

# Risk Aversion and Trade Union Membership\*

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## Abstract

In an open-shop model of trade union membership with heterogeneity in risk attitudes, a worker's relative risk aversion can affect the decision to join a trade union and the outcomes of collective bargaining. Using German panel data (GSOEP) and three novel direct measures of individual risk aversion, we find evidence of a significantly positive relationship between individual risk aversion and the likelihood of being a union member. Additionally, our findings suggest that risk aversion is correlated negatively with wages and thus positively with employment.

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## 1. Introduction

Unions bargain over wages, the wage structure or working conditions. They have an impact on employment and provide excludable goods like legal advice or cheaper access to insurances. The evaluation of the gains and costs of such private goods can depend on the preferences of individuals. Therefore, the benefits and costs of trade union membership are likely to vary with risk attitudes. However, the nature of this linkage is largely unexplored. This is challenging because individual membership decisions lead to variations of overall union density and therefore affect bargaining power. In addition, membership decisions might directly influence union preferences. Accordingly, being aware of the relation between risk attitudes and union membership can also help to ascertain how collective negotiations are influenced by changes in the distribution of individual risk preferences.

Risk attitudes and collective bargaining may be related if trade unions insure their members against income variations by reducing uncertainty (e.g., Agell and Lommerud 1992, Burda 1995). The strength of this insurance motive will depend on risk preferences. However, this line of investigation assumes a certain level of union membership. In open-shop settings in particular, a reduction in income variability represents a public good and provides no incentive for an individual to voluntarily join a trade union in the first place. To establish a relation between personal risk attitudes and an individual's decision to join a trade union, an open-shop trade union must supply an excludable good.

In this paper we therefore focus on an open-shop union model in the tradition of Booth (1985) and Booth and Chatterji (1995). We assume that a worker's willingness to pay for the private good which union membership entails varies with risk preferences. This establishes a relationship, albeit an ambiguous one, between risk aversion and the net gains from union membership. In the literature on open-shop models—surveyed, for example, by Schnabel (2003)—very few papers have explicitly incorporated notions of risk aversion. These contributions assume workers to be heterogeneous with respect to the valuation of a union-provided good and do not allow for variations in individual risk attitudes, as is also the case in our analysis. We also analyse the effect of risk aversion on bargained wages which is, again, theoretically indeterminate. The linkage between an individual's level of risk aversion and union membership status and the implications for collective bargaining outcomes are, therefore, largely empirical issues. In this paper, we use data from the German Socio-Economic Panel (GSOEP), a nationally representative longitudinal survey, which contains a novel set of direct measures of individual risk attitudes. To the best of our knowledge, no such investigation has been undertaken to date. We find that a worker is more inclined to be a trade union member the

more risk-averse he is. In addition, we analyse the correlation between aggregated wages and average risk preferences of union members. Our results suggest that an overall increase in risk aversion contributes to wage moderation and promotes employment.

In summary, this paper makes three contributions: First, it provides a theoretical analysis of the impact of a worker's risk attitude on the propensity to join a union, and the consequences of this for collective bargaining outcomes. Second, it offers an explicit empirical test of the membership effect of individual risk preferences. Third, it provides evidence on the wage effects of changes in risk preferences of union members. The paper unfolds as follows: Section 2 sets out the model of endogenous union membership. The analysis features one open-shop trade union and one firm. The framework is based on the German institutional situation in which there is no differential treatment of workers according to union membership status. Thus, a union wage premium or a lower dismissal probability cannot help to overcome the free-rider problem. Section 3 contains the description of the data and our empirical specification. In Sections 4 and 5 we present the empirical results, while Section 6 summarises.

## **2. Risk Aversion, Wage Bargaining, and Endogenous Union Membership**

Risk attitudes and labour market outcomes can be related in a multiplicity of ways. To investigate the relation between risk aversion and trade union membership we focus on the employment risk, because excessive wage claims are essential ingredients of trade union models. Given the absence of employment discrimination due to membership in Germany, trade union members and non-members face the same probability of being employed or unemployed. The risk attitude then describes how an individual evaluates the income variation due to the different employment situations. In our setting, with strictly concave utility functions and gross incomes depending on the employment status, the resulting payoffs are affected by trade union membership because a membership fee has to be paid.

We choose such an approach for a number of reasons: first, it is based on the previous modelling of open-shop unions and allows us to compare and relate our findings to those from earlier contributions. Second, the empirical proxies for risk we use in Sections 4 and 5 mainly refer to variations in monetary payoffs. Consequently, the theoretical approach provides a close match to the empirical application. Third, as indicated above, our simple theoretical model provides no clear-cut predictions regarding the impact of risk aversion on the incentives to join a union. This ambiguity is aggravated in more elaborate set-ups. An Occam's Razor argument therefore also suggests focussing on the most straightforward channel of influence.

### *Membership Decision*

To generate an incentive for joining the trade union, it is assumed that the union provides a private good which each member consumes with certainty. Let total utility be additively separable in the utility from income and from the private good. The utility from income is given by  $w^{(1-\sigma_i)/(1-\sigma_i)}$  for  $0 < \sigma_i \neq 1$  and by  $\ln w$  for  $\sigma_i = 1$ , where  $w$  represents the wage and  $\sigma_i$  the constant individual Arrow-Pratt measure of relative risk aversion. Our subsequent exposition focuses on the case of  $\sigma_i \neq 1$ . The measure of relative risk aversion is distributed on the interval  $[\sigma_{\min} + \varepsilon; \sigma_{\max} + \varepsilon]$ ,  $\varepsilon \geq 0$ . Increasing  $\varepsilon$  from  $\varepsilon = 0$  mimics a general rise in risk aversion. The effects of such a rise will be looked at later on. The utility from consuming the private good can differ for employed and unemployed workers and is denoted by  $C^e$  and  $C^u$ , respectively,  $C^e, C^u > 0$ .<sup>1</sup> Theoretically, no restriction on the relative magnitude of  $C^e$  and  $C^u$  is feasible.

The membership fee  $Gw$ ,  $0 < G < 1$ , of an employed worker is a linear function of the wage  $w$ ,<sup>2</sup> so that the disposable income amounts to  $\tilde{w} := w(1 - G)$ . An unemployed worker receives unemployment benefits  $b$ . As a member of the trade union he also pays a membership fee and his disposable income equals  $0 < \tilde{b} < b < \tilde{w}$ . An employed (unemployed) non-member also receives the wage  $w$  (benefits  $b$ ). The probability that a worker is employed equals  $N(w)$ , assuming a random draw from the population of all workers, the size of which is normalised to unity. Hence,  $0 < N(w) \leq 1$  also describes the employment level.

Worker  $i$  decides about membership, anticipating the (equilibrium) levels of union density and wages determined subsequently, and taking into account the utility from the private union good, the benefit level, and the membership fees. Worker  $i$  will join the union if the gain  $Z(\sigma_i)$  from doing so is positive. To ensure the existence of the trade union, there is at least one worker for whom  $Z(\sigma_i) > 0$  holds. Since the utility from the private union good is assumed to be independent of risk attitudes for analytical simplicity, while the evaluation of incomes differs across workers, risk attitudes affect the costs of union membership only. As one consequence there is a measure of risk aversion denoted by  $\sigma$  which makes a particular worker indifferent between leaving the trade union and remaining in it.

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<sup>1</sup> The nature of this private good, which may consist of legal advice, the provision of insurance or pension plans at lower prices than available elsewhere, or the provision of job-related information, is irrelevant for the analysis and will, hence, not be specified in detail.

<sup>2</sup> This assumption is in line with the situation in Germany, where membership fees amount to 1% of the gross wage for employed workers. The subsequent results extend to a fee which is an increasing and weakly convex function  $G(w)$  of the wage  $w$ ,  $0 < G(w) < w$ ,  $1 > G' > 0$ ,  $G'' \geq 0$ .

$$Z(\sigma, \dots) := N(w) \left[ \frac{\tilde{w}^{1-\sigma}}{1-\sigma} + C^e - \frac{w^{1-\sigma}}{1-\sigma} \right] + (1-N(w)) \left[ \frac{\tilde{b}^{1-\sigma}}{1-\sigma} + C^u - \frac{b^{1-\sigma}}{1-\sigma} \right] = 0 \quad (1)$$

The worker implicitly defined by equation (1) represents the marginal member. The derivatives of  $Z(\sigma, \dots)$  with respect to wages ( $Z_w$ ) and the marginal member's measure of relative risk aversion ( $Z_\sigma$ ), are given by:

$$Z_w = N'(w) \left[ \frac{\tilde{w}^{1-\sigma} - w^{1-\sigma}}{1-\sigma} + C^e - C^u - \frac{\tilde{b}^{1-\sigma} - b^{1-\sigma}}{1-\sigma} \right] + N(w) \left[ \tilde{w}^{-\sigma} (1-G) - w^{-\sigma} \right] \quad (2)$$

$$Z_\sigma = N(w) \frac{-\tilde{w}^{1-\sigma} \ln \tilde{w} + w^{1-\sigma} \ln w - C^e}{1-\sigma} - (1-N(w)) \frac{\tilde{b}^{1-\sigma} \ln \tilde{b} - b^{1-\sigma} \ln b + C^u}{1-\sigma} \quad (3)$$

The consequences of higher wages or greater relative risk aversion on the gain from trade union membership are ambiguous. Empirically, a worker's wage has not been found to alter the probability of union membership in Germany (see the estimates presented below and also Wagner 1991, Fitzenberger, Ernst and Haggenev 1999, and Goerke and Pannenberg 2004). This implies  $Z_w = 0$ . The further theoretical analysis will make use of this finding to simplify the exposition. The gain from membership varies with the measure of relative risk aversion  $\sigma$  in an ambiguous manner because  $\sigma$  alters the utility differential from membership in both employment states differently. This ambiguity arises despite the fact that the utility  $C^e$  (or  $C^u$ ) from consuming the private union good is certain, additive, and not subject to an employee's risk attitude. More general assumptions on the nature of this good thus cannot clarify the relation between union membership and risk aversion from a theoretical point of view. Note for later reference that if the gain from membership rises with risk aversion, implying  $Z_\sigma > 0$ , all workers characterised by  $\sigma_i > \sigma$  will benefit from membership so that the worker with the highest measure of relative risk aversion will be the first to join the union.

To relate our analysis to earlier contributions note that in Booth's (1984) seminal paper, the membership decision is independent of risk attitudes for a given wage. This is because an employed worker's gain from membership  $C^e$  is also subject to risk aversion, and a non-member is unemployed with certainty. In Moreton's (1998, 1999) set-up, a variation in risk aversion is modelled as a change in the second derivative of the utility function, holding constant the first derivative. Since the membership decision only depends on utility levels, it is unaffected by risk attitudes. Finally, Oswald (1982) presumes that the income of a union member is higher than that of a non-member, i.e., that  $\tilde{w} > w$  holds, given full employment in

his set-up. In this case, the benefits from union membership decline with the measure of relative risk aversion.

### *Wage Bargaining*

The outcome of the wage bargain between the firm and the union is determined by the (symmetric) Nash solution. The union's preferences are given by those of the median member, whose Arrow-Pratt measure of relative risk aversion is denoted by  $\mu$ . The median member is employed with probability  $N(w)$  and in this case obtains  $\tilde{w}^{1-\mu}/(1-\mu) + C^e$  as payoff, while he is unemployed with probability  $(1 - N(w))$  and then receives  $\tilde{b}^{1-\mu}/(1-\mu) + C^u$ . The trade union's fallback payoff is defined by an unemployed worker's utility, so that the gain from bargaining amounts to  $N(w)\Omega$ ,  $\Omega := (\tilde{w}^{1-\mu} - \tilde{b}^{1-\mu})/(1-\mu) + C^e - C^u$ . The firm uses labour as the only input, while the output price is normalised to unity. Profit maximization leads to  $\partial\Pi/\partial N = 0$ ,  $\partial\Pi/\partial w = -N(w)$  by the envelope theorem, and  $\partial N/\partial w := N'(w) < 0$ . The fallback payoff of the firm is zero. The wage is consequently defined by:

$$V := \frac{N(w)\tilde{w}^{-\mu}(1-G)}{\Omega} - \frac{(N(w))^2}{\Pi} + N'(w) = 0 \quad (4)$$

Subsequently, an interior solution is assumed, implying  $V_w < 0$ , which yields a wage above the full employment level, so that  $0 < N(w) < 1$ . The wage effect of an increase in the measure  $\mu$  of relative risk aversion of the median member is then determined by:

$$V_\mu = -\frac{N(w)(1-G)\tilde{w}^{-\mu}}{\Omega^2} \left[ (C^e - C^u) \ln \tilde{w} - \frac{\tilde{b}^{1-\mu}}{1-\mu} (\ln \tilde{w} - \ln \tilde{b}) + \frac{\tilde{w}^{1-\mu} - \tilde{b}^{1-\mu}}{(1-\mu)^2} \right] \quad (5)$$

The sign of  $V_\mu$  is shaped by two effects: A greater relative risk aversion lowers the gain  $\tilde{w}^{-\mu}$  from a higher wage in equation (4). Additionally, a rise in  $\mu$  alters the median member's gain  $N(w)\Omega$  from bargaining. The overall impact is negative for  $\tilde{w} \geq \tilde{b}$  and  $C^e > C^u$ . This is because the term in square brackets in (5) will be positive for  $\tilde{w} = \tilde{b}$  and rise with  $\tilde{w}$  for  $C^e > C^u$ . However, an unemployed worker's gain from consuming the private good may exceed or fall short of the gain for his employed counterpart, so that the sign of  $C^e - C^u$  is indeterminate.

Relating our findings to those of previous contributions, the negative wage and positive employment impacts of higher risk aversion that we have established in (closed-shop) collective bargaining models have been derived, for example, by Sampson (1983), McDonald (1991),

Oswald (1982), and Blair and Crawford (1984) as well. The employment result extends to a setting in which the alternative income is endogenised (see Nickell 1990).

### *Comparative Statics*

We start by looking at the impact of a rise in the measure of relative risk aversion of all workers on the incentives to join a trade union. Subsequently, we investigate the consequences for wages. Because a change in the wage does not alter the probability of membership (that is, since  $Z_W = 0$ ), the membership curve is vertical in the wage–risk aversion space. This implies that the marginal trade union member—and, hence, union density—are uniquely defined by  $Z(\sigma, \dots) = 0$ . In particular, if the interval  $[\sigma_{\min} + \varepsilon; \sigma_{\max} + \varepsilon]$ ,  $\varepsilon \geq 0$ , from which the measure of risk aversion stems, shifts to the right because  $\varepsilon$  rises from zero to  $\varepsilon > 0$  as depicted in Figure 1, the new marginal member will be characterised by the same value of relative risk aversion as the original one ( $\partial\sigma/\partial\varepsilon = 0$ ).<sup>3</sup> However, the level of risk aversion of the marginal member will be closer to the lower bound of the interval. For  $Z_\sigma > 0$ , this effect is equivalent to an increase in the number of union members. The result can be summarised as:

Proposition 1:

For  $Z_W = 0$  and  $Z_\sigma > 0$ , a general rise in the Arrow–Pratt measure of relative risk aversion raises trade union density.

*Figure 1: Equilibrium Wage and Marginal Member in Wage – Risk aversion Space – about here*

Given  $V_W < 0$  and assuming  $V_\mu < 0$ , the wage effects of a rise in risk aversion nevertheless cannot be ascertained because the impact of a general increase in risk aversion on the median member's measure of risk aversion  $\mu$  is uncertain. The measure  $\mu$  is likely to increase with a general shift of the distribution to the right (implying  $\partial\mu/\partial\varepsilon > 0$ ), because everyone becomes more risk-averse. Therefore, the original median member, prior to the general increase in risk aversion, will be characterised by a greater level of risk aversion subsequent to the shift of the distribution. Theoretically, however, a fall in  $\mu$  cannot be ruled out (that is,  $\partial\mu/\partial\varepsilon < 0$ ). This is the case since the identity of the median changes. If a relatively large mass of the distribution of the measure of risk aversion lay to the left of the original marginal member but to the right of  $\sigma$  subsequent to the shift of the distribution, the median member's risk aversion might decline. This effect will not occur if the distribution is fairly symmetric around the positions of the original and new marginal member. Assuming, therefore, a uniform distribution, the median

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<sup>3</sup> Our subsequent results will also hold if all workers in the neighbourhood of the marginal and the median member become more risk-averse, although not necessarily by the same amount.

member's measure of relative risk aversion equals  $\mu = [\sigma + (\sigma_{\max} + \varepsilon)]/2$ . Accordingly, a general increase also raises  $\mu$  ( $\partial\mu/\partial\varepsilon = 0.5$ ). In this case, the wage-bargaining curve is unambiguously downward-sloping in the wage–risk aversion space, as depicted in Figure 1. Moreover, a general rise in risk aversion shifts the wage-bargaining curve downward from  $V_0$  to  $V_1$ . The wage effect is given by  $dw/d\varepsilon = -V_\mu/(2V_w)$ . The employment consequences are determined by the wage change. We may then summarise:

Proposition 2:

Assume  $V_\mu < 0$ , that is, a negative relationship between the median member's measure of risk aversion and the bargained wage. If, in addition,  $Z_w = 0$  holds and the Arrow–Pratt measure of relative risk aversion is distributed uniformly, a general rise in the measure of relative risk aversion will lower the bargained wage and raise employment.

Given the theoretical ambiguities underlying the Propositions, the relationships between risk aversion and (1) the individual incentives to become a trade union member and (2) collective bargaining outcomes ultimately become empirical issues. The multiplicity of possible effects indicates, in addition, that a more sophisticated, that is non-linear, specification of the utility function, a more detailed treatment of the behaviour of unemployed workers or of the specification of the risk that workers face will not yield more precise predictions.

### 3. Data and Empirical Specifications

#### *Data*

In our theoretical model wages result from negotiations between a trade union and employer. To capture this setting, matched employer–employee data with detailed information on firms and workers are desirable. However, the available linked employer–employee data sets for Germany provide no information on individual risk attitudes, which is pivotal for our analysis. Therefore, we utilise data from the German Socio-Economic Panel (GSOEP), a nationally representative longitudinal survey of the resident German population (Wagner, Burkhauser, and Behringer 1993, SOEP Group 2001), containing a number of direct measures of individual risk attitudes, three of which we use. The 2003 survey included information on union membership, while the 2004 survey contained the risk indicators.<sup>4</sup> Our sample consists of full-time workers with valid information on the relevant risk measures and union membership from West and East Germany. Self-employed persons, apprentices and civil servants ('Beamte') are excluded.

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<sup>4</sup> The data used was extracted using the add-on package SOEP Menu written by J. P. Haisken-DeNew (Haisken-DeNew 2005; <http://www.soepmenu.de>) and SOEP Menu plug-ins written by J. P. Haisken-DeNew and M. Hahn.

Moreover, in the regression analyses all respondents with missing information on relevant variables are dropped. Using NACE one-digit industry classifications, union density in our sample ranges from 8% in the financial sector to 66% in ‘mining and quarrying’, with an average of 18.4%.

As argued above, the individual decision to join a trade union depends on wages, the income when unemployed, the utility of the private good provided by the trade union and the membership fee. Hence, information on how individual risk attitudes affect the evaluation of monetary payments is required. To meet this requirement we first utilise a survey question requiring respondents to indicate their willingness to take risks in financial matters. This willingness is recorded on an eleven-point scale. A value of zero (ten) indicates a total unwillingness (willingness) to take risks. Second, we employ a survey question corresponding more closely to one of the standard lottery measures used in experiments. In particular, information is collected on an individual's investment choices, based on a hypothetical lottery prize of €100,000. The questionnaire allows for six opportunities to invest these winnings. More precisely, the respondent can purchase a risky asset for €100,000, €80,000, €60,000, €40,000, or €20,000 or can refrain from such an acquisition, with equal chances of doubling the amount invested or losing half of it after two years. Since the second measure is based on explicit stakes and probabilities, it holds risk perceptions constant across individuals.<sup>5</sup> As a check of robustness, we additionally employ a survey question on the willingness to take risks in general.

The GSOEP risk measures have been validated in several experiments. Dohmen, Falk, Huffman, Sunde, Schupp, and Wagner (2005) find that questionnaire responses to the general risk question are reliable predictors of actual risk-taking behaviour in a field experiment with representative subject pools. Moreover, answers to the general risk question are strongly correlated with answers to the other two questions. In addition, Dohmen et al. (2005) demonstrate that the best predictor of a specific outcome is the risk measure most closely associated to the relevant context. Therefore, we are confident that the GSOEP risk measures are high-quality proxies for actual risk preferences in our specific context.

Due to data availability we link the information on individual risk attitudes in 2004 with data on union membership and its determinants measured in 2003. Hence, the crucial assumption of our empirical work is that individual union membership in 2003 does not alter peoples' risk

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<sup>5</sup> Within the expected utility framework, the hypothetical lottery allows calculating the Arrow–Pratt measure of relative risk aversion  $\sigma_i$  for each respondent (see, for example, Caliendo, Fossen, and Kritikos 2007 or Guiso and Paiella 2005). However, Belzil (2007) questions the validity of such a measure based on lottery questions. Since our results do not depend on the value of  $\sigma_i$ , we only use the plain information.

attitudes until 2004. This requirement is consistent with evidence provided by Andersen, Harrison, Lau, and Rutström (2005), Barsky, Juster, Kimball, and Shapiro (1997), and Sahn (2007) that risk preferences elicited from hypothetical lotteries in surveys are stable over time.

### *Empirical Specifications*

Since we are interested in assessing the effect of individual risk attitudes on trade union membership, we start with the following specification of a standard probit model:

$$P(U_{i,03} = 1 | R_{i,04}, X_{i,03}) = \Phi(\alpha R_{i,04} + \beta' X_{i,03}), \quad (6)$$

where  $U_{i,03}=1$  if the individual is a union member (in 2003),  $R_{i,04}$  is the relevant measure of individual risk attitudes (in 2004),  $X_{i,03}$  is a vector of control variables (also measured in 2003),  $\alpha$ ,  $\beta'$  are (vectors) of unknown parameters and  $\Phi()$  is the cdf of the standard normal distribution. Estimated marginal effects and standard errors robust with respect to clustering at the household level are documented.

As a first check of robustness, we address the potential endogeneity of our plain risk measures and employ an instrumental variable probit estimator (Wooldridge 2002, 472-477). Individual height is used as an instrument for individual risk attitudes, since height (i) is plausibly exogenous to the indicators of individual risk attitudes and has a significant impact on individual risk preferences, (ii) is not correlated with the error term in the union membership equation, and (iii) has no direct impact on the likelihood of being a union member.

Both probit estimators require a distributional assumption to be made, i.e., a particular normality assumption. However, there is no prior knowledge on the validity of this assumption. As a second check of robustness, we therefore employ a semi-nonparametric estimator originally suggested by Gallant and Nychka (1987) and used in applied work, for example, by Gabler, Laisney and Lechner (1993), Gerfin (1996), and Stewart (2005). Essentially, this estimator approximates the true distribution of the error terms by a Hermite series. The approximation can be expressed as the product of the normal density and a squared polynomial and thus nests the standard probit model of equation (6). It can be estimated by maximizing a pseudo-likelihood function and usual test procedures can be applied. We adopt the framework proposed by Stewart (2004) to test the validity of the distributional assumption of the probit model in our application and to estimate the parameters of interest.<sup>6</sup>

The vector of control variables consists of the usual covariates that previous studies have found to affect the probability of union membership in Germany: age, age squared, tenure, tenure

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<sup>6</sup> See Stewart (2004) for a detailed description of the econometric specification.

squared, and dummy variables for being a foreigner, being male, different firm size categories, having completed an apprenticeship, having a university degree, being a member of a works council, having preferences for the Social Democratic Party (SPD) or the Christian Democratic Parties (CDU/CSU), the father being self-employed when the respondent was 15 years old, being a blue collar worker, the industry (NACE 1-digit) in which the respondent works, and the state of residence ('Bundesland').<sup>7</sup> Since we link data from the years 2003 and 2004, longitudinal sample weights are calculated and used to account for the design of the different subsamples of the GSOEP as well as panel attrition (cf. Pannenberg et al. 2004).

## 4. Results

### *Descriptive Evidence*

Figure 2 shows the distribution of individual risk attitudes in financial matters by union membership status. Each bar in the histograms indicates the percentage of respondents choosing a number on the eleven-point scale, indicating their willingness to take risks in financial matters. The according reluctance is striking: 86% of all non-members and 91% of all union members choose a value of five or less on the eleven-point scale. Moreover, Figure 2 reveals that union members are more risk-averse than non-unionists. Figure 3 corroborates this impression with respect to the lottery measure: 64% of all union members and 54% of all non-members do not invest a positive amount of the hypothetical lottery prize in the risky asset.<sup>8</sup> With respect to general risk attitudes, Figure A1 (in the Appendix) documents that 63% of all workers choose a value of five or less on the eleven-point scale. However, for this measure we do not observe significant differences in the distributions of risk attitudes for members and non-unionists.

*Figures 2 and 3: Union Membership and Risk Preferences – about here*

### *Regression Results*

The descriptive evidence indicates that risk aversion is more prevalent among union members. We therefore use the standard weighted probit specification to assess whether individual risk attitudes have an impact on union membership. For the sake of a more intuitive interpretation we recoded the eleven-point scale of the two risk measures for our regression analysis in

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<sup>7</sup> Descriptive statistics for all control variables are presented in Table A2 in the Appendix.

<sup>8</sup> Kolmogoroff/Smirnov tests reject the null hypothesis of equality of the distributions of risk attitudes for union members and non-members at the  $\alpha = 0.002$  ( $\alpha = 0.061$ ) level for the financial risk (lottery) question.

reverse order, i.e., '0' indicating strong risk-love and '10' total reluctance to take risks. Consequently, for all measures of risk a higher value indicates greater risk-aversion.<sup>9</sup>

As a preliminary exercise, we estimated regressions also including the log of the monthly gross wage as covariate. Irrespective of the measure of individual risk aversion employed, we were able to replicate previous findings by Wagner (1991), Fitzenberger et al. (1999), and Goerke and Pannenberg (2004) that the individual gross wage does not influence the probability of membership.<sup>10</sup> Accordingly, the wage is not included in our main specifications. In terms of our theoretical model, the assumption  $Z_w = 0$  captures the insignificant wage effect.

*Table 1: Union Membership and Individual Risk Attitudes: Probit-Estimates – about here*

Table 1 presents the estimated marginal effects and their standard errors for the three measures of individual risk attitudes. Since our focus is on the relationship between risk aversion and union membership we do not discuss the parameter estimates for the set of control variables. They are in line with results from other studies.<sup>11</sup> Column 1 reveals that full-time workers who are more risk-averse in financial affairs exhibit a significantly higher probability of being a union member than their less risk-averse colleagues. The marginal effects imply that someone who switches from being extremely risk-loving ('0') to being extremely risk-averse ('10', after recoding) in financial matters exhibits a roughly seven-percentage-point higher likelihood of being a union member than before. Given that the unconditional mean of being a union member is slightly above 18% in our sample, the size of the estimated marginal effect is remarkable. Column 2 presents the estimates for the lottery measure of individual risk aversion. We observe a significant increase of similar magnitude in the probability of being a union member if someone decides not to invest a positive fraction of the hypothetical prize in the risky asset. If we use the more encompassing measure of individual risk attitudes—instead of the one related to financial matters or the lottery—we do not find a significant effect (column 4). This is in line with evidence presented by Dohmen et al. (2005) that a context-specific measure of individual risk attitudes is the best predictor of actual behaviour in that context.

Summing up, we observe a significantly positive association between individual risk aversion in monetary affairs and the likelihood of being a union member. Hence, in terms of the

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<sup>9</sup> With respect to the lottery measure, we do not have to recode our variable, since '1' indicates an investment of €100,000 and '6' indicates an investment of €0.

<sup>10</sup> Table A1 in the Appendix documents the parameter estimates for a specification with the measure of individual risk attitudes in financial matters.

<sup>11</sup> See, for example, Fitzenberger et al. (1999), Fitzenberger et al. (2006), Goerke and Pannenberg (2004), and Schnabel and Wagner (2003). Only the significantly positive effect of acting as a works council member represents a new result. See Goerke and Pannenberg (2007) for evidence on the relationship between union membership and works council membership.

theoretical discussion in Section 2, an overall increase in risk aversion is accompanied by an increase in union density, a finding which is consistent with Proposition 1.

### *Checks of Robustness*

The previous empirical specifications have assumed that the measures of individual risk attitudes are not correlated with the errors in the membership equation. However, one might argue that individual risk attitudes are endogenous. We test for the potential endogeneity of individual risk attitudes by means of the IV probit estimator, using the instrument ‘individual height’, as described above.<sup>12</sup> Wald tests indicate that we cannot reject the hypothesis that the relevant measures of risk aversion are exogenous.<sup>13</sup> Hence, taking these results at face value, there is no need for an IV specification.<sup>14</sup>

As pointed out above, there is no a priori evidence that the normality assumption underlying the probit models is appropriate. Performing likelihood ratio tests comparing the log-likelihoods of the probit and the semi-nonparametric specification of the union membership equation described above indeed indicate that the normality assumption of the probit model might not be upheld. Therefore, in Table 2 we additionally present the estimated parameters for the different risk measures based on the semi-nonparametric specification.<sup>15</sup>

### *Table 2: Union Membership and Individual Risk Attitudes: Semi-Nonparametric Estimates (SNP) – about here*

The estimated parameters of the two measures of individual risk preferences on monetary issues are significantly positive and similar in size to the estimated parameters of the standard probit specification (not documented). Hence, relaxing the distribution assumptions of our econometric specifications again leads to parameter estimates which confirm the finding of a positive correlation between individual risk aversion and trade union membership. Summing up, there is substantial evidence that the probability of trade union membership of German full-time workers rises with their aversion to risk, particularly in monetary matters.

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<sup>12</sup> Height is a valid instrument in terms of significantly negative parameter estimates for the two risk measures based on the willingness to take risks in financial matters and in general in reduced-form specifications where the individual risk aversion measures are regressed on height and the described set of control variables, confirming findings by Dohmen et al. (2005). The respective test statistics are  $\chi^2(1) = 5.47$  and  $\chi^2(1) = 3.96$ . There is no significant correlation between height and the measure of risk aversion based on the hypothetical lottery.

<sup>13</sup> The respective test statistics are  $\chi^2(1) = 1.76$  and  $\chi^2(1) = 2.06$ . These results are confirmed by the test statistics of the Rivers/Vuong test of exogeneity. See Wooldridge (2002, pp. 472) for a description of both tests.

<sup>14</sup> Note, however, that the IV results (not documented) again suggest a positive correlation between individual risk aversion and trade union membership.

<sup>15</sup> The other parameter estimates are available from the authors on request.

## 5. Further Correlation Analysis

The theoretical model shows that the degree of risk aversion of the median trade union member has an impact on the bargained wage and, consequently, on employment. Our estimates indicate that an overall increase in the degree of risk aversion raises the individual probability of union membership and, *ceteris paribus*, leads to a rise in union density. Our preliminary estimates also suggest  $Z_w = 0$  (see Table A1 in the Appendix). As a consequence, the bargained wage will decrease and employment increase if  $V_\mu < 0$  holds, i.e., if there is a negative relation between the bargained wage and the measure of risk aversion of the median member (see Proposition 2).

Due to the lack of matched employer–employee data with information on risk attitudes, we proceed in three steps to gain a crude grasp of the sign of  $V_\mu$ . First, we generate a set of cell dummies indicating combinations of union-specific industry dummies (eight unions), whether an individual lives in West or East Germany and has either of three occupational qualifications (low, medium, high). These 48 dummies mimic the bargaining structure in Germany. Second, we specify standard Mincer earnings regressions at the individual level including these 48 cell-specific dummies as well as the following covariates: age, age squared, tenure, tenure squared and dummy variables for being a foreigner, being male, different firm size categories, having completed an apprenticeship, having a university degree, being member of a works council, and being a blue collar worker. In a third step, we use the estimated parameters of the cell-specific dummies and regress these adjusted average wage differentials on the cell-specific average risk preferences of union members as well as on union density. The observations are weighted by the size of the particular cell. Table 3 documents the parameter estimates of the third step.<sup>16</sup>

*Table 3: Gross Wages and Risk Attitudes of Union Members in Germany – about here*

We observe significantly negative correlations between adjusted cell-specific (log) gross monthly wages and both averaged measures of the individual willingness to take risks in monetary affairs.<sup>17</sup> Our finding of a negative correlation is consistent with the assumption of  $V_\mu < 0$ . Moreover, the parameter estimates reveal a positive correlation between industry-specific union densities and wages, but this correlation is not significantly different from zero.

Our simple correlation exercise provides supportive evidence for the two effects of individual risk aversion in the theoretical model: higher risk aversion is correlated with lower wages while it also leads to a rise in union density, which tends to increase bargained wages. This finding is consistent with the interpretation that an increase in individual risk aversion changes the

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<sup>16</sup> The correlation analysis is based on  $N = 43$  observations, since we do not observe union members in five cells.

<sup>17</sup> Bonin et al. (2007) find a significantly negative correlation of individual wages and individual risk preferences for Germany.

preferences of the median member, which unions take into account when bargaining over wages and which *ceteris paribus* has a negative impact on wages.

## **6. Summary**

Why do workers belong to trade unions? Our theoretical analysis is based on the assumption that a union provides its members with an excludable good. This constitutes the gain from union membership. We, furthermore, show that the costs of membership, namely the utility losses resulting from the membership fee, vary with the extent of risk aversion. As a consequence, individual risk aversion alters the propensity to be a trade union member. Our empirical findings support this prediction. More specifically, using the German Socio-Economic Panel (GSOEP), we find that the probability of union membership increases significantly and by a sizeable amount with indicators of individual aversion to risk. In a collective bargaining set-up, a change in risk aversion will then have two effects. First, the median member's preferred wage (and employment) outcome changes. In addition, the variation in the level of union membership will alter the identity of the median member. Accordingly, variations in risk aversion have wage and employment effects. A simple correlation analysis suggests that wages may fall and employment may rise with an increase in risk aversion of the labour force. This empirical result is also consistent with the interpretation that trade unions provide insurance against income variations by reducing uncertainty (Agell and Lommerud 1992, Burda 1995), where the strength of this insurance motive depends on risk preferences.

The impact of individual, direct measures of risk aversion on the individual decision to become a trade union member has not been analysed previously. Since our information relates to Germany, it will be interesting to see whether this positive correlation between risk aversion and union membership is also robust to other systems of industrial relations. The wider implications of such a positive relationship—for union organising campaigns, for the preferred degree of centralisation in bargaining, for the interaction between product and labour market imperfections, and for the role of trade unions as insurance mechanisms in open-shop settings, to cite only a few examples—will be important topics for future investigation.

Figure 1: Equilibrium Wage and Marginal Member in Wage – Risk Aversion Space

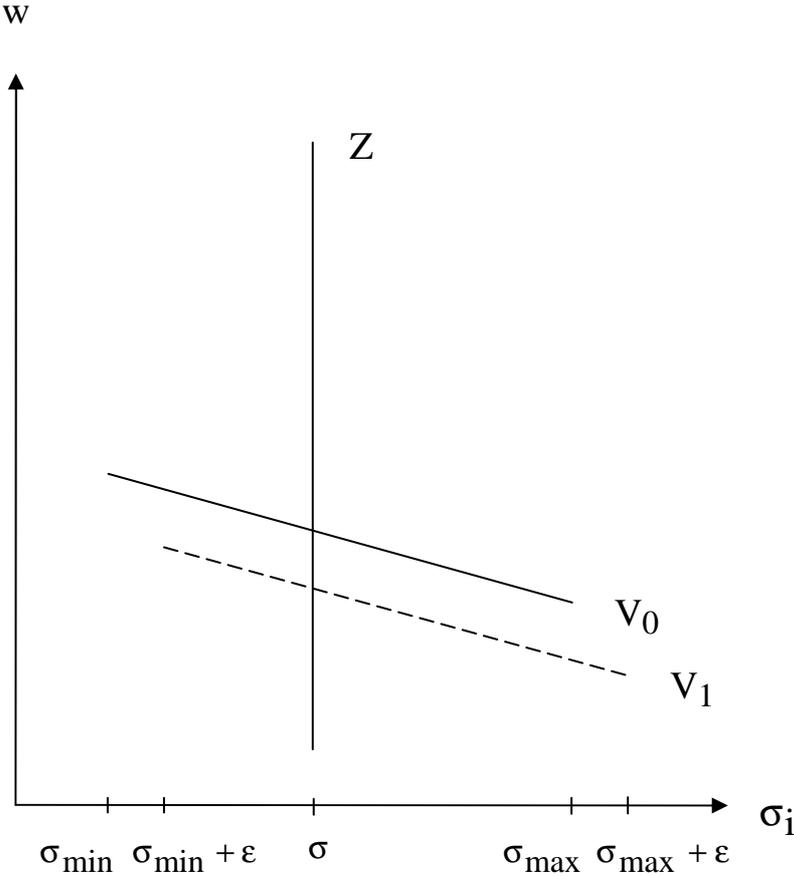
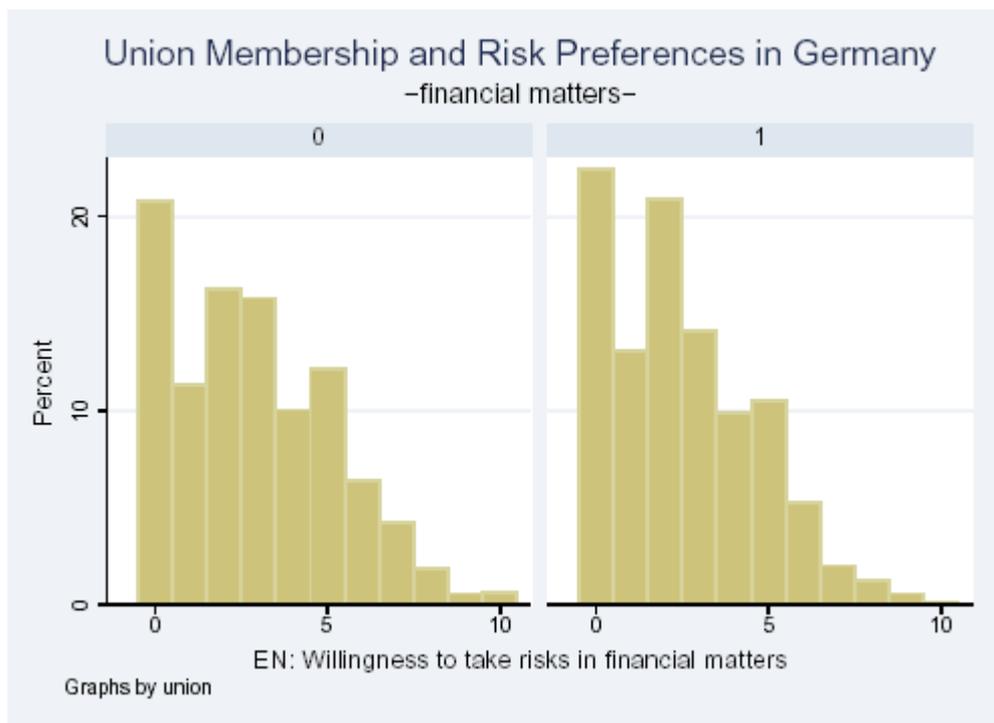


Figure 2:



0: non-member; 1: member of a trade union

Figure 3:



0: non-member; 1: member of a trade union

Table 1: Union Membership and Individual Risk Attitudes in Germany

- Probit Estimates -

	ME / s.e.	ME / s.e.	ME / s.e.
Risk Aversion_finance	0.007* (0.003)	-- --	-- --
Risk Aversion_lottery	-- --	0.013* (0.006)	-- --
Risk Aversion_general	-- --	-- --	-0.003 (0.003)
Blue_collar	0.124** (0.020)	0.125** (0.019)	0.129** (0.020)
Father_self-employed	-0.051* (0.021)	-0.057* (0.020)	-0.054* (0.020)
Prefers SPD	0.105** (0.022)	0.103** (0.021)	0.101** (0.021)
Prefers CDU/CSU	-0.046** (0.016)	-0.047** (0.016)	-0.050** (0.016)
Member of works council	0.364** (0.044)	0.360** (0.043)	0.359** (0.043)
Tenure	0.010** (0.002)	0.010** (0.002)	0.010** (0.002)
Tenure (sqrd)	-0.000* (0.000)	-0.000* (0.000)	-0.000* (0.000)
Apprenticeship	0.017 (0.026)	0.017 (0.025)	0.016 (0.025)
University degree	-0.042 (0.027)	-0.041 (0.027)	-0.044 (0.027)
Firm size: 20 ≤ X < 200 workers	0.095** (0.027)	0.094** (0.027)	0.094** (0.026)
Firm size: 200 ≤ X < 2000 workers	0.189** (0.033)	0.185** (0.033)	0.186** (0.033)
Firm size: X ≥ 2000 workers	0.256** (0.035)	0.253** (0.035)	0.251** (0.035)
Male	0.029 (0.016)	0.027 (0.015)	0.020 (0.016)
Foreigner	0.016 (0.028)	0.016 (0.028)	0.020 (0.028)
Age	0.011 <sup>+</sup> (0.006)	0.011 <sup>+</sup> (0.006)	0.011 <sup>+</sup> (0.006)
Age (sqrd)	-0.000 <sup>+</sup> (0.000)	-0.000 (0.000)	-0.000 <sup>+</sup> (0.000)
Industry dummies & state dummies	yes	yes	yes
Wald_X	547.2**	547.0**	551.5**
N	5369	5370	5372

Source: SOEP 2003-2004. Longitudinal weights are used.

ME/s.e.: marginal effect/standard error. Robust standard errors also allow for clustering at the household level.

Wald\_X: Wald test with H0: no joint significance of all regressors. (df=45)

Significance levels: \*\* (0.01), \* (0.05), + (0.10).

Table 2: Union Membership and Individual Risk Attitudes in Germany  
 - Semi-Nonparametric Estimates (SNP) -

	Risk Aversion _finance	Risk Aversion _lottery	Risk Aversion _general
$\hat{\alpha}$	0.035*	0.067*	-0.008
(s.e.)	0.017	0.033	0.015
LR_D	17.1**	15.5**	14.4**
Wald_X	877.4**	953.0**	900.6**
N	5369	5370	5372

Source: SOEP 2003-2004. Longitudinal weights are used.

$\hat{\alpha}$  : Parameter estimate of particular risk measure.

s.e.: standard error.

Robust standard errors.

Significance levels: \*\* (0.01), \* (0.05), + (0.10).

Hermite polynomial is of order 3, i.e., three additional parameters are estimated.

Set of covariates is identical to specifications in Table 1.

LR\_D: Likelihood-Ratio test of Probit-Model against SNP extended model. (df=1)

Wald\_X: Wald-Test with H0: no joint significance of all regressors. (df=45)

Table 3: Gross Wages and Risk Attitudes of Union Members in Germany

	ME / s.e.	ME / s.e.	ME / s.e.
Risk Aversion_finance_cell	-0.130* (0.052)	--	--
Risk Aversion_lottery_cell	--	-0.196* (0.094)	--
Risk Aversion_general_cell	--	--	-0.012 (0.036)
Union density_cell	0.006 (0.005)	0.006 (0.005)	0.005 (0.005)
N	43	43	43
R <sup>2</sup>	0.16	0.12	0.03

Source: SOEP 2003-2004. Cell-specific weights are applied.

OLS-Regression of cell-specific average log gross monthly wages on a cell-specific average of individual risk aversion of union members, cell-specific union density, and dummies for cell-specific average qualifications.

Significance levels: \*\* (0.01), \* (0.05), + (0.10).

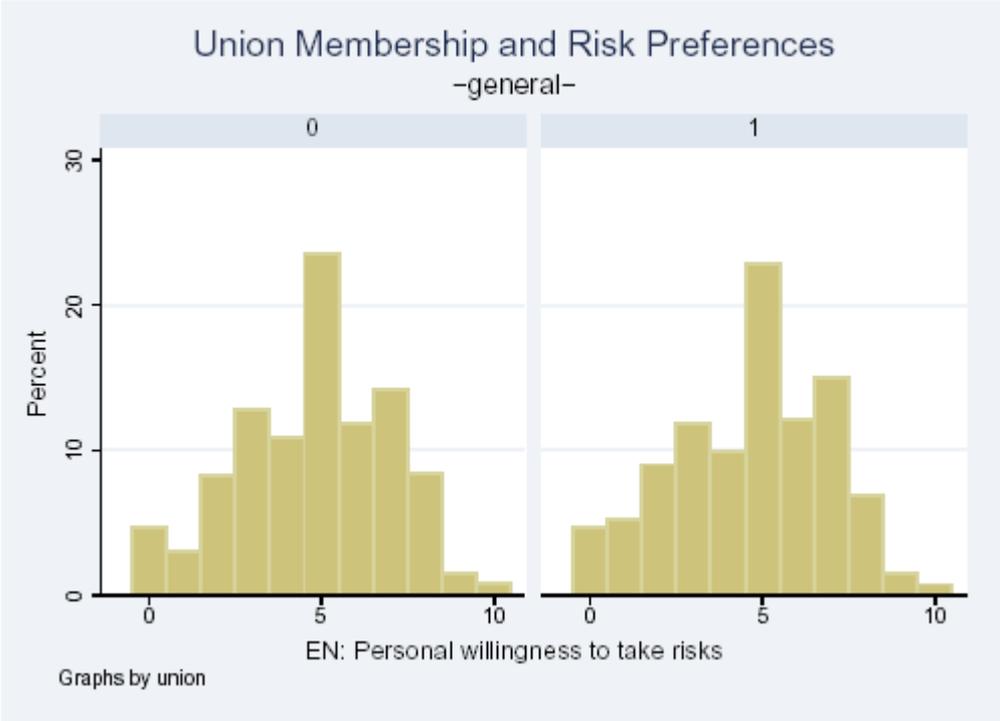
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Appendix

Figure A1:



0: non-member;      1: member of a trade union

Table A1: Union Membership and Individual Risk Attitudes in Germany  
- Probit Estimates -

	ME / s.e.
Risk_finance	0.007* (0.003)
Log (gross wage)	-0.028 (0.025)
Male	0.043* (0.017)
Foreigner	0.002 (0.028)
Age	0.011 (0.006)
Age (sqrd)	-0.000 (0.000)
Tenure	0.012** (0.003)
Tenure (sqrd)	-0.000* (0.000)
Apprenticeship	-0.008 (0.027)
University degree	-0.050 (0.028)
Prefers SPD	0.106** (0.022)
Prefers CDU/CSU	-0.048** (0.017)
Blue-collar	0.110** (0.022)
Father_self-employed	-0.030 (0.022)
Firm size: 20 ≤ X < 200 workers	0.099** (0.028)
Firm size: 200 ≤ X < 2000 workers	0.198** (0.035)
Firm size: X > 2000 workers	0.255** (0.038)
Member of works council	0.355** (0.047)
Industry dummies & state dummies	yes
N	4881
Wald_X	500.2**

Source: SOEP 2003-2004. Longitudinal weights are used.

ME/s.e.: marginal effect/standard error.

Robust standard errors also allow for clustering at the household level.

Wald\_X: Wald-Test with H0: no joint significance of all regressors. (df=45)

Significance levels: \*\* (0.01), \* (0.05), + (0.1)

Table A2: Descriptive Statistics of Covariates

Variable	Mean	Std. Dev.
Male	0.631	0.482
Foreigner	0.078	0.267
Age ( <i>in years</i> )	41.089	10.75
Tenure ( <i>in years</i> )	10.512	9.666
Apprenticeship	0.658	0.474
University degree	0.212	0.409
Prefers Social Democrats ( <i>SPD</i> )	0.191	0.393
Prefers Christian Parties ( <i>CDU/CSU</i> )	0.185	0.388
Blue collar worker	0.367	0.482
Father was self-employed	0.101	0.302
Firm size: $20 \leq X < 200$ workers	0.305	0.460
Firm size: $200 \leq X < 2000$ workers	0.247	0.431
Firm size: $X \geq 2000$ workers	0.235	0.424
Member of works council	0.040	0.197
Schleswig-Holstein	0.033	0.181
Hamburg	0.025	0.156
Lower Saxony	0.085	0.279
Bremen	0.007	0.087
North Rhine-Westphalia	0.219	0.414
Hesse	0.065	0.247
Rhineland-Palatinate, Saarland	0.054	0.226
Baden-Wuerttemberg	0.134	0.341
Bavaria	0.160	0.366
Berlin (East)	0.015	0.122
Mecklenburg / Western Pomerania	0.019	0.139
Brandenburg	0.030	0.173
Saxony-Anhalt	0.029	0.169
Thuringia	0.034	0.182
Saxony	0.055	0.229
Mining / quarrying	0.011	0.108
Manufacturing	0.004	0.067
Electricity / gas/ water supply	0.320	0.466
Construction	0.014	0.119
Wholesale and retail trade/ repair	0.067	0.250
Hotels / restaurants	0.120	0.325
Transport, storage / communication	0.022	0.146
Financial intermediation	0.059	0.236
Real estate / renting / business	0.054	0.227
Public administration/ defence	0.082	0.275
Education	0.056	0.231
Health / social work	0.038	0.193
Other services / Private households	0.106	0.308
Individual height (cm)	174.297	9.116

Source: SOEP 2003-2004. Longitudinal weights are used. N=5908.