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IZA DP No. 13828

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ABSTRACT

Risk Preferences and Training Investments*

We analyze workers' risk preferences and training investments. Our conceptual framework differentiates between the investment risk and insurance mechanisms underpin- ning training decisions. Investment risk leads risk-averse workers to train less; they undertake more training if it insures them against future losses. We use the German Socio-Economic Panel (SOEP) to demonstrate that risk affinity is associated with more training, implying that, on average, investment risks dominate the insurance benefits of training. Crucially, this relationship is evident only for general training; there is no relationship between risk attitudes and specific training. Thus, as expected, risk preferences matter more when skills are transferable – and workers have a vested interest in training outcomes – than when they are not. Finally, we provide evidence that the insurance benefits of training are concentrated among workers with uncertain employment relationships or limited access to public insurance schemes.

JEL Classification: J24, C23, D81

Keywords: human capital investment, work-related training, risk preferences

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1 Introduction

Human capital investments inevitably involve risk. Investment decisions depend not only on people's individual risk tolerance, but also on the nature of the risks they face and the way those risks drive potential investment returns. Investment risk is generated in the first instance by uncertainty about the future payoffs to newly acquired skills (see for example Levhari and Weiss, 1974; Brown *et al.*, 2006), but may also stem from other sources such as people's uncertainty about their own ability (Shaw, 1996). Education, in particular, also provides a degree of labor market insurance – likely reducing risk – raising questions about whether people view schooling acquisition as a risky investment (Belzil and Leonardi, 2007, 2013). Empirically, attitudes towards risk seem to be very influential in education decisions (see Heckman and Montalto, 2018, for a review). Many studies find that risk aversion is linked to lower educational attainment (Brown *et al.*, 2006), though in some cases only weakly so (Belzil and Leonardi, 2007), while others find a positive relationship (Harrison *et al.*, 2007). Risk preferences also influence choices about enrolment in higher education (Hartlaub and Schneider, 2012; Heckman and Montalto, 2018), fields of study (De Paola and Gioia, 2012) as well as occupational choices (King, 1974).

Thus far, researchers asking whether human capital is an investment or a form of insurance have focused exclusively on formal education. Our research extends this literature by – for the first time – studying the question in the context of training that takes place on the job. This is an important contribution because of the key role that work-related training has in making internal labor markets more dynamic, improving firms' competitive position, ensuring that workers' skills remain up-to-date and transferable, and promoting social inclusion.[1] The ongoing structural change in the global labor market as a result of, for example, digitalization, automation, and the dramatic increase in remote working in response to the COVID-19 pandemic has the potential to generate new opportunities for some workers, while leaving many others behind. Not surprisingly, promoting investments in work-related education and training is a key policy priority for national governments and international development agencies alike (OECD, 1996; European Commission, 2007). Success in achieving this goal relies on a better understanding of the way that uncertainty

[1]There is evidence, for example, that training improves productivity at the firm level (e.g. Barrett and O'Connell, 2001). Training is positively associated with workers' wages (Lynch, 1992; Frazis and Loewenstein, 2005; Haelermans and Borghans, 2012), performance ratings (Bartel, 1995), promotion chances (Bishop, 1990), reemployment probabilities (Ok and Tergeist, 2003), and occupational position (Greenhalgh and Stewart, 1987).

affects workers' training choices.

Our research contributes to this effort by estimating the effect of workers' risk preferences on their decisions to invest in work-related training. We begin by developing a conceptual framework that differentiates between the key investment and insurance mechanisms underpinning people's training decisions. Training is modelled as an inter-temporal choice made under uncertainty. In the first case we consider, workers face uncertainty about the payoff to training which results in training being a risky investment. In the second case, it is assumed that training provides insurance against falls in future income that, for example, occur as a result of involuntary job loss or labor market downturns. This results in our first empirical prediction. The overall relationship between workers' risk preferences and their training choices depends on the relative strength of these two sources of underlying risk. To the extent that it is investment risk that dominates, risk-averse workers will undertake less training; risk-averse workers will engage in relatively more training whenever it has a large role in insuring them against future income losses.

Importantly, we take inspiration from Becker (1962) and are also mindful of the difference between training that is transferable (i.e. general training) to other employment contexts and training that is not (i.e. specific training). This is a key contribution of our research to the previous literature that considers the role of risk solely in the context of investments in education. While formal education is the quintessential example of general human capital, work-related training may constitute either general or specific human capital and often involves elements of both (see Acemoglu and Pischke, 1999a; Asplund, 2005; Frazis and Loewenstein, 2007, for reviews). The fundamental role of skill transferability in the allocation of training costs and returns first identified by Becker (1962) leads us to expect that workers' risk preferences will be most relevant for their decisions to invest in general human capital. This insight results in our second key prediction. We expect risk preferences to play a larger role in general training decisions than in specific training decisions because the returns to specific training largely accrue to firms rather than workers.

We utilize data from the German Socio-Economic Panel (SOEP, 2019) to test our hypotheses empirically. We find that those with greater affinity for occupation-related risk are more likely to invest in some type of work-related training. This positive relationship indicates that, on average, the investment risk of training generally dominates its insurance benefits. Importantly, we demonstrate that the link between risk preferences and training is driven by the positive association between risk tolerance and general training; there is no

significant relationship between risk preferences and the probability of investing in specific training. As expected, workers' attitudes towards risk play a larger role in those training decisions in which the returns accrue to them rather than firms; workers' risk attitudes play little role when they do not. Caliendo *et al.* (2020) reach the same conclusion with respect to the role of locus of control in work-related training decisions. Taken together, our research provides new insights into the conceptual importance of skill transferability in human capital investment decisions like work-related training. Skill transferability gives people a vested interest in the outcomes of their choices. Consequently, their responses to both subjective and objective investment returns will be stronger when skills are transferable – and the returns largely accrue to them – than when they are not.

Risk preferences matter, in particular, because they shape the way people trade off the utility costs associated with the uncertainty of investment returns against the insurance benefits that training may provide. Extending our main analysis, we empirically investigate the relative importance of these competing factors in labor market contexts in which one mechanism can reasonably be argued to dominate the other. Our results provide evidence that – consistent with our conceptual framework – the insurance motive for training is stronger in jobs with relatively stable wages, in non-permanent jobs, and among those who have recently experienced unemployment. These insights highlight the need to assess investments in employment-related training through the lens of the broader decision environment.

Finally, our research makes a contribution by lending weight to a key debate on the measurement of risk preferences. Previous researchers have noted that attitudes towards risk are context-specific, raising questions about the capacity of more general measures of risk preferences to adequately capture risk-related behavior (see e.g. Slovic, 1972; Weber *et al.*, 2002). We consider this issue and find that our domain-specific measure of occupational risk affinity is more predictive of people's training choices than is a measure of general risk affinity.

2 Theoretical Framework

Levhari and Weiss (1974) were the first to consider the role of risk in human capital investments using a simple two-period model in which earnings depend on the amount of time invested in human capital and on a random variable capturing the uncertainty of human

capital returns. Similarly, Williams (1978) explicitly models the connection between risky human capital and risky asset investments. This focus on the risk underlying human capital investments has led researchers to investigate the links between individuals' risk attitudes and their investment choices. In particular, Shaw (1996) develops a theoretical model of the joint investment in financial wealth vs. human capital; increasing risk aversion is predicted to decrease households' investments in risky human capital. Shaw does not, however, explicitly consider the nature of that human capital, i.e. whether it is best characterized as schooling or on-the-job training. To date, empirical studies of the issue largely focus on the effects of risk preferences on schooling decisions (see e.g. Brown *et al.*, 2006; Belzil and Leonardi, 2007, 2013), typically finding a negative association between risk aversion and schooling investments.

We develop a stylized model of training investment in the face of uncertain returns. We assume that each worker decides at the beginning of a period whether or not to invest in training. In the absence of training, a worker earns wage w_0. The costs c of training T are known to the worker, while the returns from training are uncertain. Utility depends positively on income and the shape of this relationship depends on the risk aversion θ_i. A worker decides to invest in training if the expected returns from training exceed the costs.

In our stylised framework, we distinguish between two cases. In the first case, training leads to an increase in wages with some positive probability. Wage increases may occur, for example, if training leads to future promotion, job change, or upward career mobility. However, these future payoffs are uncertain, implying that participation in training is a risky investment. Workers who are more risk-averse are less likely to undertake training, everything else equal. In the second case, training acts as an insurance mechanism by reducing the likelihood of future income losses. Participation in training reduces the income loss associated with negative labor market shocks (e.g. involuntary job loss), leading workers who are more risk-averse to have a higher probability of undertaking training. The empirical relationship between workers' risk preferences and their training choices will depend on the relative strength of these two sources of underlying risk. In what follows, we discuss the two cases in more detail.

Case 1 – Training as a risky investment: In practice, there are many reasons for uncertainty about the returns to training including uncertainty about: (i) how quickly training investments become obsolete; (ii) one's own ability to benefit from training; (iii) firm-specific

success; and (iv) the quality of the training (see e.g. Levhari and Weiss, 1974; Shaw, 1996; Williams, 1979). We model this uncertainty as follows. Training leads with probability p_w to an increase in wages of Δw; with probability $(1 - p_w)$ wages remain unchanged. The expected wage (w) is thus $w = w_0 + Tp_w\Delta w$. At the same time, participation in training incurs costs c. The expected value of training (T=1) versus no training (T=0) conditional on risk aversion θ_i can be expressed as:

$$V_i(T = 1|\theta_i) = (1 - p_w)u(w_0 - c|\theta_i) + p_w u(w_0 - c + \Delta w|\theta_i) \quad (1)$$

$$V_i(T = 0|\theta_i) = u(w_0|\theta_i) \quad (2)$$

Worker i undertakes training if:

$$(1 - p_w)u(w_0 - c|\theta_i) + p_w u(w_0 - c + \Delta w|\theta_i) > u(w_0|\theta_i).$$

Undertaking training is potentially beneficial only if the associated future wage increase exceeds the cost, i.e. if $\Delta w - c > 0$. Whether or not a worker participates in training depends on the chances of receiving a future wage increase; the utility gain associated with this wage gain; and the utility loss associated with paying the costs of the training. The way these monetary costs and benefits are translated into worker utility is dictated by the shape of the utility function which depends on workers' degree of risk aversion (θ_i). Even if the expected monetary costs and benefits of training do not differ across workers, the expected utility gain from training will be smaller for a worker who is generally risk-averse than for a worker who is generally willing to take risks. This leads to the prediction that – if training is a risky investment with uncertain returns – the likelihood of undertaking training depends negatively on individual-specific risk aversion.

Case 2 – Training as an insurance against income loss: We now consider the case in which workers lose their jobs with probability p_j. Training acts as partial insurance against this job loss. Workers who participate in training experience job loss with probability $p_{jT} = p_j - \Delta p_j$, with $p_j > \Delta p_j > 0$. If they lose their jobs, workers receive transfer payments$b$ instead of the wage w_0. Given this framework, the expected values of training (T=1) and no training (T=0) conditional on risk aversion θ_i are given by:

$$V_i(T = 1|\theta_i) = (1 - p_{jT})u(w_0 - c|\theta_i) + p_{jT}u(b - c|\theta_i) \quad (3)$$

$$V_i(T = 0|\theta_i) = (1 - p_j)u(w_0|\theta_i) + p_j u(b|\theta_i) \quad (4)$$

Worker i participates in training if the following inequality holds:

$$(1 - p_{jT})u(w_0 - c|\theta_i) + p_{jT}u(b - c|\theta_i) > (1 - p_j)u(w_0|\theta_i) + p_j u(b|\theta_i).$$

Workers undertake training if expected utility from training (given on the left) exceeds the expected utility from not receiving training (given on the right). In this case, uncertainty in the returns to training is captured through a differential in the probability of future job loss. Training reduces this probability by Δp_j, but involves costs c.

Given this framework, undertaking training reduces income in both possible states – working for wage w_0 or receiving transfer payments b – by the costs c. If we make the reasonable assumption that the probability of keeping one's job is greater than losing it, i.e. $p_j > 1 - p_j$, and unemployment benefits are less than wages, i.e. $w_0 > b$, the variance of the income given training is smaller than the variance given no training. This leads to the prediction that – if undertaking training reduces the probability of a negative income shock – the chances of participating in training depends positively on workers' degree of risk aversion θ_i.

General vs. specific training: One of the key distinctions between work-related training and formal education is the range of contexts in which any newly acquired skills are productive. Some training is like formal education in that it results in skills that are broadly applicable; other types of training have limited applicability beyond the current context. In his seminal work, Becker (1962) demonstrates that this degree of skill transferability drives the way that the costs and benefits of training are shared between workers and firms. Firms receive all benefits and pay all costs when training is "perfectly specific" (i.e. raises productivity only in the current firm). Workers receive all benefits and pay all costs when training is "perfectly general" (i.e. fully transferable across firms). Most training naturally falls between these two extremes, including some components which may be specific to the current employer as well as other components which increase productivity both inside and outside the current firm. Moreover, imperfect competition may allow firms to earn rents by paying post-training wages that are lower than workers' post-training productivity. The consequence is that there are a wide variety of circumstances in which firms may find it profitable to pay – at least in part – for training that is general (see Acemoglu and Pischke, 1999a,b; Caliendo *et al.*, 2020, for a review).

The key insights of our theoretical framework remain unchanged in the face of these

extensions to the Becker (1962) model, however, so long as wages continue to depend positively on worker productivity. The returns to training fundamentally depend on the cost-benefit-sharing rule. Workers undertaking general training face investment risk because they largely both pay and receive the benefits of training. In contrast, specific training poses little investment risk for workers because they neither pay the costs nor receive the benefits of the training they undertake. Consequently, the role of risk preferences in training decisions depends on the transferability of the skills to be acquired. We expect the decision to invest in general training to depend on workers' level of risk aversion, however,0 the relationship between risk aversion and participation in specific training is likely to be less pronounced.

3 Data and Descriptives

3.1 Estimation Sample

We utilize data from the German Socio-Economic Panel (SOEP, 2019) which is an annual representative household panel survey. In 1984, approximately 12,000 individuals living in 6,000 households were surveyed. Subsequently, the SOEP sample has periodically been extended to include samples of those living in the former German Democratic Republic or minority groups (e.g. migrants). In 2018, approximately 30,000 individuals from 15,000 households were surveyed (Goebel *et al.*, 2019). The SOEP data provide us with rich information about respondents' socioeconomic background, labor market behavior, and economic preferences.

The years 2004 and 2008 are of particular interest for our analysis because detailed information on training activities and risk attitudes are available in these years. We pool data from these two waves and make a number of sample restrictions. Specifically, we restrict our analysis to the working-age population between the ages of 25 and 60 who were employed at the time of training. We exclude individuals who are self-employed at the time of the interview. And, finally, we exclude respondents with missing data for the risk measure, the training measure, or any other control variables. This results in an estimation sample of 7,249 individuals, 2,347 of whom we observe in both years, giving us a total of 9,596 observations.

3.2 Training Measures

In 2004 and 2008, SOEP respondents under the age of 65 were asked whether they had engaged in any courses for further professional education in the last three years. If so, they

were then asked detailed questions about the timing, duration, and costs of the three most recent courses they had undertaken. As we have information about training start dates, we can identify those respondents who participated in at least one training course in the 12 months prior to the interview date. We define these individuals to be training participants.[2]

Our conceptual framework suggests that the effect of risk preferences on training participation depends on the extent to which any acquired skills are transferable across jobs, i.e. whether the training is of general or specific nature. The information provided in 2004 and 2008 about skill transferability allows us to distinguish between general and specific training using responses to the following question: "To what extent could you use the newly acquired skills if you got a new job in a different company?". Survey participants respond by indicating: "Not at all", "Only to a limited extent", "For the most part", and "Completely".

Following Becker (1962), we define specific training to be training that is "not at all" or "only to a limited extent" transferable outside the company; general training is training that can be transferred "for the most part" or "completely".[3] Overall, 1,493 respondents report that their most recent training course involved general training, while 827 respondents report participating in specific-only training. In addition, 168 respondents report participating in both types of training within the proceeding 12 months. This provides us with a total of 2,488 observations which are classified as training participants and 7,108 observations which are classified as non-participants.

Detailed information regarding the nature of the training courses undertaken can be found in Table A.1 in the Appendix. General training is more likely to take place in private institutes and for the purpose of "qualification for professional advancement", while specific training is more likely to be organized by the current employer and for the purpose of "adjustments to new demands in the current job". There is clearly, however, a wide variety of contexts in which training occurs. Interestingly, approximately 19 percent of those participating in specific training believe that the training they received was not worth it professionally; this is true for only 8 percent of those participating in general training.

[2]We do not use training data from 2000 or 2014-2018 because we do not have information on attitudes towards risk in 2000 or the transferability of training in 2014-2018.

[3]We consider the robustness of our results to alternative definitions of general and specific training in Section 4.3.

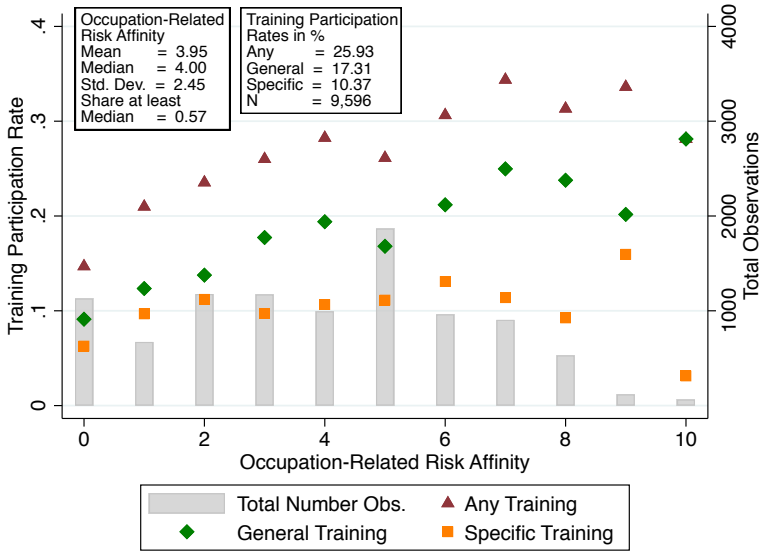
3.3 Risk Preferences

Beginning in 2004, the SOEP survey adopted a variety of approaches to measuring risk preferences. First, respondents are asked to make a general assessment of their willingness to take risks by answering the following question: "How willing are you to take risks, in general?". Respondents answer using an 11-point Likert scale that ranges from "not at all willing to take risks" to "very willing to take risks". This measure of general risk preferences is available in 2004, 2006, 2008, and every year since.[4] Second, in 2004, 2009, and 2014, respondents are asked about their willingness to take risks in six different domains. Given our interest in employment-related training investments, we focus on 2004 occupation-related risk preferences which are assessed using the following question: "People can behave differently in different situations. How would you rate your willingness to take risks in the following areas? – in your occupation". Once again, respondents rate their willingness to take occupation-related risks on a scale from 0 to 10. We use this information to create a continuous measure of occupation-related risk affinity that is increasing in the willingness to take risks.

The left text box in Figure 1 provides summary statistics for our measure of occupation-related risk affinity. The average occupation-related risk affinity in our sample is 3.95, while the median is 4. Unconditional training participation rates (left y-axis) are plotted against occupation-related risk affinity (x-axis) in Figure 1. Participation rates for training overall are indicated by triangles, while participation rates for general and specific training are indicated by diamonds and squares, respectively. The frequency of respondents with various degrees of occupation-related risk affinity are shown in the gray bars (see right y-axis). While participation in some form of training is on average 26 percent, the likelihood of participating in training varies notably by risk affinity. It is approximately 15 percent for those who report that they are not at all willing to take risks and is more than 30 percent among those who rate their willingness to take occupation-related risks as a six or higher. Participation rates are higher for general training than for specific training irrespective of individuals' risk attitudes. Moreover, consistent with our conceptual framework, participation rates for any and general training increase with risk affinity, while participation in specific training appears to be less sensitive to risk attitudes.

[4] Dohmen *et al.* (2011) show in a field experiment that responses to the general willingness to take risks question are a good predictor of actual risk-taking behavior.

Figure 1: Training Participation Rates by Occupation-Related Risk Affinity



Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.
Notes: The figure shows the training participation rates for any training type, general and specific training by occupation-related risk affinity. The question asked in the survey is "How would you rate your willingness to take risks in your occupation?". Respondents can answer on an 11-point Likert scale ranging from "not at all willing to take risks (0)" to "very willing to take risks (10)".

3.4 Control Variables

Our choice of control variables is informed by the literature on the determinants of training participation. First, multiple socio-demographic factors have been found to influence the probability of undertaking training. Older and less educated workers, for example, are less likely to receive training (Oosterbeek, 1996; Maximiano, 2012; Lynch and Black, 1998; Bassanini *et al.*, 2007). Many studies suggest that men are more likely to receive training than are women (Lynch, 1992; Dieckhoff and Steiber, 2011; Fitzenberger and Muehler, 2015), though other studies find that the gender gap in training either favors women (Simpson and Stroh, 2002) or disappears entirely once occupational characteristics are controlled (Oosterbeek, 1996). Second, both occupational and firm characteristics influence training decisions. The probability of training increases with experience (Lynch, 1992) and is higher for workers with a permanent (Oosterbeek, 1996) or full-time contract (Leuven and Oosterbeek, 1999) or who are union members (Lynch, 1992; Booth *et al.*, 2003). Investment rates differ by labor market sector (Oosterbeek, 1998) and are higher in larger

firms (Lynch and Black, 1998; Maximiano, 2012). Finally, evidence suggests that personality traits such as locus of control (Caliendo *et al.*, 2020) affect the incidence of training investments.

Given this background, our estimation models control for a number of factors including: i) socio-demographic characteristics (i.e. age, gender, marital status, number of children, disabilities, migration background, home ownership status, highest educational degree and vocational training, employment and unemployment experience, and real net household income); ii) regional-specific variables (i.e. regional state dummies, local unemployment rates, and regional GDP); iii) job-related characteristics (i.e. employment status, occupational position, contract type, tenure, trade union and trade association membership, and ISCO88 occupation); iv) firm-specific characteristics (i.e. firm size and NACE industry)[5]; and v) personality traits (i.e. Big Five traits and locus of control).[6] Descriptive statistics for our control variables are provided by training status in Table A.2 in the Appendix.

4 Results

4.1 Estimation Strategy

Conceptually, risk attitudes influence the decision to invest in work-related training both because the returns to training are uncertain and because training may provide a degree of insurance against future income shocks. The former leads us to expect a negative relationship between risk affinity and participation in training; the latter leads us to expect a positive relationship (see Section 2). Which effect dominates then becomes an empirical question which we investigate here. Irrespective of whether risk affinity is associated with more or less training, we expect the relationship to be stronger in the case of general training because workers have a vested interest in training outcomes.

We analyze the relationship between risk affinity and three separate training outcomes, any training, general training, and specific training. Specifically, our three outcome variables are indicators for participation in the previous 12 months in: (i) any type of training T^A; (ii) general training T^G; or (iii) specific training T^S. We pool observations from 2004 and

[5]Our occupational classification is based on the International Standard Classification of Occupations 88 (ISCO88) which categorizes occupations into 10 groups. We drop "soldiers" as they are not included in our sample and focus on the remaining 9 occupations (see Table A.2). We aggregated industries into 12 categories based on the classification system NACE ("Nomenclature statistique des Activités Economiques dans la Communauté Européenne") used by the European Union (see Table A.2).

[6]We impute the missing information on trade union and association membership status from 2003 and 2007; Big Five traits are imputed from 2005; and locus of control is imputed from 1999 and 2005.

2008 and estimate the following logit model:

$$P(T^j)_{it} = \frac{\exp(\alpha_0 + \alpha_1 Risk_{i0} + \boldsymbol{X'_{it}\alpha_2})}{1 + \exp(\alpha_0 + \alpha_1 Risk_{i0} + \boldsymbol{X'_{it}\alpha_2})} \quad (5)$$

where i indicates individuals, t captures time, and $j \in \{A, G, S\}$ references the type of training (i.e. any, general, or specific). The main independent variable of interest is *Risk*, i.e. occupation-related risk affinity, which we standardize in order to facilitate interpretation and make our results more comparable to other studies. The parameter α_1 captures the effect of the occupation-related risk affinity on the probability of participating in training. We include a rich set of control variables in the vector $\boldsymbol{X_{it}}$ capturing i) socio-demographic; ii) region-specific, iii) job-related, and iv) firm-specific characteristics as well as v) personality traits as detailed in Section 3.4.

Unfortunately, we lack exogenous variation in risk affinity; indeed it is difficult to imagine the experiment that would result in a substantial and sustained shift in people's risk preference. Consequently, we regard our estimates as providing descriptive rather than causal evidence on the role of risk attitudes in training decisions.

4.2 Participation in Training

The estimated association between occupation-related risk affinity and participation in work-related training is summarized in Table 1. The results reported are the marginal effects corresponding to the logit estimation of equation (5); results from our preferred specification are reported in column (1), while results from various sensitivity tests appear in columns (2)-(7). The three panels of the table correspond to the three outcomes that we consider: (i) any training (panel A); (ii) general training (panel B); and (iii) specific training (panel C).

Consider first the estimated effects of risk affinity on training participation in our preferred specification which includes all controls (column 1).[7] We find that having a greater affinity for risk is associated with a significantly higher likelihood of undertaking any training in the previous 12 months. A one standard deviation (SD) increase in occupation-related risk affinity, i.e. a 2.5-points increase on the 11-point Likert scale, is associated with a probability of any training participation that is 2.2 percentage points (p.p.) (almost 8.5 percent) higher.

[7] Full estimations results are available in Table A.4 in the Appendix.

Table 1: Logit Estimation Results: Training Participation on Occupation-Related Risk Affinity (Marginal Effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Main Specification	**Robustness**					
		Potential Endogeneity		Alternative Training Definition			Risk Measure
		Exogenous Controls	Year 2008	Training Worth It	Transferable vs. Not	Completely vs. Not	General Risk Affinity
A. Training							
Occupation-Related Risk Affinity (std.)	0.022***	0.029***	0.017***	0.020***	0.022***	0.014***	
	(0.005)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)	
General Risk Affinity (std.)							0.004
							(0.005)
Participation Rate	25.93	25.93	27.91	23.64	25.93	10.32	25.94
Effect in %	8.48	11.18	6.09	8.46	8.48	13.57	1.54
B. General Training							
Occupation-Related Risk Affinity (std.)	0.022***	0.028***	0.021***	0.021***	0.020***	0.011***	
	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)	(0.003)	
General Risk Affinity (std.)							0.007*
							(0.004)
Participation Rate	17.31	17.31	18.89	16.45	23.77	7.71	17.29
Effect in %	12.71	16.18	11.12	12.77	8.41	14.27	4.05
C. Specific Training							
Occupation-Related Risk Affinity (std.)	0.003	0.005	0.000	0.002	0.003	0.003	
	(0.003)	(0.003)	(0.004)	(0.003)	(0.002)	(0.002)	
General Risk Affinity (std.)							-0.002
							(0.004)
Participation Rate	10.37	10.37	11.05	8.84	2.96	2.71	10.39
Effect in %	2.89	4.82	0.00	2.26	10.14	11.07	-1.92
Controls	✓	✓	✓	✓	✓	✓	✓
Observations	9,596	9,596	5,790	9,308	9,596	7,926	9,558

Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.
Notes: Standard errors are in parentheses and clustered on person-level. * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.
(1) Full specification. Detailed estimation results available in Table A.4 in the Appendix.
(2) Excluding potentially endogenous variables (highest educational degree, occupational position, ISCO88, NACE).
The remaining job and firm control variables are: employment status, contract type, tenure, member trade union/association, firm size.
(3) Only year 2008 with occupation-related risk affinity (std.) measured in 2004.
(4) Excluding those who say 'training not worth it'.
(5) Changing definition of general and specific training (general=completely, to a large extent, only to a limited extent; specific = not at all).
(6) Changing definition of general and specific training (general=completely; specific = not at all).
(7) General risk affinity (std.) measured in 2004 and 2006.

Once we distinguish between general (panel B) and specific training (panel C), it becomes evident that the relationship between risk affinity and training overall is driven mainly by general training. The 2.2 p.p. increase in general training that is associated with a one SD increase in risk affinity is of the same magnitude as that for training overall and translates into an effect size of roughly 12.7 percent. In contrast, the estimated effect of risk affinity on specific training, is small and statistically insignificant. The consequences of risk attitudes for training decisions are even more pronounced when we use an indica-

tor variable to compare risk-averse and risk-seeking individuals.[8] In this case, risk-seeking individuals are 3.4 p.p. (19.6 percent) more likely than risk-averse individuals to invest in general training (see Table A.3 in the Appendix).[9]

Taken together, our results indicate that a greater affinity for occupation-related risk is associated with a higher probability of investing in training. Thus, on average, the uncertainty around the returns to training may play a more important role in people's training decisions than does any insurance that training might provide. Consistent with our expectations, this relationship is driven by training that is largely transferable and gives workers a vested interest in training outcomes. Workers' risk attitudes are unrelated to their decision to invest in work-related training that is specific to their current job and firm.

4.3 Robustness

We turn now to consider the robustness of our conclusions to the key modelling decisions that we have made. These results are reported in columns (2)-(7) of Table 1.

Potential Endogeneity: As previously discussed, people's risk attitudes influence their educational and occupational choices (Hartlaub and Schneider, 2012; Heckman and Montalto, 2018; De Paola and Gioia, 2012; King, 1974). Consequently, we re-estimate equation (5), excluding controls for highest educational degree, occupational position, ISCO-occupation, and NACE-sector classification in order to avoid the influence of these potentially endogenous factors. The results are reported in column (2). Irrespective of the training outcome we consider, effect sizes are moderately higher as expected. At the same time, our overall conclusion remains the same; risk affinity plays a significant role for general, but not specific, training.

Another potential endogeneity concern relates to the timing of our risk affinity measure. Our training measure captures training that takes place in the 12 months prior to the 2004 and 2008 SOEP interviews. Occupation-related risk affinity was measured at the 2004 interview, however. Consequently, there is a potential for reverse causality to result in endogeneity bias in 2004 because our measure of training precedes our measure of risk affinity. To address this issue, we re-estimate equation (5) using only the 2008 cross-section in which our 2004 measure of risk affinity is pre-determined. Despite the decrease in sample

[8] We define individuals as risk-averse (risk-seeking) if the occupation-related risk affinity is below (at least equal to) the median of 4.

[9] We also tested a number of non-linear specifications, but did not find any evidence that risk attitudes have a non-linear effect on training participation. Detailed results are available on request from the authors.

size, the effect size and statistical significance remains almost unchanged (see column 3). The effect of risk affinity is estimated to be 1.7 p.p. in the case of any training and 2.1 p.p. in the case of general training. There is no effect of occupation-related risk affinity on specific work-related training.

Taken together, these results give us confidence that our overall conclusions are not confounded by these sources of potential endogeneity.

Training Definition: Following Becker (1962), our categorization of training as general vs. specific is based on respondents' views about the extent to which the skills they acquire would also be useful in a new job in another company. One possibility is that our measure of specific training captures training that respondents regard as not useful at all, rather than training that is simply not transferable across jobs. If so, this might account for the disparity that we observe in the response of general vs. specific training investments to workers' risk attitudes. We investigate this issue by excluding all respondents who report that "training was not worth it" from the analysis. We find no evidence that our results are being driven by perceptions of the usefulness of training (see column 4).

Although the dichotomy between general and specific training has proven to be a useful construct, many researchers argue that training is seldom entirely specific. Lazear (2009), for example, views all skills as general, arguing that it is only the skill mix and the weights attached to particular skills that are specific to each employer. Consequently, we also investigate the robustness of our findings to the threshold we use to differentiate between training that is specific rather than general. We first redefine training to be specific only if the skills are perceived to be "not at all" transferable to jobs in other firms and general otherwise. We find virtually no difference in the estimated relationship between risk affinity and training participation (see column 5). We then consider an even starker distinction in skill transferability by defining training as general only if the skills acquired are "completely" transferable and as specific only if the skills acquired are "not at all" transferable. This allows us to differentiate between the extremes of the transferability scale of skills; all other training events are dropped from the analysis. Although the effect of risk attitudes on training is somewhat weaker, our general conclusions remain the same; risk affinity is associated with an increase in training that is general rather than specific (see column 6).

Risk Measurement: Next, we turn our attention to the measure we use to capture risk attitudes. Our choice to focus our analysis on occupation-related risk affinity in our main analysis is motivated by the evidence that people's attitudes towards risk are often context-specific (see e.g. Slovic, 1972; Weber *et al.*, 2002; Dohmen *et al.*, 2011). In particular, risk attitudes differ across domains such as financial and business decisions or health and social decisions (Weber *et al.*, 2002). Dohmen *et al.* (2011) use the information from the SOEP survey in 2004 to analyze the relationship between the domain-specific and general risk measures as well as the predictive power of these measures. They find that the attitudes in fact differ across domains but that these attitudes correlate with each other providing evidence for an underlying general risk attitude. Investigating the predictive powers of the different measures, Dohmen *et al.* (2011) conclude that the general measure is able to predict behavior across domains, however, within each domain the respective domain-specific measure predicts the behavior best. Consequently, a growing number of studies focus their analyses on domain-specific risk attitudes (see e.g. Hanoch *et al.*, 2006; van der Pol and Ruggeri, 2008; Barseghyan *et al.*, 2011; Budria *et al.*, 2013).

The distributions of occupation-related and general risk affinity are shown in Figure A.1. The means of the two risk affinity measures are significantly different; people perceive themselves to be more risk-averse with respect to their occupations than in general.[10] The estimated effects of general risk affinity on training are reported in column (7) of Table 1. General risk affinity is unrelated to participation in either specific training or training overall, while a one SD increase in general risk affinity is associated with a 0.7 p.p. increase in general training. Thus, our main conclusions are unaffected by the measure of risk affinity we employ. At the same time, general risk affinity has an effect size that is less than half that associated with occupation-related risk affinity indicating that investment choices are likely to be better understood through the lens of context-specific rather than general risk measures.

5 Investment Returns vs. Insurance Benefits

Risk preferences influence training investment decisions in part because the returns to training are uncertain. At the same time, risk preferences also determine the extent to which

[10] A t-test on mean equality shows that the means of the occupation-related and the general risk affinity are significantly different from each other (p-value=0.000). Further, based on the Kolmogorov-Smirnov test we must reject the null-hypothesis that these two variables follow the same distribution (p-value=0.000).

workers value the insurance against future income shocks that training might provide. The former leads us to expect a positive relationship between risk affinity and training; the latter leads us to expect the opposite (Section 2). Our empirical results indicate that, across our sample as a whole, the uncertainty around the returns to training is a more important driver of people's training decisions than is the potential insurance that training might provide (see Table 1).

In what follows, we expand on this key result by conducting a series of ancillary analyses designed to disentangle the two potential mechanisms – risky returns and insurance benefits – that underpin the relationship between risk attitudes and training investments. Our strategy will be to make more detailed comparisons of training in sub-sectors of the labor market in which it is reasonable to argue that one mechanism is likely to dominate the other.[11] Specifically, we differentiate between workers: i) facing high vs. low wage variability; ii) with permanent vs. temporary contracts; and iii) with and without recent unemployment experience.

In particular, wage variability is linked to the investment risks associated with training. In labor market sectors with limited wage variance, the variability in training returns – and hence the risks – will also be low. Investment risks will be higher in sectors with less predictable and highly variable wages. Thus, everything else equal, we expect the positive relationship between risk affinity and training to be stronger in the latter case than in the former. We investigate this proposition by re-estimating our model of training participation separately for workers employed in high vs. low wage variance industries.[12] Results are presented in columns (2) and (3) of Table 2 and we find that, in high-variance industries, occupation-related risk affinity is associated with a significant increase in the chances that workers undertake any (2.9 p.p.) or general training (2.8 p.p). In contrast, there is no relationship between risk affinity and training in industries with low wage variance.

[11] Descriptive statistics for the sub-groups can be found in Appendix Table A.5.

[12] This distinction is based on the gross hourly wages of all SOEP respondents employed in 2000–2008. Industry-specific mean wages and wage variances are presented in Appendix Table A.6 We define industries to have a "high wage variance" (highlighted in bold) when the wage variance exceeds the median variance (80.3); "low wage variance" sectors have wage variances less than the median wage variance.

Table 2: Potential Mechanisms: Logit Estimation Results: Training Participation on Occupation-Related Risk Affinity (Marginal Effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Wage Variance		Contract Type		Unemployed in the last three years	
		Low	High	Permanent	Non-Perm.	No	Yes
A. Training							
Occupation-Related Risk Affinity (std.)	0.022***	0.005	0.029***	0.022***	0.008	0.023***	0.003
	(0.005)	(0.007)	(0.006)	(0.005)	(0.012)	(0.005)	(0.012)
Participation Rate	25.93	16.61	30.29	26.80	19.78	26.96	16.73
Effect in %	8.48	3.01	9.57	8.21	4.04	8.53	1.79
B. General Training							
Occupation-Related Risk Affinity (std.)	0.022***	0.007	0.028***	0.023***	0.010	0.023***	0.007
	(0.004)	(0.006)	(0.005)	(0.005)	(0.010)	(0.004)	(0.010)
Participation Rate	17.31	10.80	20.32	17.86	13.44	17.85	12.32
Effect in %	12.71	6.48	13.78	12.88	7.44	12.89	5.68
C. Specific Training							
Occupation-Related Risk Affinity (std.)	0.003	0.000	0.005	0.002	0.006	0.003	0.003
	(0.003)	(0.005)	(0.004)	(0.004)	(0.008)	(0.004)	(0.009)
Participation Rate	10.37	6.73	12.10	10.68	8.18	10.96	5.41
Effect in %	2.89	0.00	4.13	1.87	7.33	2.74	5.55
Controls	✓	✓	✓	✓	✓	✓	✓
Observations	9,596	2,944	6,569	8,398	1,198	8,589	998

Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.
Notes: Standard errors are in parentheses and clustered on person-level. * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.
(1) Main results from column (1) in Table 1.
(2/3) We define industries to have a "high (low) wage variance" when the wage variance exceeds (is below) the median wage variance (80.3).

We also consider how the employment relationship itself shapes the relationship between attitudes and training investments. Specifically, while the vast majority (87 percent) of workers in our sample have a permanent employment contract; many workers (13 percent) have a non-permanent contract. Workers in temporary jobs are likely to place a larger value on the potential insurance benefits of training. In this case, the insurance benefits of training will be at odds with the costs associated with uncertain training returns. This leads us to expect that – on balance – there will be a weaker relationship between risk affinity and training for temporary workers than there is for permanent workers who place less weight on training's insurance benefits.

Estimating our model separately for permanent and temporary workers confirms this intuition. A one SD increase in risk affinity leads to a 2.2 p.p. (8.2 percent) increase in the chance that workers with permanent contracts undertake any training (see column 4). As before, this is driven solely by their participation in general rather than specific training.

In contrast, there is no relationship between the risk attitudes and the training decisions of workers in temporary employment situations. This is consistent with their risk preferences having two opposing effects; risk affinity reduces the utility costs associated with uncertain investment returns, but reduces the utility benefits from the insurance training provides. For permanent workers who need less insurance against job loss, risk affinity primarily operates by reducing the utility cost of the uncertainty around training returns.

Finally, we consider how the relationship between risk preferences and training varies by whether or not workers have been unemployed in the past three years. Our motivation for this distinction is two-fold. First, workers with recent unemployment experience are most likely entitled to fewer unemployment benefits than are workers continuously employed.[13] Second, previous unemployment is a strong predictor for future unemployment. For both reasons, we expect that the insurance motive for training will be stronger for workers who have been unemployed in the previous three years. Like temporary workers, those recently unemployed experience two opposing influences; risk affinity reduces both the costs of uncertain training returns and the benefits of any insurance training provides. Consequently, we expect the relationship between risk preferences and training outcomes to be weaker for them than for their continuously employed co-workers who have greater access to the public unemployment insurance system.

We re-estimate our results separately by workers' unemployment histories and present the results in columns (6) and (7) of Table 2. As expected, risk affinity is positively associated with the chances that continuously employed workers participate in any work-related training. This effect on overall training is driven solely by the relationship between risk preferences and general training. Each one SD increase in risk affinity is linked to a 12.9 percent (2.3 ppt.) increase in the likelihood that a continuously employed worker undertakes general training. In contrast, risk affinity has no significant effect on the chances that recently unemployed workers participate in training.[14]

Taken together, our results indicate that the strength of the relationship between risk preferences and general training varies in ways that are consistent with the relative weight

[13] In our study period, the length of unemployment benefit entitlement depends on the months worked in the last 5/7 years and age. For example, a 35-year old who had worked 12 (24) months in the last seven years was entitled to 6 (12) months of unemployment benefits in 2003/2004. This period rose proportionally to the number of months in employment (and had several age discontinuities). Once a claim was made, it could only be renewed with new employment spells. The system was changed during the *Hartz* reforms in 2005, but the mentioned principle remained in place (see Caliendo and Hogenacker, 2012, for a short summary).

[14] Our estimates, available upon request, are very similar if we consider recent unemployment in either the previous year only or over the previous two years.

that workers are likely to place on the costs of uncertain investment returns and the insurance benefits of training. Uncertainty costs are largely ubiquitous; the insurance benefits of training, however, are likely to be concentrated among workers with uncertain employment relationships or more limited access to public insurance schemes. This tends to dampen the influence that risk affinity has in promoting their training investments. Importantly, to the extent that there is a significant relationship between risk affinity and training, this is driven entirely by general training. There is no evidence in any of the labor market sectors we consider that risk preferences are significantly related to investments in specific training.

6 Conclusions

Work-related training has become an imperative for many workers at the coalface of structural labor market change. Their investment decisions hinge not only on their tolerance for risk, but also on the way that uncertainty shapes their investment returns. Uncertainty about future payoffs no doubt increases risk. Like other types of human capital, however, training also has the potential to insure people against future job loss, reducing uncertainty and decreasing risk. A better understanding of the way that workers negotiate these trade-offs is instrumental in meeting strategic objectives to expand the take-up of work-related education and training (see OECD, 1996; European Commission, 2007).

We address these issues by analyzing the role that risk preferences have in workers' decisions to invest in work-related training. This is an important extension of the previous literature that considers the role of risk solely in the context of investments in education. Our conceptual framework is novel in two regards. First, it differentiates between the competing investment and insurance mechanisms underpinning training investment decisions. To the extent that investment risks dominate, we expect risk-averse workers to undertake less training. Risk-averse workers are expected to undertake more training whenever the predominate role of training is in insuring them against future income losses. Second, we distinguish between general training that is transferable to other employment contexts and specific training that is not. Skill transferability has a fundamental role in the allocation of investment costs and returns (see Becker, 1962). This leads us to expect that risk preferences will be less important in decisions about specific rather than general training since the returns to specific training largely accrue to firms rather than to workers.

Thus, in the end, the relationship between risk preferences and training investments is

an empirical question which we put to the data. Our estimates indicate that there is a positive association between risk affinity and training participation which is extremely robust to sample selection, variable definition, and model specification. This implies that, across the labor market as a whole, the uncertainty surrounding the return to training is more important in people's training decisions than are any insurance benefits that training might provide. Any insurance benefits of training appear to be concentrated among workers with uncertain employment relationships or more limited access to public insurance schemes.

Our results lead us to several key conclusions. First, there is value in distinguishing between the utility costs associated with uncertain investment returns and the insurance benefits of training. Doing so allows us to begin to identify when workers' risk affinity will lead to increased work-related training and when training investments are likely to be prompted by workers' risk aversion. A willingness to take risks is more likely to drive training decisions when workers' are unsure about either their own ability to benefit from training or the quality and enduring value of training itself, for example. In contrast, risk aversion is more relevant in underpinning the training investments of workers who value the employment insurance they cannot access through on-going employment relationships or the social safety net. Future research which extends our results for the German labor market to other employment contexts would be particularly valuable in shedding light on these issues.

Second, skill transferability ultimately drives the allocation of training costs and benefits, and by extension, the extent to which workers have a vested interest in the investment decisions being made. Risk preferences matter more for general training because workers are more likely to both pay the costs and receive the benefits of training that is transferable to other contexts. Importantly, these insights about workers' differential responsiveness to investments in general vs. specific training extend beyond their risk preferences to their perceptions of control (Caliendo *et al.*, 2020). Our belief is that other key economic preferences (e.g. impatience, time consistency), personality traits, and cognitive biases may also have a more important influence on investments in general as opposed to specific work-related training. Research investigating this supposition would be extremely useful in advancing our conceptual understanding of work-related education and training.

Finally, we conclude that risk preferences matter for training investments. In one sense, this is hardly surprising given the extensive evidence that people's willingness to take risks underpins not only the human capital investments they make, but also has consequences

for their labor market and health outcomes, addictive behavior, financial decisions, and migration choices (e.g., Shaw, 1996; see Schildberg-Hörisch, 2018, for a review). Despite this, the previous literature is silent about the role of risk preferences in work-related training investments. We are the first to investigate this issue. The insights we have gained are particularly apparent when we consider stated preferences for occupation-related risk. Although our substantive conclusions are unaffected, stated preferences for risk in general have an effect size that is less than half that associated with occupation-related risk affinity. This points to the benefits of context-specific rather than general measures of risk affinity in understanding how workers respond to uncertainty in the labor market.

Despite these insights, at least two key issues remain unaddressed. The first is that the nature of risk almost certainly differs between general and specific training. Our data prevent us from investigating this issue directly. Yet, the insurance value of training, for example, quite naturally depends on the nature of that training. Training which is specific to a particular firm or occupation is unlikely to provide much insurance against employment loss following widespread labor market down turns. This implies that the particular investment risk–insurance benefit trade-off that workers face when making training decisions is dependent on the degree of skill transferability. Developing an understanding of the differences in the risks associated with general and specific training – and the consequences of those differences for training decisions – awaits future examination of contexts in which the returns risks and insurance benefits of training not only vary, but also can be identified.

The second issue is whether attitudes towards risk can shed light on the apparent underinvestment in training among certain groups of workers. Researchers often find, for example, that female, less-skilled, and older workers tend to receive less training than their otherwise similar co-workers (Mitsakis, 2019; Oosterbeek, 1996; Leuven and Oosterbeek, 1999). Risk preferences can also differ across labor market groups. Women, for example, seem to make safer, less risk-averse choices (see e.g. Hersch, 1996; Jianakoplos and Bernasek, 1998; Halek and Eisenhauer, 2001; Eckel and Grossman, 2008), while demographic evidence on risk attitudes indicates that people also become more risk-averse as they grow older (see e.g. Halek and Eisenhauer, 2001; Dohmen *et al.*, 2011). Whether or not these disparities in risk affinity are linked to the differential training investments observed in the literature is an open question.

Future research which addressed these, and other, important related issues would be valuable in developing policy levers targeting work-related training. Understanding the

tension between the uncertain returns and insurance mechanisms inherent in training investments, for example, might open the door for policy interventions in which the private risks of training are publicly insured. However future training policy unfolds, it is crucial that policymakers are mindful of the way that skill transferability mediates the training risks that workers face. The sources of underlying risk fundamentally depend on the nature of the training workers undertake and the share of the training returns they receive.

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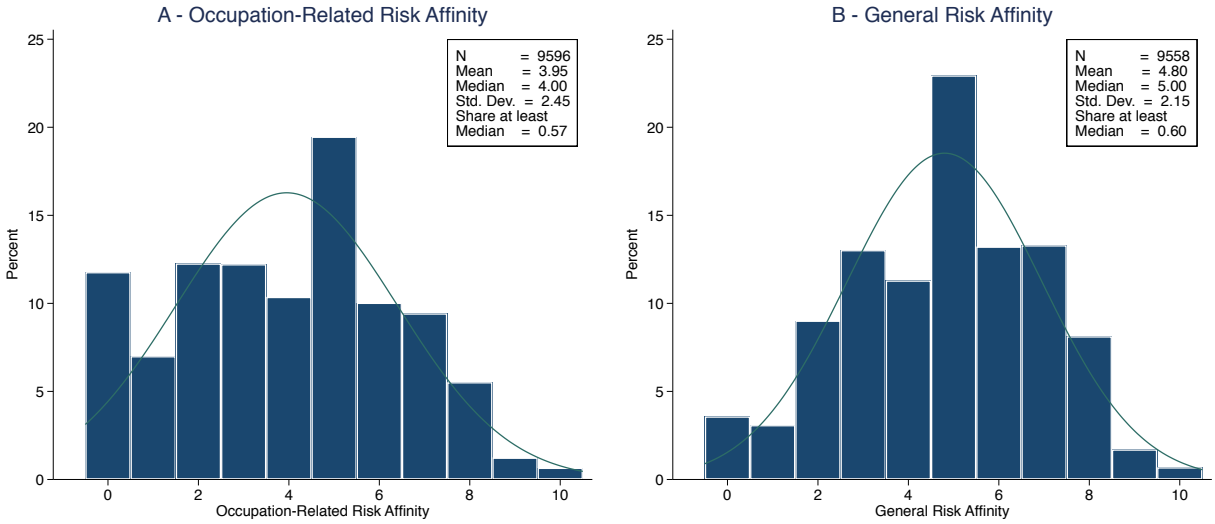
A Supplementary Tables and Figures

Figure A.1: Distribution of Occupation-Related Risk Affinity and General Risk Affinity



Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.

Notes: Figure A shows the distribution of the occupation-related risk affinity for the years 2004 and 2008. Occupation-related risk affinity is available in 2004 and is imputed to 2008. Figure B shows the distribution of the general risk affinity. It is available in 2004 and 2006 and is imputed from 2006 to 2008.

Table A.1: Descriptives Course Characteristics

	(1) General Training	(2) Specific Training
A. Transferability of Skills		
To what extent could you use the newly acquired skills if you got a new job in a different company?[a]		
Not at all	0.00	0.27
Limited	0.00	0.73
To a large extent	0.56	0.00
Completely	0.44	0.00
B. Further Course Characteristics		
Total course duration (weeks)[b]	4.07	1.63***
Hours of instruction every week	16.26	15.18*
Correspondence course	0.03	0.04
What was the purpose of this instruction?		
Retraining for a different profession or job	0.01	0.00*
Introduction to a new job	0.04	0.05*
Qualification for professional advancement	0.24	0.14***
Adjustment to new demands in current job	0.75	0.78*
Other	0.11	0.13
Did the course take place during working hours?		
During working time	0.66	0.76***
Some of both	0.12	0.10
Outside working time	0.21	0.13***
Did you receive a participation certificate?	0.80	0.65***
Who held the course?		
Employer	0.44	0.63***
Private institute	0.18	0.10***
Did you receive financial support from your employer?		
Yes, from the employer	0.72	0.75
Yes, from another source	0.01	0.00*
Dummy for no own costs	0.84	0.90***
Own costs	682.05	262.31***
Looking back, was this further education worth it for you professionally?		
Very much	0.42	0.18***
A little	0.38	0.53***
Not at all	0.08	0.19***
Do not know yet	0.11	0.10
Observations[a]	1,493	827

Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.
Notes: * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.
[a] The numbers of observations of the presented survey questions vary slightly due to item non-response. The 168 individuals who participated in both general and specific training within one cross-section have been excluded from the descriptives. In case individuals participated in more than one course (of the same type) within one cross-section, we took the information available of the most recent course.
[b] Own calculation, based on information of the length (days, weeks, months) of each course.

Table A.2: Summary Statistics of Explanatory Variables

	(1) No Training	(2) General Training	(3) Specific Training
Observations[a]	7,108	1,493	827
Share of estimation sample[a]	0.74	0.16	0.09
Occupation-Related Risk Affinity[b]	3.79	4.55***	4.12***
Socio-Economic Variables			
Age[b]	43.15	42.06***	43.98**
Female	0.50	0.47	0.45**
Married	0.70	0.67**	0.71
Number of Children[b]	0.64	0.67	0.59
Disabled	0.07	0.05**	0.06
Migration Background			
No Migration Background	0.82	0.90***	0.92***
Direct Migration Background	0.14	0.06***	0.06***
Indirect Migration Background	0.04	0.03	0.02***
Owner of House or Dwelling	0.54	0.59***	0.61***
Highest Educational Degree			
No, Other Degree, Hauptschule	0.37	0.16***	0.16***
Realschule	0.34	0.31*	0.36
Abitur or Fachhochschule	0.09	0.13***	0.08
University or College	0.20	0.40***	0.40***
Vocational Training			
No Vocational Training	0.20	0.21	0.17**
Apprenticeship	0.53	0.41***	0.43***
Vocational School	0.27	0.37***	0.40***
Work Experience (FT + PT) (in Years)[b]	20.36	19.12***	21.24**
Unemployment Experience (in Years)[b]	0.74	0.43***	0.35***
Real Net HH Income Last Month of 2 Years Ago (in 1000 €)[b]	3.06	3.39***	3.34***
Regional Information			
Region			
West Germany	0.33	0.34	0.32
East Germany	0.26	0.27	0.32***
South Germany	0.28	0.25**	0.23***
North Germany	0.11	0.11	0.11
City States	0.05	0.07***	0.06
Unemployment Rate in Region[b]	9.34	9.23	9.72**
GDP in 1,000 € in Region[b]	28.88	29.76***	28.47
Job-Specific Characteristics			
Employment Status			
Full-Time	0.71	0.79***	0.80***
Part-Time	0.22	0.19**	0.19*
Other	0.07	0.02***	0.01***
Occupational Position			
White-collar Worker	0.55	0.74***	0.66***
Blue-collar Worker	0.40	0.13***	0.16***
Civil Servant	0.05	0.12***	0.18***
Contract Type			
Permanent	0.86	0.91***	0.91***
Temporary	0.07	0.06	0.04***
Other	0.07	0.03***	0.05**
Tenure (in years)[b]	11.49	11.83	14.60***
Member Trade Union	0.17	0.20**	0.25***
Member Trade Association	0.06	0.13***	0.11***
ISCO88			
Managers	0.05	0.09***	0.06
Professionals	0.13	0.29***	0.27***
Technicians and Associate Professionals	0.22	0.30***	0.32***
Clerical Support Workers	0.13	0.10***	0.12

(Table continues on the next page)

Table A.2: Summary Statistics of Explanatory Variables (Continued)

	(1)	(2)	(3)
Service and Sales Workers	0.11	0.08***	0.08***
Skilled Agricultural, Forestry and Fishery Workers	0.01	0.00	0.00
Craft and Related Trades Workers	0.15	0.09***	0.09***
Plant and Machine Operators, and Assemblers	0.10	0.03***	0.03***
Menial Jobs	0.09	0.01***	0.02***
Firm-Specific Characteristics			
Firm Size			
Small	0.57	0.48***	0.36***
Medium	0.21	0.24**	0.26***
Large	0.21	0.28***	0.37***
NACE Industry			
Manufacturing	0.12	0.13	0.10
Agriculture	0.01	0.01	0.01
Mining, Quarrying, Energy, Water	0.01	0.02	0.03***
Chemicals, Pulp, Paper	0.07	0.05***	0.05*
Construction	0.07	0.04***	0.03***
Iron, Steel	0.06	0.03***	0.04**
Textile, Apparel	0.01	0.00***	0.00***
Wholesale, Retail	0.14	0.08***	0.07***
Transportation, Communication	0.06	0.04***	0.06
Public Service	0.27	0.44***	0.46***
Financials, Private Services	0.13	0.14	0.12
Other	0.05	0.03**	0.03*
Personality Characterstics			
Big Five Factor Openness[b]	4.44	4.68***	4.58***
Big Five Factor Conscientiousness[b]	6.04	6.03	5.94***
Big Five Factor Extraversion[b]	4.83	4.98***	4.83
Big Five Factor Agreeableness[b]	5.43	5.43	5.31***
Big Five Factor Neuroticism[b]	3.92	3.76***	3.85*
Locus of Control[c,b]	4.38	4.57***	4.42*

Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.

* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$

Notes: Table shows mean values of explanatory variables by training status. Result of mean comparison tests are indicated by asterisks. The test compared non-training participants to specific and general training participants. The summary statistics in columns (2) and (3) refer to those people who exclusively participate in general or specific training.

[a] The number of non-training, general, and specific training participants does not add up to the estimation sample size as 168 people participate in both general and specific training within one cross-section which are excluded from the descriptives.

[b] Denotes continuous variable.

[c] The locus of control index in the descriptives table is the average sum over all internal and reversed external items.

Table A.3: Logit Estimation Results: Training Participation on Occupation-Related Risk Affinity (Marginal Effects) (Dummy)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Main Specification	**Robustness**					
		Potential Endogeneity		Alternative Training Definition			Risk Measure
		Exogenous Controls	Year 2008	Training Worth It	Transferable vs. Not	Completely vs. Not	General Risk Affinity
A. Training							
Occupation-Related Risk Seeking (Dummy)	0.033***	0.049***	0.028**	0.030***	0.033***	0.018**	
	(0.010)	(0.010)	(0.012)	(0.009)	(0.010)	(0.007)	
General Risk Seeking (Dummy)							0.001
							(0.009)
Participation Rate	25.93	25.93	27.91	23.64	25.93	10.32	25.94
Effect in %	12.73	18.90	10.03	12.69	12.73	17.44	0.39
B. General Training							
Occupation-Related Risk Seeking (Dummy)	0.034***	0.046***	0.037***	0.033***	0.032***	0.014**	
	(0.008)	(0.009)	(0.011)	(0.008)	(0.009)	(0.007)	
General Risk Seeking (Dummy)							0.010
							(0.008)
Participation Rate	17.31	17.31	18.89	16.45	23.77	7.71	17.29
Effect in %	19.64	26.57	19.59	20.06	13.46	18.16	5.78
C. Specific Training							
Occupation-Related Risk Seeking (Dummy)	0.007	0.012*	-0.001	0.004	0.003	0.003	
	(0.007)	(0.007)	(0.009)	(0.006)	(0.004)	(0.004)	
General Risk Seeking (Dummy)							-0.007
							(0.007)
Participation Rate	10.37	10.37	11.05	8.84	2.96	2.71	10.39
Effect in %	6.75	11.57	-0.90	4.52	10.14	11.07	-6.74
Controls	✓	✓	✓	✓	✓	✓	✓
Observations	9,596	9,596	5,790	9,308	9,596	7,926	9,558

Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.
Notes: Standard errors are in parentheses and clustered on person-level. * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.
(1) Full specification.
(2) Excluding potentially endogenous variables (highest educational degree, occupational position, ISCO88, NACE).
The remaining job and firm control variables are: employment status, contract type, tenure, member trade union/association, firm size.
(3) Only year 2008 with occupation-related risk affinity (std.) measured in 2004.
(4) Excluding those who say 'training not worth it'.
(5) Changing definition of general and specific training (general=completely, to a large extent, only to a limited extent; specific = not at all).
(6) Changing definition of general and specific training (general=completely; specific = not at all).
(7) General risk affinity (std.) measured in 2004 and 2006.

Table A.4: Logit Estimation Results: Participation in Training, General Training, Specific Training

	(1) Training	(2) General Training	(3) Specific Training
Occupation-Related Risk Affinity (std.)	0.022***	0.022***	0.003
	(0.005)	(0.004)	(0.003)
Age	-0.002*	-0.003***	0.001
	(0.001)	(0.001)	(0.001)
Female	-0.009	-0.000	-0.006
	(0.011)	(0.010)	(0.008)
Married	0.000	-0.006	0.003
	(0.011)	(0.009)	(0.008)
Number of Children	0.006	0.008*	0.001
	(0.006)	(0.005)	(0.004)
Disabled	-0.008	-0.005	-0.010
	(0.019)	(0.018)	(0.014)
Migration Background (Ref.: None)			
Direct Migration Background	-0.045**	-0.038**	-0.018
	(0.018)	(0.016)	(0.015)
Indirect Migration Background	-0.035	-0.007	-0.028
	(0.026)	(0.022)	(0.021)
Owner of House or Dwelling	0.014	0.010	-0.000
	(0.010)	(0.009)	(0.007)
Highest School Degree (Ref.: No, Other Degree, Hauptschule)			
Realschule	0.052***	0.027**	0.036***
	(0.014)	(0.013)	(0.011)
Abitur or Fachhochschule	0.040**	0.041***	0.006
	(0.019)	(0.016)	(0.015)
University or College	0.107***	0.059***	0.058***
	(0.018)	(0.016)	(0.013)
Vocational Education (Ref.: None)			
Apprenticeship	0.066***	0.033***	0.048***
	(0.014)	(0.012)	(0.010)
Vocational School	0.095***	0.051***	0.053***
	(0.014)	(0.012)	(0.010)
Work Experience (FT + PT) (in Years)	-0.000	0.001	-0.001
	(0.001)	(0.001)	(0.001)
Unemployment Experience (in Years)	-0.006	0.000	-0.007**
	(0.004)	(0.004)	(0.003)
Real Net HH Income Last Month of 2 Years Ago (in 1000 €)	-0.007**	-0.002	-0.004*
	(0.003)	(0.003)	(0.002)
Region (Ref.: West Germany)			
East Germany	0.023	0.008	0.019
	(0.021)	(0.018)	(0.015)
South Germany	-0.034**	-0.025**	-0.016
	(0.014)	(0.012)	(0.010)
North Germany	-0.003	0.002	-0.002
	(0.016)	(0.014)	(0.011)
City States	0.020	0.027	-0.008
	(0.021)	(0.019)	(0.015)
Unemployment Rate in Region	-0.005**	-0.004*	-0.002
	(0.003)	(0.002)	(0.002)
GDP in 1,000 € in Region	0.000	0.001	-0.000
	(0.001)	(0.001)	(0.001)
Dummy for year 2008	0.022**	0.019**	0.006
	(0.011)	(0.010)	(0.008)
Employment Status (Ref.: Other)			
Full-Time	0.127***	0.083***	0.081***
	(0.030)	(0.027)	(0.028)

(Table continues on the next page)

Table A.4: Logit Estimation Results: Participation in Training, General Training, Specific Training (Continued)

	(1)	(2)	(3)
Part-Time	0.100***	0.062**	0.075***
	(0.030)	(0.026)	(0.028)
Occupational Position (Ref.: Civil Servant)			
White-collar Worker	-0.043**	-0.000	-0.030***
	(0.018)	(0.015)	(0.012)
Blue-collar Worker	-0.166***	-0.108***	-0.070***
	(0.025)	(0.022)	(0.017)
Contract Type (Ref.: Permanent)			
Temporary	-0.052***	-0.032*	-0.019
	(0.019)	(0.016)	(0.015)
Other	-0.065***	-0.053***	-0.011
	(0.023)	(0.020)	(0.015)
Tenure (in Years)	0.000	-0.000	0.001**
	(0.001)	(0.001)	(0.000)
Member Trade Union	0.034***	0.021**	0.009
	(0.012)	(0.010)	(0.008)
Member Trade Association	0.044***	0.044***	0.004
	(0.015)	(0.013)	(0.011)
ISCO88 (Ref.: Menial Jobs)			
Managers	0.198***	0.181***	0.057**
	(0.034)	(0.033)	(0.025)
Professionals	0.200***	0.178***	0.074***
	(0.031)	(0.032)	(0.023)
Technicians and Associate Professionals	0.171***	0.145***	0.067***
	(0.030)	(0.031)	(0.022)
Clerical Support Workers	0.124***	0.105***	0.057**
	(0.031)	(0.032)	(0.023)
Service and Sales Workers	0.162***	0.138***	0.059**
	(0.031)	(0.032)	(0.023)
Skilled Agricultural, Forestry and Fishery Workers	0.125	0.125	0.025
	(0.083)	(0.077)	(0.066)
Craft and Related Trades Workers	0.183***	0.168***	0.065***
	(0.031)	(0.032)	(0.022)
Plant and Machine Operators, and Assemblers	0.073**	0.080**	0.007
	(0.035)	(0.036)	(0.026)
Firm Size (Ref.: Large)			
Small	-0.069***	-0.021**	-0.062***
	(0.011)	(0.010)	(0.008)
Medium	-0.025**	-0.008	-0.024***
	(0.012)	(0.011)	(0.008)
NACE Industry (Ref.: Other)			
Manufacturing	0.051**	0.049**	0.012
	(0.025)	(0.022)	(0.019)
Agriculture	0.100*	0.025	0.087*
	(0.060)	(0.049)	(0.046)
Mining, Quarring, Energy, Water	0.077*	0.036	0.060**
	(0.040)	(0.037)	(0.026)
Chemicals, Pulp, Paper	0.009	-0.000	0.010
	(0.029)	(0.026)	(0.022)
Construction	-0.008	0.000	-0.016
	(0.031)	(0.028)	(0.025)
Iron, Steel	-0.005	-0.010	0.011
	(0.031)	(0.028)	(0.023)
Textile, Apparel	-0.312**	-0.184*	
	(0.122)	(0.097)	
Wholesale, Retail	-0.045*	-0.033	-0.017
	(0.026)	(0.024)	(0.020)

(Table continues on the next page)

Table A.4: Logit Estimation Results: Participation in Training, General Training, Specific Training (Continued)

	(1)	(2)	(3)
Transportation, Communication	0.019	0.000	0.025
	(0.030)	(0.027)	(0.021)
Public Service	0.068***	0.046**	0.033*
	(0.022)	(0.020)	(0.017)
Financials, Private Services	0.041*	0.027	0.017
	(0.024)	(0.022)	(0.018)
Big Five Factor Openness	0.010**	0.006	0.002
	(0.004)	(0.004)	(0.003)
Big Five Factor Conscientiousness	-0.001	0.005	-0.007*
	(0.006)	(0.005)	(0.004)
Big Five Factor Extraversion	0.002	0.005	-0.002
	(0.005)	(0.004)	(0.003)
Big Five Factor Agreeableness	-0.002	0.004	-0.006
	(0.005)	(0.005)	(0.004)
Big Five Factor Neuroticism	0.000	0.001	-0.002
	(0.004)	(0.004)	(0.003)
Locus of Control (std.)	0.015***	0.019***	-0.000
	(0.005)	(0.004)	(0.003)
Observations	9,596	9,596	9,596
$\overline{R^2}$	0.133	0.112	0.097

Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.

Notes: Standard errors are in parentheses and clustered on person-level. Dependent variable indicated in column header. * $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.

Table A.5: Descriptives Risk Attitude and Training by Subgroups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Baseline	Wage Variance		Contract Type		Unemployed in the last three years	
		Low	High	Permanent	Non-Perm.	No	Yes
Risk Attitudes							
Occupation-Related Risk Affinity							
Mean	3.95	3.97	3.94	3.95	3.99	3.90	4.41***
Median	4.00	4.00	4.00	4.00	4.00	4.00	5.00
Share $\geq$ Median	0.57	0.57	0.57	0.56	0.59	0.56	0.65***
General Risk Affinity	4.80	4.91	4.75***	4.79	4.84	4.76	5.11***
Training							
Any Training	0.26	0.17	0.30***	0.27	0.20***	0.27	0.17***
General Training	0.17	0.11	0.20***	0.18	0.13***	0.18	0.12***
Specific Training	0.10	0.07	0.12***	0.11	0.08***	0.11	0.05***
Observations	9,596	2,944	6,569	8,398	1,198	8,589	998

Source: Socio-Economic Panel (SOEP), data for years 2004, 2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.
Notes: The number of observations for the presented general risk affinity vary slightly due to item non-response. Results of mean comparison tests are indicated by asterisks (except for the median occupation-related risk affinity).
* $p \leq 0.1$, ** $p \leq 0.05$, *** $p \leq 0.01$.
(2/3) We define industries to have a "high (low) wage variance" when the wage variance exceeds (is below) the median wage variance (80.3).

Table A.6: Descriptives Hourly Wages based on 2000-2008

	(1) Observations	(2) Mean	(3) Variance	(4) Min	(5) Max
NACE Industry					
Manufacturing	9,171	17.45	**128.56**	0.48	673.25
Agriculture	846	10.78	69.67	0.24	184.57
Mining, Quarrying, Energy, Water	1,095	19.01	**84.52**	2.00	159.48
Chemicals, Pulp, Paper	4,327	17.18	**92.74**	0.70	178.94
Construction	4,885	13.62	43.48	0.91	176.83
Iron, Steel	4,001	15.87	48.60	0.98	150.36
Textile, Apparel	572	12.95	73.31	3.05	142.71
Wholesale, Retail	8,999	12.23	64.19	0.34	235.35
Transportation, Communication	4,081	14.85	76.01	1.45	110.75
Public Service	23,583	16.48	**143.49**	0.35	838.12
Financials, Private Services	9,046	15.90	**279.77**	0.33	1,165.75
Other	3,703	13.71	**165.34**	0.77	489.63

Source: Socio-Economic Panel (SOEP), data for years 2000-2008, version 35, SOEP, 2019, doi:10.5684/soep.v35, own calculations.
Notes: Variances greater than or equal to the median variance (80.3) are highlighted in bold. These sectors are categorized as "high wage variance" sectors.