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Risky Business – The Role of Individual Risk Attitudes in Occupational Choice

Abstract

This study analyzes the relationship of individual risk attitudes and occupational sorting with respect to occupational earnings risk. By using the German Mikrozensus, a precise measure for earnings risk is computed as the occupation-wide standard deviation of wages. Following the procedure proposed by Bonin (2007), this earnings risk measure is used as dependent variable in cross-sectional and panel data estimations using the SOEP data of 2004 and 2006, including a measure of the individual willingness to take risks. The significant relationship in cross-sectional analyses vanishes when controlling for unobserved heterogeneity. Cross-sectional results seem to be driven by the correlation of unobserved ability and willingness to take risks, and are potentially biased by an attenuation bias due to unstable risk preferences. This study contributes to the existing literature by showing the importance of controlling for unobserved heterogeneity and instability of attitudes when examing the effects of personality traits in labor market decisions.

JEL Classification: J31, J24, D81

Keywords: Risk attitudes; occupational sorting; earnings risk; mundlak transformation

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1. Introduction

Typically, applied labor economists are interested in analyzing main labor market outcomes like wages and employment status, which they tend to explain directly by individual characteristics, such as age, education and gender. Nonetheless, these approaches deny an important upstream process that to some extent predetermines these outcomes, namely occupational choice. As each individual chooses his occupation more or less freely, it is appropriate to look at how individual characteristics determine occupational choice and thereby have an effect on wages or unemployment probability. A huge literature in economics covers a broad variety of potential factors of impact in occupational choice, e.g. personality traits (Ham et al., 2009), gender (Johnes, 2000), intergenerational transmission (Chevalier, 2002) or tax policies (Shan and Powell, 2010).

This study particularly examines the relationship between individual risk attitudes and occupational earnings risk. Expected wages, employment stability and probability, injury risk differ greatly between occupations, as do preferences for specific tasks, risks, money or leisure between individuals.

The first study taking this uncertainty into account was carried out by King (1974), who assumed occupation-related income to be a random variable. Standard economic theory should then predict a dependency of occupational choice to risk preferences. Although implemented in such microeconomic models, individual risk attitudes are only seldom taken into account in empirical studies. Only recently have risk attitudes been regularly included in major microeconomic datasets. This allows the analysis of effects of heterogeneous risk attitudes in uncertain environments as the labor market, by controlling for huge sets of socioeconomic characteristics.

This study follows the approach by Bonin et al. (2007), who analyzed this question previously in a cross-sectional approach by using the German SOEP data. By extending their approach by using panel estimation methods, it is shown that the effect of risk attitudes is prevalent in cross-sectional analysis but becomes insignificant when controlling for unobserved heterogeneity. Potential reasons are biases due to instable preferences and labor market conditions, and due to the correlation between ability and risk attitudes, which both cannot be controlled for in cross-sectional analysis.

The analysis uses a two-step approach. First, earnings risk is computed as the occupational standard deviation of a standard Mincer style wage regression, following the approach by Mcgoldrick (1995). In the second step, this earnings risk measure is then used as dependent variable of a regression on an individual level, including willingness to take risks as explanatory variable.

For the purpose of this analysis, occupational change is defined as changing the occupation at the 2- or 3-digit level of the International Standard Classification of Occupations (ISCO88). Using the most detailed level of ISCO88 is crucial for the analysis. First, using broader definitions of occupations leads to a loss in variance in occupational change, as people have to change their field of work drastically to be identified as occupational changers. Second, broader definitions of occupations lead to a broader variety of different jobs within occupations, which in turn leads to an artificial earnings risk within occupations. To illustrate this: At the 2-digit ISCO88 level, economists are coded together with social workers and philosophers. Very different mean wages of these professions lead to a high earnings risk that is mainly an artifact of the broad occupational definition.

The main contribution of this study is the usage of the panel structure of the German Socio-Economic Panel (SOEP) to control for unobserved heterogeneity and timing of sorting decisions. This bypasses two potential pitfalls that may bias a cross-sectional analysis detrimentally.

Risk attitudes are often discussed to be correlated with cognitive ability, see for example the experiments by Dohmen et al. (2007). This leads to potentially biased results, as one cannot clearly identify whether one is measuring the effect of risk attitudes or simply cognitive ability.

Also the timing of sorting decisions has to be taken into account in this framework. By analyzing sorting decisions in a purely cross-sectional framework, very severe assumptions have to be imposed. Both labor market conditions and risk attitudes have to be assumed to be stable since sorting (which happened sometimes in the past). The assumption of stable risk preferences is clearly rejected by the SOEP data. Only 27 percent of all individuals that were observed in 2004 and 2008 did *not* change their self assessed willingness to take risks between 2004 and 2008. Such violations of these stability assumptions potentially induce an attenuation bias that can be avoided when looking only at recent or observable occupational changes.

This study makes use of two different datasets, the German Mikrozensus[1] for computing highly precise measures of occupational earnings risk and the SOEP[2] to have access to information on individual risk attitudes. Using the Mikrozensus has the main advantage of providing a very large number of observations within each occupational cell at the 3-digit level, which should produce more precise estimates than those used in previous studies using this method to compute earnings risk, as for example Bonin et al. (2007), who only relied on the SOEP data.

The remainder of this paper is as follows. In section 2, the recent literature on the topic is summarized and the contributions of this study are shown. Section 3 explains the method of eliciting the earnings risk measure from the Mikrozensus and gives some information on measurement of willingness to take risks within the SOEP data.

In section 4, cross sectional estimations similar to the ones by Bonin et al. (2007) are analyzed, using the data from the Mikrozensus and SOEP waves of 2004 and 2006. Regardless of period and level of observation (ISCO88 2- or 3-digit) a significant relationship between individual risk attitude and earnings risk is identified. A higher willingness to take risks by one point is related to a higher earnings risk by 5 percent.

Section 5 uses then a Mundlak style panel estimation method to control addi-

[1]The Mikrozensus is a representative annual 1 percent sample of the German population, published by the German Federal Statistical Office. For further information see www.destatis.de

[2]The SOEP is a panel survey conducted since 1984 and covering roughly 20.000 individuals per wave. For more information see Haisken-DeNew and Frick (2005). The data used in this thesis was extracted using the Add-On package PanelWhiz for Stata. PanelWhiz (http://www.PanelWhiz.eu) was written by Dr. John P. Haisken-DeNew (john@PanelWhiz.eu). See Haisken-DeNew and Hahn (2006) for details. The PanelWhiz generated DO file to retrieve the data used here is available from me upon request. Any data or computational errors in this thesis are the author's.

tionally for unobserved heterogeneity and to identify recent sorting decisions. When controlling for unobserved heterogeneity, the coefficients are rendered in general insignificant. There is still a significant relationship, but only for recent job changers, indicating a potential attenuation bias of time passing since the actual sorting took place.

Finally, section 6 concludes and discusses the implications arising from the differences between cross-sectional and panel estimations.

2. Literature overview

This study is related to two strands of recent literature, the one concerning the role of risk attitudes in occupational sorting and the other one concerning wage growth. The first strand, the role of risk attitudes in sorting processes, is motivated by economic job search theory which implies lower mean wages due to lower reservation wages for more risk-averse individuals (see Cox and Oaxaca (1989)).

The recent study by Bonin et al. (2007) analyzes the effect of individual risk attitudes within a sorting process with respect to earnings risk on the 2-digit level of the ISCO88 classification. Using the 2004-wave of the SOEP, i.e. focusing on a cross-sectional view, they find a significant relationship between willingness to take risks and earnings risk within chosen occupations, but with a very small magnitude.

Pfeifer (2008) examines the role of risk attitudes in the decision between public and private sector, again using the SOEP data and finds that an increased willingness to take risks also increases the probability of working in the private sector.

A number of studies finally assesses the question whether risk attitudes influence the decision of becoming self-employed. For an overview on this topic see Parker (2004). For the SOEP data, this question was analyzed most recently by Caliendo et al. (2009), finding strong positive influence of the willingness to take risks on the probability to be self-employed.

To have a look on non-econometric evidence, Dohmen and Falk (2006) examine the effect of risk attitudes on the decision between different payment schemes by using an experimental approach. They find a positive influence of willingness to take risks on the probability of choosing a piece rate contract instead of a time rate contract.

The second strand of literature this study is related to is the literature concerning the relationship between risk attitudes and wage growth. Repeated job changes into occupations with higher mean wages can be seen as a major channel for wage growth influenced by risk attitudes.

The relationship between willingness to take risks and wage growth as a channel for higher mean wages for risk loving individuals is first analyzed by Shaw (1996). She develops a human capital investment model and shows that investment in human capital is an inverse function of the degree of relative risk aversion. Using data from the Survey of Consumer Finances, she finds a negative relationship between returns to education, experience and tenure and the degree of risk aversion, concluding that indeed risk-averse people have lower wage growth.

Budria et al. (2009) reproduce the estimates given by Shaw and test her model for three additional data sets, namely the SOEP, the Spanish Survey of Household Finances (EFF) and the Italian Survey of Household Income and Wealth (SHIW). They conclude that, although risk attitudes have an impact on wage growth, the support for Shaw's model is quite weak and not very robust if compared over several countries.

3. Earnings Risk and Risk Attitudes

This study analyzes the effect of individual risk attitudes within a sorting process with respect to earnings risk. Both dependent and major explanatory variable have some features worth mentioning, which are discussed in this section.

The analysis follows a two-step procedure, first computing the earnings risk measure from the Mikrozensus, and using it as dependent variable in step two by using the SOEP data. The earnings risk measure used in this study is based on Mcgoldrick (1995) and was previously used in Bonin et al. (2007) in this same context. The earnings risk is defined as the unexplained variance of a standard Mincer style wage regression within occupations, expressed by the occupation-wide standard deviation. Controlling for standard variables, this measure expresses the uncertainty of wages within occupations and can be taken as exogenously prior to the decision to choose an occupation.

Bonin et al. (2007) elicit the earnings risk measure from the SOEP data. Due to low observation numbers within the SOEP, the occupational cells on the 3-digit level become relatively small. On average, 62 individuals are within each of the 107 observable occupations, but 24 occupational cells are filled by less then 10 observations. Nonetheless, Bonin et al. (2007) note that the results on the 3-digit level do not differ from the reported results on the 2-digit level. This study uses the German Mikrozensus to increase drastically the observation numbers within occupational cells. Using the Mikrozensus, the number of observations within one occupational cell on the 3-digit ISCO88 level is higher than by staying on the 2-digit level with the SOEP data: on average, each 3-digit cell contains 216 individuals.

Step one starts with the estimation of a Mincer style earnings equation for the Mikrozensus waves of 2004 and 2006[3], including standard explanatory variables (age, tenure, educational degrees, dummies for East Germany and working in the private sector). Here, one shortcoming of the Mikrozensus is that only information on total income is available and not on wages. Additionally, income is only coded categorically. But by recoding the income by its category means and focusing on observations that report labor earnings as their main income source, the shortcoming is bypassed.

The sample used is restricted as follows. Individuals in self-employment, marginal employment or military service are dropped. Only individuals between 25 and 55 are included to focus on working persons, who have finished their education. These restrictions ensure a comparability between SOEP and Mikrozensus sample and are imposed in both datasets. To control for outliers, the highest and lowest income category are not considered. Finally, the sample contains 27,959 individuals in 2004 and 62,354 individuals in 2006. These differences in sample size are due to a very

[3]The SOEP measure for willingness to take risks is only available every second year starting from wave 2004

	2004		2006	
	2-digit	3-digit	2-digit	3-digit
Age	0.063***	0.063***	0.085***	0.085***
	(0.003)	(0.002)	(0.002)	(0.002)
Age^2	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Tenure in actual job	0.007***	0.007***	0.010***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)
Tenure^2	0.000***	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Education	0.065***	0.059***	0.039***	0.034***
	(0.002)	(0.002)	(0.001)	(0.001)
New federal states	-0.289***	-0.287***	-0.135***	-0.133***
	(0.005)	(0.005)	(0.004)	(0.004)
Constant	6.140***	5.503***	5.781***	5.609***
	(0.097)	(0.083)	(0.061)	(0.374)
ISCO88 2-digit dummies	Yes	No	Yes	No
ISCO88 3-digit dummies	No	Yes	No	Yes
r2	0.380	0.404	0.346	0.369
N	27959	27959	62354	62354

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1: Mincer Wage Regressions (Mikrozensus 2004/2006)

high number of occupational observations coded as “not classifiable” in 2004. This does not influence the distribution of the earnings risk measure significantly.

From these estimations, the earnings risk for every wave is computed as the occupation-wide standard deviation. That basically means that the lower the fit of the regression within one occupation, the higher the defined earnings risk. This measure can be interpreted as an exogenous and commonly known measure of earnings risk within occupations. It depicts to which degree the wage within one occupation is determined by observables (Bonin et al., 2007).

The results of this first step, the Mincer wage equations, are summarized in table 1. The coefficients have the expected signs and magnitudes, inversed U shaped for age and tenure, positive effects for education and negative effects for living in East Germany. The resulting earnings risk measure on the 3-digit ISCO88 level has a mean of 0.41 in 2004 (0.43 in 2006), and a standard deviation of 0.11 (0.11), and a range from 0.13 (0.16) to 0.87 (0.84). The computed earnings risk measure is lowest for relatively low paid blue collar jobs, such as machine and vehicle operators. The highest earnings risk is found in white collar occupations which are related to a high wage level, such as lawyers, physicians and managers.

To utilize further the higher precision of the Mikrozensus, mean wages are computed for every 3-digit occupation. Looking at figure 1, the strong positive relationship between mean wages and earnings risk within occupations can be seen. This stable relationship offers a potential channel for the effect of risk attitudes in wage growth as analyzed by Shaw (1996) and Budria et al. (2009). Repeated occupational changes into jobs with higher earnings risk, but also higher mean wages, would explain the higher wage growth for individuals with a higher willingness to take risks.

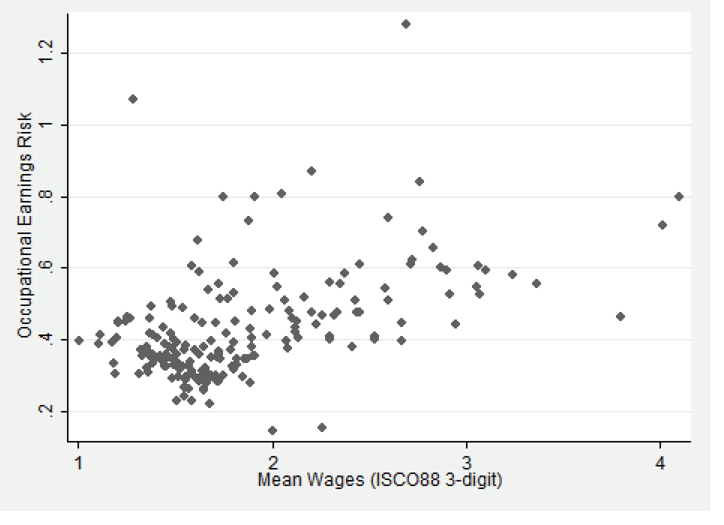

Figure 1: Relationship of mean wages and earnings risk on the 3-digit ISCO88 level

The main explanatory variable of interest in this study is the self-reported willingness to take risks. Since the wave of 2004, self-reported measures of the personal willingness to take risks are included in the SOEP, a representative panel study covering roughly 20.000 individuals each year. The willingness to take risks is assessed in every other year by the following question:

> "How do you see yourself: Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?"

To answer the participants have to tick a box on a 0-10 ranged scale, where 0 stands for "risk-averse" and 10 means "fully prepared to take risks". One could argue that results based on self-reported, subjective measures of individual risk attitudes without monetary incentives are not really appropriate to explain average economic behavior. In order to show that the SOEP data does not suffer from lacking monetary incentives, Dohmen et al. (2005) conducted an experiment with a sample similar in distribution with the SOEP sample. They show that self-assessed risk attitudes are indeed a very good predictor of actual risk behavior with monetary incentives.

To combine the information from Mikrozensus and SOEP, the earnings risk measure can be merged to the SOEP data by using the ISCO88 code. As this study focuses only on actually working individuals, it is possible to identify an ISCO88 code for each individual. Therefore, each individual is assigned an earnings risk level, according to his actual occupation.

4. Cross-Sectional Analysis 2004/2006

This section follows the proceedings by Bonin et al. (2007). The computed earnings risk from the Mikrozensus is merged to the SOEP data, using the ISCO code as merging variable. Then the relationship of earnings risk within occupations and the individual willingness to take risks is analyzed at the 2- and 3-digit ISCO level to replicate the results by Bonin et al., but by using additional information from the Mikrozensus.

To keep the results comparable, the SOEP sample is restricted similar as in Bonin et al. (2007). All different subsamples of the SOEP are taken into account. The analysis focuses on men between 25 and 55 years, who are in full employment, not self employed and not in military service or apprenticeship. To ignore outliers, the upper and lowest percentile of the wage distribution are dropped. The resulting final sample contains 3451 individuals, slightly fewer observations than in Bonin et al. (2007).

	2006		2004	
Variable	**mean**	**sd**	**mean**	**sd**
Willingness to take risks	5.29	2.05	5.08	2.11
Age	41.67	7.93	41.33	7.99
Experience	22.87	8.35	22.58	8.25
Tenure	11.68	9.15	11.38	9.13
Education in years	12.80	2.79	12.75	2.81
Married	0.68	0.47	0.69	0.46
Body height	179.48	6.89	179.20	6.95
Living in East Germany	0.21	0.41	0.21	0.41
Public Service	0.03	0.18	0.23	0.42
Log Monthly Wage	7.984	0.458	7.986	0.445

Descriptive statistics, SOEP sample 2004 and 2006

Table 2: Descriptive Statistics by Year

Table 2 shows the main descriptive statistics for the explanatory variables. The main variable of concern, the willingness to take risks, is well distributed around a mean of 5 on the 0-10 scale. The individuals have on average 23 years of experience, are 42 years of age, and have had 12 years of education. Some 68 percent are married, 21 percent living in East Germany, 3.4 percent are working in the public sector.

To assess the effect of willingness to take risks in the sorting process, the occupation-wide standard deviation as a measure for earnings risk, is regressed on the same set of explanatory variables as previously used by Bonin et al. (2007). In a first specification, solely the willingness to take risks is used. A second specification controls for experience, tenure, education, ,dummies for being married, living in East Germany and working in the public sector are included. Third, the estimation equation is augmented with gross monthly wages.

Table 3 summarizes the results of the estimations on the 2-digit level. As this specification is much similar to the one used by Bonin et al. (2007), it seems worthwhile to compare both results, which seem not to be altered drastically by switching the data source to the Mikrozensus. Signs and significance are comparable, although the effect of willingness to take risks increases, potentially an effect of the higher precision of the Mikrozensus estimates. All estimations use robust standard errors, allowing for clustering at the ISCO88 2-digit level.

The willingness to take risks remains a significant factor throughout all specifications, with slightly decreasing coefficients by including further explanatory variables. The economic significance of the effect is questionable, though increasing willingness to take risks by one standard deviation increases the earnings risk on average by only 5 percent of its standard deviation. Other variables of impact are education, family status and living in East Germany. The positive impact of wages captures the positive relationship between wages and earnings risk mentioned above. This can be interpreted as even if individuals are compensated for higher earnings risk, the willingness to take risks still has an impact on the earnings risk.

Also turning to the 3-digit level (table 4), but staying with the same specifications, does not change the effects dramatically, but the effects of willingness to take risks decrease by some degree, in 2004 it even becomes insignificant when controlling for monthly wage. This points to the already mentioned problem of an artifically constructed earnings risk at the 2-digit level, that potentially biases the results. Nonetheless, the results are remarkably comparable to the ones by Bonin et al. (2007), despite changing level of analysis, period and data source.

So far the analysis followed very closely the cross-sectional approach applied by Bonin et al. (2007). Such a cross-sectional approach imposes very severe implicit assumptions on the stability of both the dependent and the explanatory variables. As the analyzed sorting decisions happened sometime in the past, it has to assumed that both labor market conditions and willingness to take risks have not changed since then.

These severe stability assumptions, although commonly used in the literature, are clearly rejected by the SOEP data. Between 2004, when the willingness to take risks was introduced, and 2008, which is the latest available wave, only 27 percent of all observed individuals kept their reported risk attitudes on the same level. More technically, a Kolmogorov-Smirnov test clearly rejects the hypothesis that the distribution of willingness to take risks stays the same between 2004 and 2006. Figure 2 shows the densities of changes in the willingness to take risks. The

	(1)	(2)	(3)	(4)	(5)	(6)
Willingness To Take Risks	0.005***	0.004***	0.003***	0.005**	0.004**	0.003**
	(3.88)	(4.20)	(3.38)	(2.42)	(2.18)	(2.46)
Experience	–	0.000	-0.000	–	0.000	0.000
		(0.90)	(-0.17)		(0.63)	(0.03)
Tenure	–	0.001*	0.000	–	0.001	0.000
		(1.83)	(0.41)		(1.50)	(0.32)
Education in Years	–	0.015***	0.009**	–	0.017**	0.012**
		(3.13)	(2.16)		(2.75)	(2.06)
Married	–	-0.011	-0.020***	–	-0.003	-0.010**
		(-1.66)	(-3.06)		(-0.38)	(-2.21)
Body Height	–	0.001**	0.001**	–	0.001**	0.001**
		(2.70)	(2.74)		(2.53)	(2.42)
East Germany	–	-0.023***	-0.000	–	-0.015**	0.006
		(-3.38)	(-0.03)		(-2.28)	(0.51)
Public Sector	–	0.029	0.036*	–	0.006	0.017
		(1.31)	(1.77)		(0.33)	(0.98)
Gross Monthly Wage	–	–	0.070**	–	–	0.060*
			(2.58)			(1.72)
Constant	0.406***	0.012	-0.370	0.428***	0.015	-0.322
	(16.65)	(0.12)	(-1.59)	(17.23)	(0.12)	(-1.10)
r2	0.009	0.216	0.265	0.008	0.173	0.203
r2_a	0.009	0.214	0.264	0.008	0.171	0.201
N	3540	3488	3487	3145	3107	3106

t statistics in parentheses, dependent variable: earnings risk on 2-digit ISCO88
Standard errors are robust, allowing for clustering on the 2-digit ISCO88 level
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Reproducing estimates by Bonin (2007) using the Mikrozensus (2-digit ISCO88)

	(1)	(2)	(3)	(4)	(5)	(6)
Willingness To Take Risks	0.004***	0.003***	0.001	0.005**	0.003***	0.003**
	(3.31)	(2.64)	(1.45)	(2.33)	(2.67)	(2.02)
Experience	–	0.001**	0.000	–	0.001	0.000
		(2.23)	(1.21)		(1.08)	(0.48)
Tenure	–	0.000	-0.001	–	-0.000	-0.001
		(0.18)	(-1.30)		(-0.26)	(-1.15)
Education in Years	–	0.015***	0.009***	–	0.015***	0.011***
		(4.20)	(2.85)		(4.18)	(2.98)
Married	–	-0.008	-0.017***	–	-0.002	-0.009*
		(-1.49)	(-2.88)		(-0.47)	(-1.83)
Body Height	–	0.001***	0.001**	–	0.001***	0.001**
		(3.20)	(2.50)		(2.73)	(2.25)
East Germany	–	-0.026***	-0.003	–	-0.016***	0.001
		(-4.01)	(-0.37)		(-2.98)	(0.15)
Public Sector	–	0.000	0.007	–	-0.013	-0.003
		(0.03)	(0.40)		(-0.82)	(-0.17)
Gross Monthly Wage	–		0.072***	–		0.053**
			(4.16)			(2.62)
Constant	0.390***	-0.020	-0.411**	0.410***	0.035	-0.259
	(17.47)	(-0.22)	(-2.52)	(22.59)	(0.38)	(-1.50)
r2	0.006	0.178	0.226	0.007	0.148	0.173
r2_a	0.005	0.176	0.224	0.006	0.146	0.171
N	3451	3401	3400	3096	3058	3057

t statistics in parentheses, dependent variable: earnings risk on 3-digit ISCO88
Standard errors are robust, allowing for clustering on the 2-digit ISCO88 level
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4: Reproducing estimates by Bonin (2007) using the Mikrozensus (3-digit ISCO88)

high densities for increases or decreases up to 5 points show that the outcome of the Kolmogorov-Smirnov test is not only due to a simple shift in distribution.

Also individually, people seem to change their willingness to take risks drastically. Even if increases or decreases by 2 points on the 0 to 10 scale are still accounted as stable, 21 percent of all observations still report changing risk attitudes. This volatility indicates a higher situational dependence of risk attitudes as it is discussed in psychological literature (see for a further discussion Ekelund et al. (2005)).

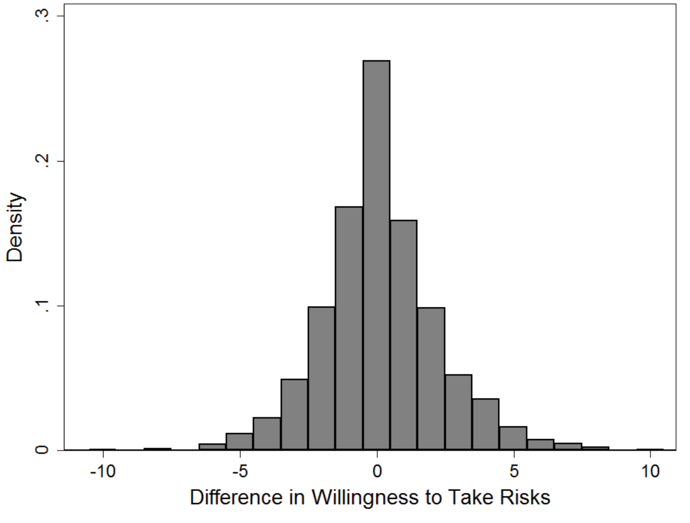

Figure 2: Distribution of Changes in Willingness to take risks 2004-2006

This violation of implicit stability assumptions is expected to introduce a measurement error problem into the analysis, that creates a potential attenuation bias in the coefficients of interest. Using the panel structure of the SOEP, the timing of occupational changes can be identified to focus the analysis only on those who recently changed to minimize the measurement error.

Second, maybe more advantageous, panel data methods allow one to control for unobserved heterogeneity in personality traits. There is an often discussed positive relationship between cognitive ability and risk attitudes (see for example Dohmen et al. (2007)). Without controlling for heterogenous ability in cross-sectional data, an omitted variable problem occurs, introducing a potential upward bias in the coefficient of willingness to take risks. As noted before, high earnings risk is often found in occupations related to high education, and therefore more likely chosen by individuals with a higher ability. However, by using panel estimation methods, these ambigous biases can be controlled for, as it is shown in the next section.

5. Controlling for Unobserved Heterogeneity and Timing

In this part, the SOEP waves of 2004 and 2006, both including the willingness to take risks, are used. Using this panel data structure enables one to identify actual sorting processes within these two waves, making the mentioned stability assumptions obsolete.

This study shows that the relationship of willingness to take risks and occupational choice vanishes when controlling for unobserved heterogeneity. The cross-sectional results seem to be entirely driven by the correlation of ability and risk attitudes. This correlation is for example discussed in Dohmen et al. (2007).

To compare the effect of violations of the stability assumption, first only the estimation method is changed, whereas the basic specification stays the same. To control for unobserved heterogeneity, the approach proposed by Mundlak (1978) is used. The individual specific effect is assumed to be dependent on the time averages of explanatory variables. This assumption is less restrictive than the random effects assumption of independent error term and individual fixed effects, that is not met by the data. Additionally, the Mundlak model has the advantage of allowing the inclusion of non-timevarying variables into the estimation, that would otherwise drop out in a fixed effects model. Also, both between- and within-variation of the dependent variable are used, which is crucial as the occupation-wide earnings risk has only very little variation over time. The Mundlak approach is implemented by including the individual specific time averages of all explanatory variables within the estimation equation. The Mundlak approach can be seen in this case as a compromise between fixed and random effects models.

To control for the timing of sorting decisions, a dummy variable is included, in-

	Non-Changers		Changers	
Variable	**mean**	**sd**	**mean**	**sd**
Willingness to Take Risks	5.153	2.061	5.261	2.129
Experience	23.253	8.094	21.211	8.680
Tenure	12.448	9.050	8.944	8.902
Education	12.740	2.785	12.861	2.826
Married	0.707	0.455	0.627	0.484
Body Height	179.250	6.888	179.566	7.010
East Germany	0.209	0.407	0.216	0.412
Public Sector	0.120	0.325	0.191	0.393
Gross Monthly Wage (log)	8.003	0.430	7.935	0.502

Descriptive statistics, "Changers" are those individuals who changed their occupation in previous period

Table 5: Descriptive Statistics by Group

dicating a recent occupational change within the last year. Secondly, an interaction variable of this dummy with the self-reported willingness to take risks is included. The coefficient of this interaction term can then be interpreted as the effect of willingness to take risks in recent occupational changes, compared to the effect in the overall sample. Table 5 shows that those who changed their occupation recently have only small systematic differences in characteristics. The explanatory variables are again the willingness to take risks, gross monthly wage, experience, tenure, education, body height and dummies for being married, living in East Germany and working in public service.

Table 6 lists the results of these Mundlak estimations. The table is organized as follows. Columns (1) and (2) show the coefficients of using the same specification as in section 4, but augmented with time averages of explanatory variables ("Mundlak terms") to account for unobserved heterogeneity. Columns (3) and (4) then show the results of a specification again augmented with an interaction term of willingess to take risks and a dummy indicating an occupational change.

The results differ clearly from the cross-sectional results in the previous section. Controlling for unobserved heterogeneity renders the coefficient of willingness to take risks insignificant in all specifications. The coefficient of willingness to take risks decreases when controlling for unobserved heterogeneity, which can be interpreted as upward biased in the cross-sectional case due to the correlation of ability and willingness to take risks.

Augmenting this specification by the interaction term of willingness to take risks and job change and by the job change dummy itself (specifications (3) and (4) in table 6), the coefficient for willingness to take risks alone stays insignificant, but the interaction effect has a comparably strong effect. Although willingness to take risks is no longer significant in the whole sample, there is a significant relationship for those who recently changed their occupation. This difference can be potentially explained by the mentioned attenuation bias. The instable risk preferences as well as changing earnings risk over time induce a measurement error into dependent and independent variables, that increases over time. This measurement error is ignored in the previous cross-sectional analysis.

Hence, focusing the view on those who actually changed their job, a one-point increase of willingness to take risks increases the earnings risk of the chosen occupation by around 0.5 percent.

It may be questionable whether those who changed their occupations between 2004 and 2006 differ in some systematic way from the overall sample. Table 5 compares the characteristics of both groups. Out of the total sample of 6.457 individuals, 1.700 either changed their occupation or chose an occupation out of non-employment. Those who changed their occupations seem to be indeed a selected group, less experienced, shorter tenure, but higher educated. This is consistent with the idea of higher fluctuation in the beginning of a career.

Taken together, these results show that the usage of panel data in the context of occupational choice has indeed the advantages of controlling for timing and unobserved heterogeneity, which both introduce ambigous biases. The relatively weak effects that were found previously were mainly driven by recent sorting decisions and unobserved ability. The mentioned attenuation bias, caused by violations of implicit stability assumptions, led to underestimation of the effect of risk attitudes.

	(1) Linear	(2) Log-lin	(3) Linear	(4) Log-lin
Willingness To Take Risks	0.000	0.001	-0.000	-0.000
	(0.42)	(0.56)	(-0.06)	(-0.13)
Changed Occupation			-0.000	-0.010
			(-0.07)	(-0.67)
Interaction Term			0.002	0.005**
			(1.47)	(2.15)
Experience	-0.001	-0.003	0.001	0.001
	(-0.24)	(-0.42)	(0.31)	(0.14)
Tenure	0.000	0.000	0.000	0.001
	(0.04)	(0.03)	(0.44)	(0.46)
Education in Years	-0.008	-0.016	-0.007	-0.014
	(-1.09)	(-0.83)	(-1.01)	(-0.76)
Married	-0.012***	-0.027***	-0.011***	-0.026***
	(-3.59)	(-3.80)	(-3.51)	(-3.73)
Body Height	-0.000	-0.001	0.000	-0.001
	(-0.03)	(-0.42)	(0.00)	(-0.39)
East Germany	0.007	0.001	0.007	0.002
	(0.23)	(0.01)	(0.24)	(0.03)
Public Sector	0.013***	0.024***	0.013***	0.026***
	(3.04)	(2.62)	(3.16)	(2.73)
Gross Monthly Wage	-0.003	-0.014	-0.002	-0.012
	(-0.36)	(-0.76)	(-0.23)	(-0.62)
Willingness to Take Risks (mean)	0.002*	0.004	0.002	0.003
	(1.71)	(1.49)	(1.47)	(1.16)
Experience (mean)	0.001	0.003	-0.001	-0.000
	(0.33)	(0.50)	(-0.23)	(-0.06)
Tenure (mean)	-0.001	-0.001	-0.001	-0.002
	(-0.84)	(-0.77)	(-1.13)	(-1.10)
Education in years (mean)	0.018**	0.038**	0.017**	0.037*
	(2.40)	(2.02)	(2.32)	(1.94)
Body Height (mean)	0.001	0.003	0.001	0.003
	(0.69)	(1.10)	(0.65)	(1.06)
East Germany (mean)	-0.008	-0.004	-0.008	-0.005
	(-0.27)	(-0.08)	(-0.27)	(-0.09)
Public Sector (mean)	-0.012*	-0.021	-0.013*	-0.023
	(-1.69)	(-1.41)	(-1.85)	(-1.57)
Gross Monthly Wage (mean)	0.065***	0.152***	0.064***	0.150***
	(6.64)	(7.00)	(6.57)	(6.92)
Year Dummy (2004)	-0.027***	-0.067***	-0.026***	-0.066***
	(-5.40)	(-6.13)	(-5.25)	(-5.97)
Constant	-0.312***	-2.542***	-0.314***	-2.542***
	(-6.08)	(-23.36)	(-6.11)	(-23.38)
r2	0.21	0.22	0.21	0.22
N	6457	6457	6457	6457

t statistics in parentheses, Standard errors are robust, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Mundlak earnings risk estimates, using SOEP 2004-2006

6. Conclusion

This study uses German SOEP data to analyze the effect of individual risk attitudes within an occupational sorting process with respect to earnings risk on the 3-digit ISCO88 level.

The earnings risk measure is computed from the large sample of the German Mikrozensus as the occupation-wide standard deviation of Mincer style wage regressions and is then merged to the SOEP data to combine it with a self-reported measure of willingness to take risks. In cross-sectional analysis, a strong positive relationship between willingness to take risks and earnings risk is found for the years of 2004 and 2006, similar to the findings of Bonin et al. (2007).

To control for unobserved heterogeneity and timing of sorting decisions, the estimations are repeated in a Mundlak framework. This panel approach assumes, contrary to common assumptions in the literature, that willingness to take risks changes over time. Using the SOEP data, it is shown that this assumption is more likely to be the case than the common stability assumptions.

The panel estimations reveal a positive significant relationship between earnings risk and willingness to take risks only for recent job changes. Individuals with a higher willingness to take risks by one point (on a 0-10 scale) choose on average an occupation with a higher earnings risk by 0.5 percent. The relationship becomes insignificant for the overall sample.

The differences between cross-sectional and panel analysis are due to two potential biases. Firstly, the positive relationship between unobserved ability and willingness to take risks biases coefficients of willingness to take risks. Secondly, an increasing measurement error that is introduced by time passing since the sorting decisions increases the probability of an attenuation bias, which leads to an underestimation of the effect of coefficients.

The significant differences between cross-sectional and panel estimations show the importance for using all available data sources to obtain a preferably close look and to control for unobserved heterogeneity, especially when examing personality traits, whose determinants are only hard to measure and to be observed in microeconomic data.

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