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Conference Paper

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Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Skills, Risks, and Wages, No. E10-V3

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Leuermann, Andrea; Necker, Sarah (2010) : Intergenerational Transmission of Risk Attitudes - A Revealed Preference Approach, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2010: Ökonomie der Familie - Session: Skills, Risks, and Wages, No. E10-V3, Verein für Socialpolitik, Frankfurt a. M.

This Version is available at:

<https://hdl.handle.net/10419/37490>

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Intergenerational Transmission of Risk Attitudes - A Revealed Preference Approach*

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February 26, 2010

Abstract

Using data the German Socio-Economic Panel (GSOEP), we investigate whether the willingness to take risks which is revealed via observed choices of occupation is transmitted from parents to children. Our approach resembles the one by Dohmen et al. (2008) who investigate the same question using stated preferences. As risk variable we use earnings risk measured by the cross-sectional coefficient of residual variation obtained from Mincerian wage regressions. We find that fathers' riskiness of the job chosen is a significant determinant of sons' occupational risk. Our results are robust to different specifications, underpinning the hypothesis of intergenerational transmission of risk preferences.

*We thank J. Diederich and J. Jarke for supporting the development of a first draft. We thank M. Arntz and H. Bonin for valuable comments.

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1 Introduction

Almost any decision in everyday life involves uncertainty on the likelihood that certain outcomes occur. The predictive power of any theory trying to explain such decisions hinges on the understanding of individual attitudes towards uncertainty, in particular the willingness to take risks. In standard economic theory, risk preferences (as any other preferences) are exogenous and stable. Only recently economists (and psychologists) have begun to ask where they come from and, more importantly, how they are influenced by personal, social and economic variables. We contribute to this line of research by building on the work of Dohmen et al. (2008) in testing the hypothesis that risk attitudes are to some extent transmitted from parents to their children. The empirical findings deliver new insights for theoretical models, particularly when intergenerational or dynamic contexts are studied.

Dohmen et al. use a *stated preference approach* employing *self-reported* measures of risk attitudes to study the connection between a child's and its parents' willingness to take risks. According to their results, individuals' risk attitudes seem to be influenced by their parentage, slightly larger by mothers than by fathers. In an attempt to validate the reliability of the preferences stated, Dohmen et al. (2005) conduct a field experiment in which they indeed discover correlation between the survey responses and actual behavior. Nonetheless, skepticism towards stated preferences cannot fully be dispelled. Biases due to ordering of questions, an individual's desire to convey a certain impression or simply wrong self-evaluation suggest that relying on stated preferences only is not sufficient (Bertrand and Mullainathan 2001).

The purpose of the present paper is to investigate whether the findings of Dohmen et al. (2008) also hold in a *revealed preference approach*. We focus on the *actual* job choice behavior. According to the theory of compensating wage differentials, first mentioned by Adam Smith in *The Wealth of Nations* (1776), individuals are compensated for non-pecuniary features of alternative occupations, inter alia the riskiness of the job. Occupations vary by health risk, risk of fatality, or unemployment and earnings risk. The theory predicts that workers opt for the occupation that maximizes their utility such that, controlling for all other relevant factors, their choice reveals information regarding their willingness to take risks. We exploit this sorting effect to investigate whether an intergenerational transmission of risk preferences is indeed reflected in the the choice of children's and parents' occupation being similarly risky.

We use the cross-sectional variation in monthly income that is not explained by human capital differences as a measure of occupational earnings

risk¹ as proposed by McGoldrick (1995). We employ data from the German Socio-Economic Panel (GSOEP) to calculate the unexplained variation of income per occupation on a 2-digit-ISCO level², and sector (public vs. private) and assign the resulting values to those individuals for which we have information on child and parents. At the same time, we exclude all individuals that have exactly the same job. Robust to different specifications, we observe a significant correlation between fathers' and sons' earnings risk. We are hence able to confirm the intergenerational transmission hypothesis for men.

The remainder is organized as follows. In section 2 determinants of individual risk attitudes and occupational choice are identified and the construction of the measure of risk described. The empirical implementation and analysis is demonstrated in section 4 followed by a discussion of the robustness in section 5. We conclude in section 6.

2 Framework

2.1 Determinants of Individual Risk Preferences

In various studies, risk preferences are related to personal and socio-economic characteristics. Relying on individuals' responses to hypothetical lottery questions, the influence of a broad set of characteristics on risk aversion is analyzed.

The willingness to take risks increases the probability of entering high education modestly (Belzil and Leonardi 2007), albeit Barsky et al. (1997) find a U-shaped relationship between completed years of education and their measure of risk. While some studies find risk aversion to decrease in income and wealth (Hartog et al. 2002), Barsky et al. (1997) show that risk aversion increases in income and wealth until the middle of the distributions, and then decreases. Gender seems to play an important role, with women being more risk averse than men (e.g. Barsky et al. 1997, Hartog et al. 2002). Another factor of influence is cognitive ability which is found to be positively correlated to the willingness to take risks (Dohmen et al. 2007).

In addition to hypothetical lottery questions, Dohmen et al. (2005) use self-evaluations of risk attitudes (on an 11-point scale) which has been generated in the 2004 wave of the GSOEP. The authors find substantial hetero-

¹Hereafter, we will use the terms occupational earnings risk and occupational risk equivalently.

²The *International Standard Classification of Occupations* (ISCO) is a 4-digit code provided by the International Labor Organisation (ILO)

geneity in risk tolerance among the population. In particular, being female, increasing age, shorter height, lower parental education, and being married are identified as major determinants of increasing risk aversion.

With respect to their origin, standard economic theory, however, takes individual risk preferences usually as exogenously given and stable. Few attempts have been made to understand where these preferences actually come from. Bisin and Verdier (2005) emphasize that “preferences, beliefs, and norms that govern human behavior are formed partly as a the result of genetic evolution, and partly they are transmitted through generations and acquired by learning and other forms of social interactions.” This statement summarizes the work of several authors who establish similarities in the behavior of parents and their children such as Knowles and Postlewaite (2004) for saving behavior, or Fernandez et al. (2004) for attitudes regarding female labor market participation and educational attainments, to only name a few. While Bisin and Verdier (2005) argue that cultural transmission also is a determinant of risk attitudes, little has been done to provide an empirical foundation of intergenerational transmission of risk preferences.

Two exceptions are the studies by Charles and Hurst (2003) and Dohmen et al. (2008) which both rely on stated preferences. Charles and Hurst (2003) analyze data from a survey in which children and parents were interviewed regarding their tolerance of income risk.³ The authors find evidence that children and their parents have similar preferences for income risk, especially if their risk attitudes belong to one of the extreme risk categories.

Dohmen et al. (2008) provide another study of the intergenerational transmission of risk attitudes using the already mentioned self-reported evaluations of risk preferences from the GSOEP. They find that the responses of parents and children have a significant positive relationship. This result is observed with respect to the general willingness to take risks but also regarding specific domains such as financial matters, health, car driving, sports and leisure or career. To underpin the reliability of their findings, the authors refer to an earlier study by some of the authors (Dohmen et al. 2005) in which the behavioral relevance of the stated preference measures is tested in a complementary field experiment. In this experiment, the stated preferences are found to be a good predictor of the riskiness of choices with real money at stake.

³One of the questions asked was “Suppose you had a job that guaranteed you income for life equal to your current, total income. And that job was (your/your family’s) only source of income. Then you are given the opportunity to take a new, and equally good job with a 50-50 chance that it will cut your income by a third or, on the other hand, it could double your income with a 50-50 probability. Would you take that new job?”, Charles and Hurst (2003: 1173-74)

A compelling question is whether responses from surveys match revealed behavior in real life. Common objections are that the ordering and wording of questions, little effort to answer questions accurately, the desire of an individual to convey a certain impression, absence of having an attitude etc. might bias the preferences stated by surveyed individuals (Bertrand and Mullainathan 2001). Furthermore, people potentially value risks differently on a certain scale, which leads to further biases. The willingness to take risks is revealed by an individual's behavior on financial markets, the choice of sports, or occupational choice. In our study, we focus on willingness to take occupational risk. Provided that children observe the riskiness of their parents' behavior and act accordingly, we should be able to confirm previous findings of intergenerational transmission.

2.2 Revealing Risk Preference by Occupational Choice

Standard economic theory argues that an individual chooses an occupation that maximizes his (expected) utility (Becker 1962). Utility is assumed to be a function of wage, personal traits such as education, experience, and preferences but also of occupational features like working conditions or the exposure to risk of job loss, illness or death. The theory of compensating (or equalizing) differences claims that in a competitive labor market, unfavorable working conditions have to be compensated by a wage premium in order to attract workers (Rosen 1987). According to this theory, higher risk of future income growth, unemployment and health are reflected in a wage premium.

Many studies indeed find that compensating wages are paid to workers which work in occupations exposed to higher income risk. King (1974) was among the first to measure such risk as the standard deviation of income within an occupation. He finds that mean income of professionals is higher in those jobs where income varies to a larger extent. Johnson (1977) follows his approach and confirms his finding. Feinberg (1981, 1981a) uses the coefficient of variation in annual income as a measure of risk and also finds evidence for a risk premium.

McGoldrick (1995) proposes another way of approximating earnings risk that dominates in the subsequent literature. She obtains a measure of risk by estimating a standard Mincer wage regression including education, experience and other characteristics and exploiting the residual from that regression. In particular, the variation in monthly income within an occupation that is *unexplained* by observable differences in the individual's stock of human capital is assumed to indicate the risk associated with that particular job. The measure is supposed to reflect the uncertainty that is associated with an occupation from an *ex ante* perspective and can therefore be taken

as given when making the job decision. McGoldrick and Robst (1996), Hartog et al. (2003) and a number of other studies follow that approach and confirm McGoldrick's finding that an individual's wage increases with the unsystematic variation of income.

As the costs of bearing occupational uncertainty are lower for risk seeking individuals, the expectation of monetary compensation makes those individuals more likely to opt for jobs with higher risk. A number of studies indeed find that risk preferences have a significant impact on occupational choice. DeLeire and Levy (2004) show that the risk of injuries has a considerable effect on an individual's choice of job. An interesting result of their study is individuals that are primary care givers tend to work in occupations that are less risky. Ekelund et al. (2005) find that agents with a high score in a psychosometric indicator of risk attitude are more likely to be self-employed. Dohmen and Falk (2006) conduct a laboratory experiment to show that risk averse workers prefer fixed payments and are less likely to sort into variable pay schemes. The study by Bonin et al. (2007) reveals that individuals self-select according to their risk preferences into occupations that differ with regard to earnings risk. Finally, Pfeifer (2008), also using GSOEP-data, points out that individuals with relatively high stated risk aversion tend to sort into public sector employment.

The assumption that risk preferences are revealed by the willingness to face earnings uncertainty thus seems to be justified. The study by Bonin et al. (2007) - which is also conducted with GSOEP data - is particularly interesting for our approach. The authors find that individuals who have a higher willingness to take risk are sorted into occupations which are characterized by a higher unexplained variation of income. The choice of occupation thus reveals information regarding an individual's risk preferences. We use this as our starting point.

3 Measuring Earnings Risk

3.1 Data selection and regression results

In constructing a measure of earnings risk, we essentially follow the approach suggested by McGoldrick (1995). However, in contrast to previous studies which focused either on variation of income over time or across occupation, we consider both. We use the 1998-2007 waves of the GSOEP to generate a measure that allows for variation across observed years and all occupations. We think that this is the most representative indicator of the risk an individual perceives *ex ante*.

Several adjustments of this raw data apply. We restrict the sample to adults between age 25 and 55 to avoid biases that may occur in the age-related tails. Examples are student jobs or apprenticeships for the young and early retirement provisions or workers in retirement for the older individuals. We further restrict the sample to employees that were *full-time* employed. Part-time workers are eliminated since their wages have a different variability and decisions are possibly made less conscious than full-time employment decisions (Constant and Zimmermann 2003). We discard the self-employed as the definition of earnings in this sector is typically not comparable to the earnings of employees.

Another important step is the restriction of the sample to men. A women's choice of job is more likely to be driven by factors that cannot be captured by the Mincer regression than that of men. The residuals in the wage regressions then represent different factors for women and men and are therefore not comparable. The fact that female employment and occupational decisions changed substantially over the last decades while males' decisions remained stable might also bias the results. For this reason, we exclude all women and concentrate on the transmission from fathers to their sons.⁴ Finally, we exclude implausible earnings information at the bottom of the distribution of earnings by dropping the lowest 1-percentile.⁵

We conjecture that the risk measure differs between private and public sector employment. For example, teaching professionals (ISCO-Code 23) can either be employed in the private or the public sector while the earnings risk can be expected to be lower in the public sector. We thus estimate separate equations for public and private sector. Our adjustments leave us with 30.052 individuals in the private sector sample and 8.810 individuals in the public sector sample.

Our dependent variable is the logarithm of the gross monthly earnings of the individual i ($\ln GEARN$). As explanatory variables, we include the variables commonly contained in Mincer regressions (e.g. McGoldrick and Robst (1996), Bonin et al. 2007). The classical regression dates back to Mincer (1958, 1974) and is aimed at capturing a correlation between market wages and human capital variables, in particular education, experience and tenure. The human capital variables included in our model are education ($EDUC$) measured by years of schooling, experience (EXP) measured by

⁴E.g. McGoldrick (1995) finds that women face lower uncertainty in total, systematic and unsystematic earnings but have a lower percentage of earnings uncertainty attributable to systematic factors. Subsequent studies, such as Bonin et al. (2007), for this reason focus on the employment of the Mincer residual for men.

⁵The lowest reported gross monthly income was about 39 Euros, by dropping the lowest percentile we drop all income below 715 Euros.

years of professional experience, and tenure (TEN) measured by years of employment at the current employer. To capture decreasing returns to experience and tenure, we also include the second order polynomial of those variables. As further controls, we include dummy variables indicating in which of the 16 German states s the individual lives ($STATE$), a dummy for each occupation per 2 digit-ISCO code ($ISCO$)(28 sub-major groups⁶) as well as time dummies (γ_t).

The Mincer wage regression which is estimated with OLS is thus the following equation

$$\ln GEARN_i = \alpha_i + \gamma_t + \rho EDUC_i + \beta_0 EXP_i + \beta_1 \frac{EXP_i^2}{100} + \delta_0 TEN_i + \delta_1 \frac{TEN_i^2}{100} + \varphi STATE_s + \lambda ISCO_j + \varepsilon_i \quad (1)$$

Table 1 shows the results of the regressions for public and private sector employees. In general, the regressions explain a large fraction of gross monthly earnings with coefficient signs as expected and highly significant. Experience (EXP) is positively correlated, with a slightly higher coefficient in the public sector regression. In contrast, the positive effect of tenure (TEN) is estimated to be slightly higher in public sector employment. The negative coefficients on squared experience and tenure indicate that the returns to these types of human capital are in fact decreasing. The positive effect of years of education ($EDUC$) appears to be more important in private employment.⁷

⁶For an extensive documentation see the website of the International Labor Organization (ILO) [<http://www.ilo.org/public/english/bureau/stat/isco>].

⁷All dummies for the different German states have significant coefficients in the private sector regression, with negative signs for the East German states. In contrast, in the public sector model only the coefficients on the East German states are significant. This result is unsurprising as wages are largely standardized in the public sector except for differences between East and West.

Variable	Private Sector b/se	Public Sector b/se
EXPB	0.027*** (0.001)	0.037*** (0.001)
EXPB2BY100	-0.056*** (0.002)	-0.072*** (0.004)
TEN	0.014*** (0.001)	0.012*** (0.001)
TEN2BY100	-0.023*** (0.002)	-0.025*** (0.003)
EDUC	0.053*** (0.001)	0.043*** (0.002)
Intercept	6.461*** (0.154)	6.773*** (0.053)
ISCO dummies included?	YES	YES
STATE dummies included?	YES	YES
TIME dummies included?	YES	YES
N	30052	8810
F	648.350	172.303
Adj. R2	0.551	0.526

Significance levels : * : 10% ** : 5% *** : 1%.

Table 1: Mincer Regression: Results Private and Public Sector

3.2 Construction of the Risk Measure

We compute the measure of earnings risk as the coefficient of variation for the residuals transformed from log values back to Euro amounts in each ISCO sub-cell

$$COEFF_j = \frac{\text{std}(e^{\hat{\varepsilon}_j})}{J^{-1} \sum \hat{\varepsilon}_j} \quad (2)$$

where j is the index indicating the ISCO-subcell and J the total number of observations in subcell j . By standardizing the standard deviation of the residuals by the cell mean of the residual, we extend the approach by McGoldrick (1995) by incorporating the relative nature of risk. The rationale is that the same absolute size of variation is less decisive in relation to a high income than to a low income.

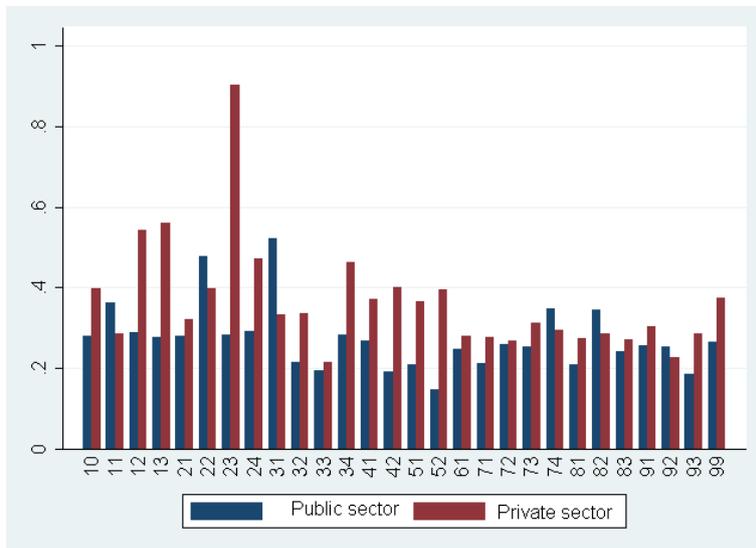


Figure 1: Earnings risk measure ($COEFF$) per 2-digit ISCO code for men

The results are visualized in figure 1. The figure shows that the expected differences in unexplained earnings variability between sectors actually exist. While the average earnings variability in the public sector is .2724 (SD: .0813), it is .3644 (SD: .1365) in the private sector. In most occupation categories, private sector employment displays a higher variability and thus involves higher risk from an ex ante perspective. The obtained risk measures appear broadly plausible. ISCO cells with the highest earnings risk among privately employed are administrative and commercial managers (12) and production and specialized services managers (13) as well as teaching professionals (23). Whereas the high earnings risk of the first two categories seems to be obvious that of teaching professionals is less so. Possible explanations are the wide-spread use of fixed-term contracts or working on commission. Among publicly employed men, the income of physical and engineering science professionals (31) as well as life science and health professionals (22) are most uncertain among available occupation cells.

However, some ISCO sub-cells end up with too few observations as a consequence of partitioning. According to the common rule of thumb for applicability of the Central Limit Theorem, we exclude any sub-cell containing less than 30 observations in the regressions of intergenerational transmission.⁸

Even though the Mincer residual has also been employed as a measure

⁸Excluded ISCO-cells in private sector employment: 10, 11.
Excluded ISCO-cells in public sector employment: 11, 13, 52, 73, 92, 99.

of ability, its calculation differs. The Mincer residual as a measure of ability is used in its pure form (e.g. Mwabu and Schultz 1996). As has been described, the Mincer residual as a measure of risk is calculated as the standard deviation of the unexplained part. The exploitation of those different features assures that our measure actually captures what is desired. For further discussion of the risk measure see also section 5.

4 Empirical Approach

4.1 Data and Methodology

For our investigation of intergenerational transmission of the willingness to take earnings risk, we construct a dataset from the GSOEP wave of 2004 that contains information on children and their parents. The choice of the 2004 wave is due to the aim to facilitate comparability of our study with that of Dohmen et al. (2008). Unfortunately, for reasons described in section 3.1, the construction of the earnings risk measure is restricted to males. Our sample in the transmission regressions thus also only includes sons and their fathers. We only include sons for which we have information on the earnings risk of the father and end up with 652 son-father pairs. However, information on some explanatory variables are only available for fewer pairs so that the number of observations used in our regressions is lower in some models.⁹

The dependent variable is the earnings risk associated with a child's occupation, as has been described in great detail above. Earnings risk is assigned to a child according to the 2-digit-ISCO code of the occupation pursued in the year 2004 and whether it is employed in the public or private sector. Our main variable of interest is the earnings risk of the father's occupation. As such, we assign the measure of occupational risk as described for children. Provided that intergenerational transmission of risk attitudes takes place and is reflected in the riskiness of the job chosen, our variable of father's job risk should be positively related to the child's job risk.

Tables 2 and 3 display correlations between the risk measures for fathers and sons obtained from the Mincer regressions as well as with two stated willingnesses to take risks: one general (*RISKGEN*) and one with respect to career issues (*RISKCAR*). Both stated measures are obtained from the respondents' self-assessment on a scale of 0 to 10. These questions are the ones used by Dohmen et al. (2008).

⁹The actual number entering each regression is given in connection with the regression results.

Table 2 shows correlations between the Mincer risk measure and the two stated preferences for sons and fathers. A correlation between the measure obtained from real life decisions and those from stated preferences can clearly be established for sons and fathers. In general, the risk preference revealed by occupational choice is more successful in capturing preferences stated with respect to career than the general risk aptitude.

	<i>JOB RISK</i> of	
	Sons	Fathers
<i>RISK GEN</i>	0.0903	0.1064
<i>RISK CAR</i>	0.1602	0.1565

Table 2: Correlations of revealed and stated risk measures for sons and fathers

	<i>JOB RISK</i> (revealed)	<i>RISK GEN</i> (stated)	<i>RISK CAR</i> (stated)
Sons with fathers	0.2087	0.2267	0.1830

Table 3: Intergenerational correlations of revealed and stated risk measures

Table 3 shows intergenerational correlations between stated and revealed measures. Both stated risk preferences of sons are substantially correlated with those of their father. Interestingly, a positive intergenerational correlation between revealed risk attitude of sons and fathers can be found with about the same magnitude as in the case of stated risk measures.

Further controls for occupational choice as well as controls for risk attitude are required. First of all, we include the age of the child in the year 2004 (*AGE*). Even though previous research finds older individuals to have a lower risk tolerance, this relationship would not be true if individuals chose a job with high earnings risk in an early stage of life and are still working in that job but their risk aptitude decreased in the meantime. We thus refrain from a prediction on the sign. On the contrary, we expect the child's height (*HEIGHT*) to have a positive impact. Tallness is found to have an impact on confidence and self-esteem which translates into increased willingness to take risks and in turn into higher (average) incomes (Persico, Postlewaite and Silverman 2004, Dohmen et al. 2005). Besides, a number of studies established a higher earnings potential for taller individuals (Persico, Postlewaite and Silverman 2004, Case and Paxson 2008, Gawley, Perks and Curtis 2009).

The riskiness of the occupation chosen should be influenced by years of education (*EDUC*) and job tenure (*TEN*). More years of education induce individuals to sort into more sophisticated professions that can be connected

to a higher level of earnings risk. Likewise, the duration at an employer can influence the position in the company. Since the evidence on the connection between risk aversion and human capital endowment is ambiguous, we refrain from hypothesizing on the expected signs of the coefficients. The risk taken in an occupation can also be related to the income. We thus include the gross monthly income in logs ($\log INC$) in some of the specifications. Besides, the aptitude to take earnings risk is likely to be influenced by the wealth of a family. We take the net household income of the father as a proxy ($\log HH - INCFATHER$).

A binary variable for living in the eastern part of Germany ($EAST$) is included. The necessity to take into account whether an individual is living in East Germany stems from the fact that the historical and economic environment differs between these two parts of Germany. Even though evidence for significant differences in the willingness to take risks is rather limited (Dohmen et al. 2005, Bonin et al. 2007), the omission of this variable might lead to biased results. A dummy for being married ($FAMILY$) captures effects on the willingness to take risk that can arise from such a commitment. As additional controls, we include dummies for religion and residence of youth before the age of 16 in some regressions.

Furthermore, controls for family background are required, not least because parental characteristics have been found to play a role for a child's risk attitudes as has been outlined in section 2. These are the years of education of the father ($EDUCFATHER$), the respective age in the year 2004 ($AGEFATHER$) as well as the height ($HEIGHTFATHER$). Additional controls in some models are also religion and residence of youth of the father.

Summary statistics are given in the appendix. The exact specification of our models varies. The explanatory variables included in each model are specified below.

4.2 OLS Regression Results

The framework developed in section 2 describes the risk preference of a child as a function of the parents' risk attitude and own characteristics. In the previous section, variables are identified that capture those influences. We regress the son's risk variable on the father's risk variable using four different specifications. Model 1 is a bivariate regression without any controls. Model 2 adds personal and labor-market-related variables of the child except for its income. The reason is that the relationship between our measure of risk and income is potentially subject to an endogeneity problem. This variable is added in model 3 which allows us to compare whether the results are biased in model 2. In the comprehensive fourth specification, we include the father's

characteristics as described in the previous section. The results of the OLS estimates can be found in table 4.

The coefficients on the main variable of interest, the fathers' earnings risk, are positive as expected. In models 1 to 3, the coefficients are significant at the 1% level, the significance drops to the 5% level only when we include the father's characteristics (model 4). Based on these regressions, we are thus able to confirm our main hypothesis that risk attitudes revealed in occupational choices are transmitted between generations. Due to the construction of the variables, a proper interpretation of the magnitudes of the coefficients is however difficult.

Concerning control variables some further results are notable. As already found by Bonin et al. (2007), the son's years of education are quantitatively and statistically highly significant drivers of the willingness to take risks. This seems plausible given that well-educated individuals are likely to recover from failures more easily than those poorly educated. Unsurprisingly, then, is the correlation between the father's education level and the son's risk preference. Our approach further reveals a negative influence of tenure. We find no significant impact of age, height, experience, family status, being located in the east of Germany and income.

A comparison of the second and third model which only differ in the inclusion of the child's income shows that the results are largely unaffected by inclusion of this variable. Its inclusion only takes away some of the explanatory power. The coefficient on the main variable of interest is basically unchanged, only the significance on the coefficient of the tenure variable drops to the 5% level.

4.3 Ordered Probit Regression Results

Our measure of earnings risk provides an estimate of the unsystematic earnings variability associated with a specific occupation. However, it cannot necessarily be expected to display a continuous measure of risk that individuals intuitively use to make quantitative comparisons (such that one occupation is perceived to be 10% riskier than another). Even so, individuals should be able to order occupations according to riskiness and choose one that is in line with their risk attitude. Since OLS is biased in discrete choice models, we employ a second estimator, namely ordered probit. Our dependent variable is constructed by assigning occupations to four ranks, where 0 contains occupations with the lowest risk and 3 occupations with the highest risk. The cutoff points between the ranks are defined by the quartiles of the cumulative density distribution of the earnings risk. The results of the ordered probit estimates can be found in table 5.

	OLS 1	OLS 2	OLS 3	OLS 4
	b/se	b/se	b/se	b/se
JOB RISK FATHER	0.127*** (0.039)	0.106*** (0.038)	0.103*** (0.038)	0.093** (0.041)
AGE		0.003 (0.002)	0.003 (0.002)	0.002 (0.002)
HEIGHT		-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)
EDUC		0.008*** (0.003)	0.008*** (0.003)	0.006** (0.003)
TEN		-0.004*** (0.001)	-0.003** (0.002)	-0.004** (0.002)
FAMILY		-0.003 (0.018)	0.008 (0.021)	0.006 (0.022)
EAST		-0.016 (0.012)	-0.008 (0.015)	-0.011 (0.014)
log INC			-0.008 (0.006)	-0.006 (0.007)
log HH-INC FATHER				-0.013 (0.011)
AGE FATHER				0.001 (0.001)
HEIGHT FATHER				-0.001 (0.001)
EDUC FATHER				0.005** (0.002)
Additional controls?	NO	CHILD	CHILD	CHILD&FATHER
N	652	580	471	446
F	10.804	5.164	3.689	2.315
Adj. R2	0.021	0.100	0.104	0.105

Robust standard errors in parentheses. Significance levels : * : 10% ** : 5% *** : 1%. Dependent variable is the coefficient of variation of the antilog of the residuals as obtained from the wage regressions shown in table 1. Additional controls are indicator variables for the residence of youth before age of 16 (large city, medium city, small city, countryside, missing (as reference)) and indicator variables for religion (catholic, protestant, other christian religion, other religion, no religion, missing (as reference)). Coefficients of the additional controls and the intercepts upon request.

Table 4: OLS Regression Results

	OP 1	OP 2	OP 3	OP 4
	b/se	b/se	b/se	b/se
JOBRISK FATHER	0.155*** (0.038)	0.129*** (0.042)	0.117** (0.048)	0.100* (0.054)
AGE		0.020 (0.013)	0.019 (0.016)	0.010 (0.019)
HEIGHT		-0.007 (0.007)	-0.008 (0.008)	-0.005 (0.010)
EDUC		0.111*** (0.024)	0.123*** (0.028)	0.106*** (0.030)
TEN		-0.043** (0.018)	-0.036* (0.020)	-0.039* (0.021)
FAMILY		-0.079 (0.175)	-0.032 (0.210)	-0.095 (0.226)
EAST		-0.278** (0.127)	-0.307** (0.151)	-0.293* (0.171)
log INC			-0.092 (0.092)	-0.084 (0.098)
log HH-INC FATHER				-0.130 (0.143)
AGE FATHER				0.012 (0.012)
HEIGHT FATHER				-0.009 (0.009)
EDUC FATHER				0.047* (0.028)
Additional controls?	NO	CHILD	CHILD	CHILD&FATHER
N	652	580	471	446
Log Likelihood	-802.455	-683.184	-549.231	-513.453
Pseudo R2	0.011	0.053	0.048	0.058

Robust standard errors in parentheses. Significance levels : * : 10% ** : 5% *** : 1%. Dependent variable is the coefficient of variation of the antilog of the residuals as obtained from the wage regressions shown in tables 1 and 2. Controls are indicator variables for the residence of youth before age of 16 (large city, medium city, small city, countryside, missing (as reference)) and indicator variables for religion (catholic, protestant, other christian religion, other religion, no religion, missing (as reference)). Coefficients of the additional controls and the intercepts upon request.

Table 5: Ordered Probit Regression Results

The re-estimation of the four specifications described in the previous section with ordered probit largely confirms the results obtained with OLS. The coefficients on the fathers' earnings risk are positive and significant. The level of significance is however lower in some specifications. While the coefficients are significant at the 1% level in the first two models, the inclusion of the child's earnings in model 3 implies a decrease of significance to the 5% level. When further including the father's characteristics significance drops to the 10% level (model 4). With respect to the control variables, our findings resemble the ones from OLS. The most important difference is that in the ordered probit estimates, the geographical location within Germany seems to play a significant role.

The evidence from ordered probit regression nonetheless hints to a positive relationship between categories of a son's and father's occupational risk.¹⁰ Due to the difficulties in interpreting the coefficient on the risk variable, we dispense with reporting marginal effects which of course otherwise would be necessary for inferences on the effects.

5 Robustness Checks

Enlarged Mincer Dataset In the Mincer regression, we excluded all subjects younger than 25 and older than 55. We conjecture that in the age tails below 25 and above 55 training and early retirement might bias our results. A potential claim is that we use a different age span in the Mincer regression than used in the transmission process, where we include all subjects from 18 to 65. In this section, we enlarge the time span by these individuals. Table 6 shows the results of the Mincer regression. The results remain basically the same and all important variables stay significant at the same level as before. Some coefficients are slightly smaller.

The resulting coefficients of variation for each ISCO-cell are displayed and compared to the ones derived in the age span from 25 to 55 in figure 2 and 3. The differences between the risk measure over both age spans remain small. The transmission regression¹¹ is displayed in table 7 in regression OLS A. Again, results do not change substantially.

Exclusion of pairs with the same ISCO-Code at 2-digit level A further question to address is the possibility of father and son having the

¹⁰Grouping occupational risk in more than 4 categories would allow more precision. We will consider this in following versions of the paper.

¹¹In the following, we will display the comprehensive fourth model (OLS 4) for all robustness checks. The results hold equally for all other regressions.

Variable	Private Sector b/se	Public Sector b/se
EXPB	0.023*** (0.001)	0.033*** (0.001)
EXPB2BY100	-0.042*** (0.001)	-0.058*** (0.002)
TEN	0.014*** (0.000)	0.010*** (0.001)
TEN2BY100	-0.023*** (0.002)	-0.019*** (0.002)
EDUC	0.053*** (0.001)	0.045*** (0.001)
Intercept	6.599*** (0.101)	6.849*** (0.049)
ISCO dummies included?	YES	YES
STATE dummies included?	YES	YES
TIME dummies included?	YES	YES
N	35267	11046
F	788.700	244.93
Adj. R2	0.560	0.560

Significance levels : * : 10% ** : 5% *** : 1%.

Table 6: Mincer Regression: Results Private and Public Sector, Age 18-65

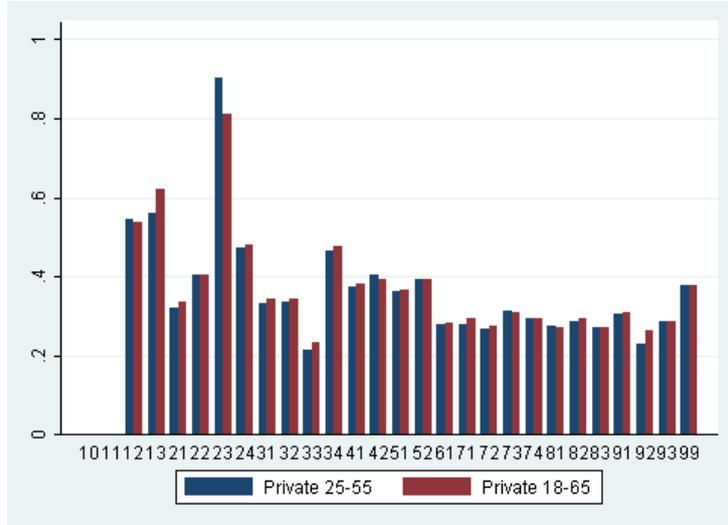


Figure 2: Comparison of Mincer residuals from age span 25-55 and 18-65 - private sector

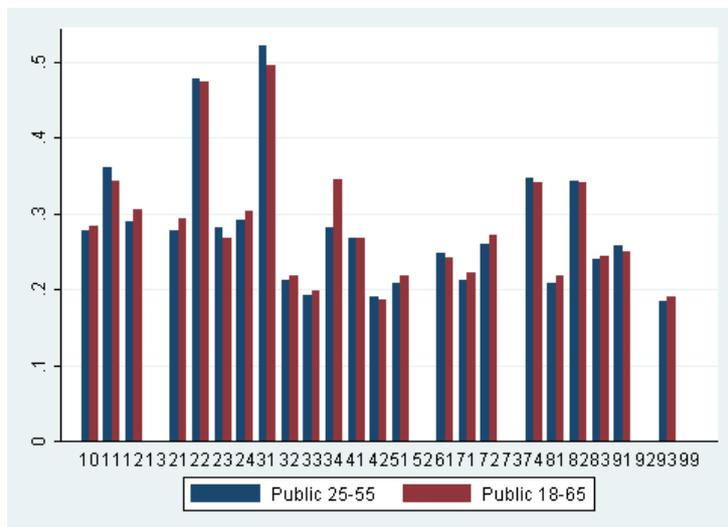


Figure 3: Comparison of Mincer residuals from age span 25-55 and 18-65 - public sector

	OLS A	OLS B
	b/se	b/se
JOBRISK FATHER	0.082** (0.039)	0.073* (0.043)
AGE	0.002 (0.002)	0.002 (0.003)
HEIGHT	-0.000 (0.001)	-0.001 (0.001)
EDUC	0.007** (0.003)	0.006* (0.007)
log INC	-0.006 (0.007)	-0.005 (0.007)
TEN	-0.003* (0.002)	-0.004** (0.002)
FAMILY	-0.002 (0.020)	0.015 (0.023)
EAST	-0.014 (0.013)	-0.009 (0.015)
AGE FATHER	0.001 (0.001)	0.001 (0.001)
HEIGHT FATHER	-0.001 (0.001)	-0.001 (0.001)
EDUC FATHER	0.004** (0.002)	0.005** (0.002)
log HH-INC FATHER	-0.010 (0.011)	-0.012 (0.011)
N	446	411
F	2.260	1870
Adj. R2	0.097	0.079

Significance levels : * : 10% ** : 5% *** : 1%.

Table 7: Robustness checks

same ISCO code at the 2-digit level. While we already exclude pairs of fathers and sons that have exactly the same ISCO code at the 4-digit level throughout, in this section we will also exclude all pairs with the same 2-digit ISCO code. It might be the case that sons enter a similar occupational category (which is captured by the 2-digit ISCO code) as the father because of family tradition or because they gained skills throughout their childhood that facilitate the entrance in this sector. Regression B in Table 7 displays our main OLS regression without the above mentioned pairs. We observe that the transmission effect of the father coefficient remains significant at the 5 % level. Thus, the transmission effect still exists.

Females As we point out in section 3.2, there might be problems with our risk measure calculated for female employees. This section now provides some empirical justification why female observations are not used in the determination of the Mincer residual. While all coefficients in the Mincer regression still remains significant, as can be seen in table 8, the coefficient of variation of each ISCO-code are significantly different as shown in figures 4 and 5. The revealed risk measure is different than the measure for male, potentially due to different reasons than the income risk.

Variable	Private Sector b/se	Public Sector b/se
EXPB	0.023*** (0.001)	0.033*** (0.001)
EXPB2BY100	-0.047*** (0.003)	-0.071*** (0.004)
TEN	0.011*** (0.001)	0.015*** (0.001)
TEN2BY100	-0.012*** (0.004)	-0.025*** (0.004)
EDUC	0.055*** (0.001)	0.039*** (0.002)
Intercept	6.975*** (0.147)	6.478*** (0.049)
ISCO dummies included?	YES	YES
STATE dummies included?	YES	YES
TIME dummies included?	YES	YES
N	11754	6991
F	230.440	127.86
Adj. R2	0.518	0.504

Significance levels : * : 10% ** : 5% *** : 1%.

Table 8: Mincer Regression: Results Private and Public Sector

Comparing the revealed risk preferences with the stated risk attitudes of the 2004 wave of the GSOEP yields further interesting insights. Tables 9 and 10 display correlations between daughters' and fathers' stated and revealed risk attitudes.

Table 9 shows that a correlation between the measure obtained from the job decisions and those from stated preferences can also be established for daughters and fathers. Nevertheless, the correlation for daughters is significantly smaller than the one for sons, as described in section 4.1. Regarding both risk categories (career and general), the positive relationship is significantly lower compared to males.

Table 10 shows that while both stated risk preferences of daughters are substantially correlated with those of their father, no correlation can be found using our risk measure from job choices. This confirms prior suspicions.

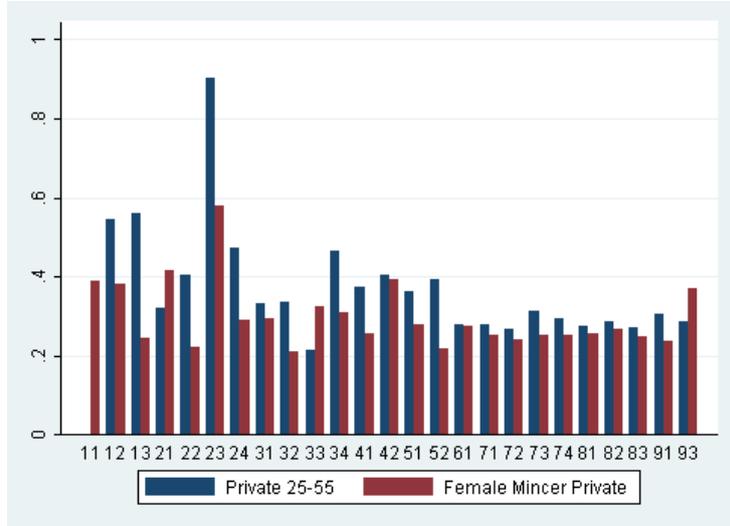


Figure 4: Comparison of Mincer residuals for females and males - private

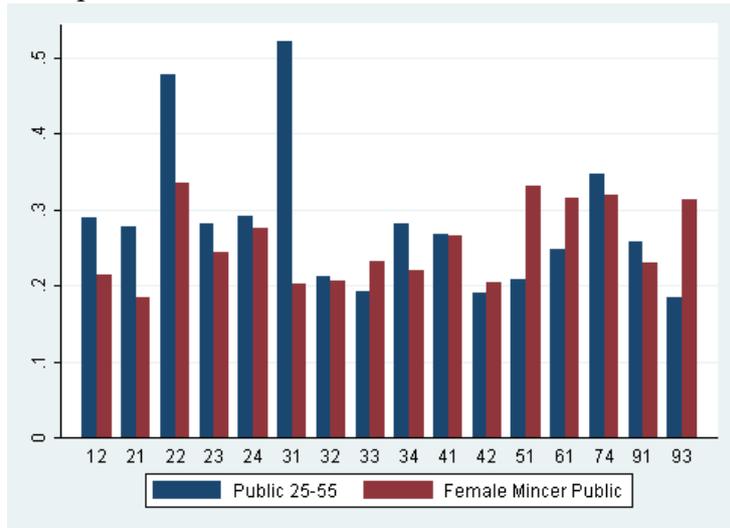


Figure 5: Comparison of Mincer residuals for females and males - public

	<i>JOB</i> RISK of	
	Daughters	Fathers
<i>RISKGEN</i>	0.0496	0.1064
<i>RISKCAR</i>	0.1047	0.1565

Table 9: Correlations of revealed and stated risk measures for daughters and fathers

	<i>JOB</i> RISK (revealed)	<i>RISK</i> GEN (stated)	<i>RISK</i> CAR (stated)
Daughters with fathers	0.0134	0.2447	0.1971

Table 10: Intergenerational correlations of revealed and stated risk measures

6 Conclusion

This paper provides further evidence on the intergenerational transmission of risk attitudes. Prior research indicates that children of more risk-loving parents describe themselves as having similar preferences. Our contribution is the supplementation of those evidence generated with stated preferences by results based on a real and major economic decision: the choice of occupation.

The justification to question findings based on responses to surveys is rooted in the criticism regarding the reliability of stated preferences. Our approach builds on the theory of compensating wage differentials, which suggests that risk-seeking individuals sort into occupations connected to higher uncertainty. The main hypothesis we test hence is whether transmission of risk attitudes can be observed by children of parents in a riskier job also tending to opt for riskier jobs. To our knowledge, this is the first paper that uses revealed preferences to test intergenerational transmission of risk attitudes.

Several approaches to classify occupations according to their riskiness are available. The unexplained variability of earnings is a general measure that is well known in the literature and obtainable from GSOEP data. We follow previous literature and use the residuals of standard Mincerian wage regressions that aim at explaining earnings by human capital and other variables. Assuming that the variation of earnings that cannot be explained presents perceived *ex ante* income uncertainty (i.e., *risk*) when deciding for a job, we calculate the coefficient of variation of the residuals for particular groups of occupations. This measure extends existing literature which commonly employs the standard deviation or variance and provides a more accurate measure. By computing the risk measure over different years, we also increase the validity of our measure.

The riskiness of a job thus derived is then assigned to sons and fathers according to their occupation and employment sector (public/private). We find a highly significant transmission effect from fathers to sons. This result is robust to different specifications. When we group the risk measure obtained into four risk classes based on the assumption that individuals rather sort into risk categories instead of making cardinal comparisons, we obtain the same results even though significance regarding the main variable of interest,

the father’s job risk, drops in some specifications.

Difficulties with the measure of occupational risk surface with the female part of the data though. Despite clear correlations between the stated risk attitudes between fathers and children, including daughters, no correlation between these groups can be found for the revealed Mincerian measure. In addition, the Mincerian risk measure obtained for women does not show clearly lower figures as one would expect from the evidence on higher risk-aversion of women on average. We suggest that several women-specific biographical aspects are likely to disqualify the form of the Mincer equation that is employed to derive the job-risk measure. Consequently, the exclusion of women and daughters seems to be justified.

Additional robustness checks include the issue of choosing the appropriate age span included in the Mincer regression and the effect of similar occupations of parents and children. As to the first, computing the risk measure for a broader age span does not change the result. The exclusion of father-son pairs in the same occupation according to the 2-digit ISCO code also does not change the results.

Intergenerational transmission of risk attitudes is thus confirmed with evidence based on a profound economic decision. Accordingly, risk preferences are, to a certain extent, part of the inheritance. This should be considered in economic research where applicable.

7 Appendix

Variable	Obs	Mean	Std. Dev.	Min	Max
JOBRISK	652	.3227259	.0893857	.1855393	.9035591
JOBRISK FATHER	652	.3349051	.1058875	.1855393	.9035591
AGE	652	24.89877	5.537655	17	45
HEIGHT	649	180.9399	7.155963	160	210
EDUC	582	11.82904	2.375013	7	18
TEN	652	3.146626	3.404538	0	20
log INC	525	6.975824	.8612631	4.043051	9.648595
FAMILY	652	.107362	.3098106	0	1
EAST	652	.2592025	.4385333	0	1
AGE FATHER	652	52.88804	6.233405	36	76
HEIGHT FATHER	651	177.1982	6.9755	155	200
EDUC FATHER	646	12.29257	2.701049	7	18
log HH INC	611	8.082505	.4485956	6.684612	9.472705

Table 11: Summary statistics

ISCO Code	Occupation Group
1	Legislators, Senior Officials, and Managers
11	Legislators and Senior Officials
12	Corporate Managers
13	General Managers
2	Professionals
21	Physical, Mathematical and Engineering Science Professionals
22	Life Science and Health Professionals
23	Teaching Professionals
24	Other Professionals
3	Technicians and Associate Professionals
31	Physical and Engineering Science Professionals
32	Life Science and Health Associate Professionals
33	Teaching Associate Professionals
34	Other Associate Professionals
4	Clerks
41	Office Clerks
42	Customer Services Clerks
5	Service Workers and Shop and Market Sales Workers
51	Personal and Protective Service Workers
52	Models, Salespersons and Demonstrators
6	Skilled Agricultural and Fishery Workers
61	Market-Oriented Agricultural Skilled Agricultural and Fishery Workers
62	Subsistence Agricultural and Fishery Workers
7	Craft and Related Trades Workers
71	Extraction and Building Trades Workers
72	Metal, Machinery and Related Trades Workers
73	Precision, Handicraft, Printing and Related Trades Workers
74	Other Craft and Related Trades Workers
8	Plant and Machine Operators and Assemblers
81	Stationary-Plant and Related Operators
82	Machine Operators and Assemblers
83	Drivers and Mobile-Plant Operators
9	Elementary Occupations
91	Sales and Services Elementary Occupations
92	Agricultural, Fishery and Related Labourers
93	Labourers in Mining, Construction, Manufacturing and Transport
0	Armed Forces
01	Armed Forces

Table 12: ISCO Cells

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