariousness*, the findings suggest a robust positive partial relationship between *gregariousness* and wages.

In regression (2) the coefficient for *high social interaction* is negative and significant but only in the sample of males. Compared to a job with *no social interaction* (reference category), working in a job with *low* (females) or *medium* (males) *social interaction* is partially correlated with a higher wage of roughly 4 per cent.

These findings so far hint at some relevance of *social interaction* for wages and a robust positive association with *gregariousness in leisure times*.

All coefficients for the other variables are as expected. Whereas returns to education are similar for females and males (with a coefficient of around 0.07), the coefficient for *number of children* is negative for females and positive for males, which seems to reflect a gender-specific pattern in childbearing and participation in the labour market. Furthermore, and in accordance with Heineck and Anger (2010), *agreeableness* is negatively related with wages. The significant and positive association between wages and firm size (see Oi and Idson 1999) seems to be stronger in the female sample.

To investigate potential wage differences according to personal traits for gregariousness and according to the firm size in further specifications, interaction terms of *social interaction* and the personality factor *extraversion* as well as working in a *large firm* have been included in the wage re-

gressions. Results from gender-specific regressions are summarised in Appendix (Table 6). More interaction terms were investigated. Because of sketchy results, they are not documented.

The coefficients for *low*, *medium* and *high social interaction* and their significance are not affected when the interaction with the personality factor *extraversion* is included. The negative coefficient for e*xtraversion* in the male sample becomes significant again confirming the results from Heineck and Anger (2010) and Mueller and Plug (2006). The coefficients for the interaction terms are positive although insignificant. Regarding significance there is one exception: Extraverted males seem to earn significantly more when working in a job with low social interaction which gives evidence for the wage compensation hypothesis from Krueger and Schkade (2008). We conclude that (for males) the personality factor *extraversion* has a zero or moderately negative relationship with wages. However, in an interactive job, the personality factor *extraversion* seems to have a moderately positive (for males) or a zero association (for females).

The coefficients for the indicators of *social interaction* at the workplace and their significance are affected when the interaction terms with the variable *large firm* are included. As a rule, the coefficients as well as their significance increase, suggesting that social interaction is positively related to wages. The coefficients for the interaction terms with firm size are all negative and increase with the degree of social interaction at the working place in both samples. They all differ significantly from zero in the male sample, but not in the female sample. One finding seems to be robust for both genders: Working in a job with *high social interaction* in a *large firm* is associated with a lower wage. The coefficient is -0.207 for males and -0.186 for females. We conclude that jobs in large firms with medium or high social interaction seem to suffer and wage penalty.

6 Conclusion

Gregariousness is an important aspect of human life with significant implications for labour market outcomes. The analysis suggests regularities in the samples taken from the German Socio-Economic Panel (SOEP) which highlight the role of gregariousness or, to cite Karl Marx again, "to individuate itself in the midst of society" for labour market outcomes. Sorting into interactive jobs depends on schooling, sex and the personality factor *extraversion*, among others. As demonstrated by our estimations with the youth sample these findings seem to be robust and causal.

The findings on the association with wages seem to be more ambiguous. There is a robust positive association with *gregariousness in leisure time* for both males and females and a swaying negative association with *extraversion* but only for males. We observe moderately significant wage compensations depending on the degree of social interaction at the working place and the gender. Whereas males seem to earn more in medium interactive jobs woman seem to earn more in jobs with low social interaction. Finally, there is a robust and negative relationship for workers in *large firms* who work in a job with *high social interaction*. If this finding turns out to be robust in future research, it may have consequences for wage policies. Given a wage elasticity in the labour market of 0.3 (Dan Hamermesh's best estimate), a wage increase by 20 per cent in highly interactive jobs in large firms may reduce employment in these jobs by 6.7 per cent.

With the exception on firm size the results on wage compensations in interactive jobs remain ambiguous and a number of open research questions emerge. Future research should in particular help to resolve some limitations of our study. First, the degree of social interaction needs to be measured in addition to the occupational at the individual level. Second, the origin of social interaction at the workplace needs more examination. Either the desire for interaction is the result of socialisation in a world where adolescents are taught to be responsible for interaction and social relationship, or it may result from comparative advantages in the division of labour during adulthood, or a combination of both. Particularly the firm size effects suggest that collecting more details on social interaction at the workplace should be fruitful for additional research.

Executive summary

Gregariousness and social interaction are important aspects of human life with significant implications for labour market outcomes. The analysis suggests regularities in the samples taken from the German Socio-Economic Panel (SOEP) which highlight the role of gregariousness or, to cite Karl Marx, "to individuate itself in the midst of society" for labour market outcomes. Sorting into interactive jobs depends on schooling, sex and the personality factor *extraversion*, among others. As demonstrated by our estimations with the youth sample these findings seem to be robust and causal.

The findings on the association with wages seem to be more ambiguous. There is a robust positive association with *gregariousness in leisure time* for both males and females and a swaying negative association with *extraversion* but only for males. We observe moderately significant wage compensations depending on the degree of social interaction at the working place and the gender. Whereas males seem to earn more in medium interactive jobs woman seem to earn more in jobs with low social interaction. Finally, there is a

robust and negative relationship for workers in *large firms* who work in a job with *high social interaction*. If this finding turns out to be robust in future research, it may have consequences for wage policies. Given a wage elasticity in the labour market of 0.3 (Dan Hamermesh's best estimate), a wage increase by 20 per cent in highly interactive jobs in large firms may reduce employment in these jobs by 6.7 per cent.

The firm size effect demonstrates that collecting more data on social interaction at the workplace should be fruitful for future research.

Kurzfassung

Geselligkeit und soziale Interaktion sind wichtige Dimensionen menschlichen Daseins, deren Konsequenzen für die Verteilung der beruflichen Tätigkeiten und der Löhne noch wenig erforscht ist. In dieser Studie werden daher, unseres Wissens erstmals für Deutschland, die Bedeutung von Geselligkeit für die Wahl der beruflichen Tätigkeit und für damit einhergehende Lohndifferentiale untersucht. Der empirische Teil der Studie basiert auf Stichproben aus dem Sozio-Ökonomischen Panel (SOEP). Es wird gezeigt, dass etwa 80 Prozent der Beschäftigten in der Stichprobe als gesellig gelten können. Etwa 59 Prozent der Frauen und 30 Prozent der Männer arbeiten in Berufen mit hoher sozialer Interaktion, in der Geselligkeit eine Rolle spielt.

Die Ergebnisse der Studie verdeutlichen, dass der Persönlichkeitsfaktor Extrovertiertheit die Wahrscheinlichkeit erhöht, in einem Beruf mit mehr sozialer Interaktion tätig zu sein. Ferner zeigen die Ergebnisse, dass Frauen deutlich häufiger als Männer eine berufliche Tätigkeit mit sozialer Interaktion ausüben. Eine ergänzende Untersuchung mit Stichproben von Jugendlichen, die noch nicht erwerbstätig sind, bestätigt, dass das Geschlecht und der Persönlichkeitsfaktor Extrovertiertheit bereits im Jugendalter mit dem Wunsch nach Geselligkeit im späteren Berufsleben einhergehen.

Die Regressionsergebnisse deuten darauf hin, dass Geselligkeit in der Freizeit mit signifikant höheren Löhnen einhergeht, während Extrovertiertheit bei Männern mit (leicht) niedrigeren Löhnen einhergeht. Die Stärke des Zusammenhangs mit dem Lohn hängt vom Grad der sozialen Interaktion im Beruf und vom Geschlecht ab. Für beide Geschlechter gilt: in Unternehmen mit mehr als 2.000 Beschäftigten ist der Lohn in Berufen mit viel sozialer Interaktion um 20 Prozent niedriger. Falls sich dieses Ergebnis auch in weiteren Forschungen als robust erweist, sind Konsequenzen der Lohnpolitik zu erwarten. Falls die Lohnelastzität der Arbeitsnachfrage bei einem Wert von 0.3 liegt (Dan Hamermesh's plausibelster Schätzwert), wird eine Lohnerhöhung um 20 Prozent in Berufen mit hoher sozialer Interaktion mit einem Beschäftigungsrückgang in diesen Berufen in großen Unternehmen von bis zu 6,7 Prozent einhergehen. Die Ergebnisse verdeutlichen, dass es aus Forschungssicht wünschenswert wäre, in Zukunft bessere Daten zur sozialen Interaktion am Arbeitsplatz zu erheben.

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Appendix

Table 5 The score of *social interaction* and average wages in the job, by gender

	Males			Females		
	Score	$\ln(w)$	(s.d.)	Score	$\ln(w)$	(s.d.)
Armed forces	3	2.53	(0.23)	–	–	–
Legislators and senior officials	2.71	3.08	(0.31)	3	2.84	(0.18)
Corporate managers	2.76	3.04	(0.42)	3.05	2.72	(0.53)
General managers	2.89	2.71	(0.65)	2.93	2.38	(0.59)
Physical, mathematical and engineering science professionals	1.78	2.98	(0.49)	1.79	2.81	(0.43)
Life science and health professionals	3.71	3.25	(0.40)	3.78	2.86	(0.51)
Teaching professionals	3.79	3.02	(0.36)	3.95	2.90	(0.39)
Other professionals	2.56	3.01	(0.42)	2.84	2.78	(0.48)
Physical and engineering science associate professionals	1.29	2.87	(0.45)	1.45	2.63	(0.42)
Life science and health associate professionals	3.23	2.72	(0.41)	3.56	2.48	(0.42)
Teaching associate professionals	4	2.71	(0.52)	4	2.60	(0.27)
Other associate professionals	2.50	2.77	(0.50)	2.43	2.51	(0.44)
Office clerks	1.63	2.70	(0.51)	1.87	2.44	(0.47)
Customer service clerks	3.73	2.66	(0.45)	3.45	2.23	(0.40)
Personal and protective services workers	3.42	2.33	(0.51)	3.74	2.10	(0.46)
Models, salespersons and demonstrators	4	2.36	(0.41)	4	2.09	(0.40)
Market-oriented skilled agricultural and fishery workers	1.37	2.23	(0.51)	1.19	1.83	(0.48)
Extraction and building trade workers	1.45	2.42	(0.42)	1	2.03	(0.40)
Metal, machinery and related trades	1.36	2.53	(0.45)	1.22	2.27	(0.41)
Precision, handicraft, printing and related trades workers	1	2.56	(0.36)	1	2.30	(0.43)
Other craft and related trades workers	1.45	2.30	(0.45)	1.64	2.16	(0.38)
Stationary plant and related operators	1	2.71	(0.42)	1	2.45	(0.00)
Machine operators and assemblers	1	2.58	(0.37)	1	2.20	(0.40)
Drivers and mobile plant operators	1.81	2.30	(0.38)	2.43	2.10	(0.25)
Sales and services elementary occ.	2.77	2.40	(0.43)	2.94	2.08	(0.37)
Agricultural, fishery and related labourers	1	2.03	(0.34)	1	1.88	(0.57)
Labourers in mining, construction, manufacturing and transport	1	2.36	39(4.07)	1	2.07	(0.41)
Other elementary occupations	2.4	2.39	(0.57)	2.18	2.15	(0.66)

Source: Own calculation; sample taken from SOEP (see text); $N = 3,117$ females, 3,789 males; score varies between 1 (no), 2 (low), 3 (medium) and 4 (high social interaction)

Table 6 Further results on social interaction and wages

	Interaction with *extraversion*		Interaction with *large firm*	
	Males	Females	Males	Females
Low social interaction	0.015	0.040[a]	0.023	0.057[b]
	(0.015)	(0.022)	(0.017)	(0.025)
Social interaction	0.043[b]	0.001	0.075[c]	0.011
	(0.018)	(0.023)	(0.020)	(0.025)
High social interaction	−0.054[b]	0.020	0.001	0.058[b]
	(0.024)	(0.021)	(0.027)	(0.023)
Gregariousness in leisure time	0.063[c]	0.066[c]	0.063[c]	0.065[c]
	0.016	0.019	0.016	(0.019)
Extraversion	−0.026[b]	−0.011	–	–
	(0.011)	(0.017)		
and low social interaction	0.030[b]	0.030	–	–
	(0.015)	(0.022)		
and medium social interaction	0.021	−0.015	–	–
	(0.017)	(0.022)		
and high social interaction	0.027	0.022	–	–
	(0.024)	(0.020)		
Large firm	–	–	0.311[c]	0.395[c]
			(0.027)	(0.044)
and low social interaction	–	–	−0.048	−0.074
			(0.033)	(0.053)
and medium social interaction	–	–	−0.126[c]	−0.078
			(0.038)	(0.055)
and high social interaction	–	–	−0.207[c]	−0.186[c]
			(0.051)	(0.052)
Constant	0.531[c]	0.699[c]	0.530[c]	0.675[c]
	(0.051)	(0.056)	(0.051)	(0.057)
Adj. R^2	0.485	0.433	0.487	0.439
N	3,789	3,117	3,789	3,117

Source: Sample taken from SOEP 2007, OLS regressions (standard errors in parentheses), dependent variable: $\ln(w)$
[a] $p < 0.1$, [b] $p < 0.05$,
[c] $p < 0.01$

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